Does Product Market Competition Influence Analyst Coverage and Analyst Career Success?

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ABSTRACT: We use information from product descriptions in firm 10-Ks to analyze whether product market competition influences analysts' decisions to cover firms, the accuracy and consistency of their earnings reports and their likelihood of obtaining Analyst All-Star status. We find that a firm's analyst coverage and analyst forecast accuracy and consistency increase with product market competition and when firms are covered by analysts who also cover a larger fraction of the firm's competitors. Analyst decisions to cover new firms or drop firms from their coverage are also related to whether the firms are competitors of the existing firms in their coverage portfolios. We also show that analysts whose portfolios comprise a larger fraction of firms that are competitors are more likely to obtain Analyst All-Star status.

Key words: Product Market Competition, Analyst Coverage, Career Outcomes, Industry Specialization

JEL classification: G24, L20

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I. INTRODUCTION

Analysts are an important information intermediary for investors and firms under their coverage. Industry knowledge is ranked as the most important analyst characteristic according to a survey of institutional fund managers by *Institutional Investor* magazine and is the most important determinant of analyst compensation according to a survey of sell-side analysts by Brown, Call, Clement and Sharp (2015). Recent research by Hoberg and Phillips (HP) (2010) and Li, Lundholm and Minnis (LLM) (2013) has shown that competition and firm disclosure about competition are important to firm merger outcomes and investment. Yet, despite its potential first-order importance to analysts, there is little evidence on the impact of industry product market interactions and competition on analyst coverage and analyst career outcomes, likely due to the difficulty in directly producing firm-specific measures of competition.

In this study, we examine whether industry competition is important to analysts as we hypothesize that there may be gains for analysts due to enhanced industry knowledge about product market interactions among competitors. We use new firm and analyst level measures of industry competitors to examine analysts' coverage decisions, their forecast accuracy and consistency, and their career outcomes.

Industry competition may intuitively affect analysts' coverage decisions and accuracy for multiple reasons. First, product market competitors have similar factor inputs / suppliers, production technologies, and markets / customers, and thus correlated costs and revenues. Understanding this correlation may improve forecast accuracy and induce analysts to cover these firms. Understanding competition and following competitors will thus potentially help an analyst

predict a given focal firm's profits as this understanding will help forecast how a rival's pricing and product offering decisions may impact the main firms an analyst is following.[1]

Second, firms may shift markets over time and thus their competitors may change. In addition, industries may become more or less competitive over time, directly impacting firm profits. Analysts thus need to understand how firms compete against each other over time and how competition changes and thus how their products impact the predictability of each other's profits. This understanding should help improve forecast accuracy and induce analysts to cover these firms. For example, prior to the iPhone, computer companies like Dell were major competitors of Apple as they both produce personal computers. Today, cellular phone companies more directly impact Apple's profits. The measure of competition and identification of competitors we use takes into consideration this constantly shifting competitive landscape. Third, following firms with in competitive industries may also allow analysts to focus on one or a few related products to gain necessary experience and special knowledge to become an expert or a specialist in a particular field and make more accurate and consistent earnings forecasts.

Several examples illustrate the conceptual points we are making about the importance of following both firms and their competitors. For example, in forecasting Apple's profits, it is important to know Samsung's product offerings in cell phones, as well as Blackberry's new phone plans and other entrants into the industry. In forecasting DuPont's profits, the analyst needs to know competitor chemical companies' product and supply decisions. Following all the competitors (e.g. HP, Dell, IBM and Oracle and others) in industries such as the database and information services industries is important in forecasting any one company's profits.

We also hypothesize that following related firms in competitive industries may have larger

[1] Berger, Minnis and Sutherland (2017) in a recent working paper show evidence consistent with banks having more experience in industry sectors in which they have concentrated lending exposure as banks collect less audited financial statements for firms in these industry sectors.

benefits than following firms in concentrated industries to understand industry dynamics. Conceptually, Schumpeter (1942) provides the theoretical underpinnings for why it may be harder for analysts to correctly forecast firm profits over extended period of time in high concentration industries. If the industry is stable, with high concentration, it might seem likely that analysts will be able to better forecast earnings of firms in these industries. However, as Schumpeter (1942) emphasized in his formulation of the concept of creative destruction, and recent evidence also shows, high concentration frequently promotes entry and few firms remain market leader for long periods of time. For example in the cell phone business, Motorola was the original market leader. It was displaced by Nokia, which in turn was displaced by Blackberry, which has been subsequently displaced by Apple and Samsung. Thus, high concentration and high profits today does not imply high predictability of profits in the longer term and a stable top firm. In contrast, in already competitive industries with multiple firms, supply and demand can be modeled at the industry level and any one firm will not have a large destabilizing effect on the industry. The analyst can then follow a core of industry firms, without having to worry as much about high profits being eroded affecting her average forecast accuracy and consistency.

Lastly, although the above benefits may induce analysts to cover firms facing greater competition, we recognize that the marginal benefits of following firms in competitive industries to analysts may fall as analysts are less likely to outperform peers covering firms competing in products and face less demand for their research from investors due to potentially greater number of analysts covering these firms. Reaping these benefits also require substantial additional effort to understand product competition. Taking into consideration of these different channels, competition may have ambiguous effects on firms' information environment, performance, and survivability, making firms more or less attractive for analysts to cover.

In this paper, we examine the impact of competition and the importance of following competitors on coverage decisions and analyst performance (accuracy and consistency). We capture the competitors of each firm and the competition they face using new text-based firm-level measures of firms' product descriptions recently developed by HP and used in HP (2010, 2016). These new text-based measures of competitors and competition measure firm competitors by capturing how much firms' products overlap with each other. The text-based measure of competitors is localized and is constructed by combining web crawling and text parsing algorithms that process the text of product descriptions in 10-K annual filings, and calculate firm-by-firm pairwise similarity scores as a Hoteling-like product location space to directly quantify a dynamic, firm-specific relation. A firm's competitors are then identified using a minimum pairwise product similarity score between a firm and a potential rival firm. Given the set of firm-specific competitors, measures of competition including a firm-specific Herfindahl index can be constructed at the firm level given each firm's competitors are potentially unique, analogous to a different Facebook circles of friends. These measures of competition and the identification of competitors are also updated each year and thus can capture new shifting product market competitors.

The HP measures of competitors also provide information on the identities of firms that comprise a firm's peer firms. The data on firm peers allows us to investigate analysts' decisions to add/drop a firm to/from their portfolios based on whether the firm has more or less competition with other firms in their portfolios. The new measures of competition also allow us to investigate whether the analysts make more accurate and consistent earnings forecasts based on coverage of firm competitors and the competition firms face and whether they achieve better career outcomes when firms in their portfolios have differing levels of competition with each other.

We conduct our analysis at three levels: (1) analyst coverage, forecast accuracy, and forecast consistency at the firm level, (2) analyst coverage, relative forecast accuracy, and relative consistency at the analyst firm level, and (3) analyst career outcomes at the analyst level. Note that our earlier discussion about how product market competition may affect each aspect related to analysts (i.e., coverage decisions, career outcomes, and forecast properties) applies to all the levels of our analysis that examine those aspects (e.g., coverage decision at both analyst-firm and firm levels).

At the firm level, we compare text-based measures of competition to aggregate industry measures, i.e., more traditional measures of competition such as Herfindahls using SIC, NAICS or GICS based-industries. We find a positive and significant impact of multiple measures of industry competition on the number of analysts covering the firm and of changes in a firm's industry competition on changes in the number of analysts covering the firm. We further find that analyst forecasts are more accurate and consistent for firms within more competitive industries, and that changes in a firm's industry competition are positively related to changes in forecast accuracy. Because the firm-specific product competition from the HP database continuously measures the within- or between-industry distance of firm-specific pairwise product relatedness and accounts for the fact that firms' industry structure and competition strategies are dynamic rather than static, it is may not be surprising that the firm-specific competitors and measures of product market competition outperform aggregate industry measures.

At the analyst-firm level, we find that analysts are more likely to drop a firm from (add a firm to) coverage if the firm has fewer (more) competitors in the analyst's portfolio, with the relation showing a noticeable concave shape. Further, an analyst's forecast accuracy and forecast consistency are greater than other analysts covering the same firm when the firm has fewer

competitors in the analyst's portfolios, with the effect of product competition attenuating with its own level. At the analyst level, we find that analysts with portfolios of firms more competing among each other are less likely to be fired and are more likely to be nominated *Institutional Investor* all-stars, with the impact of product competition again attenuating with its own level. Taken together, these results provide robust evidence of how product competition affects analysts' career outcomes.

Our paper makes several contributions to the literature. First, our study contributes to the literature on analyst behavior by providing a direct explanation for analysts' industry specialization. Although it is well observed that analysts are industry specialists, little evidence exists to explain this phenomenon. Consistent with Chamberlin (1933) and Hotelling (1929), who show that product differentiation is fundamental to industrial organization, our evidence (e.g., career outcomes) suggests that analysts have incentives to cover firms that are product market competitors to benefit from enhanced industry knowledge. Our large-sample empirical evidence complements the survey-based evidence (e.g., the one provided by *Institutional Investor*) on the importance of industry knowledge to analysts and sheds new light on analysts' decision processes. We add to the analysis of Li et al. (2013) by showing the importance of competition to analyst coverage decisions.

Numerous studies examine the determinants of analyst coverage decisions, focusing largely on the effect of disclosure decisions (e.g., Lang and Lundholm 1996). While these studies are thoughtfully executed, they do not consider differences in competition that firm's face. They also face an obstacle in establishing causality from their focal variables to coverage decisions. For example, analysts may influence firms to improve disclosure quality or make accounting information more comparable (e.g., Jung 2013). However, while firm managers might have

various motives to change, say, accounting disclosure practices to cater to analysts and other capital market players, it is difficult to imagine that firms would change product strategies (e.g., product composition and consequent product market competition) to influence analysts' coverage decisions. Our focus on product market competition therefore allows us to draw more powerful inferences about factors driving coverage decisions as product market competition will not be driven by analyst coverage decisions.

Second, our study contributes to the analyst coverage literature by examining how analysts select firms in their portfolios, which can be directly studied only at the analyst-firm level. Our evidence shows that firm's competition relation with the other firms is an important factor that influences how analysts select portfolio companies. Our study therefore helps fill the gap noted by Beyer, Cohen, Lys and Walther (2010, 329): "Despite the numerous empirical studies documenting the association between the degree of analyst following and firm characteristics, we still do not know the factors that analysts consider when making this decision, and how the incentives faced by the analyst and/or the composition of the analyst's portfolio of followed firms shape this decision." We extend this work by examining how the variation in the economic setting a firm faces through competition contributes to analysts' earnings forecasts and as such we provide an understanding to what industry economic factors drives forecast properties and analyst coverage decisions *within* typical industry groups.

The rest of our paper is organized as follows: Section II develops our hypotheses. Section III presents our firm-level analyses. Section IV presents our analyst-firm level analyses. Section V shows our analyst-level analyses and Section VI concludes.

II. COMPETITION AND ANALYST COVERAGE, ACCURACY AND CAREER OUTCOMES

We conduct three sets of tests on the effect of industry competition on analysts. First, we examine how analysts' coverage, forecast accuracy, and forecast consistency at the firm level depend on product-market competition and covering competitors. Second, we examine how covering existing firms' competitors is related to analyst add/drop decisions, analyst relative accuracy, and relative consistency at the analyst-firm level. Third, we examine how analysts' career outcomes at the analyst level are related to coverage of product-market competitors.

Our first set of tests examines the relation between different measures of competition and competitor coverage on analyst coverage and analyst forecast properties (accuracy and consistency) at the firm level. As indicated in Bhushan (1989) and Lang and Lundholm (1996), the number of analysts covering a firm is a function of analysts' costs and benefits. If there is an overall benefit for analysts to follow a firm and its competitors in markets with high product market competition by enabling analysts to understand the economic environment of the firm, we expect the number of analysts covering a firm to increase with the measures of competition. We also expect that analyst forecast accuracy and consistency will improve for firms in these economic environments where product competition is high and will improve when covering a firm's competitors.

At the analyst-firm level, we first consider the effect of already covering some firms competing in products within an analyst portfolio on adding a firm to or dropping a firm from their coverage. This decision can be the analyst's decision or can be the result of an assignment by the broker. If it is the broker's managers deciding, our tests would pick up the fact that they would wish to have the analyst make more successful earnings forecasts and thus would take into

account similar factors in coverage decisions that the analyst would consider when making a choice, including competition in the firm's products. We hypothesize that in comparing firms not covered by analysts last year, the new firms would be added to coverage portfolios based on the expected success in accurately covering these firms. Analysts, or the broker, would compare firms in last year's portfolio and drop firms that are less desirable this year. If the benefits from choosing close competitors to the firm dominate the related costs, we expect firms that are in more direct competition with existing firms in analyst coverage portfolios to be added, and dropping firms that are in less direct competition with other firms in the analyst's portfolios.

We also examine the relation between how directly firms are in competition with other firms followed by the analyst and the analyst's relative accuracy and relative consistency at the analyst-firm level. While much of the literature finds that forecast accuracy is an important performance matrix (Stickel 1992; Hong and Kubik 2003), recent research suggests that consistency is also important (Hilary and Hsu 2013). As argued earlier, analysts have incentives to follow product market competitors to deepen their industry knowledge. Understanding competition and following competitors as well thus helps the analyst predict the focal firm's profits. Thus, we expect that covering firms more directly competing with each other helps analysts issue relatively more accurate forecasts and more consistent.

Next, we consider whether covering a large fraction of competitors by the analyst affects analyst career outcomes. We expect the impact of covering product market competitors on career outcomes to be highly consistent with that for analyst coverage decisions, because analysts and their firms likely make coverage decisions based on how industry coverage affects their career outcomes. In particular, picking product market competitors should help deepen analysts' industry knowledge and thus help improve an analyst's career outcomes.

We consider two dimensions of analyst career outcomes: being nominated *Institutional Investor* all-stars, and moving to a smaller brokerage house or leaving the analyst profession. Among the various dimensions of career development, one of the key metrics is the prestige of one's employer. For example, Hong and Kubik (2003) note that being an analyst at a lower status brokerage house is typically regarded as worse (e.g., lower compensation and prestige) than being an analyst at a higher status brokerage house. We also consider the effect the closeness of the products of firms followed by the analyst on the likelihood that they are nominated to the All-American Research Team compiled by *Institutional Investor* magazine. Being named to the All-American Research Team has a significant effect on analyst compensation (Stickel 1992; Michaely and Womack 1999; Hong, Kubik, and Solomon 2000; Emery and Li 2009).

To motivate our analysis of competition before conducting more detailed multivariate tests, we first present some initial simple statistics that show how covering product-market competitors and competition are related to analyst coverage and outcomes. Again, we focus on the text-based identification of firm competitors and the firm-level measure of competition from Hoberg and Phillips (2016) as this measure varies across firms within an industry. The measure of competition is the Herfindahl for the text-based network industry identification of competitors (*TNIC HHI*) and it has been shown to more accurately capture competition faced by firms by Hoberg and Phillips (2016). Later in the paper, we also compare this measure in multivariate tests to more traditional industry measures of competition.

We partition our sample into terciles based on localized product-market competition (*TNIC HHI*) within each Fama and French (1997) industry and report the mean for analyst coverage, analyst accuracy, analyst consistency, and the fraction of all-star analysts in each

quartile. Inspection of Table 1 shows that analyst coverage decisions, analyst accuracy and the fraction of all-star analysts all increase with firm product-market competition.

[Insert Table 1 Here]

III. FIRM-LEVEL ANALYSIS OF ANALYST COVERAGE, FORECAST ACCURACY AND CONSISTENCY

Research Design

We now present the research design that we use to analyze analyst decisions and forecast properties in a multivariate context. Later in this section, we describe the data and sample that we use. To examine how product market competition and covering competitors affects the number of analysts covering a firm, we estimate the firm-level regression:

$$Coverage_{it} = \alpha + \beta_1 * Product\ Market\ Competition_{it} + \beta_k * Firm\ Level\ Controls_{it} + \varepsilon_{jt,} \quad (1)$$

where *Coverage* is the number of analysts who issue annual earnings forecasts for firm *i* in year *t*. We focus on localized firm-level measures of competition but also compare to more traditional industry based measures of competition.

At the firm level, we employ the text-based industry Herfindahl provided by HP (2016) as well as other measures of competition for comparison. *TNIC HHI* is the HP HHI index. *TNIC Competitors* is the average of *TNIC Competitor %* at the firm level. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio and N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio (not including focal firm *i*) and focal firm *i*'s total similarity calculation. *LLM HHI* is the competition measure from LLM (2013).

We also compare these firm-level measures of competition to more typical industry measures. At the industry level we use standard measures of industry Herfindahls (HHI) based on SIC (3-digit), NAICs (4-digit), and GICS (6-digit) industry codes to derive *SIC HHI*, *NAICS*

HHI, and *GICS HHI*. We also use *FIC300 HHI* and *FIT HHI*, which are industry Herfindahls based on the fixed industries (FIC 300 and SIC3) from HP (2015).

Many of these measures of competition are skewed. To facilitate comparison across different measures, we use standardized measures based on the deciles of each measure. The standardized decile ranks are zero to nine based on the industry or firm measure in year *t* divided by nine. If analysts benefit from following firms in the same industry, we expect TNIC competitors to be positive, while if analysts benefit from following firms in industries with high product competition, we expect β_1 to be negative for the measures of industry Herfindahl (HHI). As discussed earlier, the TNIC HHI has the advantage of being determined each year so that it captures industry competitor changes and also represents actual products that firms report offering to customers.

We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification and adjust for heteroskedasticity and clustering by both firm and year in all the firm-level regressions.

Next, we test the relation between product market competition and analyst forecast accuracy using the following firm-level regression:

$$\begin{aligned} \textit{Forecast Accuracy}_{it} = \alpha + \beta_1 * \textit{Product Market Competition}_{it} \\ + \beta_k * \textit{Firm Level Controls}_{it} + \beta_3 * |\Delta EPS|_{it} + \varepsilon_{it}. \end{aligned} \quad (2)$$

Forecast Accuracy is defined as the negative of the absolute difference between I/B/E/S reported actual earnings and the last consensus analyst forecast before the annual earnings announcement, scaled by the share price at the prior fiscal year-end. We use decile ranks of competition measures to control for potential skewness in the distribution of competition. Following previous research (e.g., Lang and Lundholm 1996; Duru and Reeb 2002), we also control for the absolute value of

the change in earnings per share from the prior to the current year *(|ΔEPS|*). If product market competition enhances analysts' ability to forecast earnings and increases convergence among analysts about how to value the firm, we expect β_1 to be negative for *Accuracy* (for *TNIC HHI)*.

We then test the relation between product market competition and analyst forecast consistency using the following firm-level regression:

$$Forecast\ Consistency_{it} = \alpha + \beta_1 * Product\ Market\ Competition_{it} + \beta_k * Firm\ Level\ Controls_{it} + \beta_3 * STDROA_{it} + \varepsilon_{it}. \quad (3)$$

Forecast Consistency is defined as follows. Consistent with Hilary and Hsu (2013), we calculate an analyst's forecast consistency as the standard deviation of forecast errors (the difference between I/B/E/S actual earnings and the latest forecast) over the previous three years (ending year *t*).[2] We then define the firm-level *Forecast Consistency* as the negative of median forecast consistency among analysts following a firm, scaled by share price at the prior fiscal year end. Following Hilary and Hsu (2013), we also control for the standard deviation of return on assets (ROA) over the past three years (*STDROA*) as earnings volatility may also affect forecast consistency. Because our consistency measure is calculated over a rolling three year window, we calculate our independent variables (except *STDROA*) as their average values over the same three-year window (our data begin in 1998 for this regression). If product market competition enhances analysts' ability to make the forecasts more consistent, we expect β_1 to be negative for *Consistency* (for *TNIC HHI)*.

In Equations (1) to (3), we control for a number of firm variables that have been shown

[2] We drop analysts with fewer than three years of experience from this test because we need a sufficiently long time series of forecasts to estimate the volatility of forecast errors. Our inferences are not affected if we construct $Consistency_{ijt}$ using standard deviation of last annual forecasts over the previous four or five years or using standard deviation of last quarterly forecasts over the previous eight quarters (ending the fourth quarter in year *t*).

to affect analyst coverage and forecast properties. Unless otherwise stated, the control variables at the firm level are measured at the end of the prior fiscal year. Specifically, we include the logarithm of the market value of equity (*Ln (Market Cap)*) (e.g., Bhushan 1989; O'Brien and Bhushan 1990; Lang and Lundholm 1996), the book-to-market ratio (*Book-to-Market*) as a proxy for firm value (e.g., Barth, Kasznik, and McNichols 2001; Lehavy, Li, and Merkley 2011), and institutional holdings (*Inst. Holdings*) measured as the percentage ownership by institutions obtained from 13-F disclosures in the most recent year (Bhushan 1989; O'Brien and Bhushan1990; Frankel, Kothari, and Weber 2006). We also include *Return Volatility*, the standard deviation of firm monthly stock returns for the fiscal year (Bhushan 1989; Lehavy et al. 2011), *Ln(#Segments),* the natural logarithm of the number of business segments reported in the Compustat Segment File (e.g., Bradshaw, Miller, and Serafeim 2013), *R&D Intensity* and *Advertising Intensity*, the ratio of research and development and advertising expenses, respectively, to operating expense (Barth et al.2001). Finally, we include share volume (*Share Volume*) for the current fiscal year in millions of shares (Barth et al. 2001) and an indicator for loss firms (*Loss Firms*) (e.g., Brown 2001).

Data and Sample

We obtain measures of competition from the HP database. Our sample period is from 1996 to 2013, corresponding to the availability of competition data derived from electronically filed 10 – K documents. We retrieve stock price and return data from CRSP, accounting and segment data from Compustat, actual earnings and analyst forecast data from the I/B/E/S Detail History files, institutional holdings from Thomson Reuters. We collect *Institutional Investor*'s rankings of All-American Research Team analysts for our sample period. The All-American rankings are published each year in the October issue of the magazine. For our analysis, we require the

availability of all the variables except for institutional holdings, R&D intensity, and advertising intensity, which we replace with zero if their values are missing, and the number of segments, which we replace with one if its value is missing.

[Insert Table 2 Here]

Panel A of Table 2 shows summary statistics for the competition variables at the firm level. Table 2 Panel B presents summary statistics for the sample of 62,930 firm-year observations used in the firm-level regressions, that is, Equations (1) and (2). The sample mean and median text-based Herfindahl (*TNIC HHI*) and the other industry competition variables are similarly skewed. For comparability across measures and given the mean is greater than the 75% cutoff for many of these measures, which suggest skewed distributions, we use standardized versions of these variables (equal to decile ranks from zero to nine based on the raw indices divided by nine) in the regression. The mean and median deciled competition measures presented in the Panel A of Table 2 are fairly close for the measures. Panel B shows that the mean (median) number of analysts covering a firm is 9.09 (6.00). The mean (median) firm-level forecast accuracy is -0.06 (-0.002). The mean (median) firm-level forecast consistency is -0.03 (-0.003).

The descriptive statistics on the other variables are as follows: The mean (median) market value of equity is approximately USD 2.78 billion (0.46 billion), suggesting a skewed distribution. The average book-to-market value and institutional ownership are both about 50%, and the average monthly return standard deviation is about 14%. The mean (median) number of business segments is 2.16 (1.00). The mean (median) ratio of R&D and advertising expenses to operating expense are 0.07 (0.00) and 0.01 (0.00), respectively. The mean (median) share volume is 194.34 (46.78) million shares and the mean (median) absolute earnings surprise is 0.13 (0.02). About 28% of firms report a loss in the sample period.

Empirical Results

Analyst coverage

Table 3 reports results from estimating the effect of firm-level competition on the number of analysts covering the firm (i.e., Equation (1)).

[Insert Table 3 Here]

The coefficient on *TNIC HHI* is negative and significant. Thus analyst coverage increases with more competition and decreases with concentration. The rationale is that firms in more concentrated markets are more difficult to cover as their returns vary based on idiosyncratic factors. Changes in competition also can occur in highly concentrated markets with earnings begin subject to competitive threats and interactions which are more difficult to model. We find that the coefficient estimate on *TNIC Competitors* in column 2 is positive and significant, which suggests that analyst coverage is greater for firms with a larger fraction of competitors in the same TNIC competitor network that are in also in the analyst's portfolio.

Similar but weaker results are found using other measures of competition such as *SIC HHI* and *NAICS HHI* – albeit with generally smaller coefficient estimates in magnitude or in some cases statistically insignificant. One exception is the result for *GICS HHI* which shows a positive effect of concentration. The results for other measures of competition are perhaps not surprising as traditional fixed industry classifications are fixed 0-1 based (don't belong or belong to an industry), and change infrequently. They cannot easily accommodate entire new product markets, nor can they continuously measure the within- or between-industry distance of firm-specific pairwise product competition as they classify firms to industries on a zero-one basis.

The results for the control variables are consistent with prior research (e.g., Barth et al. 2001; Lehavy et al. 2011). Larger firms, firms with greater institutional holdings, firms with

greater uncertainty, less complex firms, value stocks and higher trade volume stocks are associated with higher analyst following. Firms with higher R&D intensity, advertising intensity and return volatility are also associated with higher analyst following, reflecting higher demand for analyst services for those firms.

Forecast accuracy and consistency

Table 4 reports results from estimating the effect of firm-level competition on the consensus analyst forecast accuracy (i.e., Equation (2)). Column 1 shows that the coefficient estimate on *TNIC HHI* is negative and significant for *Forecast Accuracy*, which suggests that accuracy is the highest (lowest) for firms in the most competitive (concentrated) industries. Column 2 shows that the coefficient estimate on *TNIC Competitors* is positive and significant – which is consistent as it means that competition improves the information environment of firms and in turn analysts, leading to increased forecast accuracy.

[Insert Table 4 Here]

We report results based on other competition measures columns 3-8. Except for *SIC HHI* (column 7), and *NAICS HHI* (column 8), the remaining measures are statistically insignificant. The firm level measures of competition outperform the industry level measures of competition.

The results for the control variables are consistent with prior research. Firms with a better information environment (e.g., firms with greater institutional holdings) exhibit greater accuracy in their forecasts. Analysts covering firms with greater uncertainty (e.g., greater return volatility), loss firms, and firms with greater earnings changes are associated with lower forecast accuracy.

[Insert Table 5 Here]

Table 5 reports results from estimating the effect of firm-level competition on the analyst forecast consistency (i.e., Equation (3)). Column 1 shows that the coefficient estimate on *TNIC*

HHI is negative and significant for *Forecast Consistency*. Similarly, column 2 shows that the coefficient estimate on *TNIC Competitors* is positive and significant. Other competition measures in columns 3-8 generate smaller coefficient estimates than those in column 1 (*TNIC HHI*) and column 2 (*TNIC Competitors*).

Economic effects and robustness checks

We compare the economic effects of different measures of competition and report the results in Panels A to C of Table 6. We present the effects of one standard deviation change, the change from 10% to median, and the change from median to 90% of competition measures. The results indicate that the *TNIC HHI* and *TNIC Competitors* have the largest economic effects.

[Insert Table 6 Here]

We also conduct a number of additional robustness checks for our firm-level results using *TNIC HHI*. Our results continue to hold when we use different fixed industry classifications (two-digit SIC, three-digit SIC, four-digit GICS, six-digit GICS, three-digit NAICS and four-digit NAICS) to control for industry fixed effects in our firm-level regressions and the results are shown in Panels D to F of Table 6. Our results are also unaffected when we define I/B/E/S variables using the Summary History Files instead of Detail History Files, or when we use quarterly instead of annual data for all our tests.

We also conduct a change test at the firm level for these measures of competition. Since the competition indexes could change significantly from one year to the next, it offers us an opportunity to examine the impact of the changes in product competition on the changes in analyst following and forecast accuracy. We take the first difference of every variable in Equations (1) and (2). The results (which we do not report in the interest of space) show that the changes in competition are positively and significantly related to changes in analyst following and

forecast accuracy, which suggests that analysts consider the benefits through product competition in their following decisions and actively adjust it to the changes in firm's business accordingly. For the change in analyst consistency, the results are not significant, which we ascribe to less time series variation as we construct this variable using the prior 3 years of data.

We also create fixed industry *Competitors* measure similar to *TNIC Competitors* using SIC or GICS data and rerun Equations (2) and (3). The results show that coefficients on such measures are generally significant but again *TNIC competitors* outperforms all these measures. Finally, we find qualitatively similar results (untabulated) for product market competition when we include accounting comparability ($ACCTCOMP_{it}$) as in De Franco, Kothari, and Verdi (2011) in the firm-level regressions. However, our sample shrinks to 36,848 (a reduction of over 40%) when we include this variable.

IV. ANALYST-FIRM-LEVEL ANALYSIS OF ANALYST COVERAGE AND FORECAST PROPERTIES

Research Design and Descriptive Statistics

We now investigate how coverage decisions (adding and dropping firms) are made based on how close competitors compete in products with the analyst's existing firms covered. We thus focus on product competition at the individual analyst firm level. We estimate the following analyst-firm level logit model:

$$\text{Prob}(Add_{ijt}=1) = \alpha + \beta_1 * TNIC\ Competitor\ \%_{ijt} + \beta_k * Firm\ Level\ Controls_{it} + \beta_m * Analyst\ Level\ Controls_{ijt} + \varepsilon_{ijt}, \quad (4)$$

where Add_{ijt} is equal to one if firm i was not covered by analyst j in year t-1 but is covered in year t, and zero if firm i was not covered by analyst j in either year t-1 or year t.

In these tests, we use the localized measure of how close a firm's products are to the other firms covered by the analyst –*TNIC Competitor %* at the analyst-firm level so we can see how each firm is related to the existing competitor firms in an analyst's portfolio. For firm *i* in analyst *j*'s portfolio, we define *TNIC Competitor %*$_{ijt}$ as N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio (not including focal firm *i*) and focal firm *i*'s total similarity calculation. A larger number for *TNIC Competitor %*$_{ijt}$ therefore indicates that firm *i* is competing more to other firms within analyst *j*'s portfolio*,* given the fact that for another firm to enter the calculation of firm *i*'s HP index, the score between them has to be larger than the minimum similarity threshold according to the design of the HP index. Thus, we expect β_1 to be positive in Equation (4) if adding industry competitors has a benefit to analysts.

If analysts randomly choose firms to follow, any firm from the overall population not covered by analyst *j* in either year *t*-1 or *t* can be in our *Add*=0 sample. However, since the number of firms in this sample pool (Pool A) is very large, the number of observations for regressions at the firm-analyst-year level would be huge. To ensure that any significant result is not caused by too large a number of observations, we use a restricted benchmark sample, which we call Pool B, whereby we include only the firms from Pool A that appear in the calculation of the HP index described above for existing firms in analyst *j*'s portfolio.[3]

We control for firm-level variables same as those in Equation (1). We further control for analyst-level variables. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. To be consistent with prior analyst

[3] Note that this choice (i.e., reduce the *Add*=0 sample from Pool A to Pool B) works against finding the expected results since benchmark firms (i.e., Add_{ijt}=0 firms) in Pool B already compete with the existing firms in the analyst's portfolio.

studies (e.g., Hong and Kubik 2003), we define the other analyst characteristics using relative ranks among analysts following a firm to facilitate the comparison across analysts due to the differences in the firms that they cover. $Accuracy_{ijt}$ is relative accuracy rank among analysts following a firm. To obtain this variable, we first calculate the absolute value of analyst *i*'s forecast error for firm *j* in year *t*. We then rank all of the analysts that cover firm *j* in year *t* based on absolute forecast error, and define $Accuracy_{ijt}$, as 1 - ($Rank_{ijt}$ - 1) / (# $of\ Analysts_{it}$ - 1), where # $of\ Analysts_{it}$ is the total number of analysts covering firm *i*. If more than one analyst has the same accuracy and thus rank on firm *i*, we assign each of these analysts the average of their ranks. *Breadth* is similar to *Accuracy* but based on the number of firms covered by the analyst. *Boldness* is similar to *Accuracy* but based on the absolute value of the distance between the analyst's forecast and the consensus (defined as the average of the other analysts' forecasts). *Experience* is similar to *Accuracy* but based on the number of years the analyst has covered the firm. *Broker Size* is similar to *Accuracy* but based on the number of analysts employed by the brokerage house of the analyst. *Horizon* is similar to *Accuracy* but based on the number of days between the last forecast and earnings announcement dates. We then take the average of these measures (*Accuracy*, *Breadth*, *Boldness*, *Experience*, *Broker Size*, and *Horizon*) over all firms covered by analyst *j* in year *t* to obtain the corresponding *analyst-level* variables. Note that we cannot obtain analyst-firm level control variables for this regression because they are unavailable for the large number of firms that an analyst does not cover (i.e., *Add*=0) in year *t*. For the same reason, we cannot obtain the relative ranks among analysts following a firm for our main variable ($TNIC\ Competitor\ \%_{ijt}$) in Equation (4).

To investigate the impact of how close a firm's products are to the other firms in an analyst's portfolio on their decision to drop a firm from their portfolio, we use the following

analyst-firm level logit model:

$$\text{Prob}(Drop_{ijt}=1) = \alpha + \beta_1 * TNIC\ Competitor\ \%_{ijt} \text{ or } Rank\ TNIC\ Competitor\ \%_{ijt} + \beta_k * Firm\ Level\ Controls_{it} + \beta_n * Analyst\text{–}Firm\ Level\ Controls_{jt} + \varepsilon_{ijt}, \quad (5)$$

where $Drop_{ijt}$ is equal to one if firm i was covered by analyst j in year t but not in year t+1, and zero if firm i was covered by analyst j in both years. Thus, in this test our sample consists of firms covered by analysts in year t and we examine whether an analyst drops a firm from coverage in the next year. In Equation (5), *TNIC Competitor %*$_{ijt}$ is defined as above; again, it measures the degree of competition between a given firm (firm i) and existing firms in analyst j's portfolio in year t.

In this and all subsequent analyses, we calculate relative rank of product competition following Hong and Kubik (2003) given we focus on firms that are covered by analysts in year t. Therefore, we create a relative measure of competition, *Rank TNIC Competitor %*$_{ijt}$, following a similar approach as that used to calculate relative accuracy. Specifically, we calculate the relative rank of *TNIC Competitor %*$_{ijt}$ among analysts following firm i in year t. Using a relative (rank) measure instead of a raw measure mitigates the effects of common shocks that affect all analysts covering a firm at a given point in time and hence helps us focus on the analysts' roles. If the benefit from product market competition dominates the cost, we expect β_1 to be negative in Equation (5).

We control for firm-level and analyst-firm level variables in Equation (5). Firm-level controls are same as those in Equation (1). We continue to use relative ranks to measure analyst characteristics (except for *Star*). Since all firms are covered by analysts in year t in this analysis, we define analyst characteristics (*Accuracy*, *Breadth, Boldness*, *Experience*, *Broker Size*, and *Horizon*) at the analyst-firm level instead of the analyst level. In both Equations (4) and (5), we

include year and industry fixed effects (based on the 48 industry classifications of Fama and French (1997) to account for inter-temporal and cross-industry differences beyond the controls.[4]

To examine the impact of product competition on forecast accuracy and forecast consistency at the analyst-firm level, we estimate the following regression:

$$Accuracy_{ijt} = \alpha + \beta_1*(Rank)\ TNIC\ Competitor\ \%_{ijt} + \beta_2*Star_{jt} + \beta_3*Breadth_{ijt} + \beta_4*Boldness_{ijt} + \beta_5*Experience_{ijt} + \beta_6*Broker\ Size_{ijt} + \beta_7*Horizon_{ijt} + \varepsilon_{ijt}; \quad (6)$$

$$Consistency_{ijt} = \alpha + \beta_1*(Rank)\ TNIC\ Competitor\ \%_{ijt} + \beta_2*Star_{jt} + \beta_3*Breadth_{ijt} + \beta_4*Boldness_{ijt} + \beta_5*Experience_{ijt} + \beta_6*Broker\ Size_{ijt} + \beta_7*Horizon_{ijt} + \varepsilon_{ijt}. \quad (7)$$

$Accuracy_{ijt}$ is relative forecast accuracy defined previously. $Consistency_{ijt}$ is Hilary and Hsu (2013) measure of relative forecast consistency. We first calculate the raw consistency as the standard deviation of last annual forecast errors over the previous three years (ending year t) for analyst i following firm j. We then use the same procedure described before to rank all of the analysts that cover firm j in year t based on the raw consistency measure to obtain $Consistency_{ijt}$. If product market competition increases analysts' forecast accuracy and consistency, we expect β_1 in Equations (6) and (7) to be positive.

Other variables are defined same as Equation (5) and motivated from prior literature (e.g. Hong and Kubik 2003; Clement and Tse 2005; Ke and Yu 2006). Lastly, we include year fixed effects in Equations (6) and (7). In all of our analyst-firm level analyses (Equations (4) to (7)), we adjust standard errors for heteroskedasticity and clustering by analyst, firm, and year (Gow, Ormazabal, and Taylor 2010; Cameron, Gelbach, and Miller 2011). Because our consistency measure is calculated over a rolling three-year window, we calculate our independent variables in

[4] Adding industry fixed effects is more necessary for $TNIC\ Competitor\ \%_{ijt}$ than for $Rank\ TNIC\ Competitor\ \%_{ijt}$. As discussed above, the relative rank measure mitigates the effects of common shocks that affect all analysts covering a firm at a given point in time.

Equation (7) as their average values over the same three-year window.

To capture the potential non-linear relation between product competition and our variables of interest, we also re-estimate Equations (4) to (7) by adding the square of our competition measure, *TNIC Competitor %*^{2} or *(Rank TNIC Competitor %)*^{2}. If the effect of product market competition on analyst coverage (i.e., *Add* or *Drop*) decision and forecast properties (accuracy and consistency) attenuates as product competition increases, we expect that the sign of the coefficient on *TNIC Competitor %* or *Rank TNIC Competitor %* remains the same as what we discussed above, whereas the sign of the coefficient on *TNIC Competitor %*^{2} or *(Rank TNIC Competitor %)*^{2} is opposite to that of *TNIC Competitor %* or *Rank TNIC Competitor %*.

[Insert Table 7 Here]

Table 7 shows summary statistics for the key variables at the analyst-firm level. These variables seem to be largely well distributed. For add decisions, about 1% of firms competing in products but not covered by an analyst in one year become covered the next year (=147,602 / (147,602 + 16,174,879)). For drop decisions, about 27 % of firms covered by an analyst in one year are dropped from coverage the next year (=149,911 / (149,911 + 406,828)). Given that analysts generally cover a similar number of firms across years, this implies turnover of about 30% of firms each year in the average analyst's portfolio. These percentages are essentially the unconditional probability of firms being added to and dropped from and analyst coverage, respectively. By comparing observations within three subportfolios (newly covered firms (Add_{ijt}=1), firms with continued coverage ($Drop_{ijt}$=0), and firms dropped from coverage ($Drop_{ijt}$=1), we can see that analysts change a large proportion of their portfolios every year. Panel A also shows that the mean (median) *Accuracy* is 0.50. The mean (median) *Consistency* is 0.51(0.50). The mean (median) of *TNIC Competitor %* is 0.33 (0.21) for the *Add* sample, and is

0.44 (0.40) for the *Drop* sample. The mean (median) of *Rank TNIC Competitor %* is 0.50 (0.50) for the *Drop* Sample.

Coverage Decisions, Relative Accuracy and Consistency

Coverage decisions

Table 8 presents the results of the logit model in Equation (4) for analysts' add decisions. The mean coefficient on *TNIC Competitor %$_{ijt}$* is positive and significant, suggesting that analysts are more likely to add firms that compete more in products with the existing firms in their portfolios. In untabulated results, we find that a one standard deviation increase in *TNIC Competitor %$_{ijt}$* increases a firm's probability of being added by 0.15% (based on column 1 results). Given that Table 7 shows that the unconditional probability of being added to analyst portfolios is 1%, a one standard deviation increase in *TNIC Competitor %$_{ijt}$* increases a firm's probability of being added to coverage by 15% (= 0.15% divided by 1%) .

[Insert Table 8 Here]

Table 8 also shows that the coefficient estimate on *TNIC Competitor %* (column 1) is positive and significant, whereas its square term *TNIC Competitor %^{2}* (column 2) is negative and significant in the *Add* regression. The result suggests that the likelihood of adding a firm to coverage declines when the firm competes too much in products with the other firms in the analyst's portfolio.

[Insert Table 9 Here]

Table 9 presents the results of the logit model in Equation (5) for analysts' drop decisions. The coefficient estimates on *TNIC Competitor %$_{ijt}$* (*Rank TNIC Competitor %$_{ijt}$*) are negative and significant, suggesting that analysts are less likely to drop firms that compete more in products with the other firms in their portfolios. Given that Table 7 shows that the unconditional

probability of being dropped from analyst portfolios is 27%, the result here means a one standard deviation increase in *TNIC Competitor %*$_{ijt}$ (*Rank TNIC Competitor %*$_{ijt}$) decreases a firm's probability of being dropped by 3.0% (2.8%), (based on columns 1 and 3 results), which is equivalent to approximately 11.1% (= 3.0% divided by 27%) (10.4%= 2.8% divided by 27%) of the unconditional probability of being dropped. Overall, the results from the coverage decision regressions suggest that analysts actively adapt to the product competition of covered firms.

We also find that the coefficient estimates on *TNIC Competitor %* and *Rank TNIC Competitor %* have opposite sign to those of their square terms, *TNIC Competitor %*^{2} and *(Rank TNIC Competitor %)*^{2}, respectively, while all is statistically significant. These results suggest that the net benefit of covering a firm declines when the firm competes too much in products with the other firms in the analyst's portfolio.

The other variables are mostly consistent with our expectations. For example, for drop decisions, firms with large size and more institutional holdings are less likely to be dropped by analysts, whereas firms with higher return volatility and loss firms are more likely to be dropped by analysts. Analysts are less likely to drop firms from their coverage when they are star analysts, when their forecasts for these firms are more accurate or bold, when they are more experienced with these firms or employed by smaller brokerage houses, or when they issue more recent forecasts for these firms. We often find the opposite sign for the control variables in the add decision regression. These results are consistent with analysts deciding whether to cover individual firms on the basis of both the benefit and the cost of covering the firm.

Relative accuracy and consistency

Table 10 reports results from estimating Equations (6) and (7). Columns 1 and 3 show that the coefficients on *TNIC Competitor %* and *Rank TNIC Competitor %* are positive and significant,

which suggests that an analyst issues more accurate forecasts on a firm relative to other analysts covering the same firm when the firm competes more with the other firms in the portfolio. We find a nonlinear relation between product competition and relative accuracy in columns 2 and 4. The coefficients estimate on *(TNIC Competitor %)*^{2} and *(Rank TNIC Competitor %)*^{2} is negative and significant, suggesting that the net benefit of product competition decreases when the firm's products compete too much with those of the other firms in the analyst's portfolio.

[Insert Table 10 Here]

Columns 5 to 8 of Table 10 report the effect of having competitor firms covered on relative consistency. Columns 5 and 7 show that the coefficients on *TNIC Competitor %* and *Rank TNIC Competitor %* are positive and significant, while columns 6 and 8 show a nonlinear relation between product competition and relative consistency. The results suggest that an analyst issues more consistent forecasts on a firm relative to other analysts covering the same firm when the firm competes more in products with the other firms in the portfolio and the net benefit decreases as firms compete too much in products .

We also estimate the effect of covering product market competitors on relative accuracy and consistency at the analyst level. We regress the mean relative forecast accuracy and consistency across all firms within an analyst's portfolio on our analyst-level competition measure *Mean Rank TNIC Competitor %* and the control variables (*Breadth*, *Boldness*, *Experience*, *Broker Size*, and *Horizon*). Our results (untabulated) show that the coefficient on *Mean Rank TNIC Competitor %* is significantly positive. Thus, we find additional evidence suggesting that analysts issue relatively more accurate and consistent forecasts when their portfolios consist of firms that compete with each other.

Robustness checks

Our results hold when we use other alternative competition measures in the analyst-firm level regressions (Tables 8-10). First, we use *Mean Competition*, which is equals the sum of detailed net pairwise scores of firms (other than firm *i*) shown both in analyst *j*'s portfolio and firm *i*'s HP index calculation. Second, we use *Dcompetition*, which is one if the firm is in one of analyst portfolio firms' TNIC total similarity calculation and zero otherwise. Third, we define competition based on firms' fixed industry membership. Specifically, we define *FIC Competition* as the percentage of firms in analyst *j*'s portfolio that come from the same fixed industry (e.g., three-digit SIC) as firm *i* in year *t* (Jacobs, Lys, and Neale 1999). Untabulated results show that HP competition measures generate stronger results than fixed-industry-based measures. Our results also hold when we rank these alternative competition measures using the Hong and Kubik (2003) approach or when we require at least five analysts cover a firm in calculating relative accuracy and consistency.

In a robustness check, we also control for analysts' affiliation with a stock's underwriter in our analyst-firm level analyses. Prior studies find that analysts strategically issued optimistically biased forecasts or recommendations if analysts are affiliated with a stock's underwriter (e.g., Lin and McNichols 1998; Michaely and Womack 1999; Malmendier and Shanthikumar 2014). Analysts' affiliation with stock underwriters may serve as an explanation for why analysts do not always cover high competition firms. We define *Affiliated Analyst* following prior literature (e.g., Malmendier and Shanthikumar 2014) as one if the analyst's investment bank was the lead underwriter of an initial public offering of the firm during the past five years, or of a seasoned equity offering of the firm during the past two years, and zero otherwise. The untabulated results show that affiliation significantly increases (decreases) the likelihood of adding (dropping) a firm

to (from) an analyst's portfolio, but it does not affect the analyst's relative accuracy or consistency. These results are consistent with analysts having incentives to cover firms with which their employers have underwriting businesses. Our main results in Tables 8 to 10 continue to hold otherwise with this additional control.

Finally, our untabulated results show that our main findings in Tables 8 to 10 are robust to controlling for analysts' general forecasting experience (Clement 1999), industry experience (Mikhail, Walther and Willis 1997), or brokerage house experience. We control for firm-specific experience in our baseline models following prior studies (e.g., Clement 1999; Ke and Yu 2006; Hilary and Hsu 2013). We define analysts' general forecasting experience as the number of years analyst *i* appears in the I/B/E/S annual earnings forecast database as of year *t*, industry experience as the number of years analyst *i* covers a fixed industry based on two-digit SIC as of year *t*, and brokerage house experience as the number of years analyst *i* issue annual forecasts with the same brokerage house as of year *t*. We find that analysts' general experience and industry experience decrease both the likelihood of adding a new firm to their coverage and the likelihood of dropping an existing firm from their coverage. Brokerage house experience also decreases the likelihood of adding a new firm but does not seem to affect the likelihood of dropping an existing firm. These alternative experience measures generally do not affect relative accuracy or relative consistency.

V. ANALYST-LEVEL ANALYSIS OF CAREER OUTCOMES

We next assess the effect covering product market competitors on analysts' career outcomes at the analyst level. To measure product market competition at the analyst level, we create *Mean Rank TNIC Competitor %*$_{jt}$ by averaging the analyst-firm-level competition indexes, *Rank TNIC Competitor %*$_{ijt}$, across firms within analyst *j*'s portfolio. This measure proxies for the degree of competition among firms within analyst *j*'s portfolio. The larger is *Mean Rank Rank*

TNIC Competitor %$_{jt}$, the more competitor firms are within analyst *j*'s portfolio.

We use the following analyst-level regressions to examine the impact of covering product market competitors on the career outcomes of analysts:

$$\text{Prob}\,(Fire_{jt+1} = 1) = \alpha + \beta_1 * Mean\ Rank\ TNIC\ Competitor\ \%_{jt} + \beta_2 * Star_{jt} + \beta_3 * Accuracy_{jt} + \beta_4 * Breadth_{jt} + \beta_5 * Boldness_{jt} + \beta_6 * Experience_{jt} + \beta_7 * Broker\ Size_{jt} + \varepsilon_{jt}, \quad (8)$$

$$\text{Prob}\,(Star_{jt+1} = 1) = \alpha + \beta_1 * Mean\ Rank\ TNIC\ Competitor\ \%_{jt} + \beta_2 * Star_{jt} + \beta_3 * Accuracy_{jt} + \beta_4 * Breadth_{jt} + \beta_5 * Boldness_{jt} + \beta_6 * Experience_{jt} + \beta_7 * Broker\ Size_{jt} + \varepsilon_{jt}. \quad (9)$$

Following Hong et al. (2000) and Ke and Yu (2006), we define $Fire_{jt+1}$ as an indicator variable equal to one if analyst *j* moves to a small brokerage house (less than 25 analysts) or permanently leaves the I/B/E/S database in the following year (i.e., between July 1 of year *t*+1 and June 30 of year *t*+2), and zero otherwise. $Star_{jt+1}$ is an indicator variable that equals one if the analyst is on *Institutional Investor* magazine's all-star list in the following year, and zero otherwise. If product competition benefits analysts' career outcomes, we expect β_1 to be negative and positive in Equations (8) and (9), respectively.

We include several analyst-level variables to control for other factors that might affect analyst career outcomes. Consistent with prior studies (e.g., Ke and Yu 2006; Hilary and Hsu 2013), we control for *Breadth, Boldness*, *Experience*, and *Broker Size*. We also control for the current year's all-star status (*Star*) and *Accuracy* because these variables may capture analysts' visibility, which affects their career outcomes (Emery and Li 2009).[5] We average the firm-analyst-level *Breadth, Boldness, Experience, Broker Size*, and *Accuracy* across firms within analyst *j*'s portfolio to get the corresponding analyst-level counterparts. We adjust standard errors for heteroskedasticity and clustering by both analyst and year. Finally, we include broker fixed

[5] We control for *Accuracy* but not *Consistency* in Equations (8) and (9) to avoid a significant loss of observations due to a greater restriction of data in calculating *Consistency*, although our inferences are unaffected when we control for *Consistency*.

effect and year fixed effect.

To capture the potential non-linear relation between covering product market competitors and analyst career outcomes, we also re-estimate Equations (8) to (9) by adding the square of our competition measure, $(Mean\ Rank\ TNIC\ Competitor\ \%_{jt})^2$. If the effect of product competition on analyst career outcomes attenuates as product competition increases, we expect that the sign of the coefficient on $Mean\ Rank\ TNIC\ Competitor\ \%_{jt}$ remains the same as what we discussed above, whereas the sign of the coefficient on $(Mean\ Rank\ TNIC\ Competitor\ \%_{jt})^2$ is opposite to that of $Mean\ Rank\ TNIC\ Competitor\ \%_{jt}$.

[Insert Table 11 Here]

Table 11 presents summary statistics for the sample of 56,155 analyst-year observations used in the analyst-level regressions. The mean (median) *Fire* and *Star* are 0.16 (0.00) and 0.09 (0.00), respectively. The mean (median) of *Mean Rank TNIC Competitor %* is 0.43 (0.45). The mean (median) *Boldness* is 0.51 (0.50). The mean (median) *Breadth* is 12.30 (11.00), meaning that an analyst covers about 12 firms on average. The mean (median) *Experience* is 3.24 (2.00) years. Finally, the mean (median) brokerage has 61.93 (40.00) analysts.

[Insert Table 12 Here]

Table 12 presents results of estimating firing outcomes (i.e., Equation (8)). The coefficients on *Mean Rank TNIC Competitor %* and *Mean Rank TNIC Competitor %* are negative and significant, which suggests that analysts whose portfolios consist of firms that compete more in products with each other are less likely to be fired. In untabulated results, we find that a one standard deviation increase in *Mean TNIC Competitor % (Mean Rank TNIC Competitor %)* decreases an analyst's probability of being fired by approximately 0.5% (0.84%). Given that Table 11 shows that the unconditional probability of being fired is 16%, a one standard deviation

increase in *Mean Rank TNIC Competitor %* decrease the unconditional probability of being fired by approximately 3.1% (= 0.5% / 16%) (5.3%=0.84%/16%).

[Insert Table 13 Here]

Table 13 presents results on star status (i.e., Equation (9)). The coefficients on *Mean TNIC Competitor %* and *Mean Rank TNIC Competitor %* are positive and significant, which means that analysts with firms that compete more in products with each other in their portfolios are more likely to be voted all-stars. In untabulated results, we find that a one standard deviation increase in *Mean Rank TNIC Competitor %* (*Mean Rank TNIC Competitor %)* increases an analyst's probability of being an all-star by approximately 0.5% (0.5%). Given that Table 11 shows that the unconditional probability of being an all-star is 9%, a one standard deviation increase in *Mean Rank TNIC Competitor %* (*Mean Rank TNIC Competitor %)* increases the unconditional probability of being an all-star by approximately 5.6% (= 0.5% / 9%) (5.6% (= 0.5% / 9%)).

The signs for the control variables are largely consistent with expectations. For example, all-star analysts in the previous year, analysts with higher relative forecast accuracy and larger coverage are less likely to be fired and more likely to be an all-star this year. The results overall suggest that high competition as captured by how intensively firms compete in products with each other within analysts' portfolios improves analysts' career outcomes.

We also include square terms *(Mean TNIC Competitor %)*^{2} and *(Mean Rank TNIC Competitor %)*^{2} to test the potential nonlinear relation. In columns 2 and 4 of Tables 12 and 13, we find that that *Mean TNIC Competitor %* and *Mean Rank TNIC Competitor %* remains significant and has the same sign as that in respective tables, whereas *(Mean TNIC Competitor %)*^{2} *and (Mean Rank TNIC Competitor %)*^{2} are significant and have the opposite sign to those of *Mean TNIC Competitor %* and *Mean Rank TNIC Competitor %*. Thus, the benefit of

covering product market competitors on career outcomes appears to decline with an increase in the degree of product competition among firms covered by an analyst.

Our analyst-level estimation results are robust to excluding relative accuracy from Equations (8) and (9). They are also robust to including the analyst-level relative consistency, even though our sample will decrease. Our results also hold when we use the three alternative competition measures defined previously (i.e., *Mean Competition*, *Dcompetition*, and *FIC Competition*) to calculate the degree of product competition among firms covered by an analyst. Finally, we also test the effect of product market competition within an analyst's portfolio (*Mean Rank TNIC Competitor %*) on the likelihood an analyst moves to a large brokerage house (with at least 25 analysts), providing further support for the positive effect of higher product market competition on analysts' career outcomes.

In an additional set of analyses, we further investigate the add/drop decision as well as the forecast accuracy around firm merger and acquisition (M&A) events. The M&A setting allows us to test the analyst portfolio management decision subsequent to an exogenous shock to product competition among firms. The outcome of an M&A is that the merged new firm has different competition relation to existing firms in analysts' portfolios.

We identify M&A events form the SDC database and require the deal is larger than 10 million so that the event is more likely to affect the analyst behavior. For the add decision, we rerun Equation (4) using the subsample one year after the M&A event to examine which analysts select the merged firm after the M&A event. For the drop decision, we rerun the Equation (5) using the subsample at the M&A year.

[Insert Tables 14 and 15 Here]

Tables 14 and 15 report the results. Table 14 reports the results for add decision. The

results are similar to those reported in Table 8, suggesting that analysts are more likely to follow a merged firm if the firm competes more in products with the other firms in the portfolio. Table 15 presents the estimation results for drop decision. Similar to results in Table 9, analysts are more likely to drop a merged firm if the firm competes less in products with the other firms in the portfolio. Further, untabulated results show that analysts provide more accurate forecasts for a merged firm if the firm competes more in products with the other firms in their portfolios. All of these results suggest that product competition is an important information source for analysts and analysts consider it in the portfolio management process. Our results are similar if we require the M&A target to be a public firm. The results also hold when we partition our samples by whether the M&A targets are in the same or different industry (2-digit SIC).

VI. CONCLUSIONS

In this study, we examine the effect of product market competition and covering product market competitors on financial analysts. We find that firms with greater product market competition are associated with greater analyst coverage and higher forecast accuracy and forecast consistency. We also find that analysts adjust their portfolios to account for product market competition. Analysts add a firm to (drop a firm from) their portfolios if the firm has is in a similar product market with other firms in its portfolio captured by how much its products compete with those of the remaining firms in their portfolios. These results reveal that analysts consider product market competitors and competition in their portfolio management decisions. We further find that an analyst makes more accurate and consistent forecasts on a firm relative to other analysts covering the same firm when the analyst covers competitor firms and firms in more competitive industries. Finally, we find that there is a positive relation between product market competition of firms' products in an analyst's portfolio and the analyst's career outcomes.

Overall, our results at the firm, analyst-firm, and analyst levels consistently suggest that there are benefits to covering related competitors and firms in competitive industries. Analysts covering firms who are close competitors to other firms in their portfolios provide more accurate and consistent forecasts and enjoy better career outcomes. Our results are consistent with benefits to analysts from understanding competition and following competitors in predicting a given focal firm's profits. The results are consistent with following related competitors allowing the analyst to better forecast how a rival's pricing and product offering decisions impact the firms an analyst is following. Our results thus shed new light on the impact of competition on analysts and provide a direct explanation for the well-observed industry specialization of analysts.

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TABLE 1
Key Analyst Statistics Conditional on Industry Competition

Sample partitioned by *Product-Market Competition* (*TNIC HHI*)

	1 (Low Competition)	2	3 (High Competition)
Coverage	8.1232	9.4768	9.6743
Analyst Accuracy	-0.0733	-0.0606	-0.0570
Analyst Consistency	-0.0370	-0.0330	-0.0292
Fraction of All Star Analysts	0.0760	0.0908	0.0970

We partition our sample into terciles based on product-market competition (*TNIC HHI*) within each Fama and French (1997) industry and report the mean for analyst coverage, analyst accuracy, analyst consistency, and the fraction of All-star analysts in each tercile. *TNIC HHI* is the HP HHI index from Hoberg and Phillips (2016).

TABLE 2
Firm Level Descriptive Statistics

Panel A: Firm level competition measures

Variable	N	Mean	StdDev	10%	Median	90%
TNIC HHI	62,930	0.47	0.31	0.00	0.44	0.89
TNIC Competitors	62,930	0.50	0.32	0.00	0.44	1.00
FIC300 HHI	47,352	0.36	0.34	0.00	0.22	0.89
FIT HHI	26,137	0.26	0.30	0.00	0.11	0.78
LLM HHI	23,091	0.50	0.32	0.00	0.44	0.89
GICS HHI	62,930	0.34	0.29	0.00	0.33	0.78
SIC HHI	62,930	0.18	0.25	0.00	0.11	0.56
NAICS HHI	62,930	0.14	0.20	0.00	0.11	0.44

Panel B: Firm level variables

Variable	N	Mean	StdDev	25%	Median	75%
TNIC HHI	62,930	0.47	0.31	0.00	0.44	0.89
Coverage	62,930	9.09	8.43	3.00	6.00	12.00
Forecast Accuracy	62,930	-0.06	0.32	-0.01	0.00	0.00
Forecast Consistency	41,026	-0.03	0.11	-0.01	0.00	0.00
Market Cap ($million)	62,930	2,778.07	7,946.06	141.14	460.26	1,625.11
Book-to-Market	62,930	0.57	0.46	0.27	0.47	0.75
Inst. Holdings	62,930	0.47	0.34	0.14	0.49	0.77
Return Volatility	62,930	0.14	0.09	0.08	0.11	0.17
# of Segments	62,930	2.16	1.76	1.00	1.00	3.00
R&D Intensity	62,930	0.07	0.16	0.00	0.00	0.07
Advertising Intensity	62,930	0.01	0.03	0.00	0.00	0.00
Share Volume	62,930	194.34	445.19	12.83	46.78	153.10
Loss Firms	62,930	0.28	0.45	0.00	0.00	1.00
|ΔEPS|	62,679	0.13	0.36	0.01	0.02	0.08
STDROA	41,026	0.06	0.15	0.01	0.02	0.06

Penal A presents descriptive statistics for different competition variables. *TNIC HHI* is the HP HHI (TNIC3HHI) index from HP (2016). *TNIC Competitors* is the average of *TNIC Competitor %* over analysts at the firm level. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio (not including focal firm *i*) and focal firm *i*'s total similarity calculation. *FIC300 HHI* is fixed industry (FIC 300) HHI from HP (2016). *FIT HHI* is fixed industry (SIC3) HHI from HP (2016). *LLM HHI* is the competition measurement from LLM (2013). *GICS HHI* is the HHI measure based on GICS six-digit industry classification. *SIC HHI* is HHI measure based on Compustat three-digit SIC industry classification. *NAICS HHI* is HHI measure based on Compustat four-digit NAICS industry classification. We use decile ranks (minus one and divided by nine) for all competition measures.

Panel B presents descriptive statistics for variables in the firm level regressions. *Coverage* is the number of analysts providing annual earnings forecasts for the firm. *Forecast Accuracy* is the negative of the absolute value of the difference between I/B/E/S actual earnings and the latest consensus forecast prior to earnings announcements, scaled by share price at the prior fiscal year end. *Forecast Consistency* is the negative of the median standard deviation of the difference between I/B/E/S actual earnings and the latest consensus forecast over the previous three years, scaled by share price at the prior fiscal year end. *Market Cap* represents market value of equity. *Book-to-Market* is the ratio of book value of equity over market value of equity. *Inst. Holdings* is the percentage of institutional ownership at the prior fiscal year end. *Return Volatility* represents the standard deviation of a firm's monthly stock returns in the prior fiscal

year. *#Segments* is the number of reported business segments in the Compustat segment file at the prior fiscal year end. *R&D Intensity* is research and development expense as a percentage of operating expense at the prior fiscal year end. *Advertising Intensity* is the advertising expense as a percentage of operating expense at the prior fiscal year end. *Share Volume* is the share volume in millions of shares in the fiscal year. *Loss Firms* is an indicator that is one if earnings per share are negative, and zero otherwise. $|\Delta EPS|$ is the absolute value of the difference between the prior two years' earnings per share deflated by share price at the prior fiscal year end. *STDROA* is the standard deviation of return on assets over the previous three years (ending year *t*).

TABLE 3
Firm Level Regressions: Industry Competition and Analyst Coverage

Variable	*Coverage*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TNIC HHI	-0.79***							
	(-5.83)							
TNIC Competitors		3.28***						
		(14.42)						
FIC300 HHI			0.28					
			(1.48)					
FIT HHI				-0.45				
				(-1.44)				
LLM HHI					0.69***			
					(3.46)			
GICS HHI						0.42**		
						(2.49)		
SIC HHI							-1.23***	
							(-4.95)	
NAICSHHI								-0.78***
								(-2.76)
Ln (Market Cap)	3.06***	2.89***	3.08***	2.99***	3.23***	3.08***	3.08***	3.08***
	(38.66)	(33.84)	(38.81)	(37.36)	(36.57)	(39.05)	(38.73)	(38.77)
Book-to-Market	0.69***	0.72***	0.71***	1.05***	1.02***	0.71***	0.68***	0.69***
	(5.78)	(6.41)	(5.96)	(8.29)	(6.66)	(5.98)	(5.67)	(5.75)
Institutional Holdings	1.25***	1.00***	1.28***	1.34***	0.95***	1.28***	1.30***	1.28***
	(6.63)	(5.65)	(6.73)	(5.33)	(3.43)	(6.71)	(6.86)	(6.73)
Return Volatility	2.64***	1.57*	2.62***	2.32**	2.65***	2.65***	2.67***	2.66***
	(2.80)	(1.66)	(2.77)	(2.34)	(2.60)	(2.83)	(2.80)	(2.81)
Ln (# of Segments)	-0.66***	-0.55***	-0.67***	-0.67***	-0.60***	-0.67***	-0.65***	-0.67***
	(-7.57)	(-6.59)	(-7.69)	(-6.11)	(-5.63)	(-7.75)	(-7.51)	(-7.67)

R&D Intensity	2.36***	0.98	2.65***	0.98	4.75***	2.58***	2.51***	2.55***
	(3.24)	(1.57)	(3.55)	(1.25)	(3.63)	(3.56)	(3.47)	(3.46)
Advertising Intensity	7.46***	7.41***	7.09***	-0.97	4.96	6.96***	6.94***	7.14***
	(3.37)	(3.82)	(3.22)	(-0.49)	(1.64)	(3.16)	(3.12)	(3.19)
Share Volume	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.00***	0.00**
	(8.77)	(9.28)	(8.79)	(11.70)	(5.54)	(8.74)	(8.76)	(8.76)
Loss Firms	-0.12	-0.13	-0.12	-0.18	-0.06	-0.11	-0.12	-0.12
	(-1.38)	(-1.40)	(-1.32)	(-1.59)	(-0.47)	(-1.29)	(-1.34)	(-1.33)
Industry Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62,930	62,930	62,930	26,137	23,091	62,930	62,930	62,930
R-squared	0.684	0.698	0.684	0.711	0.686	0.684	0.684	0.684

This table presents the results of the following firm level regressions:

$Coverage_{it} = \alpha + \beta_1 * Competition_{it} + \beta_2 * Control\ Variables_{it} + \varepsilon.$

Coverage is Number of analysts providing annual earnings forecasts for the firm. *TNIC HHI* is the HP HHI (TNIC3HHI) index from HP (2016). *TNIC Competitors* is the average of *TNIC Competitor %* over analysts at the firm level. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio (not including focal firm i) and focal firm *i*'s total similarity calculation. *FIC300 HHI* is fixed industry (FIC 300) HHI from HP (2016). *FIT HHI* is fixed industry (SIC3) HHI from HP (2016). *LLM HHI* is the competition measurement from LLM (2013). *GICS HHI* is the HHI measure based on GICS six-digit industry classification. *SIC HHI* is HHI measure based on Compustat three-digit SIC industry classification. *NAICS HHI* is HHI measure based on Compustat four-digit NAICS industry classification. We use decile ranks (minus one and divided by nine) for all competition measures.

Ln (Market Cap) represents the natural logarithm of market value of equity. *Book-to-Market* is the ratio of book value of equity over market value of equity. *Inst. Holdings* is the percentage of institutional ownership at the prior fiscal year end. *Return Volatility* is the standard deviation of a firm's monthly stock returns in the prior fiscal year. *Ln (#Segments)* is the natural logarithm of the number of reported business segments in the Compustat segment file at the prior fiscal year end. *R&D Intensity* is the research and development expense over operating expense at the prior fiscal year end. *Advertising Intensity* is the advertising expense over operating expense at the prior fiscal year end. *Share Volume* is the share volume in millions of shares in the fiscal year. *Loss Firms* equals one if earnings per share are negative, and zero otherwise. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. *z*-statistics reported in parentheses are robust to firm and year clustering. ∗∗∗, ∗∗, ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 4
Firm Level Regressions: Industry Competition and Analyst Accuracy

	Forecast Accuracy							
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TNIC HHI	-0.02***							
	(-2.94)							
TNIC Competitors		0.05***						
		(5.74)						
FIC300 HHI			0.00					
			(0.21)					
FIT HHI				-0.01				
				(-1.11)				
LLM HHI					-0.01			
					(-1.29)			
GICS HHI						-0.01		
						(-1.53)		
SIC HHI							-0.02***	
							(-3.19)	
NAICS HHI								-0.03**
								(-2.12)
Ln (Market Cap)	0.00	-0.00	0.00	0.01***	0.00	0.00	0.00	0.00
	(0.76)	(-0.37)	(0.89)	(4.10)	(1.42)	(0.85)	(0.88)	(0.88)
Book-to-Market	0.00	0.00	0.00	0.02***	-0.00	0.00	0.00	0.00
	(0.38)	(0.29)	(0.44)	(2.69)	(-0.20)	(0.41)	(0.38)	(0.38)
Institutional Holdings	0.11***	0.11***	0.11***	0.12***	0.08***	0.11***	0.11***	0.11***
	(7.88)	(7.47)	(7.89)	(9.98)	(6.46)	(7.88)	(7.90)	(7.89)
Return Volatility	-0.18***	-0.19***	-0.18***	-0.14***	-0.08*	-0.18***	-0.18***	-0.18***
	(-6.35)	(-6.48)	(-6.34)	(-3.28)	(-1.72)	(-6.24)	(-6.29)	(-6.28)
Ln (# of Segments)	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(-0.98)	(0.09)	(-1.07)	(-0.93)	(-0.15)	(-1.04)	(-0.92)	(-1.02)

R&D Intensity	-0.05*	-0.06**	-0.04	-0.06	0.05*	-0.04	-0.05*	-0.05*
	(-1.76)	(-2.26)	(-1.57)	(-1.56)	(1.68)	(-1.51)	(-1.65)	(-1.65)
Advertising Intensity	-0.03	-0.03	-0.04	-0.15*	-0.05	-0.03	-0.04	-0.04
	(-0.44)	(-0.38)	(-0.55)	(-1.75)	(-0.84)	(-0.46)	(-0.60)	(-0.54)
Share Volume	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.67)	(1.05)	(0.71)	(0.67)	(1.16)	(0.75)	(0.69)	(0.68)
Loss Firms	-0.04***	-0.04***	-0.04***	-0.04***	-0.03***	-0.03***	-0.03***	-0.03***
	(-4.70)	(-3.44)	(-4.68)	(-4.12)	(-3.97)	(-4.66)	(-4.69)	(-4.76)
|ΔEPS|	-0.38***	-0.37***	-0.38***	-0.35***	-0.31***	-0.38***	-0.38***	-0.38***
	(-15.83)	(-13.41)	(-15.80)	(-20.69)	(-9.01)	(-15.82)	(-15.89)	(-15.89)
Industry Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62,679	62,679	62,679	25,983	23,015	62,679	62,679	62,679
R-squared	0.264	0.267	0.263	0.215	0.201	0.264	0.264	0.264

This table presents the results of the following firm level regressions:

$$Forecast\ Accuracy_{jt} = \alpha + \beta_1 * Competition_{it} + \beta_2 * Control\ Variables_{it} + \varepsilon.$$

Forecast Accuracy is the negative of the absolute value of the difference between I/B/E/S actual earnings and the latest consensus forecast prior to earnings announcements, scaled by share price at the prior fiscal year end. *TNIC HHI* is the HP HHI (TNIC3HHI) index from HP (2016). *TNIC Competitors* is the average of *TNIC Competitor %* over analysts at the firm level. *TNIC Competitor %* is N_{ijt}/M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio (not including focal firm i) and focal firm *i*'s total similarity calculation. *FIC300 HHI* is fixed industry (FIC 300) HHI from HP (2016). *FIT HHI* is fixed industry (SIC3) HHI from HP (2016). *LLM HHI* is the competition measurement from LLM (2013). *GICS HHI* is the HHI measure based on GICS six-digit industry classification. *SIC HHI* is HHI measure based on Compustat three-digit SIC industry classification. *NAICS HHI* is HHI measure based on Compustat four-digit NAICS industry classification. We use decile ranks (minus one and divided by nine) for all competition measures.

Ln (Market Cap) represents the natural logarithm of market value of equity. *Book-to-Market* is the ratio of book value of equity over market value of equity. *Inst. Holdings* is the percentage of institutional ownership at the prior fiscal year end. *Return Volatility* is the standard deviation of a firm's monthly stock returns in the prior fiscal year. *Ln (#Segments)* is the natural logarithm of the number of reported business segments in the Compustat segment file at the prior fiscal year end. *R&D Intensity* is the research and development expense over operating expense at the prior fiscal year end. *Advertising Intensity* is the advertising expense over operating expense at the prior fiscal year end. *Share Volume* is the share volume in millions of shares in the fiscal year. *Loss Firms* equals one if earnings per share are negative, and zero otherwise. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. *z*-statistics reported in parentheses are robust to firm and year clustering. ∗∗∗, ∗∗, ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 5
Firm Level Regressions: Industry Competition and Analyst Consistency

	Forecast Consistency							
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TNIC HHI	-0.11***							
	(-3.02)							
TNIC Competitors		0.21***						
		(5.44)						
FIC300 HHI			0.01					
			(0.24)					
FIT HHI				-0.09**				
				(-1.99)				
LLM HHI					0.09**			
					(2.25)			
GICS HHI						-0.08**		
						(-2.07)		
SIC HHI							-0.07*	
							(-1.68)	
NAICS HHI								-0.02
								(-0.58)
Ln (Market Cap)	0.01	0.00	0.01	0.04***	0.04***	0.01	0.01	0.01
	(0.80)	(0.15)	(0.93)	(2.61)	(3.15)	(0.88)	(0.94)	(0.93)
Book-to-Market	-0.18***	-0.18***	-0.18***	-0.07	-0.08	-0.18***	-0.18***	-0.18***
	(-3.16)	(-3.08)	(-3.14)	(-0.61)	(-0.92)	(-3.18)	(-3.17)	(-3.17)
Institutional Holdings	0.63***	0.63***	0.63***	0.54***	0.41***	0.64***	0.63***	0.63***
	(7.94)	(7.82)	(7.94)	(9.87)	(8.12)	(7.95)	(7.94)	(7.94)
Return Volatility	-2.08***	-2.09***	-2.08***	-1.62***	-0.91***	-2.07***	-2.08***	-2.08***
	(-5.95)	(-5.78)	(-5.93)	(-2.63)	(-3.00)	(-5.84)	(-5.91)	(-5.91)
Ln (# of Segments)	-0.00	0.00	-0.00	-0.01	0.01	-0.00	-0.00	-0.00
	(-0.29)	(0.43)	(-0.39)	(-0.41)	(1.10)	(-0.33)	(-0.29)	(-0.39)

R&D Intensity	0.43***	0.47***	0.47***	0.49**	0.59***	0.48***	0.46***	0.47***
	(2.66)	(3.08)	(2.96)	(2.01)	(2.72)	(3.01)	(2.92)	(2.92)
Advertising Intensity	-0.03	-0.11	-0.08	-1.07**	-1.23**	-0.03	-0.09	-0.07
	(-0.09)	(-0.29)	(-0.21)	(-1.98)	(-2.18)	(-0.07)	(-0.24)	(-0.20)
Share Volume	-0.00*	-0.00	-0.00*	-0.00**	-0.00	-0.00*	-0.00*	-0.00*
	(-1.95)	(-1.50)	(-1.92)	(-2.22)	(-1.59)	(-1.85)	(-1.91)	(-1.92)
Loss Firms	-0.68***	-0.68***	-0.67***	-0.58***	-0.56***	-0.67***	-0.67***	-0.67***
	(-6.85)	(-6.82)	(-6.82)	(-5.38)	(-6.26)	(-6.84)	(-6.84)	(-6.83)
STDROA	-1.62***	-1.61***	-1.62***	-1.14***	-1.54***	-1.62***	-1.62***	-1.62***
	(-6.17)	(-6.18)	(-6.16)	(-5.46)	(-2.77)	(-6.17)	(-6.16)	(-6.16)
Industry Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	41,026	41,026	41,026	14,291	15,387	41,026	41,026	41,026
R-squared	0.252	0.255	0.252	0.210	0.205	0.252	0.252	0.252

This table presents the results of the following firm level regressions:

$$Forecast\ Consistency_{jt} = \alpha + \beta_1 * Competition_{it} + \beta_2 * Control\ Variables_{it} + \varepsilon.$$

Forecast Consistency is the negative of the median standard deviation of the difference between I/B/E/S actual earnings and the latest consensus forecast over the previous three years (ending year *t*), scaled by share price at the prior fiscal year end. *TNIC HHI* is the HP HHI (TNIC3HHI) index from HP (2016). *TNIC Competitors* is the average of *TNIC Competitor %* over analysts at the firm level. *TNIC Competitor %* is N_{ijt}/M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio (not including focal firm i) and focal firm *i*'s total similarity calculation. *FIC300 HHI* is fixed industry (FIC 300) HHI from HP (2016). *FIT HHI* is fixed industry (SIC3) HHI from HP (2016). *LLM HHI* is the competition measurement from LLM (2013). *GICS HHI* is the HHI measure based on GICS six-digit industry classification. *SIC HHI* is HHI measure based on Compustat three-digit SIC industry classification. *NAICS HHI* is HHI measure based on Compustat four-digit NAICS industry classification. We use decile ranks (minus one and divided by nine) for all competition measures.

Ln (Market Cap) represents the natural logarithm of market value of equity. *Book-to-Market* is the ratio of book value of equity over market value of equity. *Inst. Holdings* is the percentage of institutional ownership at the prior fiscal year end. *Return Volatility* is the standard deviation of a firm's monthly stock returns in the prior fiscal year. *Ln (#Segments)* is the natural logarithm of the number of reported business segments in the Compustat segment file at the prior fiscal year end. *R&D Intensity* is the research and development expense over operating expense at the prior fiscal year end. *Advertising Intensity* is the advertising expense over operating expense at the prior fiscal year end. *Share Volume* is the share volume in millions of shares in the fiscal year. *Loss Firms* equals one if earnings per share are negative, and zero otherwise. *STDROA* is the standard deviation of return on assets over the previous three years (ending year *t*). We take the mean for all right hand variables (except *STDROA*) over the previous three years. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. All coefficients are multiplied by 10 for readability. *z*-statistics reported in parentheses are robust to firm and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 6
Economic Effects of Different Competition Measures and Results with Different Industry Fixed Effects

Panel A: Economic effects on coverage

Change	*Coverage*							
	TNIC HHI	*TNIC Competitors*	*FIC300 HHI*	*FIT HHI*	*LLM HHI*	*GICS HHI*	*SIC3 HHI*	*NAICS HHI*
One standard deviation	0.2435	1.0486	0.0949	0.1338	0.2201	0.1219	0.3024	0.1536
10% to Median	0.3499	1.4419	0.0627	0.0502	0.3072	0.1400	0.1370	0.0867
Median to 90%	0.3507	1.8351	0.1884	0.3015	0.3079	0.1871	0.5493	0.2601

Panel B: Economic effects on forecast accuracy

Change	*Forecast Accuracy*							
	TNIC HHI	*TNIC Competitors*	*FIC300 HHI*	*FIT HHI*	*LLM HHI*	*GICS HHI*	*SIC3 HHI*	*NAICS HHI*
One standard deviation	0.0055	0.0157	0.0005	0.0039	0.0023	0.0036	0.0059	0.0055
10% to Median	0.0079	0.0216	0.0003	0.0015	0.0032	0.0041	0.0027	0.0031
Median to 90%	0.0080	0.0274	0.0009	0.0087	0.0032	0.0055	0.0108	0.0093

Panel C: Economic effects on forecast consistency

Change	*Forecast Consistency*							
	TNIC HHI	*TNIC Competitors*	*FIC300 HHI*	*FIT HHI*	*LLM HHI*	*GICS HHI*	*SIC3 HHI*	*NAICS HHI*
One standard deviation	0.0295	0.0662	0.0021	0.0283	0.0253	0.0233	0.0170	0.0047
10% to Median	0.0389	0.0911	0.0020	0.0105	0.0327	0.0243	0.0051	0.0018
Median to 90%	0.0428	0.1159	0.0038	0.0627	0.0359	0.0395	0.0333	0.0089

Panel D: Coverage test with different industry fixed effects

	Coverage					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
TNIC HHI	-0.76***	-0.61***	-0.96***	-0.90***	-0.84***	-0.73***
	(-5.30)	(-3.81)	(-6.34)	(-5.41)	(-4.93)	(-4.11)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effects	2-digit SIC	3-digit SIC	4-digit GICS	6-digit GICS	3-digit NAICS	4-digit NAICS
Observations	62,930	62,930	62,930	62,930	62,930	62,930
R-squared	0.689	0.701	0.685	0.691	0.693	0.703

Panel E: Accuracy test with different industry fixed effects

	Forecast Accuracy					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
TNIC HHI	-0.02***	-0.02***	-0.02***	-0.02**	-0.02***	-0.02**
	(-2.95)	(-2.59)	(-2.85)	(-2.36)	(-2.85)	(-2.33)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effects	2-digit SIC	3-digit SIC	4-digit GICS	6-digit GICS	3-digit NAICS	4-digit NAICS
Observations	62,679	62,679	62,679	62,679	62,679	62,679
R-squared	0.266	0.270	0.264	0.266	0.268	0.273

Panel F: Consistency test with different industry fixed effects

	Forecast Consistency					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
TNIC HHI	-0.12***	-0.12***	-0.09**	-0.08**	-0.13***	-0.12***
	(-3.02)	(-2.66)	(-2.40)	(-2.20)	(-3.46)	(-2.59)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effects	2-digit SIC	3-digit SIC	4-digit GICS	6-digit GICS	3-digit NAICS	4-digit NAICS
Observations	41,026	41,026	41,026	41,026	41,026	41,026
R-squared	0.254	0.262	0.252	0.255	0.256	0.265

Panels A, B and C present the economic effects of competition on coverage, accuracy and consistency, respectively. All competition measures are defined in Table 2. We report the effects of one standard deviation change, the change from 10% to median, and the change from median to 90% of competition measures.

Panels D, E and F present coverage, accuracy and consistency test results with different industry fixed effects, respectively. All coefficients in Panel F are multiplied by 10 for readability.

TABLE 7
Analyst-firm Level Descriptive Statistics

Variable	N	Mean	StdDev	25%	Media	75%
Add	16,322,481	0.01	0.09	0.00	0.00	0.00
Drop	556,739	0.27	0.44	0.00	0.00	1.00
Accuracy	556,739	0.50	0.31	0.24	0.50	0.76
Consistency	233,524	0.51	0.33	0.22	0.50	0.79
TNIC Competitor % (*Add* Sample)	16,322,481	0.33	0.30	0.09	0.21	0.50
TNIC Competitor % (*Add*=1)	147,602	0.46	0.26	0.22	0.46	0.68
TNIC Competitor % (*Add*=0)	161,74,879	0.33	0.30	0.09	0.21	0.50
TNIC Competitor % (*Drop* Sample)	556,739	0.44	0.33	0.13	0.40	0.73
TNIC Competitor % (*Drop* =1)	149,911	0.42	0.34	0.09	0.38	0.73
TNIC Competitor % (*Drop* = 0)	406,828	0.44	0.32	0.14	0.42	0.73
Rank TNIC Competitor % (*Dro*p Sample)	556,739	0.50	0.31	0.25	0.50	0.75
Rank TNIC Competitor % (*Drop* =1)	149,911	0.44	0.31	0.17	0.42	0.67
Rank TNIC Competitor % (*Drop* = 0)	406,828	0.52	0.30	0.27	0.50	0.78
Star	556,739	0.13	0.34	0.00	0.00	0.00
Breadth	556,739	0.51	0.32	0.23	0.50	0.78
Boldness	556,739	0.50	0.31	0.23	0.50	0.77
Experience	556,739	0.50	0.30	0.23	0.50	0.76
Broker Size	556,739	0.50	0.32	0.22	0.50	0.79
Horizon	556,739	0.50	0.31	0.24	0.50	0.75

This table presents descriptive statistics for variables in the firm-analyst level regressions. *Add* is an indicator variable that is one if firm *i* was not covered by analyst *j* in year *t*-1 but is covered in year *t*, and zero if firm *i* was not covered by analyst *j* in either year *t*-1 or *t*. *Drop* is an indicator variable that is one if firm *i* was covered by analyst *j* in year t but not in year *t*+1, and zero if firm *i* was covered by analyst *j* in both years *t* and *t*+1. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %. Accuracy* is Hong and Kubik's (2000) measure of relative accuracy. *Consistency* is Hilary and Hsu (2013) measure of relative forecast consistency. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. *Breadth* is a variable similarly defined as *Accuracy* but based on the number of firms coved by the analyst. *Boldness* is Hong and Kubik's (2003) measure of boldness in earnings forecasts. *Experience* is a variable similarly defined as *Accuracy* but based on firm experience. *Broker Size* is a variable similarly defined as *Accuracy* but based on the number of analysts employed by a brokerage house. *Horizon* is a variable similarly defined as *Accuracy* but based on the number of days between the forecast and earnings announcement dates.

TABLE 8
Analyst-firm Level Regressions of Add Decisions

	Add	
Variable	(1)	(2)
TNIC Competitor %	**1.66*** **	**2.53*** **
	(39.89)	**(11.81)**
(TNIC Competitor %)²		**-0.91*** **
		(-4.73)
Star	-0.08***	-0.08***
	(-2.94)	(-2.93)
Accuracy	0.32***	0.31***
	(10.14)	(10.27)
Breadth	1.40***	1.44***
	(52.78)	(47.90)
Boldness	-0.01	-0.01
	(-0.23)	(-0.21)
Experience	-3.86***	-3.86***
	(-47.53)	(-47.27)
Broker Size	0.01	0.01
	(0.42)	(0.36)
Horizon	-0.25***	-0.25***
	(-9.59)	(-9.76)
Firm Control Variables	Yes	Yes
Industry Effects	Yes	Yes
Year Effects	Yes	Yes
Observations	16,322,481	16,322,481

This table represents the results of the following analyst-firm level logit models:

$$Prob(Add_{ijt} = 1) = \alpha + \beta_1 * TNIC\ Competitor\ \%_{ijt} + \beta_k * Firm\ Level\ Controls_{it} + \beta_n * Analyst\ Level\ Controls_{jt} + \varepsilon_{ijt}.$$

Add equals one if firm *i* was not covered by analyst *j* in year *t*-1 but is covered in year *t*, and zero if firm *i* was not covered by analyst *j* in either year *t*-1 or *t*. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. We add square term of *TNIC Competitor %* in column 2.

Firm control variables as in Table 3 are included but not reported. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. We calculate *Accuracy, Breadth*, *Boldness*, *Experience*, *Broker Size*, *and Horizon* by averaging these analyst-firm-level variables across firms within analyst *j*'s portfolio. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. *z*-statistics reported in parentheses are robust to analyst, firm, and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 9
Analyst-firm Level Regressions of Drop Decisions

	Drop			
Variable	(1)	(2)	(3)	(4)
TNIC Competitor %	**-0.56*** **	**-0.64*** **		
	(-14.20)	**(-18.64)**		
(TNIC Competitor %) ²		**0.18*** **		
		(4.54)		
Rank TNIC Competitor %			**-0.50*** **	**-1.25*** **
			(-21.11)	**(-14.80)**
(Rank TNIC Competitor %)²				**0.76*** **
				(9.99)
Star	-0.63***	-0.63***	-0.64***	-0.64***
	(-14.67)	(-14.66)	(-14.83)	(-14.84)
Accuracy	-0.92***	-0.92***	-0.92***	-0.92***
	(-28.62)	(-28.68)	(-28.42)	(-28.48)
Breadth	-0.38***	-0.37***	-0.37***	-0.34***
	(-8.41)	(-8.12)	(-8.05)	(-7.41)
Boldness	-0.02***	-0.02***	-0.02***	-0.03***
	(-2.74)	(-2.81)	(-2.71)	(-2.93)
Experience	-0.17***	-0.17***	-0.15***	-0.15***
	(-3.53)	(-3.51)	(-3.34)	(-3.19)
Broker Size	0.09*	0.09*	0.11**	0.12**
	(1.79)	(1.76)	(2.06)	(2.26)
Horizon	2.55***	2.55***	2.54***	2.53***
	(17.92)	(17.92)	(17.85)	(17.87)
Firm Control Variables	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Observations	556,739	556,739	556,739	556,739

This table presents the results of the following analyst-firm level logit models:

$$Prob(Drop_{ijt} = 1) = \alpha + \beta_1 * (Rank)TNIC\ Competitor\ \%_{ijt} + \beta_k * Firm\ Level\ Controls_{it} + \beta_m * Analyst\ Firm\ Level\ Controls_{ijt} + \varepsilon_{ijt}.$$

Drop equals one if firm *i* was covered by analyst *j* in year *t* but not in year *t*+1, and zero if firm *i* was covered by analyst *j* in both years *t* and *t*+1. *TNIC Competitor %* is N_{ijt}/M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %.* We add square term in columns 2 and 4.

Firm control variables as in Table 3 are included but not reported. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. *Accuracy* is Hong and Kubik's (2003) measure of relative accuracy. *Breadth* is a variable similarly defined as *Accuracy* but based on the number of firms coved by the analyst. *Boldness* is Hong and Kubik's (2003) measure of boldness in earnings forecasts. *Experience* is a variable similarly defined as *Accuracy* but based on firm experience. *Broker Size* is a variable similarly defined as *Accuracy* but based on the number of analysts employed by a brokerage house. *Horizon* is a variable similarly defined as *Accuracy* but based on the number of days between the forecast and earnings announcement dates. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. *z*-statistics reported in parentheses are robust to analyst, firm, and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 10
Analyst-firm Level Regressions of Accuracy and Consistency

	Accuracy				*Consistency*			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TNIC Competitor %	**0.02*** **	**0.04*** **			**0.02*** **	**0.04*** **		
	(13.47)	**(15.02)**			**(6.09)**	**(7.29)**		
(TNIC Competitor %)²		**-0.02*** **				**-0.03*** **		
		(-9.29)				**(-4.41)**		
Rank TNIC Competitor %			**0.04*** **	**0.10*** **			**0.05*** **	**0.10*** **
			(15.58)	**(15.41)**			**(11.80)**	**(6.51)**
(Rank TNIC Competitor %)²				**-0.06*** **				**-0.05*** **
				(-11.10)				**(-3.62)**
Star	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(4.60)	(4.45)	(4.74)	(4.41)	(2.75)	(2.64)	(2.83)	(2.77)
Breadth	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	(1.62)	(1.11)	(1.13)	(0.54)	(1.50)	(1.31)	(1.48)	(1.35)
Boldness	-0.03***	-0.03***	-0.03***	-0.03***	-0.09***	-0.09***	-0.09***	-0.09***
	(-12.73)	(-12.70)	(-12.76)	(-12.68)	(-13.88)	(-13.88)	(-13.92)	(-13.93)
Experience	0.01***	0.01***	0.01***	0.01***	0.03***	0.03***	0.03***	0.03***
	(3.21)	(3.18)	(2.81)	(2.66)	(4.74)	(4.76)	(4.42)	(4.41)
Broker Size	0.02***	0.02***	0.02**	0.02**	0.03***	0.03***	0.03***	0.03***
	(2.76)	(2.80)	(2.49)	(2.39)	(3.17)	(3.21)	(2.86)	(2.78)
Horizon	-0.29***	-0.29***	-0.29***	-0.29***	-0.35***	-0.35***	-0.35***	-0.35***
	(-22.17)	(-22.19)	(-22.12)	(-22.14)	(-13.16)	(-13.17)	(-13.15)	(-13.16)
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	556,739	556,739	556,739	556,739	233,524	233,524	233,524	233,524
R-squared	0.087	0.088	0.088	0.089	0.041	0.041	0.042	0.042

This table presents the results of the following analyst-firm level regressions:

$Accuracy_{ijt}=\alpha+ \beta_1* (Rank)TNIC\ Competitor\ \%_{ijt}+ \beta m* Analyst\ Firm\ Level\ Controls_{ijt}+ \varepsilon_{ijt}$.

$Consistency_{ijt}=\alpha+ \beta_1* (Rank)TNIC\ Competitor\ \%_{ijt}+ \beta m* Analyst\ Firm\ Level\ Controls_{ijt}+ \varepsilon_{ijt}$.

Accuracy is Hong and Kubik's (2003) measure of relative accuracy. *Consistency* is Hilary and Hsu (2013) measure of relative consistency. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %.* We add square terms in columns 2, 4, 6 and 8.

Star is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. *Breadth* is a variable similarly defined as *Accuracy* but based on the number of firms coved by the analyst. *Boldness* is Hong and Kubik's (2003) measure of boldness in earnings forecasts. *Experience* is a variable similarly defined as *Accuracy* but based on firm experience. *Broker Size* is a variable similarly defined as *Accuracy* but based on the number of analysts employed by a brokerage house. *Horizon* is a variable similarly defined as *Accuracy* but based on the number of days between the forecast and earnings announcement dates. In columns 3 and 4, we calculate independent variables as their average values over a three-year rolling window. We include year fixed effects in all regressions. *z*-statistics reported in parentheses are robust to analyst, firm, and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 11
Analyst Level Descriptive Statistics

Variable	N	Mean	StdDev	25%	Median	75%
Mean TNIC Competitor %	56,155	0.21	0.41	0.00	0.22	0.50
Mean Rank TNIC Competitor %	56,155	0.43	0.25	0.25	0.45	0.62
Fire	56,155	0.16	0.37	0.00	0.00	0.00
Star	56,155	0.09	0.28	0.00	0.00	0.00
Accuracy	56,155	0.49	0.18	0.40	0.51	0.60
Breadth	56,155	12.30	7.62	7.00	11.00	16.00
Boldness	56,155	0.51	0.16	0.42	0.50	0.59
Experience	56,155	3.24	3.03	1.00	2.00	4.00
Broker Size	56,155	61.93	60.78	17.00	40.00	93.00

This table presents descriptive statistics for variables in the analyst level regressions. *Mean TNIC Competitor %* is the mean of *TNIC Competitor %* of firms in an analyst's portfolio. *Mean Rank TNIC Competitor %* is the mean of *Rank TNIC Competitor %* of firms in an analyst's portfolio. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %*. *Fire* is an indicator variable that is one if analyst *j* is demoted (moves to a different and smaller brokerage house) or permanently leaves the I/B/E/S database in the following year (i.e., between July 1 of year *t*+1 and June 30 of year *t*+2), and zero otherwise. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. *Accuracy* is Hong and Kubik's (2000) measure of relative accuracy. *Breadth* is a variable similarly defined as *Accuracy* but based on the number of firms coved by the analyst. *Boldness* is Hong and Kubik's (2003) measure of boldness in earnings forecasts. *Experience* is a variable similarly defined as *Accuracy* but based on firm experience. *Broker Size* is a variable similarly defined as *Accuracy* but based on the number of analysts employed by a brokerage house. We average the firm-analyst-level *Accuracy*, *Breadth*, *Boldness*, *Experience*, and *Broker Size* across firms within analyst *j*'s portfolio to get the corresponding analyst-level counterparts.

TABLE 12
Analyst Level Regressions of Analyst Firing

			Fire $_{t+1}$	
Variable	(1)	(2)	(3)	(4)
Mean TNIC Competitor %	**-0.21*** **	**-0.21*** **		
	(-3.40)	**(-3.47)**		
(Mean TNIC Competitor %)^2		**0.13** **		
		(2.34)		
Mean Rank TNIC Competitor %			**-0.46*** **	**-1.28*** **
			(-5.18)	**(-4.01)**
(Mean Rank TNIC Competitor %)^2				**0.94*** **
				(3.18)
Star	-1.33***	-1.33***	-1.32***	-1.32***
	(-10.40)	(-10.41)	(-10.41)	(-10.41)
Accuracy	-6.15***	-6.15***	-6.13***	-6.10***
	(-31.35)	(-31.46)	(-31.42)	(-30.99)
Breadth	-2.54***	-2.53***	-2.48***	-2.40***
	(-41.69)	(-39.87)	(-39.46)	(-34.98)
Boldness	-1.18***	-1.19***	-1.19***	-1.20***
	(-11.46)	(-11.40)	(-11.57)	(-11.68)
Experience	1.63***	1.63***	1.64***	1.66***
	(13.59)	(13.58)	(13.90)	(13.89)
Broker Size	0.61***	0.61***	0.60***	0.59***
	(4.50)	(4.46)	(4.39)	(4.32)
Broker Effects	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Observations	56,155	56,155	56,155	56,155

This table presents the results of the following analyst level regression:

$$Prob\ (Fire_{jt+1} = 1) = \alpha + \beta_1 * Mean\ (Rank)\ TNIC\ Competitor\ \%_{jt} + \beta_n * Analyst\ Level\ Controls_{jt} + \varepsilon_{jt}.$$

Fire is an indicator variable that is one if analyst *j* is demoted (moves to a different and smaller brokerage house) or permanently leaves the I/B/E/S database in the following year (i.e., between July 1 of year *t*+1 and June 30 of year *t*+2), and zero otherwise. *Mean TNIC Competitor %* is the mean of *TNIC Competitor %* of firms in an analyst's portfolio. *Mean Rank TNIC Competitor %* is the mean of *Rank TNIC Competitor %* of firms in an analyst's portfolio. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %*. We add square terms in columns 2 and 4.

Star is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. We calculate *Accuracy, Breadth*, *Boldness*, *Experience*, and *Broker Size* by averaging these analyst-firm-level variables across firms within analyst *j*'s portfolio. We include year fixed effects and broker fixed effects. *z*-statistics reported in parentheses are robust to analyst and year clustering. ∗∗∗, ∗∗, ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 13
Analyst Level Regressions of All-Star Status

	$Star_{t+1}$			
Variable	(1)	(2)	(3)	(4)
Mean TNIC Competitor %	**0.44*** **	**0.89*** **		
	(5.20)	**(5.46)**		
(Mean TNIC Competitor %)^2		**-0.92*** **		
		(-5.41)		
Mean Rank TNIC Competitor %			**0.76*** **	**3.98*** **
			(5.42)	**(6.66)**
(Mean Rank TNIC Competitor %)^2				**-3.19*** **
				(-5.48)
Star	3.72***	3.69***	3.71***	3.68***
	(43.05)	(42.27)	(43.50)	(42.39)
Accuracy	1.86***	1.89***	1.80***	1.82***
	(13.50)	(12.88)	(12.70)	(11.96)
Breadth	1.36***	1.27***	1.34***	1.15***
	(9.02)	(8.54)	(8.48)	(7.18)
Boldness	-0.17	-0.16	-0.15	-0.11
	(-1.14)	(-1.04)	(-0.96)	(-0.71)
Experience	0.09	0.09	0.06	0.02
	(0.40)	(0.41)	(0.26)	(0.07)
Broker Size	-0.77***	-0.74***	-0.70***	-0.69***
	(-3.03)	(-2.85)	(-2.75)	(-2.70)
Broker Effects	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Observations	56,155	56,155	56,155	56,155

This table presents the results of the following analyst level regression:

$Prob\ (Star_{jt+1}= 1) = \alpha + \beta_1 * Mean\ (Rank)\ TNIC\ Competitor\ \%_{jt} + \beta_n * Analyst\ Level\ Controls_{jt} + \varepsilon_{jt}$.

Star is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. *Mean TNIC Competitor %* is the mean of *TNIC Competitor %* of firms in an analyst's portfolio. *Mean Rank TNIC Competitor %* is the mean of *Rank TNIC Competitor %* of firms in an analyst's portfolio. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %*. We add square terms in columns 2 and 4.

Star is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. We calculate *Accuracy, Breadth*, *Boldness*, *Experience*, and *Broker Size* by averaging these analyst-firm-level variables across firms within analyst *j*'s portfolio. We include year fixed effects and broker fixed effects. *z*-statistics reported in parentheses are robust to analyst and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 14
Analyst-firm Level Regressions of Add Decisions for Firms with M&A

	Add	
Variable	(1)	(2)
TNIC Competitor %	**1.75*** **	**3.02*** **
	(22.29)	**(9.31)**
(TNIC Competitor %)²		**-1.30*** **
		(-4.79)
Star	0.04	0.04
	(1.18)	(1.17)
Accuracy	0.28***	0.27***
	(5.03)	(4.97)
Breadth	1.53***	1.59***
	(32.41)	(30.10)
Boldness	-0.00	-0.00
	(-0.07)	(-0.02)
Experience	-4.10***	-4.10***
	(-44.26)	(-44.26)
Broker Size	0.12***	0.11***
	(3.61)	(3.57)
Horizon	-0.20***	-0.20***
	(-5.19)	(-5.06)
Firm Control Variables	Yes	Yes
Industry Effects	Yes	Yes
Year Effects	Yes	Yes
Observations	2,079,488	2,079,488

In this table, we examine the effect of competition on analysts' add decision in year *t* using a subsample where firms experience an M&A event in year *t*-1. A firm might enter a new market and compete with different firms after an M&A event. The M&A event thus provides a shock to the firm's competition status. To conduct this analysis, we obtain a sample of firm-year observations with M&A event from SDC database and merge this sample with our main sample of *Add* test in Table 8. The table represents the results of the following analyst-firm level logit models (Year *t-1* is M&A event year):

$$Prob(Add_{ijt} = 1) = \alpha + \beta_1 * TNIC\ Competitor\ \%_{ijt} + \beta_k * Firm\ Level\ Controls_{it} + \beta_n * Analyst\ Level\ Controls_{jt} + \varepsilon_{ijt}.$$

Add equals one if firm *i* was not covered by analyst *j* in year *t*-1 but is covered in year *t*, and zero if firm *i* was not covered by analyst *j* in either year *t*-1 or *t*. *TNIC Competitor %* is N_{ijt} /M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. We add square term of *TNIC Competitor %* in column 2.

Firm control variables as in Table 3 are included but not reported. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. We calculate *Accuracy, Breadth*, *Boldness*, *Experience*, *Broker Size*, *and Horizon* by averaging these analyst-firm-level variables across firms within analyst *j*'s portfolio. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. *z*-statistics reported in parentheses are robust to analyst, firm, and year clustering. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 15
Analyst-firm Level Regressions of Drop Decisions for Firms with M&A

	Drop			
Variable	(1)	(2)	(3)	(4)
TNIC Competitor %	**-0.51*** **	**-0.65*** **		
	(-6.93)	**(-10.65)**		
(TNIC Competitor %)²		**0.30*** **		
		(3.98)		
Rank TNIC Competitor %			**-0.52*** **	**-1.28*** **
			(-15.28)	**(-12.07)**
(Rank TNIC Competitor %)²				**0.76*** **
				(7.27)
Star	-0.61***	-0.61***	-0.62***	-0.61***
	(-10.14)	(-10.11)	(-10.12)	(-10.12)
Accuracy	-0.96***	-0.96***	-0.96***	-0.95***
	(-21.64)	(-21.68)	(-21.68)	(-21.67)
Breadth	-0.43***	-0.40***	-0.41***	-0.38***
	(-6.99)	(-6.63)	(-6.61)	(-6.14)
Boldness	-0.02	-0.02	-0.02	-0.03
	(-1.00)	(-1.02)	(-1.04)	(-1.13)
Experience	-0.14***	-0.14***	-0.13***	-0.12**
	(-2.89)	(-2.85)	(-2.70)	(-2.50)
Broker Size	0.02	0.01	0.03	0.04
	(0.29)	(0.23)	(0.57)	(0.77)
Horizon	2.66***	2.66***	2.66***	2.66***
	(17.01)	(17.00)	(16.94)	(16.94)
Firm Control Variables	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Observations	111,671	111,671	111,671	111,671

In this table, we examine the effect of competition on analysts' drop decision in year *t* using a subsample where firms experience an M&A event in year *t*. To conduct this analysis, we obtain a sample of firm-year observations with M&A event from SDC database and merge this sample with our main sample of *Drop* test (Table 9). This table presents the results of the following analyst-firm level logit models (Year *t* is M&A event year):

$$Prob(Drop_{ijt} = 1) = \alpha + \beta_1 * (Rank)TNIC\ Competitor\ \%_{ijt} + \beta_k * Firm\ Level\ Controls_{it} + \beta_m * Analyst\ Firm\ Level\ Controls_{ijt} + \varepsilon_{ijt}.$$

Drop equals one if firm *i* was covered by analyst *j* in year *t* but not in year *t*+1, and zero if firm *i* was covered by analyst *j* in both years *t* and *t*+1. *TNIC Competitor %* is N_{ijt}/M_{jt}, where M_{jt} is the total number of firms in the analyst's *j*'s portfolio while N_{ijt} is the number of firms shown both in the analyst *j*'s portfolio and firm *i*'s total similarity calculation. *Rank TNIC Competitor %* is a variable similarly defined as *Accuracy* but based on *TNIC Competitor %.*

Firm control variables as in Table 3 are included but not reported. *Star* is an indicator variable that is one if the analyst is in *Institutional Investor* magazine's All American Team, and zero otherwise. *Accuracy* is Hong and Kubik's (2003) measure of relative accuracy. *Breadth* is a variable similarly defined as *Accuracy* but based on the number of firms coved by the analyst. *Boldness* is Hong and Kubik's (2003) measure of boldness in earnings forecasts. *Experience* is a variable similarly defined as *Accuracy* but based on firm experience. *Broker Size* is a variable similarly defined as *Accuracy* but based on the number of analysts employed by a brokerage house. *Horizon* is a variable similarly defined as *Accuracy* but based on the number of days between the forecast and earnings announcement dates. We include year fixed effects and industry fixed affects based on the Fama and French (1997) 48 industry classification. *z*-statistics reported in parentheses are robust to analyst, firm, and year clustering. ∗∗∗, ∗∗, ∗ denote significance at the 1%, 5%, and 10% levels, respectively.