# Does Analyst Coverage Encourage Firm Innovation? Evidence from Korea

**Woojin Kim[a] and Yoon Young Choy[b]**

**May 2020**

**Abstract**

This paper examines whether analyst coverage affects firm innovation in an economy dominated by family-controlled business groups. Using a sample of Korean publicly traded firms from 2010-2018, we find that an increase in financial analysts results in lower level of R&D. Especially, unlike in U.S., firms with more analyst coverage tend to cut investments in corporate venture capital. Moreover, the reduction in R&D is more pronounced when analysts are from other chaebol (family-controlled large business group) affiliated brokerages. These findings suggest that analyst coverage may function more as a "pressure" mechanism than "information" mechanism when information environment is less transparent.

Key words: corporate venture capital, financial analysts, innovation, acquisition, R&D

JEL code: G24, G34, O31

Woojin Kim: Professor of Finance, Seoul National University Business School, 1 Gwanak-Ro, Gwanak-gu, Seoul, 08826, Korea; email: woojinkim@snu.ac.kr, Tel: +82-2-880-5831

Yoon Young Choy: Seoul National University Business School, 1 Gwanak-Ro, Gwanak-gu, Seoul, 08826, Korea; email: yy.choy@snu.ac.kr, Tel: +82-10-9437-5401

## 1. Introduction

A growing body of the literature has highlighted the factors and outcomes of firm innovation. Recently, the literature has presented two conflicting views on analyst coverage and its effect on firms' innovation strategy. Specifically, He and Tian (2013) support the so-called "pressure effect (Guo et al., 2019)" of analyst coverage on managers to meet analysts' earnings forecasts, thereby inducing managers to cut long-term expenses related to innovation. On the other hand, Guo et al. (2019) find that the "information effect" is stronger, which makes opposite prediction that analyst coverage can mitigate managerial myopia and increase a CEO's incentive to innovate by reducing information asymmetry.

Motivated by this, this paper investigates whether the information and pressure effects of financial analysts on firm innovation persist in an emerging market where analysts may be subject to additional layers of agency problem. Our analyses focus on Korea, which is dominated by family –controlled business groups, often referred to as chaebols. (La porta et al., 1999; Kim et al., 2019). As most chaebols are conglomerates in that they run many lines of different businesses, some are engaged in stock brokerage business and as such have their own securities firms as member companies. This may induce business group-affiliated analysts to issue more optimistic estimates for member companies within the same group (Mantecon et al., 2012). The existence of group-affiliated analysts may either exacerbate the pressure effect by forcing managers to meet even higher earnings forecasts with a positive bias, or mitigate it by allowing managers to largely ignore non-arm's length forecasts. Chaebol structure itself may directly contribute to innovation in Korea by internalizing uncertainties in learning unknown technologies (Wang and Tsai, 2010).

In addition to the presence of chaebols, there are innovative Korean start-ups that grows into competitive giants over a short period of time. For instance, Naver was established with only seven engineers in 1998 and stands out as domestic premier portal space, clearly substituting Google or Yahoo in 2003. Therefore, investigating Korean market is relevant in the sense that it is one of the most up-to-date for innovative startups, rarely seen in other economies. Finally, Korean firms using IFRS can capitalize R&D, which is prohibited by U.S. GAAP. By gathering substantive R&D information for the capitalization, IFRS enriches the relevant information related to R&D transparency (Chen et al., 2017). As a result, the different accounting standard may affect the

informational role of analyst coverage. Overall, these market features may yield different consequences and the final outcome of firm innovation from developed markets, which we believe is worth an investigation.

Following Guo et al. (2019), we consider three different channels that the information and pressure effect take place differently: research and development (R&D hereafter) expenditures, acquisitions and corporate venture capital (CVC henceforth) investment. R&D and acquisitions have long been thought to be internal and external source of innovation, but few studies point out that CVC can add benefits not only to invested ventures but also to corporate investors (Dushnitsky and Lenox, 2006). Especially, since CVC is relatively rare in emerging market, the way in which CVC affects an investing firm's innovation performance is not as certain. At the same time, Korean market is vertically integrated as well as horizontally, so CVC is one of important channel to innovate since corporate investors are likely to be in a better position to provide complementary resources to investees, and the vertical relationship enables those investors to access greater information on valuable ventures, thereby obtaining innovative knowledge and products externally. Therefore, by referring to these conflicting perspectives, CVC investment in Korea provides us with an ideal setting to identify the relevant effect of CVC channel on innovation as well as long-term outcomes.

Additionally, we explore if the group-affiliated analysts' reports hold greater and more positive impact on the three investment channels than non-group affiliated counterparts, which has not received much academic attention. Prior literature mostly focuses on the level of bias in the group-affiliated analysts' forecasts and subsequent market reaction (Lim and Kim, 2019; Yoo and Park, 2016). However, studies on such biased coverage by group-affiliated analysts and its effect on managers' strategic adjustment are surprisingly rare, as shown in panel A of table 6. This paper aims at filling this gap by studying how the information and pressure effect of analyst coverage, including group-affiliated ones, vary across long-term corporate strategies, focusing on innovation.

Using publicly traded non-financial firms in Korean stock market between 2010 and 2018, we consider how the information and pressure effect of analyst coverage vary across CVC, R&D and acquisition. Firstly, our result is different from Guo et al. (2019) in that analyst coverage leads to negative CVC investment, supporting the pressure effect that the short-term earnings targets

estimated by analysts put pressure on managers, since investors can punish managers who miss the earnings forecasts. The reason is that CVC as an innovation vehicle has only recently entered emerging economies. Given that successful outcomes of venture capital investments are generally limited in these markets, companies may be careful to choose CVC investment as their innovation strategies (Rajamani and Velamuri, 2014). As a result, we argue that the pressure effect works as disciplinary actions to cut such uncertain investment as CVC in Korea.

Secondly, despite the aforementioned difference in accounting standard, we find that the pressure effect dominates in R&D effect as well, as in Guo et al. (2019). However, the pressure effect is short-term, since R&D cut enhances innovation output three years ahead. The reduction in CVC investment does not negatively affect the innovation output in the long-term.

Finally, analyst coverage increases acquisition partly supporting the information effect. That is, firms followed by more analysts acquire more innovative firms, measured by the number of patents of target firms acquired (Guo et al., 2019). However, our result differs from Guo et al. (2019) in that acquisition is indirectly affected from the pressure effect to substitute for the reduction in CVC set-ups. This is consistent to previous studies which argues that one of motives for CVC is to identify opportunistic acquisition candidates (Benson and Ziedonis, 2010). Overall, three results support the fact that the pressure effect dominates in Korean market, meaning that the analyst coverage act as a disciplinary tool to reallocate long-term expenses such as innovation. That is, the analyst effect on innovation is indirect, anchored on the pressure story of He and Tian (2013).

In order to alleviate the potential endogeneity problem, we employ an instrumental variable (IV hereafter) approach, based on the finding of Yu (2008) and Guo et al. (2019). Specifically, we impose the expected number of analyst coverage as our IV variable. The IV regressions generate consistent result with the main mentioned above, except that the reduction in CVC investment turns out to be insignificant. Overall, the endogeneity test supports a causal effect of analyst coverage on innovation, although it does not perfectly rule out endogeneity as a confounding factor.

Additionally, our main results are robust when we do subsample analyses: We split the sample according to the level of corporate governance, financial constraints, whether or not a firm

belongs to high-technology industries, and when a firm is followed by more group-affiliated analysts. Our main results are stronger for firms with bad corporate governance and firms followed by more group-affiliated analysts. Moreover, the reduction in CVC investment is significant for less-financially-constrained firms and for those in low-tech industries. In other words, to some extent, the information effect of analysts is significant for the external CVC investment of highly constrained firms and firms in the high-technology industries.

Here we emphasize that estimates from group-affiliated analysts yields higher reduction in R&D. This is due to the positive bias in group-affiliated estimates, which puts more pressure on managers to cut ineffective internal expenses, and re-allocate their resources to external innovation channel such as productive innovation. Overall, our sub-sample analysis implies that the pressure effect of analyst coverage dominates in Korea, anchoring He and Tian (2013).

We also do additional analyses to check whether the increased investment in acquisition is due to a direct effect of analyst coverage or an indirect effect of firms to compensate for the reduction in CVC and R&D investment. We find a positive direct effect of analyst coverage on R&D expenditure. However, the result from CVCs is relatively mixed in that both the direct and indirect effect of financial analysts on acquisition exist. That is, firms followed by more analysts have an additional incentive to make acquisitions since analysts increase information transparency related to firm innovation efforts. At the same time, firms make acquisition in order to compensate for the reduction in CVC investment. These results are consistent with previous findings of Benson and Ziedonis (2010), which states that the motive for CVCs is to identify acquisition opportunities, and this substitution effect between CVC and acquisition is stronger in Korean market.

Moreover, we also analyze the effect of analyst coverage on innovation output, taking three corporate innovation channels into account. When we include the differential effect of firms' innovation channels on the future patents as well as granted ones, the negative effect of R&D cut disappears or absorbed at some extent. In other words, cutting R&D expenses is harmful for future innovation, but it can be less harmful for firms covered by more analysts. Finally, when we apply the difference between actual EPS and EPS estimates instead of the number of analysts, we show that there is incentive to meet analysts' forecasts to cut R&D expenditure, but that it does not negatively affect firms' innovative output in the long-term. When we look into the decrease in

CVC setups, it implies that the pressure effect to cut CVCs is insignificant as well as its impact on long-term innovation outcomes.

Overall, the results above suggest that analyst coverage has the pressure effect, and that the effect is stronger in Korean market. Specifically, the analyst coverage reduces CVC investment and R&D expenditure, but it increases acquisition. Such results are stronger for firms with bad governance, lower financial constraints, from low-tech industries and firms followed by more group-affiliated analysts. The analyst coverage leads managers to decrease R&Ds and CVC investment, but the increase in acquisition is due to both direct information and indirect pressure effect, as suggested in previous studies. However, the disciplinary action of analyst coverage on cost re-allocation seems to works well in the long-term, since the forward number of patents is not negatively affected.

Our study contributes to studies on the relation between finance and firm innovation. Especially, this paper shows that higher uncertainties associated with CVC investment for emerging economies and different accounting standard may lead to different strategic adjustment from managers. Specifically, Korean firms may face higher uncertainties related to long-term outcomes from CVC investment, so the pressure effect dominates in CVC investment as well as R&Ds. Although the long-term output stemming from the pressure effect is insignificant, different innovation channels can absorb potential negative impact of analyst coverage, suggested by previous studies (He and Tian, 2013). Given that IFRS has been adopted in many jurisdictions, including the European Union, and that many emerging markets face the difficulty in CVC investment, our findings are not restricted to Korean market setting but rather a general phenomenon in emerging markets.

Our paper is organized as follows. Section 2 discusses prior research on analyst coverage and firm innovation. Section 3 describes the data and empirical strategy. Section 4 presents our empirical results. Section 5 concludes.

## 2. Literature review

Firstly, this paper contributes to the growing body literature on economic forces that affects innovation. Empirically, some papers show that public firms purchase more patents and

technology through acquisition (Teece, 2010; Seru, 2014). Acharya and Xu (2017) find that public firms under external financial dependence invest more on R&Ds and better patents outcome. Recently, academic attention has been paid to CVC as an important innovation channel through which established firms conduct external R&Ds (Gaba and Bhattacharaya, 2012). Focusing on the appropriation of innovation returns among companies within the same venture capital portfolios, González-Uribe (2020) shows that venture capital can influence innovation. Ma (2020) finds that firms have motivation to invest in CVCs in order to fix their innovation weaknesses. We add on this literature by relating analyst coverage to firm innovation strategies mentioned above.

This paper adds to a substantial body of research that studies the role of financial analysts. The recent paper by Lee and So (2017) shows that analyst coverage leads to changes in firm performance thereby reducing uncertainty over firm information. However, related studies cast doubt about such informational role of analyst, focusing on factors that create bias in analysts' forecast such as changes in the number of analysts covering an industry (Merkley et al., 2017). While most studies highlight the expected costs of the affiliation bias (Corwin et al., 2017), Lim and Kim (2019) show that long-term market returns can be more profitable when investors discount a positive bias in chaebol-affiliated analysts' recommendations. We contribute to the financial analyst literature by investigating the effects of analysts on firm innovation, as well as the potential consequences of positive bias existing in group-affiliated estimates using the unique feature of chaebol in Korea.

There are two explanations regarding how financial analyst affects firm investment. Derrien and Kecskes (2013) find that financial analysts increase capital expenditures due to the decrease in information asymmetry. However, other studies show that analyst distort investment out of the pressure effect on managers to beat short-term earnings targets (Benner and Ranganathan, 2012; He and Tian, 2013). The closest paper to ours is a recent paper by Guo et al. (2019). Guo et al. (2019) shows that the effect of analyst coverage varies across R&D, acquisition and CVC investment, thereby influencing the long-term outcomes from the relevant strategic decision. Our paper differs from their study in that we analyze the effect of financial analysts under the representative emerging market setting to see whether information transparency from R&D capitalization and group-affiliation affects firms' long-term strategies.

Finally, this paper also builds on the prior literature on managers' incentive for "short-termism". For instance, Kolasinski and Yang (2018) attribute managerial myopia to the subprime crisis, since CEOs with short-term incentives decide to take on riskier exposure to subprime mortgage-backed securities. Such managerial short-termism has been the suspect of distortions in firm innovation. Dechow and Slown (1991) find that managers tend to cut R&D investment by the end of their tenure, resulting in the decrease in the firm's reported earnings. This paper relates to these studies in that we connect the effect of analyst coverage and mangers' decisions to adjust their innovation strategy as well as the innovation outcome.

## 3. Data and Methodology

In this section, we describe our sample, variable construction and empirical strategy, mostly based on Guo et al. (2019).

### 3.1. Sample Selection

We use publicly traded Korean firms available on DataguidePro database from 2010 to 2018. Following Guo et al. (2019), we exclude financial and utility firms with KSIC codes of 64-66 and 35-36, respectively. The financial analyst information is also from DataguidePro. Since the analyst information under a brokerage in 2009 is limited, our sample period starts from 2010. We collect information on firm acquisition as in Cho and Kim (2019). Specifically, we identify control transfers maintained by Korea Investor's Network for Disclosure (KIND) database, and define acquisition as a control transfer from non-financial to another non-financial acquirers. To determine CVC investment data, we first obtain the fund names and the names of the parent companies, defined as the largest shareholder of the fund from the Disclosure Information of Venture Capital Analysis (DIVA hereafter) and Data Analysis, Retrieval and Transfer System (DART) database. Our sample period ends in 2018, since the periodic annual report from CVC funds is available until 2018. Then, we merge the CVC information to our sample of DataguidePro firms. As for institutional ownership, we use the list of major shareholders and their relevant equity ratio above five percent, obtained from the TS-2000 database. Finally, we manually collect the patent information from the WIPS ON database which offers the list of documentation of patents by individuals and firms. Since the information on patent citation is unavailable in Korea, we use granted patents from the WIPS ON instead. This leaves us the final sample of 18,351 firm-year

observations and 2,039 firms.

### 3.2. Variables

Based on Guo et al. (2019), our dependent variables are three innovation channels as well as innovation output. First, we compute two measures for CVC investment: *CVCSetup* is a dummy variable equal to one when a firm makes its first investment in CVC fund and zero before that. *CVCInv* is another dummy variable equal to one when a firm invests in CVC for a start-up and zero otherwise. The investment of CVC for start-up firms is available in DIVA database.

Secondly, we measure R&D investment using *RD change*, which is the difference between the ratio of R&D expenses to total assets at time t and t-1. Another measure of R&D is the dummy variable *RD cut*, which is defined to be one if firm's R&D expenses divided by total assets are lower in time t than in t-1, and zero otherwise. We replace missing observations with zero in R&D expenses, following Lewis and Tan (2016).

Thirdly, we measure acquisition based on two variables (Guo et al., 2019): *Acquisition* is dummy variable equal to one if a firm acquisition takes place in time t, and zero otherwise. We also use *lnAcquisition*, defined as the natural log of one plus the number of targets which a firm acquires. As for the degree of innovativeness of targets, we follow Guo et al. (2019) and compute the (natural log of) total number of patents (*lnTargPatent*) and granted ones(*lnTargGrant*) by target firms up to the year when a firm acquires the target. As for robustness tests to check if the long-term output gets affected by the decrease in innovation efforts, we also apply the (natural log of) annual number of both patents and granted ones by a firm in our sample, indicated as *lnPatents* and *lnGranted*, respectively.

Our key independent variable is the number of analysts, *lncoverage*, computed as the natural log of one plus the coverage. In order to get the coverage measure, we obtain the analyst coverage data of each brokerage from the DataguidePro, and get the arithmetic mean of a firm's earnings forecasts by financial analysts following each firm. As for robustness tests, we apply another measure of *EPSD*, defined as the difference between the actual EPS and analysts' EPS estimate (Guo et al., 2019).

Our control variables include firm size, R&D ratio, firm age, leverage, cash, the return on

equity (*ROE*), Tobin's Q, property, plant and equipment (*PPE*) ratio, capital expenditure, institutional ownership, Hirshman-Herfindahl Index (*HHI*) and squared HHI. For split sample analysis, we also apply corporate governance index (*CG index*), obtained from Korea Corporate Governance Service (KCGS) as well as Kaplan-Zingales index (*KZ index*) for financial constraint measure. ROE, Tobin's Q, R&D change and the KZ index are winsorized at the 1st and 99th percentiles. All variable definitions above are described in Appendix.

Table 1 provides summary statistics for our data. The average R&D ratio is 1.5% in our sample, and the average change in that ratio is about -0.003 percentage points. Moreover, the second measure for R&D investment, R&D cut, implies that 29.6% in the sample decide to cut their R&D expenses during the sample period. As for the acquisition measure, 1.1% of firms in the sample are taking acquisition deals in a given year, and 0.008 companies are acquired. For 897 firms that acquire targets, the average total number of patents of the target is 1.8, and that of granted patents are 1.8 as well. Surprisingly, the final measure for our innovation, which is CVC investment shows that 22.6% of firms set up CVC funds in a given year, and around 46% invest in start-ups. As for the innovation output, firms have on average 1 patents and 0.9 granted counterparts. In terms of coverage, firms on average are followed by 1.8 analysts per year on average. Regarding the EPSD measure show that the difference between actual EPS and the estimate are relatively large, which supports the validity of using *lncoverage* as our main independent variable to isolate the pressure and information effect.

[Table 1]

### 3.3. Methodology

Based on Guo et al. (2019), we use ordinary lease squares (OLS) to estimate how analyst coverage affects firm innovation. Later, we also apply two-stage least squares (2SLS) approach to address endogeneity problems which can be embedded in the OLS estimation. The base estimation using OLS is as follows:

$$Innovation_{(i,t+k)} = \alpha + \beta lnCoverage_{(i,t)} + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (1)$$

,where subindex i and t represent for firm and time throughout this paper, respectively. The dependent variables $Innovation_{(i,t+k)}$ stands for three different innovation measures: *RD*

*Change* and *RD Cut* for the R&D investment; *Acquisition* and *lnAcquisition* for firms' acquisition activities; *lnTargPatent* and *lnTargGrant* measure how innovative the target firms are; *CVC Setup* and *CVC inv* is for firms' CVC investment. The main independent measure is $lnCoverage_{(i,t)}$, which represents the number of analysts following a firm. The remaining control variables in $X_{(i,t)}$ are firm size, R&D ratio, firm age, leverage, cash, the return on equity (ROE), Tobin's Q, property, plant and equipment (PPE) ratio, capital expenditure, institutional ownership, KZ and corporate governance index, Hirshman-Herfindahl Index (HHI) and squared HHI, as described in previous section. $\delta_i$ and $\mu_t$ represent to firm and year fixed effects, respectively. The subindex k captures one and two to examine the effect of analyst coverage on firm innovation after one and two years.

In order to exploit the endogeneity concern, we apply IV and 2SLS approach, as in Yu (2008) and Guo et al. (2019). That is, we construct the IV and following 2SLS estimation as below:

$$ExpectedCoverage_{(i,t,j)} = \left(\frac{Brokersize_{(t,j)}}{Brokersize_{(0,j)}}\right) * Coverage_{(i,0,j)} \tag{2}$$

,where $ExpectedCoverage_{(i,t,j)}$ is the expected coverage of firm i in year t from brokerage j. $Brokersize_{(t,j)}$ and $Brokersize_{(0,j)}$ are the number of analysts working for broker j in year t and the benchmark year 0, respectively. The benchmark year is 2010, since it is the beginning period of our sample. $Coverage_{(i,0,j)}$ is the number of analysts following firm i in year 2010 working for brokerage j. $ExpectedCoverage_{(i,t,j)}$, therefore, is the expected number of analysts of brokerage j at time t with respect to the initial year 2010. Next, we sum up $ExpectedCoverage_{(i,t,j)}$ for all brokerage firms j to get the total expected number of analysts as below:

$$ExpectedCoverage_{(i,t)} = \sum_{j=1}^{n} ExpectedCoverage_{(i,t,j)} \tag{3}$$

,where we get the IV, $ExpectedCoverage_{(i,t)}$, which is the total expected number of analysts of firm i in year t. We use this IV to instrument $lnCoverage_{(i,t)}$ in equation (1) and apply the estimated $\widehat{lnCoverage}_{(i,t)}$ into the original estimation:

$$lnCoverage_{(i,t)} = \alpha + \beta ExpectedCoverage_{(i,t)} + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \tag{4}$$

$$Innovation_{(i,t+k)} = \alpha + \beta \widehat{lnCoverage}_{(i,t)} + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (5)$$

,where $\widehat{lnCoverage}_{(i,t)}$ is the instrumented $lnCoverage_{(i,t)}$ from the first stage regression, which is equation (4).

In the sub-sample analysis, we divide our sample under four categories: corporate governance based on *CG index*; financial constraints based on the median value of *KZ index*; high-tech industries according to the OECD classification (Organisation for Economic Co-operation and Development, 2011). Following the standard of Fair Trade Commision (FTC) in Korea, we identify both brokerage and firms into group-affiliated and non-group-affiliated categories, and define group-affiliated (GA) analysts as analysts in a group-affiliated brokerage estimating group-affiliated firms. Then we interact each group dummy (GD) with instrumented $lnCoverage_{(i,t)}$ in equation (5):

$$Innovation_{(i,t+k)} = \alpha + GroupDummy + \beta_1 \widehat{lnCoverage}_{(i,t)} + \beta_2 \widehat{lnCoverage}_{(i,t)} \cdot GroupDummy + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (6)$$

,where $GroupDummy$ stands for a dummy equal to 1 if a firm belongs to the four categories, which are financial constraint, corporate governance, group-affiliation and high-tech industries, and 0 otherwise. Here, our key coefficient of interest is $\beta_2$, since it measures whether analyst coverage affects the innovation activities of firms in each sub-sample.

Additionally, we perform several robustness tests to disentangle the direct and the indirect effect of analyst coverage. Specifically, we include interaction term to capture the indirect substitution which comes from any decrease in innovation channels:

$$Innovation_{(i,t+k)} = \alpha + \beta_1 \widehat{lnCoverage}_{(i,t)} + \beta_2 Cut_{(i,t+1)} + \beta_3 \left(\widehat{lnCoverage}_{(i,t)} * Cut_{(i,t+1)}\right) + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (7)$$

,where $Cut_{(i,t+1)}$ corresponds to the decreased innovation channel which may be found from the baseline equation (1), (4) and (5). Our key variables of interest are $\beta_1$ and $\beta_3$, since the two variables capture the direct and the indirect effect of analysts on innovation increased. If $\beta_1$ is positive, analysts have a direct informational effect on acquisition strategies; if $\beta_3$ is positive, the

indirect pressure effect of analysts forces managers to increase innovation to substitute the decrease in other innovation strategies, if any. The coefficient $\beta_2$ represents the increased innovation strategies and the decreased counterparts of firms without any analyst coverage. $\widehat{lnCoverage}_{(i,t)}$ is instrumented coverage variables from 2SLS in equation (4).

We also analyze how innovation output is affected from the adjustment of innovation strategies out of analyst coverage as below:

$$Outcome_{(i,t+3)} = \alpha + \beta_1 \widehat{lnCoverage}_{(i,t)} + \beta_2 innovation_{(i,t+1)} + \beta_3 (\widehat{lnCoverage}_{(i,t)} * innovation_{(i,t+1)} + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (8)$$

,where $Outcome_{(i,t+3)}$ are two measures of innovation output, which are *lnpatents* and *lnGranted*. $\widehat{lnCoverage}_{(i,t)}$ is the instrumented coverage variable from equation (4). $innovation_{(i,t+1)}$ corresponds to the three innovation channels which are R&D, acquisition and CVC investment after one year. We also include control variables and fixed effects as before. $\beta_1$ represents the effect of analysts on future patents; $\beta_2$ corresponds to the effect of three innovation strategies on long-term output of firms that are not followed by analysts; and $\beta_3$ captures the differential effect of firm innovation for firms covered by analysts.

Instead of using *lnCoverage*, we apply another measure of analyst pressure, *EPSD*, the difference between the actual EPS and analysts' EPS estimates. If analysts impose pressure to decrease any innovation channel, we analyze whether cutting the relevant investment has a causal effect on long-term innovation output:

$$Innovation_{(i,t)} = \alpha + \beta_1 I_{Meet(i,t)} + \beta_2 EPSD_{(i,t)} + \beta_3 EPSD^2_{(i,t)} + \beta_4 EPSD_{(i,t)} * I_{Meet(i,t)} + \beta_5 EPSD^2_{(i,t)} * I_{Meet(i,t)} + \beta_6 X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (9)$$

,where $Innovation_{(i,t)}$ is the innovation channel that might decrease from the pressure effect. $I_{Meet(i,t)}$ is a dummy variable equal to one if firms meet estimated EPS and zero for firms that miss the target. Here, our key coefficient of interest is $\beta_1$. If $\beta_1$ is negative, it implies that firms that meet analysts' estimate are likely to cut one of their innovation strategies, which supports the pressure effect of analysts. As in equation (8), we also estimate the effect of cutting innovation

investment because of *EPSD* on firms' patent outcomes. Following Guo et al. (2019), we use $I_{Meet(i,t)}$ as IV to estimate innovation channel that declines due to the pressure effect, based on equation (9), then put the instrumented innovation into the estimation below:

$$Outcome_{(i,t+3)} = \alpha + \beta_1 \widehat{innovation}_{(i,t)} + \beta_2 EPSD_{(i,t)} + \beta_3 (EPSD_{(i,t)} * I_{Meet(i,t)}) + \gamma X_{(i,t)} + \delta_i + \mu_t + \varepsilon_{(i,t)} \quad (10)$$

,where $\widehat{innovation}_{(i,t)}$ is from the first stage regression, which is equivalent to the equation (9). The key coefficient of interest is $\beta_1$, which corresponds to the causal effect of cutting innovation on firms' long-term innovation outcome.

## 4. Findings and robustness tests

### 4.1. Baseline results

First, we show the effect of analyst coverage on firms' innovation strategies. The result from R&D expenditure is shown in table 2. Panel A reports the OLS results, and first two columns shows the effect of an analyst coverage on the change in R&D expense on and two years forward, while column (3) and (4) of panel A report the effect on a cut in R&D. Panel B report the results of the 2SLS estimation, where column (1) shows the first-stage regressions. The column (1) of panel B indicates that the coefficient of IV, *ExpectedCoverage*, is positive and significant at the 1% level, consistent to previous studies (Yu, 2008; Guo et al., 2019). The large t-statistic (51.20) and F-statistic above the critical value of 10 confirms that the IV is not a weak instrument (Stock et al., 2002).

The results from panel A shows that analyst coverage effect is insignificant, but the result from B implies that firms followed by more analysts significantly decrease their R&Ds one year ahead at 1% significance level. Comparing the two panels, the coefficients of *lncoverage* is larger in the 2SLS regressions, suggesting that there is downward bias in OLS estimation. The rest of coefficients of control variables results in expected sign: firms with fixed assets are more likely to reduce or cut their R&Ds. The negative sign of cash might be due to the fact that firms may rely on cash holdings to smooth R&D, which results in the negative coefficient of cash holdings, as suggested in Brown and Petersen (2011).

[Table 2]

Table 3 reports the effect of analysts on firms' CVC decision. Due to the sample size, we apply industry fixed effects. The OLS coefficients in panel A suggest that firms followed by more analysts reduce the likelihood of firms investing in CVC and making the relevant investment in a start-up. However, the coefficient from the 2SLS analysis loses its significance, even though the signs for CVC setup of two years ahead and CVC investment are negative. By looking at the control variables, it implies that big firms with less leverage tend to invest in start-up via CVC channel. The result is different from Guo et al. (2019), and this may be due to the fact that firms in emerging markets may face higher probability of CVC funds failed (Teppo et al., 2009), so that firms following financial analysts may feel pressure to decrease such uncertain investments. Later, we investigate whether the decrease in CVC, as well as in R&D is the direct information effect from analysts and whether the decrease affects long-term innovation outcomes.

[Table 3]

In table 4, we report both the OLS and 2SLS regression results to discuss the effect of analyst coverage on firm's acquisition. The results show that firms followed by more analysts are more likely to acquire targets and to increase their number of target firms in two years forward in Panel A; In Panel B, the results is same except that the likelihood of acquisition and the number of target firms are higher in one year forward. Overall, both results indicate that analyst coverage makes firm acquire other targets, and that the number of acquisition increases. As for control variables, small firms and firms with more cash and more growth opportunities are more likely to acquire other firms. The negative coefficient of *ROE* and *CGindex* indicate that firms with low profitability and bad governance pursue more acquisition. For those firms, acquisition may not be out of their innovation strategy but for their growth, which necessitates the analysis of the analyst effect on innovative acquisitions as in table 5.

[Table 4]

Table 5 shows the evidence that analyst coverage encourages firms not only to invest more in acquisition but also to acquire more innovative targets. The innovativeness of target firms is

measured by the number of accumulated patents and granted patents of targets. If acquisitions are part of firms' growth strategy, there should be either insignificant or negative effect on the patents generated by targets. Since the number of firm-year observation reduced, we apply industry fixed effects instead of firm counterparts. The positive and significant coefficient of instrumented *lncoverage* indicates that financial analysts help firms to acquire more innovative firms.

[Table 5]

Overall, our main findings imply that analysts discourage R&D and CVC investment while their coverage encourages acquisitions. That is, the pressure effect dominates in R&D and CVC channel, whereas information effect exists in acquisitions.

### 4.2. Robustness Test

In this section, we conduct several robustness tests to further support the effect of analyst on firm innovations. In table 6, we split the sample into firms with corporate governance, financial constraints, industries they belong to and group-affiliation. Corporate governance is based on *CG index*, and financial constraints are based on the median value of *KZ index*. Following the standard of Fair Trade Commision (FTC) in Korea, we define group-affiliated analysts as analysts in a group-affiliated brokerage estimating group-affiliated firms. In terms of industry classification, we follow the OECD standard (2011), and divide the firm according to their KSIC codes of which the code 20, 21, 26-31, 35, 49, 61, 62, 70, 86 belong to high-tech industries.

Panel A shows the result from group-affiliated analyst coverage and non-group-affiliated counterparts. It shows that the estimate from group-affiliated analysts have higher impact on firms' R&D and acquisitions. Based on previous studies, the positive bias in group-affiliated analysts may have higher pressure effect on firms, so that those firms have higher incentive to cut R&D expenses. At the same time, thanks to analysts' information, firms may have a higher incentive to innovate by acquiring more innovative firms when they are followed by more analysts. On the other hand, the decision to make more acquisitions is also due to their incentive to compensate for the reduction in R&D and CVC from analysts' pressure effect. In the latter case, analysts indirectly affect acquisition by imposing pressure on R&D investment. Later, we investigate whether increase in acquisition result from the pressure effect on R&D and CVC investment or the

information effect of analyst coverage.

Panel B is the result for high and low financial constraints. It shows that more-financially-constrained firms increase their CVC investment, when they are followed by more financial analysts at the 10% significance level. This is consistent to previous findings (Derrien and Kecskes, 2013; Guo et al., 2019), in that information effect of financial analysts is significant for external CVC channel of more-financially-constrained firms.

Estimates in panel C show that firms in the high-tech industries tend to invest more in start-ups when more financial analysts follow those firms. Given that most of innovation occurs in high-tech industries, it is reasonable that financial analysts motivates innovation strategy of firms in high-tech industries. The results from panel B and C imply that analyst coverage increase information transparency, thereby motivates managers to increase their investment in CVC, supporting the information effect to some extent.

Finally, in panel D of table 6, the result for good and bad governance shows that firms with bad governance tend to increase acquisitions, consistent to our main findings. An explanation is that poorly governed firms get higher pressure from financial analysts to meet the targets, so managers decide to cut their CVC investment. Moreover, analysts also have a discipline effect so that the firm's poor governance can be compensated, thereby encouraging the firm to acquire target firms.

[Table 6]

In table 7, we estimate the two effects by including an interaction term of *lncoverage* and reduced investment, which are R&D and CVCs, following equation (7). As mentioned, the interaction term captures the indirect effect and the coefficient of *lncoverage* represents the direct counterpart. Panel A.1 and A.2 reports the direct and indirect effects of analyst on acquisition and innovative acquisitions respectively. It shows that the number of analysts hold a positive effect on the acquisition decision and on the number of firms acquired as well as the innovative acquisitions, which implies that firms' increased acquisition is due to analysts' informational role. The coefficient of the interaction terms is not significant in two panels.

Finally, Panel B shows that financial analysts both have direct effect on acquisition and

the number of firms acquired[1]. However, the coefficient of interaction term indicates that the indirect effect from cutting CVC investment is also significant. The possible explanation is that firms reduce innovation after cutting their CVC investment because those firms are less able to leverage to do acquisitions. The coefficient of CVC investment measures the differential effect of CVC investment of firms that are not followed by analysts, which turns out to be negative. Overall, the differential effect of cutting CVC without analyst coverage is negative on acquisitions, firms followed by analysts feel extra pressure to cut their acquisitions. The larger coefficient of interaction term than that of *lncoverage* implies that the indirect effect from reduced CVC investment dominates in acquisition, which is consistent to previous studies (Benson and Ziedonis, 2010).

[Table 7]

Table 7 above shows that the result from pressure effect on CVC investment is mixed, given that both direct information and indirect pressure effect exist in the investment. Firms cutting R&D and CVC investment may see the decrease in innovation output. However, as seen in subsample analysis, analyst coverage provides firms with reallocating their resources, since the firm may cut inefficient innovation investment. Moreover, if CVC investment is for the sake of their growth, the final innovation outcome should not be unaffected. In order to investigate the final outcome from the reduction in the two strategies, table 8 shows the possible consequences of firms' adjustment on three innovation strategies, following the equation (8).

According to panel A, three-year-forward number of patents by a firm in the sample is mainly affected by R&D cuts. This is might be due to the fact that some firms acquire other firms and sets up their CVCs out of their growth, unrelated to their innovation. Note that the effect of analyst coverage is not significant, meaning that the negative effect from the pressure of analysts is unrelated to the final innovation outcome. Moreover, when we include the interaction term between R&D cut and analyst coverage, the negative effect from cutting R&D is absorbed. On the other hand, granted patents from firms in the sample is unaffected by the reduction in R&Ds, supporting our argument that the reduction in innovation channels does not affect the final

[1] We do not analyze the direct and indirect effect on the number of target firms' patents and granted patents for CVC investment, since the sample size reduces to 24 and 17, respectively.

innovation outcomes.

[Table 8]

In table 9, we apply another measure of analyst pressure, *EPSD*, which is the difference between the actual EPS and the estimated counterparts. As in Guo et al. (2019), this measure is better estimation for the pressure effect, we apply to support our argument that the pressure effect exists, without affecting the long-term outcomes. Panel A.1 and panel B.1 reports the results of the equation (9), and panel A.2 and B.2 represents the estimation from the equation (10). Panel A.1 indicates that meeting the estimated EPS increases the likelihood of cutting R&D expenditure. However, note that the pressure effect is only the short-term phenomenon, since column (3) of panel A.1, turns out to be significantly positive. On the other hand, the result from CVC investment turns out to be insignificant, meaning that the pressure effect on CVC investment is relatively weak.

Panel A.2 and panel B.2 is the result for the effect of cutting R&D and CVC investment on innovation outcomes, respectively. Following Guo et al. (2019), we use the indicator variable to instrument R&D cut and CVC investment, and report the result from the second-stage regression. Both panels indicate that a decrease in R&D and CVC investment does not affect the innovation outcomes, further supporting our previous argument that the pressure effect on managers to cut the two channels is only a short-term.

[Table 9]

## 5. Conclusion

This paper relates to the growing body of literature to address how financial markets influence efforts and outcomes of innovation by firms. Among factors that affects corporate long-term innovation, there are conflicting views regarding the information effect and the pressure effect of financial analysts. Specifically, analysts release reliable information to the market, managers have stronger incentive to pursue innovative projects, whereas the short-term pressure to meet the estimated EPS makes them cut the long-term expense such as R&Ds. This paper adds on this literature by examining the effect of analyst on firms in emerging markets where firms face higher uncertainties to take innovative long-term strategies and large conglomerates hold higher

comparative advantage to undertake innovations as well as successful start-ups that grows into innovative giants.

Using publicly traded non-financial Korean firms in 2010-2018, we establish the following patterns: analysts put pressure on firms' R&D and CVC investments; analyst coverage encourages a firm to undertake acquisitions as well as acquiring innovative targets. The former result out of the pressure effect of analyst coverage is more pronounced when firms are poorly governed and are followed by more group-affiliated analysts. We further examine if increased acquisitions are due to the direct effect from analysts, and find that the substitution out of the decrease in CVC investment exists unlike the case in the U.S. Moreover, innovation outcomes, as measured in three-year-forward number of patents, are negatively affected by the decrease in R&D, but when we take the analyst effect on R&D into account, such negative effect is absorbed. The reduction in CVC investment does not negatively affect the long-term patents. Additionally, we apply another measure, *EPSD* instead and show the evidence that the pressure effect exists in the R&D cut. That is, R&D change and R&D cut out of the alternative coverage measure turns out to be negative and positive, respectively. Additionally, the pressure effect on both CVC and R&D investment does not negatively affect the long-term outcomes, meaning that the pressure effect is stronger in Korean market but it is the short-term phenomenon.

Overall, our findings support the argument that analyst coverage is a disciplinary tool against managers to reallocate long-term expenses. Even if financial analysts increase firms' acquisition activity, the increase results from indirect substitution of the decrease in R&D. However, it does not mean that the analyst coverage does harm to firm innovation in the long-term, since the potential negative effect on innovation output, as measured in the forward number of patents, is short-term. What is unique about Korean firms is that the uncertainty faced by firms on CVC investment makes managers to cut the external innovation out of the pressure they get from the analyst coverage. Moreover, the chaebol structure provides analysts with extra incentive to increase their affiliated companies, thereby decreasing the pressure effect on managers, which eventually encourages firm innovation. We believe that these findings are not restricted to Korean market, since its market structure and group-affiliation can be seen in many emerging economies. The contribution of this paper is that firms in emerging market that higher difficulties in undertaking long-term innovation efforts faced by those markets may result in the pressure effect

of analyst coverage; the positive bias in group-affiliated analysts hold higher impact on firms' decision to innovate; higher uncertainties associated CVC investment can be either substituted via increased acquisition or out of the pressure effect from financial analysts.

Nevertheless, our findings do not necessarily deny the information effect and subsequent impact on innovation outcomes. As shown in the sub-sample analysis, the information effect exists in firms with higher financial constraints and those from high-tech industries. Given that the indirect effect on acquisition from substituting the decrease in CVC investment exists, the final outcome depends on whether parent firms' innovation recovers when they reduce or terminate CVCs (Ma, 2020). Rather, it highlights the fact that the short-term analysts' forecasts can have an impact on firm's long-term decision. Moreover, the benefit cannot be only measured at the firm level, given that the technological development benefits not only a firm, but also the spillover benefits other participants in the industry and their subsequent innovation efforts, which we leave for future research.

## References


Acharya, V., Xu, Z. Financial dependence and innovation: The case of public versus private firms. J. Financ. Econ. 124, 223-243.

Bena, J., Li, K., 2014. Corporate innovations and mergers and acquisitions. J. Finance 69, 1923-1960.

Benner, M. J., Ranganathan, R. Offsetting illegitimacy? How pressures from securities analysts influence incumbents in the face of new technologies. Acad. Manage. J. 55, 213-233.

Benson, D., Ziedonis, R. H. Corporate venture capital and the returns to acquiring portfolio companies. J. Financ. Econ. 98, 478-499.

Brown, J. R., Petersen, B. C., 2011. Cash holdings and R&D smoothing. J. Corp. Finance 17, 694-709.

Chen, E., Gavious, I., Lev, B., 2017. The positive externalities of IFRS R&D capitalization: enhanced voluntary disclosure. Rev. Account. Stud. 22, 677-714.

Cho, E., Kim, W., 2019. Do Bad Targets Become Worse Targets?: Evidence from Sequential Transfers of Control Blocks. *한국재무학회 학술대회*, 1838-1879.

Corwin, S. A., Larocque, S. A., Stegemoller, M. A., 2017. Investment banking relationships and analyst affiliation bias: The impact of the global settlement on sanctioned and non-sanctioned banks. J. Financ. Econ. 124, 614-631.

Dechow, P. M., Sloan, R. G., 1991. Executive incentives and the horizon problem: An empirical investigation. J. Account. Econ. 14, 51-89.

Derrien, F., Kecskés, A., 2013. The real effects of financial shocks: Evidence from exogenous changes in analyst coverage. J. Finance 68, 1407-1440.

Dushnitsky, G., Lenox, M. J., 2006. When does corporate venture capital investment create firm value?. J. Bus. Venturing 21, 753-772.

Gaba, V., Bhattacharya, S., 2012. Aspirations, innovation, and corporate venture capital: A behavioral perspective. Strat. Entrepreneur J. 6, 178-199.

González-Uribe, J., 2020. Exchanges of innovation resources inside venture capital portfolios. J. Financ. Econ. 135, 144-168.

Guo, B. Pérez-Castrillo, Toldrà-Simats, A., 2019. Firms' innovation strategy under the shadow of analyst coverage. J. Financ. Econ. 131, 456-483.

He, J. J., Tian, X., 2013. The dark side of analyst coverage: the case of innovation. J. Financ. Econ. 109, 856-878.

Jegadeesh, N., Kim, W., 2006. Value of analyst recommendations: International evidence. J. Financ. Mark. 9, 274-309.

Joh, S. W., 2003. Corporate governance and firm profitability: evidence from Korea before the economic crisis. J. Financ. Econ. 68, 287-322.

Khatami, S. H., Marchica, M., Mura, R., 2015. Corporate acquisitions and financial constraints. Int. Rev. Financ. Anal. 40, 107-121.

Kim, W., Ko, Y., Wang, S., 2019. Debt restructuring through equity issues. J. Bank. Finance 106, 341-356.

Kim, Y., Kim, Y., Lee, J., 2011. Corporate venture capital and its contribution to intermediate goods firms in South Korea. Asian Econ. J. 25, 309-329.

Kolasinski, A. C., Yang, N., 2018. Managerial myopia and the mortgage meltdown. J. Financ. Econ. 128, 466-485.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 1999. Corporate ownership around the world. J. Finance 54, 471-517.

Lee, C. M., So, E.C., 2017. Uncovering expected returns: Information in analyst coverage proxies. J. Financ. Econ. 124, 331-348.

Lewis, C. M., Tan. Y., 2016. Debt-equity choices, R&D investment and market timing. J. Financ. Econ. 119, 599-610.

Lim, Y., Kim, H., 2019. Market reaction to optimistic bias in the recommendations of chaebol-affiliated analysts. J. Contemp. Account. Econ. 15, 224-242.

Ma, S., 2020. The life cycle of corporate venture capital. Rev. Financial Stud. 33, 358-394.

Merkley, K. J., Michaely, R., Pacelli, J., 2017. Does the scope of the sell-side analyst industry matter? An examination of bias, accuracy, and information content of analyst reports. J. Finance 72, 1285-1334.

Organisation for Economic Co-opration and Development, 2011. ISIC Rev. 3. Technology Intensity Definition: Classification of Manufacturing Industries into Categories Based on R&D Intensities. OECD Directorate for Science, Technology and Industry. Economic Analysis and Statistics Devision.

Rajamani, S. S., Velamuri, S.R., Corporate Venture Capital Programmes in China and India.

Seru, A., 2014. Firm boundaries matter: Evidence from conglomerates and R&D activity. J. Financ. Econ. 111, 381-405.

Song, K., Mantecon, T., Altintig, Z., 2012. Chaebol-affiliated analysts: conflicts of interest and market responses. J. Banking Finance 36, 584-596.

Stock, J. H., Wright, J. H., Yogo, M., 2002. A survey of weak instruments and weak identification in generalized method of moments. J. Bus. Econ. Stat. 20, 518-529.

Teece, D. J., 2010. Technological innovation and the theory of the firm: the role of enterprise-level knowledge, complementarities, and (dynamic) capabilities. In: Rosenberg, N., Hall, B. H. (Eds.), Handbook of the Economics of Innovation, Handbook of the Economics of Innovation, vol. 1. Elsevier B. V., pp. 679-730.

Teppo, T., Wüstenhagen, R., 2009. Why corporate venture capital funds fail–evidence from the European energy industry. World Rev. Entrepreneur Manag. Sustain. Dev, 5, 353-375.

Wang, J. H., Tsai, C., 2010. National model of technological catching up and innovation: Comparing patents of Taiwan and South Korea. J. Dev. Stud. 46, 1404-1423.

Yoo, Y., Park, H., 2016. The informational content of changes in stock recommendation: Chaebol vs. non-chaebol affiliated analysts. J. Appl. Bus. Res. 32, 1687-1696.

Yu, F. F., 2008. Analyst coverage and earnings management. J. Financ. Econ. 88, 245-271.

**Table 1. Summary statistics**

This table reports the summary statistics, including 25th percentile, median, mean, the 75th percentile, standard deviation and the number of observations of variables used in the analyses. The data corresponds to Korean non-financial firms for the period 2010-2018. The number of observations is at firm-year level. All variable definitions are described in Appendix.

| Variable | 25th percentile | Median | Mean | 75th percentile | Std. dev. | No. of obs. |
|---|---|---|---|---|---|---|
| R&D/asset | 0.000 | 0.002 | 0.015 | 0.018 | 0.039 | 17,099 |
| RD change | -0.0002 | 0.000 | -0.00003 | 0.0002 | 0.012 | 17,139 |
| RD cut | 0.000 | 0.000 | 0.296 | 1.000 | 0.456 | 16,312 |
| Acquisitions | 0.000 | 0.000 | 0.011 | 0.000 | 0.108 | 18,351 |
| lnAcquisition | 0.000 | 0.000 | 0.008 | 0.000 | 0.079 | 18,351 |
| CVC setup | 0.000 | 0.000 | 0.226 | 0.000 | 0.419 | 247 |
| CVC Inv | 0.000 | 0.000 | 0.460 | 1.000 | 0.498 | 486 |
| lnTargPatent | 0.000 | 1.386 | 1.878 | 3.135 | 1.897 | 897 |
| lnTargGrant | 0.000 | 1.386 | 1.820 | 3.135 | 1.803 | 897 |
| lnPatents | 0.000 | 0.000 | 1.005 | 1.609 | 1.412 | 18,305 |
| lnGranted | 0.000 | 0.693 | 0.985 | 1.609 | 1.319 | 18,305 |
| lnCoverage | 0.000 | 0.000 | 1.838 | 0.000 | 3.262 | 18,351 |
| EPSD | -395.83 | 4.550 | 7860.5 | 464.80 | 941062.2 | 18,351 |
| Firm size | 18.000 | 18.541 | 18.737 | 19.000 | 1.450 | 17,099 |
| Firm age | 12.000 | 19.000 | 24.133 | 37.000 | 17.807 | 18,351 |
| Leverage | 0.197 | 0.357 | 0.370 | 0.520 | 0.231 | 17,099 |
| Cash | 0.020 | 0.054 | 0.087 | 0.118 | 0.101 | 17,099 |
| ROE | 0.004 | 0.056 | 0.059 | 0.135 | 0.194 | 17,188 |
| PPE | 0.106 | 0.245 | 0.264 | 0.392 | 0.191 | 17,099 |
| CAPEX | 0.001 | 0.018 | 0.037 | 0.057 | 0.122 | 17,095 |
| InstOwn | 0.000 | 0.000 | 5.168 | 8.000 | 8.661 | 18,351 |
| Tobin's Q | 0.751 | 1.005 | 1.293 | 1.474 | 0.976 | 17,099 |
| KZ index | -3.231 | 0.001 | -20.709 | 1.322 | 105.99 | 15,001 |
| CGindex | 0.000 | 0.000 | 28.023 | 65.000 | 44.604 | 18,351 |
| HHI | 0.000 | 0.0001 | 0.003 | 0.001 | 0.026 | 18,351 |
| $HHI^2$ | 0.000 | 0.000 | 0.0007 | 0.000 | 0.015 | 18,351 |

**Table2. Number of Analyst and R&D Expenses**

This table shows OLS (panel A) and 2SLS (Panel B) estimation results of the effect of analysts (lnCoverage). The dependent variables are: the change in the ratio of R&D expense to total assets one and two years ahead in column (1) and (2); and the dummy equal to one if a firm reduces its R&D ratio and zero otherwise one and two years ahead in column (3) and (4). In Panel B, column (1) shows the first-stage regression where lnCoverage is instrumented, and column (2) to (5) shows the result from the second-stage of R&D change and R&D cut, respectively. Standard errors are in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. All variable definitions are in Appendix.

| Panel A : OLS | | | | |
|---|---|---|---|---|
| Dependent | RD Change | | RD Cut | |
| | (1) | (2) | (3) | (4) |
| | T+1 | T+2 | t+1 | t+2 |
| lnCoverage | 0.00001 | -0.00007 | -0.0028 | 0.0019 |
| | (0.00004) | (0.00006) | (0.0019) | (0.0023) |
| Control Variable | Yes | Yes | Yes | Yes |
| Year Fixed Effect | Yes | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes | Yes |
| No. of obser | 12976 | 10799 | 11004 | 9106 |
| R**2 | 0.13 | 0.16 | 0.37 | 0.31 |

| Panel B: IV 2SLS | | | | | |
|---|---|---|---|---|---|
| Dependent | First-Stage | Second-Stage | | | |
| | LnCoverage | RDChange | | RDCut | |
| | (1) | (2) | (3) | (4) | (5) |
| | t | t+1 | t+2 | t+1 | t+2 |
| ExpectedCoverage | 0.1334*** | | | | |
| | (0.0026) | | | | |
| $\widehat{lnCoverage}$ | | -0.0003*** | -0.0001 | -0.0065 | 0.0058 |
| | | (0.0001) | (0.0001) | (0.0047) | (0.0056) |
| FirmSize | 0.8327*** | 0.0050*** | 0.0015*** | -0.0443** | -0.0424** |
| | (0.0612) | (0.0003) | (0.0005) | (0.0180) | (0.0212) |
| R&D | 3.4847*** | | | 5.1574*** | 2.4827*** |
| | (1.0192) | | | (0.2650) | (0.3597) |
| Firm Age | -0.1842*** | -0.0003 | -0.0002 | -0.0085 | -0.0217*** |
| | (0.0643) | (0.0003) | (0.0004) | (0.0134) | (0.0078) |
| Leverage | -0.9332*** | -0.0032*** | -0.0034*** | -0.0724* | -0.0011 |
| | (0.1462) | (0.0008) | (0.0012) | (0.0378) | (0.0453) |
| Cash | -0.5862** | -0.0032** | 0.0010 | -0.0450 | -0.0073 |
| | (0.2624) | (0.0015) | (0.0023) | (0.0690) | (0.0857) |
| ROE | 0.5576*** | 0.0033*** | 0.00001 | -0.0506* | -0.0392 |
| | (0.1160) | (0.0006) | (0.0009) | (0.0282) | (0.0335) |
| PPE | 0.2740 | -0.0043*** | 0.0020 | 0.2324*** | 0.1455* |
| | (0.2603) | (0.0015) | (0.0024) | (0.0720) | (0.0847) |
| Capex | 0.1153 | 0.0026*** | -0.0004 | -0.0750* | 0.0306 |
| | (0.1673) | (0.0009) | (0.0013) | (0.0394) | (0.0461) |
| InstOwn | 0.0051 | -0.00003** | -0.00001 | -0.0005 | -0.0004 |
| | (0.0031) | (0.00001) | (0.000002) | (0.0007) | (0.0009) |
| Tobin's Q | 0.2660*** | 0.0003** | 0.0002 | 0.0001 | -0.0068 |
| | (0.0272) | (0.0001) | (0.0002) | (0.0073) | (0.0095) |
| KZ index | -0.0006*** | -0.0000005 | -0.0000005 | 0.00001 | -0.00008 |
| | (0.0002) | (0.000001) | (0.000001) | (0.00005) | (0.00006) |
| CGIndex | -0.0025** | -0.00001** | 0.00001 | 0.00009 | 0.0007** |
| | (0.0010) | (0.000005) | (0.000009) | (0.0002) | (0.0003) |
| HHI | 11.8820* | -0.0769** | -0.0041 | 4.5703*** | 2.9646* |
| | (6.2152) | (0.0343) | (0.0498) | (1.5152) | (1.7271) |
| $HHI^2$ | -44.1652** | 0.1352 | 0.0574 | -11.7000*** | -8.9751** |
| | (17.6457) | (0.0942) | (0.1306) | (3.9735) | (4.5109) |
| Year Fixed | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed | Yes | Yes | Yes | Yes | Yes |
| No. of Obs | 14,997 | 12976 | 10799 | 11044 | 9106 |
| F-statistic | 15.27 | | | | |
| $R^2$ | 0.70 | 0.13 | 0.16 | 0.37 | 0.31 |

**Table3. Number of Analyst and CVC Investments**

This table shows OLS (panel A) and 2SLS (Panel B) estimation results of the effect of analysts (lnCoverage). The dependent variables are: a dummy variable equal to one if a firm starts its CVC and zero otherwise in column (1) and (2); and a dummy variable equal to one if the firms's CVC invests in startup and zero otherwise in column (3) and (4). In Panel B, column (1) to (4) shows the result from the second-stage of the two dependent variables, respectively. Standard errors are in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. All variable definitions are in Appendix.

Panel A : OLS

| Dependent | CVC Setup | | CVC Inv | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | T+1 | T+2 | t+1 | t+2 |
| lnCoverage | -0.0140 | -0.0297** | -0.0120 | -0.0172* |
| | (0.0112) | (0.0119) | (0.0094) | (0.0104) |
| Control Variable | Yes | Yes | Yes | Yes |
| Year Fixed Effect | Yes | Yes | Yes | Yes |
| Industry Fixed Effect | Yes | Yes | Yes | Yes |
| No. of obs. | 187 | 171 | 348 | 294 |
| $R^2$ | 0.17 | 0.20 | 0.20 | 0.18 |

Panel B: IV 2SLS

| Dependent | Second-Stage | | | |
|---|---|---|---|---|
| | CVC Setup | | CVC Inv | |
| | (1) | (2) | (3) | (4) |
| | t+1 | t+2 | t+1 | t+2 |
| $\widehat{lnCoverage}$ | 0.0005 | -0.0120 | -0.0232 | -0.0188 |
| | (0.0173) | (0.0183) | (0.0164) | (0.0189) |
| FirmSize | 0.0085 | 0.0372 | 0.1095** | 0.1237*** |
| | (0.0514) | (0.0495) | (0.0424) | (0.0423) |
| R&D | -1.1847 | -1.4856 | 1.3504* | 1.0340 |
| | (0.9217) | (1.0466) | (0.8179) | (1.0051) |
| Firm Age | 0.0041 | 0.0005 | -0.0052 | -0.0034 |
| | (0.0042) | (0.0044) | (0.0038) | (0.0043) |
| Leverage | -0.1051 | -0.1111 | -0.3682** | -0.3435** |
| | (0.1995) | (0.2008) | (0.1514) | (0.1674) |
| Cash | 0.2117 | 0.2298 | -0.1796 | -0.2143 |
| | (0.3683) | (0.3678) | (0.2886) | (0.3086) |
| Profitability | -0.4473** | -0.4542** | -0.2546 | 0.0755 |
| | (0.1823) | (0.1889) | (0.1645) | (0.1784) |
| PPE | 0.2447 | 0.1941 | -0.3280* | -0.0605 |
| | (0.2411) | (0.2515) | (0.1976) | (0.2286) |
| Capex | -0.0230 | 0.1123 | -0.1833 | -0.5010 |
| | (0.3027) | (0.3067) | (0.2947) | (0.3499) |
| InstOwn | -0.0013 | 0.0002 | 0.0016 | -0.0023 |
| | (0.0040) | (0.0040) | (0.0032) | (0.0036) |
| Tobin's Q | 0.0288 | 0.0275 | -0.0567** | -0.0373 |
| | (0.0301) | (0.0314) | (0.0274) | (0.0314) |
| KZ index | 0.0001 | 0.0001 | 0.0001 | 0.00001 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| CGIndex | 0.0002 | 0.0001 | 0.0007 | 0.0008 |
| | (0.0010) | (0.0011) | (0.0007) | (0.0008) |
| HHI | -8.4885 | -19.4822 | 6.6734 | -6.5806 |
| | (24.6764) | (26.2594) | (18.0023) | (21.8260) |
| $HHI^2$ | 152.2541 | 391.3819 | -187.48 | 34.5398 |
| | (481.7022) | (510.6773) | (345.92) | (458.3415) |
| Year Fixed | Yes | Yes | Yes | Yes |
| Industry Fixed | Yes | Yes | Yes | Yes |
| No. of Obs | 187 | 171 | 348 | 294 |
| $R^2$ | 0.16 | 0.17 | 0.20 | 0.18 |

**Table4. Number of Analyst and Acquisition**

This table shows OLS (panel A) and 2SLS (Panel B) estimation results of the effect of analysts (lnCoverage). The dependent variables are: a dummy variable equal to one if a firm acquires one more targets and zero otherwise in column (1) and (2); and the natural log of one plus the number of targets in column (3) and (4). In Panel B, column (1) to (4) shows the result from the second-stage of the two dependent variables, respectively. Standard errors are in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. All variable definitions are in Appendix.

| Panel A : OLS | | | | |
|---|---|---|---|---|
| Dependent | Acquisition | | lnAcquisition | |
| | (1) | (2) | (3) | (4) |
| | T+1 | T+2 | t+1 | t+2 |
| lnCoverage | 0.000001 | 0.0010* | 0.00005 | 0.0007* |
| | (0.0004) | (0.0005) | (0.0003) | (0.0004) |
| Control Variable | Yes | Yes | Yes | Yes |
| Year Fixed Effect | Yes | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes | Yes |
| No. of obser | 12985 | 11002 | 12985 | 11002 |
| $R^2$ | 0.18 | 0.19 | 0.19 | 0.19 |

| Panel B: IV 2SLS | | | | |
|---|---|---|---|---|
| Dependent | Second-Stage | | | |
| | Acquisition | | lnAcquisition | |
| | (1) | (2) | (3) | (4) |
| | t+1 | t+2 | t+1 | t+2 |
| $\widehat{lnCoverage}$ | 0.0035*** | 0.0004 | 0.0024*** | 0.0002 |
| | (0.0012) | (0.0013) | (0.0008) | (0.0009) |
| FirmSize | -0.0095** | -0.0060 | -0.0076** | -0.0052 |
| | (0.0042) | (0.0051) | (0.0031) | (0.0037) |
| R&D | -0.0773 | 0.0242 | -0.0593 | 0.0120 |
| | (0.0662) | (0.0760) | (0.0481) | (0.0554) |
| Firm Age | 0.0045 | -0.0015 | 0.0033 | -0.0009 |
| | (0.0037) | (0.0038) | (0.0027) | (0.0028) |
| Leverage | 0.0094 | 0.0080 | 0.0083 | 0.0061 |
| | (0.0094) | (0.0108) | (0.0068) | (0.0079) |
| Cash | 0.0654*** | 0.0211 | 0.0457*** | 0.0111 |
| | (0.0168) | (0.0198) | (0.0122) | (0.0144) |
| ROE | -0.0025 | -0.0166** | -0.0015 | -0.0121** |
| | (0.0072) | (0.0081) | (0.0052) | (0.0059) |
| PPE | 0.0270 | 0.0397* | 0.0187 | 0.0308** |
| | (0.0170) | (0.0206) | (0.0123) | (0.0150) |
| Capex | -0.0316*** | 0.0128 | -0.0230*** | 0.0092 |
| | (0.0103) | (0.0113) | (0.0074) | (0.0082) |
| InstOwn | 0.00004 | 0.0003 | 0.00008 | 0.0002 |
| | (0.0001) | (0.0002) | (0.0001) | (0.0001) |
| Tobin's Q | 0.0031* | 0.0041** | 0.0028** | 0.0031** |
| | (0.0017) | (0.0020) | (0.0012) | (0.0015) |
| KZ index | 0.000008 | 0.00001 | 0.000006 | 0.00001 |
| | (0.00001) | (0.00001) | (0.00001) | (0.00001) |
| CGIndex | -0.0001** | -0.0002** | -0.0001*** | -0.0001** |
| | (0.00006) | (0.00008) | (0.00004) | (0.00006) |
| HHI | -1.2579*** | 0.2809 | -0.8963*** | 0.1252 |
| | (0.3841) | (0.4347) | (0.2791) | (0.3167) |
| $HHI^2$ | 3.2227*** | -0.5514 | 2.3193*** | -0.2281 |
| | (1.0543) | (1.1400) | (0.7660) | (0.8307) |
| Year Fixed | Yes | Yes | Yes | Yes |
| Firm Fixed | Yes | Yes | Yes | Yes |
| No. of Obs | 12985 | 11002 | 12985 | 11002 |
| $R^2$ | 0.18 | 0.19 | 0.19 | 0.19 |

**Table5. Number of analysts and acquisition innovativeness**

This table shows the 2SLS regressions for the effect of analyst coverage on the acquisition of innovative target firms. The dependent variables are: the natural log of one plus the total number of patents on average of all target firms up to the date when they are acquired in column (1) and (2); and the natural log of one plus the total number of granted patents of all targets up to the acquisition period in column (3) and (4). Standard errors are in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. All variable definitions are in Appendix.

| Dependent | lnTargPatent | | lnTargGrant | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | T+1 | T+2 | t+1 | t+2 |
| $\widehat{lnCoverage}$ | 0.1336*** | 0.0238 | 0.1214*** | 0.0251 |
| | (0.0389) | (0.0401) | (0.0367) | (0.0379) |
| Control Variable | Yes | Yes | Yes | Yes |
| Year Fixed Effect | Yes | Yes | Yes | Yes |
| Industry Fixed Effect | Yes | Yes | Yes | Yes |
| No. of obs | 787 | 633 | 787 | 633 |
| $R^2$ | 0.23 | 0.18 | 0.25 | 0.20 |

**Table 6. Split Sample Analysis**

This table reports the 2SLS regression on the effect of financial analysts on one-year forward innovation by splitting the sample. In panel A, we define group affiliated analysts(GA) as analysts working for a group-affiliated brokerage estimating GA firms, based on Fair Trade Commision (FTC); Panel B is from splitting the sample at the median of KZ index; in Panel C, we split the sample in high-tech industries, following industry classification of OECD (2011); in panel D, we split the sample by the mean value based on CGindex. In all regressions, we include control variables and firm and year fixed effects. Column (5) to (8) is using industry fixed effects instead. Standard errors are in parentheses. ***, **, and * shows significance at the 1%, 5%, and 10%, respectively. All variable definitions are in Appendix.

| Panel A: Group Affiliated Analysts (GA) vs Non-Group Affiliated Analysts | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dep. | RDChange | RDCut | Acquisition | lnAcquisition | lnTargPatent | lnTargGrant | CVCsetup | CVCInv |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| ln(Coverage)*GA | -0.0003*** | -0.0065 | 0.0035*** | 0.0024*** | 0.1336** | 0.1214*** | 0.0005 | -0.0232 |
| | (0.0001) | (0.0047) | (0.0012) | (0.0008) | (0.0389) | (0.0367) | (0.0173) | (0.0164) |
| No.Obs | 12976 | 11004 | 12985 | 12985 | 787 | 787 | 187 | 348 |
| $R^2$ | 0.13 | 0.37 | 0.18 | 0.19 | 0.23 | 0.25 | 0.16 | 0.20 |
| Panel B: Financial Constraints (FC) | | | | | | | | |
| Dep. | RDChange | RDCut | Acquisition | lnAcquisition | lnTargPatent | lnTargGrant | CVCsetup | CVCInv |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Ln(coverage)*FC | -0.00005 | 0.0034 | -0.0001 | -0.0003 | -0.0077 | -0.0084 | -0.0049 | 0.0290* |
| | (0.00007) | (0.0032) | (0.0008) | (0.0006) | (0.0349) | (0.0329) | (0.0178) | (0.0148) |
| No.Obs | 12976 | 11004 | 12985 | 12985 | 787 | 787 | 187 | 348 |
| $R^2$ | 0.13 | 0.37 | 0.18 | 0.19 | 0.24 | 0.25 | 0.16 | 0.23 |
| Panel C: High-tech (HT) versus low-tech industries | | | | | | | | |
| Dep. | RDChange | RDCut | Acquisition | lnAcquisition | lnTargPatent | lnTargGrant | CVCsetup | CVCInv |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Ln(coverage)*HT | 0.0001 | -0.0115 | -0.0005 | -0.00004 | 0.0295 | 0.0345 | 0.0081 | 0.0395** |
| | (0.0001) | (0.0084) | (0.0020) | (0.0015) | (0.0323) | (0.0303) | (0.0218) | (0.0161) |
| No.Obs | 12976 | 11004 | 12985 | 12985 | 787 | 787 | 187 | 348 |
| R2 | 0.13 | 0.37 | 0.18 | 0.19 | 0.27 | 0.29 | 0.16 | 0.22 |
| Panel D: Corporate Governance (CG) | | | | | | | | |
| Dep. | RDChange | RDCut | Acq | lnAcquisition | lnTargPatent | lnTargGrant | CVCsetup | CVCInv |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Ln(coverage)*CG | 0.00003 | -0.0017 | -0.0050*** | -0.0042*** | -0.0545 | -0.0256 | 0.0149 | 0.0048 |
| | (0.0001) | (0.0055) | (0.0012) | (0.0009) | (0.0345) | (0.0325) | (0.0226) | (0.0168) |
| No.Obs | 12976 | 11004 | 12985 | 12985 | 787 | 787 | 187 | 348 |
| R2 | 0.13 | 0.37 | 0.18 | 0.19 | 0.25 | 0.27 | 0.17 | 0.20 |

**Table 7. Direct vs indirect effect**

This table reports the 2SLS estimation results of the effect of interaction between analyst coverage and R&D Cut (Panel A.1 and Panel A.2) as well as CVC investment (Panel B). Panel A.1 is the effect on acquisitions and panel A.2 is on innovative acquisitions. Dependent variables are: a dummy variable equal to one if a firm acquires one more targets and zero otherwise in column (1) and (2); and the natural log of one plus the number of targets in column (3) and (4) for panel A.1 and B; the natural log of one plus the total number of patents on average of all target firms up to the date when they are acquired in column (1) and (2); and the natural log of one plus the total number of granted patents of all targets up to the acquisition period in column (3) and (4) for panel A.2. Standard errors are in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. All variable definitions are in Appendix.

| Panel A.1 : R&D and acquisitions | | | | |
|---|---|---|---|---|
| Dependent | Acquisition | | lnAcquisition | |
| | (1) | (2) | (3) | (4) |
| | t+1 | t+2 | t+1 | t+2 |
| $\widehat{lnCoverage}$ | 0.0036*** | 0.0003 | 0.0023** | 0.0002 |
| | (0.0012) | (0.0013) | (0.0009) | (0.0009) |
| RDCut | 0.0004 | -0.0065 | -0.0002 | -0.0017 |
| | (0.0088) | (0.0093) | (0.0064) | (0.0068) |
| $\widehat{lnCoverage}$ | 0.0005 | 0.0007 | 0.0004 | 0.0002 |
| $* RDCut$ | (0.0007) | (0.0007) | (0.0005) | (0.0005) |
| Control variable | Yes | Yes | Yes | Yes |
| Year Fixed | Yes | Yes | Yes | Yes |
| Firm fixed | Yes | Yes | Yes | Yes |
| No. of Obs | 11004 | 11002 | 11004 | 11002 |
| $R^2$ | 0.21 | 0.19 | 0.23 | 0.19 |
| Panel A.2 : R&D and innovative acquisitions | | | | |
| Dependent | lntargPatent | | lntargGrant | |
| | (1) | (2) | (3) | (4) |
| | t+1 | t+2 | t+1 | t+2 |
| $\widehat{lnCoverage}$ | 0.1877*** | 0.0314 | 0.1669*** | 0.0312 |
| | (0.0447) | (0.0409) | (0.0427) | (0.0387) |
| RDcut | 0.5350 | 0.3083 | 0.3217 | 0.2563 |
| | (0.4606) | (0.4392) | (0.4392) | (0.4156) |
| $\widehat{lnCoverage}$ | -0.0226 | -0.0313 | -0.0150 | -0.0253 |
| $* RDCut$ | (0.0385) | (0.0355) | (0.0367) | (0.0336) |
| Control variable | Yes | Yes | Yes | Yes |
| Year Fixed | Yes | Yes | Yes | Yes |
| Industry fixed | Yes | Yes | Yes | Yes |
| No. of Obs | 665 | 633 | 665 | 633 |
| $R^2$ | 0.14 | 0.18 | 0.28 | 0.20 |
| Panel B : CVC and acquisitions | | | | |
| Dependent | Acquisition | | lnAcquisition | |
| | (1) | (2) | (3) | (4) |
| | t+1 | t+2 | t+1 | t+2 |
| $\widehat{lnCoverage}$ | 0.0108** | 0.0126** | 0.0063 | 0.0087** |
| | (0.0047) | (0.0057) | (0.0040) | (0.0040) |
| CVCinv | -0.0777 | -0.1956*** | -0.0766* | -0.1356*** |
| | (0.0479) | (0.0607) | (0.0412) | (0.0420) |
| $\widehat{lnCoverage}$ | 0.0046 | 0.0149*** | 0.0048 | 0.0103*** |
| $* CVCInv$ | (0.0036) | (0.0046) | (0.0031) | (0.0032) |
| Control variable | Yes | Yes | Yes | Yes |
| Year Fixed | Yes | Yes | Yes | Yes |
| Industry fixed | Yes | Yes | Yes | Yes |
| No. of Obs | 348 | 294 | 348 | 294 |
| $R^2$ | 0.11 | 0.21 | 0.09 | 0.21 |

**Table 8. Number of analysts, innovation strategies, and innovation outputs**

This table reports the 2SLS regression results on the effect of analyst coverage interacted with the three innovation channels on future innovation outcomes: RD Cut, acquisition and CVC dummy. In column (2) to (4), we include interaction term between analyst coverage and R&D, acquisition and CVC, respectively. The dependent variables are: the natural log of one plus the number of three-year-forward patents and granted patents by firms in the sample, respectively. Due to the sample size, we use industry and year fixed effects. Standard errors are in parentheses. ***, ** and * indicate the significance level of 1%, 5% and 10%, respectively. All variable definitions are in Appendix.

Panel A: Patents

| Dependent | lnPatents(t+3) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\widehat{lnCoverage}$ | -0.0839 | -0.0759 | -0.0685 | -0.0636 |
| | (0.0559) | (0.0567) | (0.0565) | (0.0580) |
| RDCut | -0.4066** | 0.1164 | -0.3901** | -0.3881** |
| | (0.1886) | (0.6176) | (0.1881) | (0.1889) |
| Acquisition | -0.0430 | 0.0067 | 4.0046 | -0.0162 |
| | (0.8068) | (0.8091) | (2.5824) | (0.8058) |
| CVCInv | -0.1431 | -0.1300 | -0.1203 | 0.6076 |
| | (0.1890) | (0.1897) | (0.1888) | (0.6116) |
| $\widehat{lnCoverage} * RDCut$ | | -0.0411 | | |
| | | (0.0462) | | |
| $\widehat{lnCoverage} * acquisitions$ | | | -0.2008 | |
| | | | (0.1218) | |
| $\widehat{lnCoverage} * CVCinv$ | | | | -0.0594 |
| | | | | (0.0460) |
| Control variables | yes | yes | yes | Yes |
| Year Fixed Effect | yes | yes | yes | yes |
| Industry Fixed | yes | yes | yes | yes |
| No. Obs | 241 | 241 | 241 | 241 |
| $R^2$ | 0.35 | 0.35 | 0.36 | 0.35 |

Panel B: Granted Patents

| Dependent | lnGranted(t+3) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\widehat{lnCoverage}$ | -0.0021 | 0.0106 | 0.0094 | -0.0016 |
| | (0.0561) | (0.0567) | (0.0568) | (0.0584) |
| RDCut | -0.2589 | 0.5773 | -0.2464 | -0.2584 |
| | (0.1892) | (0.6178) | (0.1892) | (0.1902) |
| Acquisition | 0.4994 | 0.5790 | 3.5624 | 0.5000 |
| | (0.8093) | (0.8093) | (2.5976) | (0.8114) |
| CVCInv | 0.0775 | 0.0985 | 0.0948 | 0.0953 |
| | (0.1896) | (0.1897) | (0.1899) | (0.6159) |
| $\widehat{lnCoverage} * RDCut$ | | -0.0657 | | |
| | | (0.0462) | | |
| $\widehat{lnCoverage} * acquisitions$ | | | -0.1520 | |
| | | | (0.1225) | |
| $\widehat{lnCoverage} * CVCinv$ | | | | -0.0014 |
| | | | | (0.0464) |
| Control variables | yes | yes | yes | Yes |
| Year Fixed Effect | yes | yes | yes | Yes |
| Industry Fixed | yes | yes | yes | Yes |
| No. Obs | 241 | 241 | 241 | 241 |
| $R^2$ | 0.35 | 0.35 | 0.34 | 0.34 |

**Table 9. The Effect of EPSD**

This table reports the effect of EPSD on firm's R&D (Panel A.1) and that on long-term output (Panel A.2); Panel B.1 is the EPSD effect on CVCs and Panel B.2 is for their long-term outcomes. Panel A.1 and B.1 is from the OLS estimation of the effect of the indicator variable equal to one if a firm meets EPS forecast (and zero otherwise), and the difference between the actual and estimated EPS. The dependent variables are: the change in R&D in column (1) to (3); and the dummy equal to one if a firm reduces its R&D ratio and zero otherwise in column (4) to (6). For panel A.2 and B.2, the dependent variables are: the natural log of one plus the number of three-year-forward patents (column (1)) and granted ones (column (2)). In Panel B.1, due to the sample size, we use industry and year fixed effects. Standard errors are in parentheses. ***, ** and * indicate the significance level of 1%, 5% and 10%, respectively. Variable definitions are in Appendix.

Panel A.1 : EPSD and R&D

| Dependent | RD Change | | | RD Cut | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | t | t | t+1 | t | t | t+1 |
| $I_{Meet}$ | -0.0006** | -0.0006** | 0.0006*** | 0.0266*** | 0.0272*** | -0.0180 |
| | (0.0003) | (0.0003) | (0.0002) | (0.0092) | (0.0092) | (0.0112) |
| EPSD | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| EPSDpoly | 1-order | 2-order | 2-order | 1-order | 2-order | 2-order |
| Control variable | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| No.Obs | 14997 | 14997 | 12976 | 14997 | 14997 | 11004 |
| $R^2$ | 0.12 | 0.12 | 0.13 | 0.33 | 0.33 | 0.37 |

Panel A.2 : EPSD, R&D investment, and patents

| Dependent | lnPatent | lnGranted |
|---|---|---|
| | (1) | (2) |
| | t+3 | t+3 |
| $\widehat{RDCut}$ | -1.0625 | -0.4227 |
| | (1.3498) | (1.2647) |
| Control variable | Yes | Yes |
| Year fixed | Yes | Yes |
| Firm Fixed | Yes | Yes |
| No.Obs | 9058 | 9058 |
| $R^2$ | 0.48 | 0.48 |

Panel B.1 : EPSD and CVC investment

| Dependent | CVC Setup | | | CVC Inv | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | t | t | t+1 | t | t | t+1 |
| $I_{Meet}$ | -0.0516 | -0.0378 | -0.0158 | -0.0163 | 0.0013 | -0.0704 |
| | (0.0762) | (0.0793) | (0.0871) | (0.0573) | (0.0615) | (0.0693) |
| EPSD | 0.00001 | 0.00001 | 0.0000 | 0.0000 | 0.00001 | 0.00003 |
| | (0.00004) | (0.00004) | (0.00005) | (0.00001) | (0.00002) | (0.00003) |
| EPSDpoly | 1-order | 2-order | 2-order | 1-order | 2-order | 2-order |
| Control variable | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| No.Obs | 181 | 181 | 181 | 402 | 402 | 348 |
| $R^2$ | 0.37 | 0.37 | 0.16 | 0.19 | 0.20 | 0.20 |

Panel B.2 : EPSD, CVC investment, and patents

| Dependent | lnPatent | lnGranted |
|---|---|---|
| | (1) | (2) |
| | t+3 | t+3 |
| $\widehat{CVCInv}$ | -0.9746 | -0.3878 |
| | (1.2381) | (1.1600) |
| Control variable | Yes | Yes |
| Year Fixed | Yes | Yes |
| Firm Fixed | Yes | Yes |
| No.Obs | 9058 | 9058 |
| $R^2$ | 0.48 | 0.48 |

**Appendix. Variable Definitions.**

This Table describes definitions for all variables used on the sample of Korean public firms from 2010 to 2018. Variable constructions are based on Guo et al. (2019).

| Variable | Definition |
|---|---|
| *RD Change* | The difference between R&D expense / total assets at time t and that at time t-1 |
| *RD Cut* | Dummy variable equals to one if the R&D / total asset at time t is lower than that at time t-1, and zero otherwise |
| *Acquisition* | Dummy variable equals to one if a firm acquires one or more targets, and zero otherwise |
| *LnAcquisition* | Natural log of one plus the number of target firms acquired |
| *CVC Setup* | Dummy variable equals to one when CVC starts its first investment and zero for the years before the first investment |
| *CVC inv* | Dummy variable equals to one when CVC invests in a start-up firm and zero otherwise |
| *lnTargPatent* | Natural log of one plus the total number of patents of all target firms |
| *lnTargGrant* | Natural log of one plus the total number of granted patents of all target firms |
| *lnPatents* | Natural log of one plus the number of annual patents of a firm |
| *lnGranted* | Natural log of one plus the number of annual granted patents of a firm |
| *LnCoverage* | Natural log of one plus the annual average number of earnings estimates from financial analysts |
| *EPSD* | The difference between the actual EPS and EPS forecast |
| *Firm Size* | Natural log of total assets |
| *R&D* | R&D expense / total assets |
| *Firm Age* | The number of years of firms in DataguidePro |
| *Leverage* | Total debt / total assets |
| *Cash* | Cash / total assets |
| *ROE* | Operating income before depreciation / total stockholders' equity |
| *PPE* | Property, plant and equipment / total assets |
| *CAPEX* | Capital expenditure / total assets |
| *InstOwn* | The share holding of institution for a firm in TS-2000 database |
| *Tobin's Q* | (Market value of equity + total assets – book value of equity – deferred tax) / total asset |
| *KZ index* | -1.002 * cash flow + 0.283 * Tobin's Q + 3.139 * leverage – 39.368 * dividends – 1.315 * cash |
| *CG Index* | Obtained from KCGS |
| *HHI* | Sum of sales / Sales of two-digit KSIC code |
| *HHI Squared* | Squared HHI index |