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Organization capital and analysts' forecasts

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ABSTRACT

We conjecture that a firm's organization capital increases its information complexity and has an adverse effect on the accuracy of analysts' earnings. Using data on analysts' reports for U.S. firms, we find that analysts' forecasts are likely to be more biased and less accurate when they cover high organization-capital firms. Our results further indicate that analysts tend to issue more optimistic forecasts for firms with higher organization capital due to the uncertain and positive effect of organization capital on firm value. Overall, our findings suggest that a firm's organization capital is associated with analysts' bias and accuracy.

1. Introduction

Investment in intangible assets has been vital for a firm's survival and growth. The intangible assets of firms consist of knowledge capital like R&D, information capital like IT and logistics, and organization capital like human capital development, customer relation, and brand equity, etc. Even though organization capital has been considered as one of a firm's most valuable intangible assets (Corrado, Hulten, & Sichel, 2009) over the most recent decade, the literature in the finance field has not paid enough attention to organization capital as much as it has done to other intangible assets. This is largely due to the difficulty of measuring the value of organization capital which is not easily captured in book or market value (e.g., Eisfeldt & Papanikolaou, 2013, 2014; Kasznik and Mcnichols, 2001).

Recently, Eisfeldt and Papanikolaou (2013) develops a measure for organization capital using selling, general, and administrative (SG&A) expenses and the perpetual inventory method.[1] Following the paper, a few studies have investigated the association between organization capital and M&A using the measure of organization capital. For instance, Li, Qui, and Shen (2018) find that high organization-capital acquirers earn significantly higher abnormal announcement returns and achieve better post-merger operating and stock performance than low organization-capital acquirers. Li, Li, Wang, and Zhang (2018) study whether organizational capital is transferrable through mergers, and find that acquirers gain more from target firms with higher organizational capital and they are also willing to pay higher premium for those targets. Whereas the extant literature focuses on whether organization capital is related to firm performance, it has not investigated how outside information intermediaries like analysts recognize organization capital in the value of a firm. This paper aims to fill the gap by providing empirical evidence on the effect of organization capital on an analyst's forecast accuracy and bias.

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[1] This measure covers a long period and a large number of firms, which gives it an advantage compared with other measures produced by Bresnahan, Brynjolfsson, and Hitt (2002) and Bloom and Reenan (2007).

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Organization capital is related to more complex information than typical assets, such as physical and financial resources. Thus, the high complexity of information related to organization capital can lead to information asymmetry between a firm and its investors. It has traditionally been a common sense that book assets undervalue firm's intangible assets because intangibles are difficult to measure under accounting principles (e.g. Atkeson & Kehoe, 2005; Corrado, Haltiwanger, and Sichel, 2005). The fair value of most intangible assets tends not to be reflected in financial statements, and current accounting law does not impose any requirement related to report specific measures for them. In particular, organization capital is referred as more of an intangible capital that is embodied in the essential key employees of a firm and that is specific to the firm (Eisfeldt & Papanikolaou, 2013, 2014). The Eisfeldt and Papanikolaou (2014) model shows that those two distinguishing features are resulted in joint ownership and ambiguous property rights. Thus, a significant portion of organization capital does not show up in the market value, making it difficult to estimate. The value of organization capital may also be highly uncertain because it is difficult to predict the extent to which investment in organization capital will contribute to a firm's long-term value.

The difficulty in measuring organization capital naturally makes the information derived from it more uncertain and complicated. Therefore, analysts are likely to face the difficulty of assimilating, processing, and analyzing a firm's organizational capital, and as a result, their reports might induce more bias. Thus, we conjecture that the analysts' forecasts are likely to be less accurate for firms with higher organization capital, compared to those with lower organization capital.

It has been well documented that analysts have incentive to issue optimistic forecasts because of the relations among the analyst, brokerage firm, and client firm.[2] Specifically, previous literature finds that analysts act on their inclinations to issue optimistic forecasts when the uncertainty surrounding a firm is high (Ackert & Athanassakos, 1997; Chang & Choi, 2017). Firms with more organization capital have highly productive employees and unique business processes and systems (Eisfeldt & Papanikolaou, 2013; Lev, Radhakrishnan, & Zhang, 2009). Thus, organization capital is an important input into the production process and it cannot be easily mimicked by competitors and captures firms' fundamental ability to provide higher growth opportunities and create superior firm value. For example, Corrado et al. (2009) find that the inclusion of intangible capital in economy notably increases the growth rates and productivity of output. Hasan and Cheung (2018) also argue that firms' investment in organization capital enables them to develop their resource base and, thus, progress to the favorable life cycle such as growth or maturity stages. However, a firm's investment in organization capital might lead to a high uncertainty in its value because outside investors cannot exactly measure both the firm's investment in organization capital and its effect on firm value. If analysts can recognize the uncertain and positive effect of organization capital on firm value, they might issue optimistic reports for firms with higher organization capital. Therefore, we conjecture that analysts' forecasts are likely to be more optimistically biased when they make earnings forecasts for firms with higher organization capital.

We use 34,331 U.S. firm-year observations over the period of 1982–2012 to examine the effect of organization capital on the analysts' forecasting errors. Following Eisfeldt and Papanikolaou (2013), we measure the value of organization capital based on SG&A expenses because a large fraction of SG&A expenses comprises the costs associated with human capital, unique production process, and customer relations, etc.[3] Fig. 1 shows that the sample firms has gradually increased SG&A expenses from about 20% in 1982 to more than 30% in 2000, and has then decreased to the level of about 25% in 2012. This trend might be related to the sample firms' investment in organizational capital. We also measure the one-year and two-year analysts' earnings forecast errors following Core, Guay, and Rusticus (2006) and Giroud and Mueller (2011), respectively. Analysts' earnings forecast accuracy is defined as the absolute value of the difference between the mean analysts' consensus forecast and the actual earnings per share scaled by the stock price during the forecast period; whereas the analysts' forecast bias is defined as the signed forecast error between the mean consensus forecast and the actual earnings per share deflated by the stock price during the forecast period.

We first test the relation between a firm's organization capital and an analyst's earnings forecast error in multivariate regressions after controlling for other determinants. We find that organization capital is positively related to the absolute values of one- and two-year earnings forecast errors. The coefficient of organization capital with respect to the absolute value of one-year (two-year) earnings forecast error is 0.0028 (0.0038), which is statistically significant. The finding indicates that analysts issue less accurate forecasts when they cover firms with higher organization capital. Further, to account for the possibility that brokerage houses may have policies influencing the forecast error, we consider brokerage house fixed effects in our analysis.[4] However, our findings might be subject to endogeneity issues such as reverse causality and omitted variable bias. To mitigate the endogeneity concerns, we perform two-stage least squares (2SLS) regressions with an instrument variable (IV) and the regressions including firm fixed effects, and find that the main results remain unchanged. Even though we cannot perfectly control for the endogeneity problem, our results suggest that the endogeneity does not explain the relation between organization capital and analyst forecast accuracy.

Moreover, we find that organization capital is both positively and significantly associated with the signed values of one- and two-year earnings forecast errors, supporting our hypothesis on analysts' forecast bias. Our findings on forecast accuracy and bias are also robust for adjusting standard errors by clustering at the industry and year level. As a possible channel behind the relation between organization capital and analyst forecast optimism, we argue that organization capital can increase the difficulty to value a firm. To test this mechanism, we examine the relationship between the firm's organization capital and stock price uncertainty. We employ realized

[2] See Kothari, So, and Verdi (2016) for a survey on the literature of analysts' forecasts.

[3] Eisfeldt and Papanikolaou (2013) find that their measure for organization capital is consistent with the idea that its accrued value will be partly firm specific and that the organizational capital is allocated between shareholders and key talents.

[4] Boni and Womack (2002) document that internal management pressures from institutional investor clients cause analysts' bias. Moreover, Hong and Kubik (2003) suggest that brokerage houses tend to apparently reward optimistically biased analysts. Thus, brokerage houses' specific characteristics are likely to affect analysts' forecast errors.

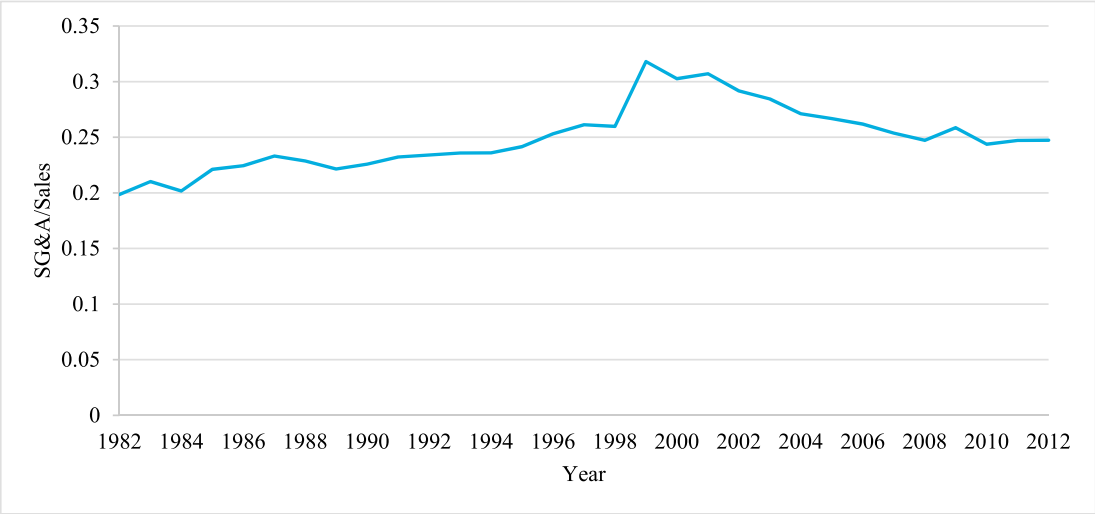

Fig. 1. The trend of SG&A expenses over sales over the time.

stock return volatility and idiosyncratic stock return volatility to measure the stock price uncertainty. Our results indicate that firms' organization capital are positively related to their stock return volatility, confirming a possible channel. In further, we employ alternate measures of forecast error and bias; forecast error and bias are scaled by total assets per share instead of stock price. Our findings are qualitatively similar even when we employ those measures.

This paper contributes to our understanding of the information attributes of organization capital and their impact on analysts' processing of the information. The effect of organization capital on a firm's value and the mechanisms for value creation have been documented (e.g., Eisfeldt & Papanikolaou, 2013; Lev et al., 2009; Lev and Radhakrishnan, 2005; Li, Qui, and Shen, 2018). Additionally, recent studies have investigated how corporate decisions are affected by organization capital (e.g., Attig & Cleary, 2014; Francis, Mani, & Wu, 2015). However, there is little evidence on how a firm's organization capital influences the accuracy and bias of analysts' reports on the firm and the extent to which information about the organization capital is assimilated into the capital market. As far as we know, this is the first study to examine the effect of organization capital on analysts' forecasts.

In addition, this paper adds to the literature on the determinants of variation in analysts' forecast accuracy and bias. Specifically, our work focuses on the effect of information attributes and complexity on the analysts' forecasting errors. Extant studies postulate that analysts' forecasts are less accurate and more optimistically biased when information is more complex (e.g., Duru & Reeb, 2002; Lim, 2001; Plumlee, 2003). We contribute to these studies by focusing on organization capital to measure the complexity of the information and by suggesting that it is related to the analysts' forecasts. Further, this paper is directly related to the literature investigating the relation between intangible assets and analysts' reports (Barth, Kasznik, & McNichols, 2001; Gu & Wang, 2005). In particular, whereas Gu and Wang (2005) investigate the effect of intangible assets related to R&D and advertising on an analyst's forecast accuracy, we focus on the effect of organization capital. We provide evidence that intangible information related to organization capital is associated with analysts' optimism and accuracy.

The remainder of the paper is organized as follows. In section 2, we review the related literature and develop the preceding arguments more fully. Section 3 describes the data, the summary statistics, and the construction of the key variables. We discuss the main empirical findings in Section 4. Section 5 summarizes our findings and draws conclusions.

2. Literature review and hypotheses development

2.1. Previous research related to organization capital

Extant literature sheds light on the role of organization capital in a variety of ways. Prior research investigates the effect of organization capital on a firm's value. Higher organization capital is closely associated with highly qualified employees and superior business processes and systems with competitive advantages. Lev et al. (2009) find that organization capital is significantly related to a firm's operating stock performance and captures a firm's fundamental value. Moreover, Corrado et al. (2009) find that the inclusion of omitted organization capital makes a significant difference in the patterns of U.S. economic growth. The growth rates and efficiency of output tends to notably increase when intangible capital is included, compared with the case in which intangibles are overlooked or excluded. Recent studies show how organization capital affects corporate decisions. Organization capital leads firms to engage in better merger and acquisition (M&A) decisions (Li, Qiu, & Shen, 2018) because acquirer's superior organization capital can be mobilized and exploited into a merged firm. Firms with high organization capital are associated with lower investment and cash flow sensitivity. Francis et al. (2015) find that innovative corporate activities are driven by organization capital since managers' career concern threats can be reduced in firms with higher organization capital. Taken together, extent literature demonstrates that organization capital has

positive influences on firm performance, value, and growth.

A growing body of literature has explored the effects of organization capital on the production process and its properties (e.g., Atkeson & Kehoe, 2005; Hall, 2000; Lustig, Syverson, & Van Nieuwerburgh, 2011). Lustig et al. (2011) argue that organization capital makes a significant contribution to the production process, and thus provides one of the important reasons behind the increase in CEO pay inequality, pay for performance sensitivity, and the subsequent decrease in labor market reallocation. Eisfeldt and Papanikolaou (2013) introduce a common stochastic factor for organization capital's productivity. They find that firms with more organization capital are riskier in the shareholders' perspective due to varying outside option of key talent.

Recent studies document difficulties encountered with measuring organization capital (Eisfeldt & Papanikolaou, 2013, 2014), which are directly related to this paper. The Eisfelt and Papanikolaou's model has two unique characteristics. First, organization capital is embodied in specialized labor input, namely key talent. Second, organization capital includes components specific to each individual firm such as executive compensation plans, employee recruiting and training programs, and unique business processes that distinguish organization capital from general human capital. By those natures, key talent is not only essential to efficiently operate a firm's organization capital but is also potentially portable across firms. Thus, unlike typical physical capital, highly specialized employees own the cash equivalent of their outside options. The value of outside options varies over time and across firms, and therefore, cash flow that is allocated between the shareholders and the key talent are also fluctuating and uncertain, suggesting that a large portion of the most important category of organization capital will not be reflected in market value. With respect to the challenge of estimating the value of organization capital, much literature also suggests that accounting values tend to underestimate a corporation's organization capital (e.g. Atkeson & Kehoe, 2005; Corrado et al., 2005; Corrado et al., 2009). Corrado et al. (2009) find that accounting practices do not reflect the intangible aspects of knowledge capital such as R&D, technical change, and human competency, and that by reflecting intangible investments, the estimated growth rate of output per hour increases by about 10%–20%, compared with analyses that exclude intangibles.

2.2. *Previous research related to analysts' forecasts*

Earlier studies identify the failure of analysts to fully integrate all available information when they issue their earnings forecasts (e.g., Abarbanell & Bernard, 1992; Bernard & Thomas, 1990; Biddle & Ricks, 1988). However, they do not provide the reasons for this outcome. Subsequently, a great deal of research investigates the determinants affecting an analyst's forecast accuracy. Mikhail, Walther, and Willis (1997, 1999) suggest that analysts improve their forecast accuracy as their firm-specific experience increases. Clement (1999) finds that analysts issue more accurate forecasts when they work in large brokerage firms, whereas analysts who cover more firms and industries are likely to produce less accurate forecasts. Lys and Soo (1995) find that forecast accuracy is positively related to the size of an analyst's following.

Whereas those studies focus on the effect of an analyst's attributes or incentives on the degree of his or her forecast accuracy, a large number of studies emphasize the information attributes of firms covered by the analyst as being another factor affecting the analyst's forecast accuracy. This line of research suggests that the information complexity of a firm covered tends to reduce an analyst's ability to process information, thereby adversely affecting the role of information producers and reducing the accuracy of earnings forecasts (e.g., Duru & Reeb, 2002; Hirst & Hopkins, 1998). Hirst and Hopkins (1988) find that analysts do not extract a firm's comprehensive income information under certain reporting formats. Duru and Reeb (2002) provide empirical evidence that greater international diversification causes analysts to report less accurate forecasts. In particular, this paper is closely aligned with the literature analyzing the relationship between information complexity caused by a firm's intangibles and an analyst's forecast accuracy. Edmans (2011) confirms that analysts fail to fully incorporate the value of employee satisfaction. Gu and Wang (2005) find that an analyst's forecast accuracy decreases where firms have more intangible assets such as those produced from R&D and advertising investments. Those studies suggest that intangible assets are associated with more complex information due to the high uncertainty regarding the value of intangibles, the non-tradability of intangible assets in active markets, and the lack of a credible measurement for estimating them.

Taken together, the preceding discussion allows us to propose testable hypotheses regarding the relationship between organization capital and analyst's earnings forecasts. Organization capital is characterized as joint ownership and property rights, accounting practices that overlook intangibles, and high uncertainty over its value. These attributes can result in difficulty when measuring organization capital, which, in turn, makes its information uncertain and complicated. The complexity of organization capital will increase the difficulty of assimilating and processing its information, negatively affecting an analyst's forecast accuracy. Thus, we hypothesize that a firm's higher organization capital is associated with the less accurate earnings forecasts of analysts.

Firms with more organization capital have highly skilled employees and also unique collection of business processes and systems that cannot be easily mimicked by competitors, thereby suggesting that organization capital can capture firms' fundamental ability for superior firm performance and value. In addition, since greater degree of organization capital is related to higher managerial quality and investment in production process, it can improve its product or service and process innovation and further, contribute to more growth opportunities and superior firm value. (Bresnahan & Trajtenberg, 1995; Corrado et al., 2009; Custodio, Ferreira, & Matos, 2017). Hence, analysts are likely to evaluate firms with high organization capital in an optimistic perspective even though they have difficulty in capturing precise value of organization capital due to its challengeable measurement. Thus, we hypothesize that analysts are likely to issue more optimistic forecasts for firms with higher organization capital than for those with lower organization capital.

3. Data description and research design

3.1. Sample construction

In our sample, the necessary variables for constructing organization capital are obtained from the Compustat. We obtain actual earnings and analyst forecast data from the International Brokers' Estimates System (I/B/E/S) Detail History files. In addition, we collect accounting and financial data from the Compustat and the Center for Research in Securities Prices (CRSP) database to construct the control variables required for multivariate analyses. The sample covers firms at the intersection of the Compustat, I/B/E/S, and CSRP databases. Observations with missing data on independent and dependent variables are excluded. Our final sample consists of 34,331 U.S. firm-year observations occurring from 1982 to 2012.

3.2. Organization capital

Following Eisfeldt and Papanikolaou (2013), we measure a firm's stock of organization capital by capitalizing SG&A expenses.[5] SG&A expenses include labor costs such as wages and employee incentives, employee training expenses, recruiting and consulting costs, advertising and marketing expenses, R&D expenses, IT expenses, and investments in information and distribution systems.

Organization capital is calculated using the perpetual inventory method. We recursively measure the stock of organization capital by cumulating the inflation adjusted value of SG&A expenses as follows,

$$OC_{i,t} = (1 - \delta_{OC})OC_{i,t-1} + \frac{SG\&A_{i,t}}{CPI_t}\ , \tag{1}$$

where δ_{OC} is the depreciation rate and CPI_t is the consumer price index. To initiate the motion in equation (1), we should choose an initial stock as follows,

$$OC_{i,0} = \frac{SG\&A_{i,1}}{g + \delta_{OC}}\ , \tag{2}$$

where $SG\&A_{i,1}$ is the first-year SG&A of firm i with a non-missing value in Compustat. Subsequent missing values of SG&A expenses are treated as zero. g is the average real growth rate of firm-level SG&A expenses and is assumed to be 10%. The depreciation rate (δ_{OC}) is 15%, which is the rate used by the Bureau of Economic Analysis to estimate the stock of R&D capital.[6] Finally, the stock of organization capital is scaled by a firm's book value of total assets, denoted as *OC/Assets*.[7]

3.3. Analysts' forecast accuracy and bias

We follow Core et al. (2006) and Giroud and Mueller (2011) to construct an analyst's earnings forecast accuracy and bias. We measure the one-year earnings forecast accuracy for each firm-year observation as the absolute value of the difference between the mean I/B/E/S consensus forecast of annual earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price during the forecast period to control for heteroskedasticity.[8] The I/B/E/S/consensus forecast is measured eight months before the end of the forecast period, i.e. four months after the previous fiscal year-end. Because the vast majority of annual reports are filed within three months of the fiscal-year end, this measurement ensures that analysts know the prior year's earnings when making their forecasts. The two-year earnings forecast accuracy is similarly estimated, with the I/B/E/S consensus forecast measured one year and eight months before the end of the forecast period, deflated by the stock price during the forecast period. Following Lim (2001), Teoh and Wong (2002), and Giroud and Mueller (2011), we remove observations for which the forecast error is larger than 10% of the price to mitigate the effect of outliers. The one-year and two-year earnings forecast accuracy, defined as the absolute forecast error, are denoted as $AFE^{1\text{-}year}$ and $AFE^{2\text{-}year}$, respectively, for the remainder of this paper. The greater the absolute value of the deviations between forecasts from realizations, the less accurate the analysts' forecasts.

As in previous research (e.g., Duru & Reeb, 2002; Gu & Wu, 2003), we measure earnings forecast bias based on the signed forecast error, which is defined as the difference between the consensus earnings forecast and the actual earnings, deflated by the lagged stock

[5] By the U.S. GAPP definition, SG&A expenses represent all commercial expenses of operation, which are costs not directly linked to product production occurred in the regular course of business related to the acquisition of operating income.

[6] See Sliker (2007) for the detail.

[7] Eisfeldt and Papanikolaou (2013) argue that because a substantial part of SG&A is related to labor and IT expenses, their measurement can implement the two distinguishing features of organization capital that are embodied in key talent and specific to a firm. In addition, they indicate that their methodology is consistent with the idea of value investing, which advocates using the stock of SG&A expenses to find the off-balance-sheet value of firm (Greenwald, Kahn, Sonkin, & Biema, 2004).

[8] For robustness, we compute the earnings forecast errors using the median forecast as the consensus rather than the mean and also deflated by lagged total assets per share, not stock price. We also remove observations for which there are less than five analyst forecasts to ensure that the I/B/E/S consensus forecast is a reliable proxy of market expectations (e.g., Easterwood & Nutt, 1999; Loha & Mianc, 2006). We find that our main results remain unaffected.

price. We refer to the one-year and two-year earnings forecast bias as $BIAS^{1\text{-}year}$ and $BIAS^{2\text{-}year}$, respectively, for the remainder of this paper. The larger earnings forecast bias represents a more optimistic analyst's forecast.

3.4. Other explanatory variables

To separate the effect of organization capital on an analyst's forecasting accuracy and bias, we control for other determinants that have been identified as important factors in driving analysts' forecasts in the literature. Firm size is measured by the natural logarithm of assets and is denoted as *Firm Size*. The relationship between firm size and forecast accuracy is ambiguous. Large firms are likely to disclose more information and have less variable earnings (e.g., Duru & Reeb, 2002; Hodgkinson, 2001), but larger firm size may increase information complexity (Duru & Reeb, 2002). Previous research posits that when analysts make forecasts for small firms, they have an incentive to issue more optimistically biased forecasts to improve their relationship with managers because less public information is available to those firms (e.g., Gu & Wu, 2003; Wu, 1998). In this line of research, we expect that firm size is negatively related to an analyst's optimism.

We include the ratio of book value to market value as a proxy for growth. It is calculated as the natural logarithm of the ratio of the book value of common equity divided by market capitalization, and is hereinafter denoted as *BM Ratio*. Growing firms tend to invest in technology-based intangibles with higher uncertainty, and information complexity is likely greater for those firms (Barth et al., 2001; Gu & Wang, 2005). In contrast, because high-growth firms probably need to raise new capital, they care about investor perception and would like to avoid an earnings disappointment, predicting the positive relationship between *BM Ratio* and the forecast measures (e.g., Brown, 2001; Richardson, Teoh, & Wysocki, 2004).

We also control for an analyst's following, which is measured as the natural logarithm of one plus the number of analysts having a forecast of earnings per share, referred to as *Analyst Coverage* for the remainder of this paper. Forecast accuracy improves with an analyst's following (Lys & Soo, 1995). However, analyst following is positively correlated to firm size (Bhushan, 1989). Thus, we do not clearly predict the effect of analyst following on forecast accuracy. A greater analyst following increases the competition among analysts, leading them to report more optimistically driven forecasts (Gu & Wu, 2003). However, a positive correlation exists between firm size and analyst coverage and also, as Das, Levine, and Sivaramakrishnan (1998) suggest, firms that are followed more are related to less optimistic forecasts. Hence, the association between an analyst's following and an analyst's forecast bias is equivocal.

We include analyst forecast dispersion to control for earnings uncertainty (Barron, Kim, Lin, and Stevens, 1998). Analyst forecast

Table 1
Sample distribution by industry and year.

Industry	N	%
Consumer Nondurables	1921	5.60
Consumer Durables	1085	3.16
Manufacturing	4613	13.44
Energy, Oil, Gas, and Coal	2051	5.97
Chemicals and Allied Products	1246	3.63
Business Equipment	7729	22.51
Telephone and Television Transmission	766	2.23
Utilities	98	0.29
Shops Wholesales, Retail, and Some Services	4104	11.95
Healthcare, Medical Equipment, and Drugs	2712	7.90
Finance	4071	11.86
Others	3935	11.46
Total	34,331	100

Year	N	%	Year	N	%
1982	362	1.05	1998	1304	3.80
1983	475	1.38	1999	1254	3.65
1984	587	1.71	2000	1260	3.67
1985	568	1.65	2001	1420	4.14
1986	632	1.84	2002	1427	4.16
1987	576	1.68	2003	1567	4.56
1988	571	1.66	2004	1535	4.47
1989	613	1.79	2005	1495	4.35
1990	711	2.07	2006	1479	4.31
1991	758	2.21	2007	1623	4.73
1992	824	2.40	2008	1431	4.17
1993	906	2.64	2009	1515	4.41
1994	946	2.76	2010	1573	4.58
1995	1156	3.37	2011	1518	4.42
1996	1278	3.72	2012	1645	4.79
1997	1322	3.85	**Total**	**34,331**	**100**

This table presents the industry (based on the Fama and French (1997), p. 12 industry classification) and fiscal year distributions of the 34,331 firm-year observations. The industry grouped as 'Others' includes mines, construction, construction materials, transportation, hotels, business service, and entertainment.

Table 2
Summary statistics.

Variables	25%	Median	Mean	75%	SD	N
Panel A: Analysts' Earnings Forecast						
Absolute 1-year Earnings Forecast Error ($AFE^{1\text{-}year}$)	0.0017	0.0059	0.0183	0.0174	0.0380	34,331
Absolute 2-year Earnings Forecast Error ($AFE^{2\text{-}year}$)	0.0039	0.0122	0.0287	0.0327	0.0459	24,374
Singed 1-year Earnings Forecast Error ($BIAS^{1\text{-}year}$)	−0.0026	0.0008	0.0121	0.0117	0.0404	34,331
Singed 2-year Earnings Forecast Error ($BIAS^{2\text{-}year}$)	−0.0025	0.0055	0.0215	0.0286	0.0497	24,374
Panel B: Organization Capital						
Organization Capital to Total Assets (*OC/Assets*)	0.1667	0.4869	0.6675	0.9613	0.6463	34,331
Organization Capital to Total Assets due to R&D (*OC/Assets_R&D*)	0.0000	0.0035	0.0931	0.1352	0.1549	34,331
Organization Capital to Total Assets due to Advertising (*OC/Assets_Advertising*)	0.0000	0.0007	0.0372	0.0245	0.0917	34,331
Organization Capital to Total Assets due to Residual Factors (*OC/Assets_Residuals*)	0.1296	0.3684	0.5372	0.7658	0.5567	34,331
Panel C: Firm Characteristics						
Total Assets, expressed as million U.S. dollars	280.77	1003.51	6298.53	3727.31	17,670.37	34,331
Ln(Total Assets) (*Firm Size*)	5.6375	6.9113	7.0038	8.2234	1.8492	34,331
Book to Market Equity Ratio	0.2887	0.4747	0.6122	0.7442	0.5790	34,331
Ln(Book to Market Equity Ratio) (*BM Ratio*)	−1.2423	−0.7451	−0.7885	−0.2955	0.7772	34,331
Number of Analysts in Consensus	3.0000	5.0000	7.7832	10.0000	7.6997	34,331
Ln(1+ Number of Analysts in Consensus) (*Analyst Coverage*)	1.3863	1.7918	1.9024	2.3979	0.6862	34,331
Dispersion in 1-year Analysts' Forecast (*Dispersion*)	0.0159	0.0397	0.0735	0.1004	0.3069	34,331
Ratio of Trading Volume to the Number of Shares Outstanding (*Trading Volume*)	0.6387	1.2330	1.7553	2.2970	0.3069	34,331
Herfindahl Index (*Industry Concentration*)	0.0806	0.1570	0.2052	0.2636	1.6285	34,331

This table presents descriptive statistics for variables used in our analysis. Panel A presents 25th percentile, medians, means, 75th percentile, standard deviations, and number of observations of analysts' earnings forecast. Panel B and C provide distributional statistics of organization capital measures and a variety of firm characteristics, respectively. Appendix provides the definition of all variables. All variables are denoted as in parentheses. The sample includes 34,331 firm-year observations over the period of 1982–2012.

dispersion is defined as the standard deviation of an analyst's outstanding forecasts divided by the mean consensus of forecasts, and denoted as *Dispersion* for the remainder of this paper. Lang and Lundholm (1996) find that smaller forecast dispersion is related to greater forecast accuracy. Further, the literature shows that when analysts make forecasts for firms with less predictable earnings, they are more likely to issue optimistic forecasts to acquire more information from management (e.g., Das et al., 1998; Gu and Wu, 2001).

We consider trading volume as one of the control variables, and it is measured by the relationship between the total number of shares traded and the number of shares outstanding, denoted as *Trading Volume*. More trading volume is related to higher volatility in stock prices and thus, high trading volume is likely to produce less accurate forecasts. Trading volume is also useful for capturing strategic reporting bias and an analyst's incentive to generate a trading commission (Gu & Wu, 2003; Hayes, 1998). Higher trading volume produces a stronger incentive to report more optimistically biased forecasts.

Finally, we control for the intensity of product market competition, which is defined as the sum of the squared share of each firm's total industry sales, i.e. its Herfindahl index. We hereafter refer to this variable as *Industry Concentration*. Extant research suggests that firms in more concentrated industries disclose less information and thus, are related to less accurate forecasts (Ali, Klasa, and Yeung, 2014; Lang & Lundholm, 1996). Further, Giroud and Mueller (2011) find that analysts tend to underestimate earnings in noncompetitive industries. Alternatively, firms in concentrated industries and with dominant market position improve the earnings predictability and reduce their information asymmetry (Gaspar & Massa, 2006; Haw, Hu, and Lee, 2015). Taken together, we predict that there is ambiguous relationship between industry concentration and an analyst's forecast accuracy and bias.

3.5. Descriptive statistics

Table 1 shows the sample distribution by 12-industry classification of Fama and French (1997) and also by fiscal year. Firms in business equipment industries including computers, software, and electronic equipment account for the largest proportion of sample, 22.51% of the firm-year observations. Subsequently, firms belonging to manufacturing, wholesale/retail service, and finance industry account for more than 11% of sample. The observations gradually increase over the sample period with a minimum of 362 in 1982 and a maximum of 1645 in 2012 because analysts are likely to cover more firms for their forecast over time.

Table 2 provides the summary statistics for all variables. Panel A of Table 2 shows the 25th percentile, median, mean, 75th percentile, and standard deviation of each variable, presenting the analysts' earnings forecast accuracy and bias. The mean absolute one-year (two-year) earnings forecast error is 0.0183 (0.0287) while the median is 0.0059 (0.0122). In addition, the mean (median) signed one-year earnings forecast error is 0.0121 (0.0008), showing a consistent distribution with the literature (Core et al., 2006; Gu & Wu, 2003). The mean (median) signed two-year earnings forecast error is also 0.0215 (0.0055).

Panel B of Table 2 presents the descriptive statistics for the main explanatory variables. The mean (median) ratio of organization capital to total assets is 0.6675 (0.4869).[9] The mean organization capital due to R&D (Advertising), 0.0931 (0.0372), comprises about 13.94%(5.57%) of the total mean organization capital scaled by the total assets. This suggests that a significant fraction of organization capital, more than 80%, results from human capital and business processes and systems, supporting the extant organization capital literature (e.g. Eisfeldt & Papanikolaou, 2014, 2013; Lev, 2001). The summary statistics for the control variables are described in Panel C of Table 2. The mean total assets are about 6298 million U.S. dollars; the mean ratio of book value to market value is 0.6122. The sample firms are on average followed by about eight analysts. The mean (median) dispersion in the analysts' forecasts and trading volume scaled by the number of outstanding shares is 0.0735 (0.0397) and 1.7553 (1.2330), while the mean (median) intensity in market competition is 0.2052 (0.1570). To mitigate the outlier effect, all variables are winsorized at the 1% level at both tails. All independent variables are calculated either one or two years before the forecast period end date.

4. Empirical findings

4.1. Analysts' earnings forecast accuracy

We run multivariate regressions to examine the effect of organization capital on an analyst's earnings forecast accuracy after controlling for other determinants. Table 3 presents our baseline results that test how a firm's organization capital affects the analyst's one- and two-year earnings forecast accuracy. In column (1), the coefficient of our main variable, *OC/Assets*, is 0.0028 and significant at the 1% level, which indicates that an increase in the organization capital of a firm leads to a greater absolute one-year analyst forecast error. With respect to two-year earnings forecast accuracy, the coefficient of *OC/Assets* is 0.0038 in column (3) and it is significant at the 1% confidence level. This finding suggests that analysts issue less accurate forecasts when their forecasts are directed at firms with higher organization capital.

The literature shows that a brokerage house's specific characteristics are likely to affect an analyst's forecast error (e.g., Boni & Womack, 2002; Hong & Kubik, 2003). Following this line of reasoning, our regressions include brokerage house fixed effects to address this possibility in columns (2) and (4). Firms with a higher level of organization capital are still significantly related to a more absolute one- and two-year forecast error. The results hold unchanged even when brokerage house fixed effects are included with industry fixed effects.

The relationship between the other control variables and the analysts' earnings forecast accuracy is in line with previous studies. The coefficients of a firm's total assets are significantly negative in all columns, whereas those pertaining to a firm's book to market ratio are significantly positive across all columns. This suggests that the accuracy of the analysts' one-year earnings forecasts for both smaller firms and higher growth firms is greater than it is for larger firms and value firms. The coefficients for the analysts' following are significantly negative. The coefficients for forecast dispersion are insignificantly negative for the one-year forecast accuracy, whereas those are significantly positive for the two-year forecast accuracy, which is consistent with our prediction. We also find that the analysts' one-year earnings forecast error tends to be larger for firms with more trading volume and in less concentrated industries. Signs and significances of control variables are mostly as expected.

Although we argue a causal relation that runs from organization capital to analysts' earnings forecast accuracy, our observed relation might be subject to the reverse causality issue that analysts who report less accurate forecasts prefer firms with more organization capital. In addition, while we explicitly control for several determinants identified in prior literature, some unobservable characteristics are likely to affect both organization capital and an analyst's forecast accuracy, making the observed findings biased. To mitigate endogeneity concerns associated with reverse causality or omitted variable bias, we thus conduct 2SLS regressions with an IV. Motivated by previous literature (Carlin, Chowdhry, & Garmaise, 2012; Hasan & Cheung, 2018), we employ mean organization capital at the industry-level in a given year, which is measured as the mean industry-level organization capital scaled by total assets and denoted as *Industry OC/Assets*. Carlin et al. (2012) and Hasan and Cheung (2018) document that firms that operate in rapidly transforming industries tend to face a higher risk from technology obsolescence, resulting in less investment in organization capital. Hence, we expect that organization capital at the industry-level is positively related to firms' organization capital in the industry. Meanwhile, the industry-level organization capital is not likely to affect analysts' earnings forecast accuracy except through the firm-level organization capital. Thus, it is likely that organization capital at the industry-level possibly captures an exogenous variation in organization capital at the firm-level.

Table 4 presents the results of 2SLS regressions. In Panel A, we examine the effect of a firm's organization capital on analysts' one-year earnings forecast accuracy. The first-stage regression result in column (1) shows that *Industry OC/Assets* is positively related to *OC/Assets*, with statistical significance at the l% level. In the second-stage regression of column (2), the coefficient on *OC/Assets* (0.0054) is significantly positive, suggesting that analysts' forecasts are likely to be less accurate for firms with higher organization capital. Further, in columns (3) and (4), our result from the 2SLS regression holds unaffected when we include brokerage house fixed effects in addition to year and industry fixed effects. In columns (1) and (3), the *F*-statistics from the weak instrument test are 23.46 and 23.89, respectively,

[9] Our numbers of organization capital are somewhat smaller compared to those of previous studies (e.g., Eisfeldt & Papanikolaou, 2013; Li, Qiu, & Shen, 2018). However, given that firm size is negatively correlated to organization capital (Eisfeldt & Papanikolaou, 2013; Li, Qiu, & Shen, 2018), our numbers of organization capital appear to be reasonable because analysts tend to issue their forecasts for relatively large firms that have less organization capital. In addition, we identify that the value of organization capital prior to the merge with the analyst forecast database is not qualitatively different from that in the extant literature.

Table 3
Organizational capital and analysts' earnings forecast accuracy.

	$AFE^{1\text{-}year}$		$AFE^{2\text{-}year}$	
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0028***	0.0028***	0.0038***	0.0036***
	(4.61)	(4.62)	(4.29)	(4.12)
Firm Size	−0.0031***	−0.0030***	−0.0042***	−0.0041***
	(-13.78)	(-12.94)	(-12.92)	(-12.19)
BM Ratio	0.0128***	0.0128***	0.0137***	0.0137***
	(26.52)	(26.48)	(20.20)	(20.25)
Analyst Coverage	−0.0020***	−0.0020***	−0.0031***	−0.0030***
	(-4.49)	(-4.46)	(-4.80)	(-4.72)
Dispersion	−0.0014	−0.0014	0.0208***	0.0206***
	(-1.09)	(-1.12)	(8.65)	(8.48)
Trading Volume	0.0018***	0.0018***	0.0023***	0.0022***
	(8.21)	(8.26)	(7.84)	(7.37)
Industry Concentration	−0.0044**	−0.0039*	−0.0071**	−0.0067**
	(-2.02)	(-1.77)	(-2.10)	(-1.99)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Broker house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.136	0.145	0.172	0.183

This table presents the results of regressions examining the relationship between organization capital and analysts' earnings forecast accuracy. $AFE^{1\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $AFE^{2\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the firm level. *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

rejecting the null hypothesis of weak instruments (Stock & Yogo, 2005). On the other hand, the Wu-Hausman tests in columns (2) and (4) reject the exogeneity of *OC/Assets*. In addition, Panel B reports the regression results that investigate the impact of a firm's organization capital on analysts' two-year earnings forecast accuracy. The results are qualitatively similar to those in Panel A. Overall, the 2SLS results are consistent with our baseline results, revealing that our findings are robust for addressing endogeneity concerns.

Moreover, we run the regressions by including firm fixed effects to further address omitted variable bias. In Table 5, the coefficient of our main variable, *OC_Assets*, continues to remain significantly positive after controlling for firm fixed effects in columns (1) and (3). Further, when we consider brokerage house fixed effects as well as firm fixed effects, our results still remain unchanged, showing that higher level of firm's organization capital tends to decrease the accuracy of analysts' one-and two year forecasts.

Overall, the results of Tables 3–5 provide supporting evidence on our first hypothesis, which posits that the greater a firm's organization capital is, the more it is related to a less accurate analysts' earnings forecast.

4.2. Analysts' earnings forecast bias

In this section, we explore the relationship between organization capital and an analyst's forecast bias. Table 6 reports the results of regressions concerning the effect of organization capital on a one- and two-year earnings forecast bias after controlling for other determinants. The coefficients of *OC/Assets*, 0.0015 and 0024, are significantly positive in columns (1) and (3), showing that the analysts' one- and two-year earnings forecasts are more optimistically biased for firms with higher organization capital. In columns (2) and (4), these results also remain unchanged even when brokerage house fixed effects are included in regressions. Collectively, the results suggest that analysts tend to report more optimistic forecasts for firms with higher organization capital than for those with lower organization capital.[10]

The signs of the coefficients on most control variables are as predicted. The coefficients of a firm's total assets are significantly negative in all columns whereas those from a firm's book to market ratio are significantly positive across all columns. The coefficients' sign for analyst following is negative. The coefficient signs for the dispersion of the analysts' forecasts are mixed in columns. We also find that the analysts' forecast bias tends to be larger for firms with higher trading volume. Analysts' forecast optimism is less severe when firms for their forecasts are in concentrated industry.

[10] In untabulated analyses, we examine a possible channel through which organization capital is positively associated with optimistic bias in analysts' earnings forecast. We argue that this relationship is likely to be due to superior firm value and performance induced from organization capital. If firms with more organization capital are positively related to their value and performance, analysts are likely to recognize at least those effects and thus, make more optimistic forecasts for the firms, although they have difficulty in measuring the value of organization capital. Untabulated tests show that organization capital is positively related to firms' Tobin's Q and profitability growth, indicating the positive relationship between organization capital and firm value and performance. Those results are in line with the findings of Lev et al. (2009).

Table 4
Organizational capital and analysts' earnings forecast accuracy: IV 2SLS regressions.

	Panel A: Analysts' 1-year Earnings Forecast Accuracy			
	1st Stage	2nd Stage	1st Stage	2nd Stage
Variable	*OC/Assets*	$AFE^{1\text{-}year}$	*OC/Assets*	$AFE^{1\text{-}year}$
	(1)	(2)	(3)	(4)
OC/Assets		0.0476***		0.0426***
		(3.70)		(3.30)
Industry OC/Assets	0.0054***		0.0055***	
	(4.84)		(4.89)	
Firm Size	−0.0490***	−0.0005	−0.0512***	−0.0006
	(-10.17)	(-0.57)	(-10.50)	(-0.74)
BM Ratio	−0.0505***	0.0151***	−0.0514***	0.0149***
	(-6.60)	(16.98)	(-6.70)	(16.87)
Analyst Coverage	0.0089	−0.0025***	0.0107	−0.0025***
	(1.17)	(-4.31)	(1.43)	(-4.52)
Dispersion	−0.0140	−0.0007	−0.0144*	−0.0008
	(-1.60)	(-0.52)	(-1.66)	(-0.60)
Trading Volume	−0.0376***	0.0035***	−0.0371***	0.0033***
	(-11.72)	(6.29)	(-11.79)	(6.02)
Industry Concentration	−0.0944	−0.0009	−0.0918	−0.0009
	(-1.58)	(-0.26)	(-1.57)	(-0.27)
Wu-Hausman *F*-statistics	N/A	18.35 ($p < 0.000$)	N/A	13.37 ($p < 0.000$)
First-stage *F*-statistics	23.46 ($p < 0.000$)	N/A	23.89 ($p < 0.000$)	N/A
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Brokerage house fixed effects	No	No	Yes	Yes
Number of obs.	34,331	34,331	34,331	34,331
	Panel B: Analysts' 2-year Earnings Forecast Accuracy			
	1st Stage	2nd Stage	1st Stage	2nd Stage
Variable	*OC/Assets*	$AFE^{2\text{-}year}$	*OC/Assets*	$AFE^{2\text{-}year}$
	(1)	(2)	(3)	(4)
OC/Assets		0.0979***		0.0791***
		(3.08)		(2.84)
Industry OC/Assets	0.0052***		0.0056***	
	(3.18)		(3.61)	
Firm Size	−0.0441***	0.0005	−0.0458***	−0.0002
	(-8.04)	(0.30)	(-8.36)	(-0.15)
BM Ratio	−0.0588***	0.0201***	−0.0594***	0.0189***
	(-6.69)	(9.19)	(-6.73)	(9.84)
Analyst Coverage	0.0043	−0.0033***	0.0047	−0.0031***
	(0.49)	(-3.12)	(0.53)	(-3.45)
Dispersion	−0.0237**	0.0063***	−0.0223**	0.0061***
	(-2.20)	(2.98)	(-2.08)	(3.15)
Trading Volume	−0.0352***	0.0058***	−0.0353***	0.0050***
	(-9.73)	(4.78)	(-9.92)	(4.67)
Industry Concentration	−0.0566	−0.0034	−0.0553	−0.0039
	(-0.78)	(-0.46)	(-0.78)	(-0.64)
Wu-Hausman *F*-statistics	N/A	17.82 ($p < 0.000$)	N/A	10.09 ($p < 0.002$)
First-stage *F*-statistics	10.08 ($p < 0.002$)	N/A	13.05 ($p < 0.000$)	N/A
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Brokerage house fixed effects	No	No	Yes	Yes
Number of obs.	24,374	24,374	24,374	24,374

This table reports the results of two-stage least squares (2SLS) regressions to examine the effect of organization capital on analysts' earnings forecast accuracy. In those regressions, the mean organization capital at the industry-level is used as an instrument variable (IV). *Industry OC/Assets* is defined as the average industry-level organization capital (based on three-digit SIC codes) divided by total assets. $AFE^{1\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $AFE^{2\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the firm level. *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

Table 5
Organizational capital and analysts' earnings forecast accuracy: Controlling for firm fixed effects.

	$AFE^{1\text{-}year}$		$AFE^{2\text{-}year}$	
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0043***	0.0045***	0.0064***	0.0062***
	(4.10)	(4.23)	(4.08)	(3.92)
Firm Size	0.0012*	0.0013**	0.0036***	0.0036***
	(1.81)	(1.97)	(3.70)	(3.58)
BM Ratio	0.0129***	0.0128***	0.0118***	0.0117***
	(20.85)	(20.52)	(14.21)	(14.00)
Analyst Coverage	−0.0006	−0.0004	−0.0004	−0.0001
	(-1.21)	(-0.82)	(-0.62)	(-0.12)
Dispersion	−0.0015	−0.0014	0.0067***	0.0065***
	(-1.18)	(-1.14)	(2.70)	(2.59)
Trading Volume	0.0010***	0.0010***	0.0009**	0.0010**
	(3.46)	(3.52)	(2.35)	(2.39)
Industry Concentration	0.0005	0.0006	0.0036	0.0030
	(0.17)	(0.18)	(0.69)	(0.56)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Broker house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.451	0.456	0.489	0.492

This table presents the results of regressions with firm fixed effects that examine the relationship between organization capital and analysts' earnings forecast accuracy. $AFE^{1\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $AFE^{2\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the firm level. *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

Table 6
Organizational capital and analysts' earnings forecast bias.

	$BIAS^{1\text{-}year}$	$BIAS^{1\text{-}year}$	$BIAS^{2\text{-}year}$	$BIAS^{2\text{-}year}$
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0015**	0.0014**	0.0024***	0.0021**
	(2.40)	(2.25)	(2.61)	(2.27)
Firm Size	−0.0026***	−0.0025***	−0.0040***	−0.0038***
	(-11.38)	(-10.39)	(-11.76)	(-10.81)
BM Ratio	0.0108***	0.0108***	0.0115***	0.0114***
	(21.57)	(21.48)	(15.80)	(15.85)
Analyst Coverage	−0.0021***	−0.0020***	−0.0040***	−0.0040***
	(-4.44)	(-4.24)	(-5.63)	(-5.61)
Dispersion	−0.0023*	−0.0024*	0.0212***	0.0209***
	(-1.66)	(-1.71)	(8.07)	(7.89)
Trading Volume	0.0017***	0.0017***	0.0023***	0.0021***
	(7.27)	(7.41)	(7.00)	(6.63)
Industry Concentration	−0.0031	−0.0027	−0.0065*	−0.0060*
	(-1.35)	(-1.17)	(-1.81)	(-1.67)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Brokerage house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.101	0.109	0.146	0.158

This table presents the results of regressions examining the relationship between organization capital and analysts' earnings forecast bias. $BIAS^{1\text{-}year}$ is the signed value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $BIAS^{2\text{-}year}$ is the signed value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the firm level. *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

4.3. Additional tests

In our regressions, standard errors have been clustered at the firm-level. However, the errors terms in the panel regressions can be correlated in the cross section and time series. Thus, we employ two-way clustering at the industry and year level to consider this possibility.

Table 7 reports the regression results including clustering at the industry and year level. Panel A (Panel B) presents the relationship between organization capital and analysts' one- and two-year earnings forecast accuracy (analysts' one- and two-year earnings forecast bias). The results reveal that organization capital is positively associated with analysts' earnings forecast accuracy and bias, indicating that our main findings remain unchanged.

Table 7
Organizational Capital and Analysts' Earnings Forecast Accuracy and Bias: Clustering at the Industry and Year level.

	Panel A: Analysts' Earnings Forecast Accuracy			
	$AFE^{1\text{-}year}$		$AFE^{2\text{-}year}$	
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0028***	0.0028***	0.0042***	0.0040***
	(5.26)	(5.28)	(5.80)	(5.58)
Firm Size	−0.0031***	−0.0030***	−0.0044***	−0.0043***
	(-11.35)	(-12.11)	(-10.90)	(-10.84)
BM Ratio	0.0128***	0.0128***	0.0145***	0.0144***
	(21.07)	(20.90)	(19.60)	(19.50)
Analyst Coverage	−0.0020***	−0.0020***	−0.0027***	−0.0027***
	(-3.91)	(-3.96)	(-3.34)	(-3.36)
Dispersion	−0.0014	−0.0014	0.0039**	0.0043**
	(-0.96)	(-0.97)	(2.22)	(2.44)
Trading Volume	0.0018***	0.0018***	0.0025***	0.0023***
	(7.02)	(7.63)	(7.55)	(7.37)
Industry Concentration	−0.0044***	−0.0039**	−0.0078***	−0.0073***
	(-2.58)	(-2.25)	(-3.17)	(-2.92)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Broker house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.136	0.145	0.164	0.176
	Panel B: Analysts' Earnings Forecast Bias			
	$BIAS^{1\text{-}year}$		$BIAS^{2\text{-}year}$	
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0015***	0.0014**	0.0029***	0.0026***
	(2.69)	(2.52)	(3.59)	(3.19)
Firm Size	−0.0026***	−0.0025***	−0.0042***	−0.0041***
	(-8.67)	(-9.09)	(-9.64)	(-9.42)
BM Ratio	0.0108***	0.0108***	0.0123***	0.0122***
	(16.89)	(16.78)	(15.36)	(15.32)
Analyst Coverage	−0.0021***	−0.0020***	−0.0036***	−0.0036***
	(-3.81)	(-3.73)	(-4.10)	(-4.20)
Dispersion	−0.0023	−0.0024	0.0041**	0.0043**
	(-1.47)	(-1.49)	(2.13)	(2.26)
Trading Volume	0.0017***	0.0017***	0.0024***	0.0023***
	(6.18)	(6.86)	(6.74)	(6.66)
Industry Concentration	−0.0031	−0.0027	−0.0072***	−0.0066**
	(-1.64)	(-1.42)	(-2.72)	(-2.45)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Broker house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.101	0.109	0.139	0.152

This table presents the results of regressions examining the relationship between organization capital and analysts' earnings forecast accuracy and bias. $AFE^{1\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $AFE^{2\text{-}year}$ is the absolute value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $BIAS^{1\text{-}year}$ is the signed value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. $BIAS^{2\text{-}year}$ is the signed value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the industry and year level. *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

Table 8
Organizational capital and stock return volatility.

	RVOL	*IVOL*	*RVOL*	*IVOL*
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.5481**	0.6146***	0.5481**	0.6146***
	(2.23)	(2.78)	(2.39)	(2.92)
Firm Size	−3.8347***	−3.8673***	−3.8347***	−3.8673***
	(-38.96)	(-44.65)	(-45.04)	(-50.89)
BM Ratio	1.9527***	1.7514***	1.9527***	1.7514***
	(11.28)	(11.52)	(11.40)	(12.73)
ROE	−24.3659***	−19.2706***	−24.3659***	−19.2706***
	(-24.26)	(-21.48)	(-19.66)	(-18.77)
Analyst Coverage	−1.0527***	−1.2393***	−1.0527***	−1.2393***
	(-5.50)	(-7.51)	(-5.83)	(-8.60)
Leverage	10.7722***	10.0901***	10.7722***	10.0901***
	(12.29)	(13.35)	(14.19)	(15.19)
Cash/Assets	8.0928***	6.2162***	8.0928***	6.2162***
	(8.51)	(7.61)	(10.00)	(8.52)
PPE/Assets	−4.6142***	−3.5457***	−4.6142***	−3.5457***
	(-4.26)	(-3.73)	(-5.63)	(-4.97)
Capx/Assets	17.2938***	12.1966***	17.2938***	12.1966***
	(7.10)	(5.61)	(7.61)	(5.88)
Trading Volume	4.2995***	3.5371***	4.2995***	3.5371***
	(46.23)	(43.21)	(47.02)	(43.06)
Industry Concentration	−1.7040*	−1.8474**	−1.7040**	−1.8474***
	(-1.86)	(-2.28)	(-2.20)	(-2.90)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Number of obs.	29,823	29,823	29,823	29,823
Adjusted R^2	0.585	0.571	0.585	0.571

This table presents the results of regressions examining the relationship between organization capital and stock return volatility. *RVOL* is realized stock return volatility, which is computed as the standard deviation of monthly stock returns during the fiscal year times the square root of 12. *IVOL* is idiosyncratic stock return volatility, which is the standard deviation of monthly excess stock returns during the fiscal year times the square root of 12. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the firm level in columns (1) and (2), whereas those are corrected for clustering at the industry and year level in columns (3) and (4). *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

Furthermore, we have argued that organization capital can increase the difficulty to value a firm, consequently decreasing analysts' earnings forecast accuracy. To test this possible mechanism, we explore the relationship between organization capital and firm uncertainty.[11] We employ realized stock return volatility and idiosyncratic stock return volatility to measure firm uncertainty. Realized stock return volatility (*RVOL*) is defined as the standard deviation of monthly stock returns during the fiscal year times the square root of 12. Idiosyncratic stock return volatility (*IVOL*) is defined as the standard deviation of monthly excess stock returns during the fiscal year times the square root of 12. Excess stock returns are calculated as the residuals obtained from the regressions of monthly stock returns on the CRSP value-weighted market returns that are estimated during the fiscal year (Dhaliwal, Judd, Serfling, & Shaikh, 2016).

Table 8 presents the results of regressions that examine the relationship between a firm's organization capital and stock return volatility. In columns (1) and (2), the coefficients on *OC/Assets* (0.5481 and 0.6146) are significantly positive with respect to *RVOL* and *IVOL*. In columns (3) and (4), those results also remain unchanged when standard errors are corrected for clustering at the industry and year level. The findings show that organization capital is indeed positively associated with stock return volatility, confirming a possible channel behind our argument.

In addition, we have used stock price to scale analysts' earnings forecast error and bias. Given that organization capital predicts expected stock returns (Eisfeldt & Papanikolaou, 2013), employing stock price to deflate forecast error and bias can introduce bias in these measures, making our observed relation suspicious.[12] To alleviate this concern, we use total assets per share to scale forecast error and bias by following previous studies (Core et al., 2006; Giroud & Mueller, 2011).

Table 9 shows the regression results using those alternate measures of forecast error and bias. In Panel A, a firm's organization capital is positively associated with an analyst's one- and two-year earnings forecast accuracy. In Panel B, organization capital is also positively related to an analyst's one- and two-year earnings forecast bias. Those results are consistent with our main findings, suggesting that our observed findings are not driven by the relation between organization capital and stock price.

[11] We thank an anonymous reviewer for this insightful comment.
[12] We thank an anonymous reviewer for an insightful comment on the measurements of forecast error and bias.

Table 9
Organizational capital and analysts' earnings forecast accuracy and bias: Analysts' earnings forecast deflated by total assets per share.

	Panel A: Analysts' Earnings Forecast Accuracy			
	AFE^{1-year}/Assets Per Share		AFE^{2-year}/Assets Per Share	
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0038***	0.0036***	0.0058***	0.0052***
	(7.36)	(7.09)	(5.08)	(4.63)
Firm Size	−0.0036***	−0.0034***	−0.0067***	−0.0063***
	(-24.97)	(-23.44)	(-19.77)	(-18.39)
BM Ratio	−0.0025***	−0.0024***	−0.0123***	−0.0122***
	(-8.81)	(-8.72)	(-18.92)	(-19.03)
Analyst Coverage	−0.0022***	−0.0021***	−0.0050***	−0.0048***
	(-7.40)	(-7.14)	(-7.04)	(-6.77)
Dispersion	0.0010	0.0010	0.0164***	0.0164***
	(1.27)	(1.25)	(6.64)	(6.67)
Trading Volume	0.0019***	0.0019***	0.0038***	0.0036***
	(11.81)	(11.57)	(10.78)	(10.08)
Industry Concentration	−0.0042**	−0.0038**	−0.0121***	−0.0113***
	(-2.28)	(-2.08)	(-2.99)	(-2.80)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Broker house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.166	0.178	0.232	0.244
	Panel B: Analysts' Earnings Forecast Bias			
	$BIAS^{1-year}$/Assets Per Share		$BIAS^{2-year}$/Assets Per Share	
Variables	(1)	(2)	(3)	(4)
OC/Assets	0.0019***	0.0016***	0.0041***	0.0033***
	(3.25)	(2.76)	(3.27)	(2.70)
Firm Size	−0.0026***	−0.0024***	−0.0059***	−0.0055***
	(-17.82)	(-16.26)	(-16.96)	(-15.61)
BM Ratio	0.0005*	0.0006*	−0.0092***	−0.0091***
	(1.69)	(1.83)	(-12.89)	(-12.94)
Analyst Coverage	−0.0026***	−0.0024***	−0.0071***	−0.0069***
	(-7.70)	(-7.13)	(-9.04)	(-8.74)
Dispersion	0.0005	0.0004	0.0184***	0.0184***
	(0.54)	(0.48)	(6.66)	(6.68)
Trading Volume	0.0016***	0.0016***	0.0036***	0.0034***
	(8.88)	(8.77)	(8.98)	(8.42)
Industry Concentration	−0.0018	−0.0015	−0.0102**	−0.0090**
	(-0.93)	(-0.78)	(-2.36)	(-2.11)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Broker house fixed effects	No	Yes	No	Yes
Number of obs.	34,331	34,331	24,374	24,374
Adjusted R^2	0.083	0.095	0.164	0.176

This table presents the results of regressions examining the relationship between organization capital and analysts' earnings forecast accuracy and bias using alternate measures of analysts' earnings forecast. *AFE^{1-year}/Assets Per Share* is the absolute value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by total assets per share at forecast date. *AFE^{2-year}/Assets Per Share* is the absolute value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by total assets per share at forecast date. *$BIAS^{1-year}$/Assets Per Share* is the signed value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by total assets per share at forecast date. *$BIAS^{2-year}$/Assets Per Share* is the signed value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by total assets per share at forecast date. *OC/Assets* is defined as organization capital scaled by total assets. Variable definitions are provided in Appendix. Standard errors are corrected for clustering at the industry and year level. *t*-statistics are in parentheses. Significance at the 10%, 5%, and 1% is indicated by *, **, ***, respectively.

5. Conclusion

Although a firm's organization capital has been considered as one of the firm's most valuable intangible assets, its role on the capital market has not been extensively examined until recently. This is may be due to the difficulty of measuring the value of organization capital which is not easily captured in book or market value.

In this paper, we investigate the effect of organization capital on analysts' earnings forecast accuracy. We find that organization capital increases information complexity due to the joint ownership and property rights of organization capital with highly uncertain value, thereby leading to information asymmetry between firms and analysts. Moreover, we show that analysts issue more favorable

forecasts for firms with greater organization capital because those firms tend to induce superior firm value and performance. Overall, our findings suggest that organization capital is likely to lead to analysts' optimism and increases earnings-forecast inaccuracy and bias.

This paper expands from the extant literature on the role of organization capital on corporate decisions. We document how a firm's organization capital influences the accuracy and bias of analysts' reports on the firm and the extent to which the intangible information is assimilated into the capital market. This paper sheds light on how organization capital influences information asymmetry between firms and analysts who act as information intermediaries. Finally, we add to an extensive body literature on the determinants of variation in analysts' forecasts accuracy and linking a firm's intangibles with analysts' forecasts.

CRediT authorship contribution statement

Hyun-Dong Kim: Methodology, Formal analysis. **Kwangwoo Park:** Conceptualization, Supervision. **Kyojik Roy Song:** Writing - original draft, Writing - review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.iref.2020.10.009.

Appendix. Variable Definitions

Variable	Definition
Analysts' Forecast Variables:	
$AFE^{1\text{-}year}$	The absolute value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. Consensus forecast is measured by mean consensus EPS forecast that is 8 months prior to fiscal year-end. (Based on Core et al. (2006))
$AFE^{2\text{-}year}$	The absolute value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. Consensus forecast is measured by mean consensus EPS forecast that is 1 year and 8 months prior to fiscal year-end. (Based on Core et al. (2006))
$BIAS^{1\text{-}year}$	The singed value of the difference between the I/B/E/S consensus forecast of 1-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. (Based on Core et al. (2006))
$BIAS^{2\text{-}year}$	The singed value of the difference between the I/B/E/S consensus forecast of 2-year earnings per share (EPS) and the I/B/E/S actual annual earnings per share, deflated by the stock price at forecast date. (Based on Core et al. (2006))
Organization Capital Variables:	
OC/Assets	Organization capital scaled by total assets. For a firm in Compustat, starting from the first year with non-missing SG&A expense, the stock of organization capital is constructed by cumulating the CPI-deflated value of SG&A expense based on a depreciation rate of 15%. The initial stock of organization capital is measured with a 10% real growth rate of SG&A expense. (Based on Eisfeldt and Papanikolaou (2013))
Firm Characteristic Variables:	
Firm Size	Natural logarithm of total assets
BM Ratio	Natural logarithm of book value of equity divided by market value of equity
Analyst Coverage	Natural logarithm of one plus number of analyst having a forecast of earnings per share (Based on Core et al. (2006)
Dispersion	Standard deviation of analysts' forecasts outstanding divided by the mean consensus forecast (Based on Core et al. (2006))
Trading Volume	The average monthly trading volume divided by the number of shares outstanding
Industry Concentration	Measured by Herfindahl Index, which is the sum of the squared share of each firm in total industry sales, constructed based on sales at the three-digit SIC level.
Capx/Assets	The ratio of capital expenditures divided by total assets
PPE/Assets	Net property, plant, and equipment divided by total assets.
ROE	Operating income before depreciation divided by total equity
Leverage	The sum of short-term debt and long-term debt divided by total assets.
Cash/Assets	Cash and cash equivalent divided by total assets
Firm Uncertainty Variables:	
RVOL	Realized stock return volatility, which is computed as the standard deviation of monthly stock returns during the fiscal year times the square root of 12.
IVOL	Idiosyncratic stock return volatility, which is the standard deviation of monthly excess stock returns during the fiscal year times the square root of 12. Excess stock returns are calculated as the residuals obtained from the regressions of monthly stock returns on the value-weighted market returns that are estimated during the fiscal year.

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(*continued*)

Variable	Definition
Instrument Variable:	
Industry OC/Assets	The mean industry-level organization capital (based on three-digit SIC codes) divided by total assets
Alternate Analysts' Earnings Forecast Variables:	
$AFE^{1\text{-}year}$*/Assets Per Share*	Analysts' 1-year earnings forecast accuracy deflated by total assets per share (Based on Core et al. (2006) and Giroud and Mueller (2011))
$AFE^{2\text{-}year}$*/Assets Per Share*	Analysts' 2-year earnings forecast accuracy deflated by total assets per share (Based on Core et al. (2006) and Giroud and Mueller (2011))
$BIAS^{1\text{-}year}$*/Assets Per Share*	Analysts' 1-year earnings forecast bias deflated by total assets per share (Based on Core et al. (2006) and Giroud and Mueller (2011))
$BIAS^{2\text{-}year}$*/Assets Per Share*	Analysts' 2-year earnings forecast bias deflated by total assets per share (Based on Core et al. (2006) and Giroud and Mueller (2011))

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