Innovations and Earnings Non-Synchronicity: Evidence from Industry M&A Activities

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Abstract

This paper investigates how earnings non-synchronicity impacts associated with firm-level research and development (R&D) investment vary as a function of industry-level merger and acquisition (M&A) intensity. Investing in R&D enables firms to differentiate and gain competitive advantages; differentiation strategies increase idiosyncratic variation in firms' earnings. We bring in an industry-level contextual variable, industry-level M&A, and show that the positive relationship between R&D investment and earnings non-synchronicity is increasing in the intensity of inside-industry but not outside-industry M&A, consistent with our conjecture that M&A within an industry facilitates an expansion of knowledge base and induces more innovative R&D through complementary effects.

Keywords: Earnings Non-Synchronicity, Innovations, Industry M&A Activities

1. Introduction

This study examines whether earnings non-synchronicity, attributable to firm-level research and development (R&D) activities, likely varies as a function of industry-level merger and acquisition (M&A) intensity. Because R&D investments have considerable economic impacts on future firm performance, extant literature frequently explores the implications of R&D investments for future earnings. For example, Lev and Sougiannis (1996) study the association of R&D investment level and future earnings realizations; Kothari et al. (2002) examine how R&D investments affect earnings variability; and Ciftci and Cready (2011) investigate whether firm size influences the effects of R&D investments on both future earnings levels and future earnings variability. In this paper, we examine an underexplored earnings trait—earnings synchronicity.

According to the resource-based view, as widely applied in strategic management literature, investing in intangibles is a strategy that firms can use to differentiate themselves from their peers and gain competitive advantages. Brown and Kimbrough (2011) show that corporate intangible investments increase earnings non-synchronicity, which refers to idiosyncratic components of firms' earnings, or the amount of earnings that cannot be explained by either overall earnings of industry membership or earnings of the entire market. Although important, this attribute has been scarcely studied. In particular, greater earnings non-synchronicity appears associated with greater information asymmetry, because it makes it more costly and difficult for corporate outsiders to gain access to firm-specific information. Therefore, these firms suffer from less analyst coverage, lower analyst forecast accuracy, and greater analyst forecast dispersion (Jones, 2007; Franco et al., 2011; Litov et al., 2012). In addition to these implications for external users of accounting information, earnings non-synchronicity influences internal

providers of the information; for example, it is associated with the likelihood that managers issue earnings forecasts (Gong et al., 2013). The management of firms with higher earnings non-synchronicity is more likely to issue earnings forecasts, which also provoke stronger market reactions.

Despite these findings regarding the consequences of earnings non-synchronicity, Gong et al. (2013) indicate that our understanding of its determinants remains fairly limited. Brown and Kimbrough (2011) take a first initiative to establish a link of intangible and R&D investments with earnings non-synchronicity. Their evidence shows that a firm's earnings non-synchronicity is increasing in its intangible investment intensity, including separable recognized intangibles, R&D investments, and goodwill. While the association between R&D investments and earnings non-synchronicity is shown to be positive, evidence in their extended analysis shows that the association between R&D investment and return non-synchronicity turns into negative. They posit that this bizarre relationship could be attributable to the phenomenon of R&D spillover effect. To offer additional insight and explore this puzzling relation with respect to R&D investments, this study brings in an industry-level contextual variable, namely, industry merger and acquisition (M&A) intensity, to analyze the role played by heterogeneity in novelty of innovation activities in this association.

We note several classifications of innovations, such as process versus product (Klepper, 1996), exploitative versus exploratory (Quintana-Garcia and Benavides-Velasco, 2008), or incremental versus radical (Ciftci et al., 2011; Barbosa et al., 2013). The degree of novelty achieved by an innovation tends to differ dramatically with various types of R&D too, such that R&D activities related to basic research may achieve greater novelty in innovations than

activities that seek to extend current technologies. Therefore, we anticipate that there is a variation in terms of the degree of novelty inherent in R&D activities among firms.

Economic literature identifies industry dynamics as a potential determinant of innovation activities and novelty. For example, Barbosa et al. (2013) reveal that an industry's maturity, entry rate, and level of competition affect firms' decisions to choose radical or incremental innovations. Phillips and Zhdanov (2013) show that, in an industry with high amount of M&A activities, small firms tend to make more market-driven R&D and large firms acquire innovations directly from these small firms. In line with anecdotal evidence that firms increasingly use M&As to achieve innovation outcomes (BusinessWeek, Forbes, and Knowledge @ Wharton, etc.), we posit that industry M&A intensity represents another influential industry-level factor on firms' innovation activities and analyze its influence on the association between R&D investments and earnings non-synchronicity. First, operating in an industry with active M&A market on firms' innovations likely facilitates firms to exchange ideas and to expand their knowledge base, inducing more innovative R&D activities. In addition, firms which externally acquire R&D likely need to conduct in-house R&D to exploit and assimilate externally acquired R&D (Cefis, 2010). The complimentary scientific and technological knowledge between targets and acquirers is likely to contribute to higher quality and more novel post-merger innovations (Cassiman et al., 2005; Makri et al., 2010). Reflecting on this association between M&A and R&D activities, we propose that the degree of novelty in the innovations produced by an industry may be higher if that industry also exhibits more intense M&A activity. That is, we analyze whether heterogeneity in novelty of innovation activities attributable to the intensity of industry-level M&A activities is observable through the relation between R&D investment and earnings non-synchronicity.

In investigating how the association varies as a function of the extent of industry dynamics, we advance literature pertaining to earnings non-synchronicity in the following ways. First, we provide evidence that complements findings of Brown and Kimbrough (2011) by highlighting the role played by heterogeneity in innovation novelty on the association between R&D investment and earnings non-synchronicity. As another contribution, our findings imply that integrating macro-level characteristics can complement the micro-level approaches commonly employed in extant accounting research. By additionally considering the impact of industry-level M&A intensity on firm-specific innovation activities, we can more precisely explain the relation between R&D investments and earnings non-synchronicity at the firm level. Finally, this study contributes to research into the implications of R&D investments on future earnings by studying how R&D activities affect an underexplored earnings attribute, namely, earnings non-synchronicity.

Section 2 briefly reviews prior literature regarding firms' innovation activities, M&A activities, and their relations, to provide a foundation for developing our hypothesis. In Section 3 we outline our research methodology, including data sources, sample selection, variable measurements, and empirical models. Section 4 contains the empirical results and discussion, and then Section 5 concludes.

2. Theory and hypotheses development

Brown and Kimbrough (2011) document that the earnings non-commonality of firms increases with their intangible investment intensity. This conjecture derives from the resource-based view, originally introduced in strategic management literature that asserts that firms invest in intangibles to differentiate themselves from their peers and thus gain competitive advantages. The outcomes of such a differentiation strategy should be conveyed through firms' financial

performance and reflected in their earnings, so the earnings patterns of firms that invest heavily in intangibles may differ notably from the earnings patterns of other firms. Consistent with this conjecture, Brown and Kimbrough (2011) find a positive association between intangible investment intensity and earnings non-commonality. However, this positive association appears to shift in relation to R&D investments: Unlike separable, recognized intangibles or goodwill, R&D is found to be negatively associated with returns non-commonality, meaning that R&D intensity causes differentiated firms' financial performance to become more synchronous with overall performance within its industry and the entire market in the long run.

By revisiting the relation between R&D investment intensity and earnings non-synchronicity, we seek to expand this view, from a firm-specific to an industry-wide context. According to Matolcsy and Wyatt (2008), technological innovations applied at an aggregate level can influence future earnings, which in turn can determine the market value of firms' equity, because technological innovations affect not only the investment decisions of the firms that generate the inventions but also those of firms that adopt them. Barbosa et al. (2013) also specify both firm-specific and industry-specific factors, such as net entry rate, growth, and concentration, that can affect firms' innovation novelty, noting that industry dynamics represent a potential determinant of innovation novelty. This combined evidence underscores the importance of considering how aggregate-level characteristics affect firms' investment and innovation decisions. Therefore, we explicitly seek to take a comprehensive approach to the influence of R&D on firm-level earnings properties, by incorporating industry-level attributes, M&A activities, into our analysis.

Mergers and acquisitions provide a mechanism for firms to acquire innovations developed by external parties; the companies directly acquire the knowledge and technologies of

their target firms. Phillips and Zhdanov (2013) construct a model to explain the effect of incentives from active M&A market on firms' innovation activities. According to their model, small firms within an active M&A market industry have more incentives to conduct market-driven innovations, and large firms have the options of acquiring innovations directly from small firms. With the justifiable assumptions that innovations possess varying degrees of novelty and that innovations with greater novelty lead to more non-synchronistic earnings, we argue that firms in an industry with higher M&A intensity are more likely to demonstrate more non-synchronistic earnings patterns. In particular, we reason that the active M&A markets facilitate an exchange of ideas among firms within the industries and that many of those firms which turn to M&A to acquire new knowledge, technologies, and capabilities (Veugelers and Cassiman, 1999; Vermeulen and Barkema, 2001; Ahuja and Katila, 2001; Uhlenbruck et al., 2006; Cassiman and Veugelers, 2007) will likely to have to conduct in-house R&D to exploit and assimilate this externally acquired R&D (Cefis, 2010). According to Cassiman et al. (2005), M&A partners with technological complementarity obtain significant R&D efficiency gains after their merger. Makri et al. (2010) also find that science and technology complementarity leads to discontinuous strategic transformations. Therefore, complimentary scientific and technological knowledge should contribute to higher quality, more novel post-merger innovations.

Even for firms that are not involved in M&A activities, existence of intensive M&A activities within an industry (inside-industry M&A¹) still might induce more innovative R&D. According to the innovation spillover effect, as theorized in economic literature, spillovers occur due to the externality of knowledge and innovations. An innovation successfully produced by one firm gradually spreads to other firms in the economy. The knowledge base of firms within

¹ We follow Phillips and Zhdanov (2012) and use this term, *Inside industry M&A Activity*, to refer to M&A activity involving acquirers from the same industry.

this industry expands, due to this spillover effect. The post-merger innovations produced by the acquirers and new demand created by these post-merger innovations in turn should stimulate other firms within the same industry to engage in more subsequent innovative activities. Therefore, even if firms do not engage in M&A themselves, the positive association between their earnings non-synchronicity and R&D intensity may increase with inside-industry M&A intensity levels.

In summary, whether a firm participates in M&A activities or not, inside-industry M&A intensity should increase the novelty of innovations resulting from that firm's R&D spending. We therefore expect the positive association between firms' earnings non-synchronicity and R&D intensity to be more pronounced when inside-industry M&A intensity increases. Formally,

Hypothesis: The positive relation between earnings non-synchronicity and R&D intensity increases with prior period inside-industry M&A intensity.

3. Data and research design

3.1 Data source and sample

The financial accounting data come from a CRSP/Compustat merged database, and our M&A data come from the SDC Mergers and Acquisitions database. The initial sample comprises all firm-quarters in the CRSP/Compustat merged database over the sample period, from 1983 to 2009. We follow Brown and Kimbrough (2011) and exclude firms whose standard industry classification (SIC) code is non-classifiable (SIC 99). Brown and Kimbrough (2011) require sample firms to have data available for at least 10 calendar quarters preceding quarter t . To examine how industry M&A activities in prior periods affect the relation between R&D intensity and earnings non-synchronicity in subsequent periods, we modify their design and require

sample firms to have data available for calculating the regression variables for at least 10 forward calendar quarters after quarter t . If an observation's intangible assets data are missing from the quarterly database, we replace the value with corresponding available information from the annual database, then set the remaining missing values to 0. If quarterly R&D expenses data are missing, we replace the missing values with one-fourth of the annual R&D expenses, then again set the remaining missing values to 0. To attenuate the serial correlation effect of using overlapping rolling windows to estimate earnings non-synchronicity, we also follow Brown and Kimbrough (2011) and include only the fourth calendar quarter of firm-quarter observations for the analysis. The final sample for our main analysis contains 130,768 firm-quarter observations.

3.2 Variable measurement

In this section, we specify the measures of the key variables of interest: earnings non-synchronicity (*noncommon*), inside and outside M&A intensity (*insidemaavg*; *outsidemaavg*), and inter-industry M&A intensity (*intersidemaavg*), as well as several control variables. We list all the variables and their definitions in the Appendix.

3.2.1. Measure of earnings non-synchronicity. To measure earnings non-synchronicity, we follow a conventional methodology (Elgers et al., 2004; Piotroski and Roulstone, 2004; Brown and Kimbrough, 2011). For each calendar quarter, we estimate the following firm-specific regression over the next 20 calendar quarters, with the restriction that at least 10 quarterly observations are available:

$$ROA_{i,t} = \beta_0 + \beta_1 MKTROA_{i,t} + \beta_2 INDROA_{i,t} + \varepsilon_{i,t},$$

where:

$ROA_{i,t}$: R&D-adjusted return on assets during calendar quarter t for firm i , defined as the pretax income of firm i plus its quarterly R&D expense and minus its quarterly R&D

amortization expenses at quarter t , deflated by the sum of its total assets and estimated unamortized R&D capital at the beginning of calendar quarter t .²

$MKTROA_{i,t}$: weighted average of R&D-adjusted ROA during calendar quarter t for all Compustat firms, excluding firms operating in the same industry as firm i (two-digit SIC code).

$INDROA_{i,t}$: weighted average of R&D-adjusted ROA during calendar quarter t for all Compustat firms in the same industry as firm i (two-digit SIC code), excluding firm i .

After obtaining R-square values from each firm-specific time-series regression, we measure the idiosyncratic portion of a firm's earnings as 1 minus R-square, denoted as $UNEXPLAINED$. Finally, we adjust $UNEXPLAINED$ to measure earnings non-synchronicity:

$$noncommon_{it} = \log \left(\frac{UNEXPLAINED_{it}}{1 - UNEXPLAINED_{it}} \right).$$

We also consider two variants of this earnings non-synchronicity measure. The first is an industry-specific earnings non-synchronicity measure, denoted $noncommonind$, which we measure similarly except that we regress $ROA_{i,t}$ on $INDROA_{i,t}$ only, rather than both $MKTROA_{i,t}$ and $INDROA_{i,t}$. The second variant is a market-wide earnings non-synchronicity measure ($noncommonmkt$), again constructed similarly, except that we regress $ROA_{i,t}$ on $MKTROA_{i,t}$ only.

As an extension of our analysis, we consider return-synchronicity. For each calendar month, we modify the approach in Brown and Kimbrough (2011) to estimate firm-specific regressions for the next 60 calendar months with the restriction that at least 40 monthly observations are available. The raw returns of firm i in month t then are regressed on value-weighted market returns and value-weighted returns of firms in the same industry as firm i

² We self-construct an estimate for unamortized R&D capital and assume that firms adopt an implicit straight-line amortization scheme for R&D expenditures over five years and across four quarters evenly.

during month t . We convert the R-square, as we did for earnings non-synchronicity, to obtain return non-synchronicity, denoted *noncommon_ret*.

3.2.2. *Measurement of inside and outside M&A intensity.* Phillips and Zhdanov (2013) construct a model to show how incentives related to M&A activity within an industry increase firms' incentives to conduct R&D. To measure the intensity of industry M&A activity, we use the prior three-year average of aggregated M&A transaction value in industry j , scaled by the book value of total assets of firms in that industry. To distinguish inside- from outside-industry M&A activity, we classify M&As in which the acquirers and target firms are from the same industry j as inside-industry M&A activity. Its intensity is denoted *insidemaavg*. If the acquiring and target firms instead operate in two different industries, we further distinguish them as either outside-industry M&A activities or inter-industry M&A activities, with intensities denoted *outsidemaavg* and *intersidemaavg*, respectively. For example, if a firm operating in industry j gets acquired by a firm operating in an industry other than j , the M&A deal is an outside-industry M&A activity for industry j . If a firm operating in industry j acquires another firm operating in an industry other than j , it represents an inter-industry M&A activity for industry j . Both *outsidemaavg* and *intersidemaavg* involve cross-industry M&A activities, yet they capture different underlying constructs. That is, the outside-industry M&A intensity measure captures the extent to which other industries expropriate elements from firms operating in industry j , but inter-industry M&A intensity measures the extent to which firms operating in industry j acquire elements from other industries and bring those new elements into their own business.

To determine whether target firms and acquirers are from the same industry, we use two classification schemes. In the main analysis, we classify an M&A as an inside M&A if the 3-digit primary SIC code of the acquirer is the same as that of the target firm but as an outside

M&A if the 3-digit primary SIC code of the acquirer differs from that of the target firm. Alternatively, following Phillips and Zhdanov (2013), we classify an M&A as an inside M&A if the acquirer has one or more segments with the same 3-digit SIC code as segments of the target firm and as an outside M&A if none of the segments have the same 3-digit SIC codes.

3.3 Empirical model

To examine whether the positive relation between earnings non-synchronicity and R&D intensity is increasing with inside-industry M&A intensity, we employ the following regression model:

Model 1:

$$NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + RDINT)_{i,t} + \beta_6 \log(1 + RDINT)_{i,t} X insidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} X outsidemaavg_{j,t} + Controls + \varepsilon_{it}, \quad (1)$$

where:

$\log(1+SEPRBLINT)_{i,t}$ is a log-transformation of 1 plus the average intensity of separable recognized intangibles, calculated as separable recognized intangibles divided by total asset adjusted for unamortized R&D capital, during the estimation period of non-synchronicity for firm i at calendar quarter t .

$\log(1+GDWLINT)_{i,t}$ is a log-transformation of 1 plus the average intensity of goodwill, calculated as goodwill over total assets adjusted for unamortized R&D capital, during the estimation period of non-synchronicity for firm i at calendar quarter t .

$\log(1+RDINT)_{i,t}$ is a log-transformation of 1 plus average R&D intensity, calculated as unamortized R&D capital over total assets adjusted for unamortized R&D capital, during the estimation period of non-synchronicity for firm i at calendar quarter t .

We use three approaches to measure inside and outside industry M&A intensity. First, we apply an industry-level dummy variable for inside- (outside-) industry M&A intensity, *Dinsidemaavg* (*Doutsidemaavg*). For each calendar year, if an industry's inside (outside) M&A intensity is greater than or equal to the median value of inside M&A intensity cross-sectionally, then *Dinsidemaavg* (*Doutsidemaavg*) equals 1, and otherwise it is 0. Second, we use a decile rank of *insidemaavg* (*outsidemaavg*) and scale the value between 0 and 1. Third, we consider a quintile rank of *insidemaavg* (*outsidemaavg*) and similarly adjust the value to a range from 0 to 1.

We anticipate that innovations by firms in an industry with more intense inside-industry M&A activity will be more novel, leading to a more pronounced positive relation between earnings non-synchronicity and R&D intensity. In other words, we expect a positive coefficient on the interaction term between R&D intensity and inside-industry M&A intensity. We do not offer ex ante predictions about the coefficient on the interaction term between R&D intensity and outside-industry M&A intensity, because we have no evidence that outside-industry M&A relates to R&D activity (Phillips and Zhdanov, 2013).

Firms operating in an industry with intense M&A activity likely have considerable goodwill on their balance sheets. That is, M&A activities often are driven by R&D initiatives, so recognized goodwill could result from successful innovations introduced by the target firms. This scenario creates a potential correlated omitted variable problem. To address this misspecification concern, we control for the interactions between goodwill intensity and inside-industry M&A intensity, as well as between goodwill intensity and outside-industry M&A intensity. This alternative model is as follows:

Model 2:

$$\begin{aligned}
NONCOMMON_{it} = & \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \\
& \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} X insidemaavg_{j,t} + \\
& \beta_6 \log(1 + GDWLINT)_{i,t} X outsidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} + \\
& \beta_8 \log(1 + RDINT)_{i,t} X insidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} X outsidemaavg_{j,t} + Controls + \varepsilon_{it}.
\end{aligned}
\tag{2}$$

Following Brown and Kimbrough (2011), we include multiple control variables. Intangible items recognized on financial statements can capture only a subset of intangible resources, so we control for market-to-book ratio (*MB*) in our regression. The rest of the control variables mainly control for the volatility of economic fundamentals at firm and industry levels. Notably, firm size (*MVE*) and market share (*MKTSHARE*) may be influential, in that the profitability of large firms and firms with larger market shares tends to be more independent of the overall industry or entire market. Alternatively, these large firms could function as market leaders and lead other firms in the industry to adopt similar strategies. Thus, their profitability might correlate closely with that of the overall market. We do not make any prediction for the signs of the coefficients on *MVE* and *MKTSHARE*. Furthermore, firms with greater earnings volatility (*STDROA*) are more likely to experience higher earnings non-synchronicity (Piotroski and Roulstone, 2004). In addition to considering the effect of firms' diversification level (*DIVERS*), we also control for firms' leverage level (*LEVERAGE*), with the prediction that higher earnings volatility induced by greater leverage could lead to higher earnings non-synchronicity. The industry concentration level (*HERF*) may be pertinent, in that the comovement of economic fundamentals in highly concentrated industries tends to be greater (Morck et al., 2000). In regulated industries (*REG*), the restrictions imposed on firms may decrease their earnings non-synchronicity. Finally, we use the number of firms in an industry (*NIND*) to control for spurious correlation. Standard errors in all the regressions in our analysis are clustered by firm.

In our extended analysis, we study the interaction effect of R&D and industry M&A intensity on return non-synchronicity. Using the model that Brown and Kimbrough (2011) introduce, we control for the frequency of analyst forecast revisions (*NREV*), turnover of shares held by institutional investors (*deltainst*), and value of net share purchases by insiders (*trades*).³

4. Results

4.1 Primary results

Table 1 presents the distribution of the full sample by industry using the two-digit Standard Industrial Classification (SIC) code. The distribution of the firms in the sample concentrates in industries such as Business Services (SIC 73), Electronic and Other Electrical Equipment (SIC 36), Chemical and Allied Products (SIC 28), and Industrial and Commercial Machinery (SIC 35). Table 2 reports descriptive statistics and correlations for our main regression variables. Consistent with Brown and Kimbrough (2011), the statistic of *noncommon* suggests that there exists variation in earnings non-synchronicity across the full sample. The estimates of the measures of intangibles and other control variables are comparable to the ones of Brown and Kimbrough (2011). In panel B of Table 2, *noncommon* is positively correlated with *SEPRBLINT* and *RDINT*. The correlations are overall comparable to the ones in Brown and Kimbrough (2011).

Table 3 presents the main results of our regression model. Consistent with the evidence documented in Brown and Kimbrough (2011), we find significantly positive coefficients on the log-transformed intensity of separable recognized intangibles, goodwill, and R&D. Thus, a firm's earnings non-synchronicity increases with the intensity of its intangibles-related items, consistent with the inferences drawn from strategic management literature that indicate investing

³ If any value of *NREV*, *deltainst*, or *trades* is missing, we follow Piotroski and Roulstone (2004) and replace the missing value with 0. With this approach, our sample size is not as constrained as Brown and Kimbrough's (2011).

in intangibles enables firms to differentiate themselves from their peers, so in turn, their earnings exhibit greater non-synchronicity.

The focus in our study is whether the positive relation between earnings non-synchronicity and R&D intensity becomes more pronounced if the firms are from an industry with greater inside-industry M&A intensity. Even though this association does not seem to be significantly different between industries with above-median inside-industry M&A intensity v.s. those with below-median inside-industry M&A intensity. Using decile and quintile ranks of inside-industry M&A intensity, we find that the coefficient on the interaction term of R&D intensity and inside-industry M&A is significantly positive. This evidence supports our conjecture that firms in an industry marked by more intense M&A activity tend to experience higher earnings non-synchronicity, because they engage in more innovative R&D investments.

We find a significantly negative coefficient on the interaction term between R&D intensity and outside-industry M&A intensity. Although we do not offer an ex ante prediction of the effect of outside-industry M&A intensity on the relation between R&D intensity and earnings non-synchronicity, we propose an explanation for why the positive innovation–earnings non-synchronicity relationship is attenuated with greater intensity of outside-industry M&A. Firms in an industry are likely to voluntarily seek outsiders to acquire or become involuntary M&A targets of outsiders once its industry reaches a mature stage. At the same time, while an industry becomes mature, a decline in innovations and outcomes will likely to follow. Therefore, based on our findings, outside-industry M&A intensity appears to moderate the impacts of R&D investments on earnings non-synchronicity.

As shown in Table 4, our results also hold when we additionally control for the interaction of goodwill intensity with inside- or outside-industry M&A intensity in Model 2.

Overall, as presented in Table 4, the results remain quantitatively and qualitatively similar to those reported in Table 3. Relative to Model 1, the coefficient for the interaction term between R&D intensity and inside-industry M&A intensity is still significantly positive and with a similar magnitude, and the coefficient on the interaction between R&D intensity and outside-industry M&A intensity is still significantly negative and with a similar magnitude.

4.2 Extension from earnings non-synchronicity to return non-synchronicity

We seek three additional insights by investigating return non-synchronicity. First, return non-synchronicity reflects not only the idiosyncratic fundamental performance of firms, as also is captured by earnings non-synchronicity, but also the idiosyncratic trading and information environment of those firms. Second, as Brown and Kimbrough (2011) note, returns reflect both realized firm performance and future performance anticipated by the market. Thus, such evidence sheds light on how the long-term impacts of non-synchronicity in firm fundamentals, associated with firm-level R&D investment intensity, vary as a function of industry-level M&A intensity. Third, though we have adjusted earnings with an assumption of R&D capitalization regimes, earnings non-synchronicity still may suffer from the contamination of mechanical relations, due to accounting treatments of R&D expenditures. Examining return non-synchronicity allows us to provide evidence from a cleaner test.

Table 5 reports how industry M&A intensity affects the relation between R&D intensity and return non-synchronicity. Consistent with Brown and Kimbrough (2011), R&D is negatively associated with return non-synchronicity when we use a dummy variable to measure inside-industry M&A intensity (*Dinsidemaavg*). According to Brown and Kimbrough (2011), R&D spillover effects could lead the market to anticipate that R&D will increase synchronicity in firm fundamental performance in the long run. Because return non-synchronicity captures the relation

between R&D and firm performance over a relatively longer time horizon, the link between R&D intensity and return non-synchronicity becomes negative. When we interact R&D with inside- and outside-industry M&A dummy variables respectively, we find that the two types of M&A activities have differential impacts on the negative relation.

The results in Table 5 show that the coefficient on the interaction term between R&D intensity and inside-industry M&A intensity is significantly positive, whereas the coefficient on the interaction term with outside-industry M&A intensity is significantly negative. These results are robust, whether we use a dummy variable or decile rank to measure industry M&A intensity.⁴ This evidence thus highlights the complexity of R&D spillover effects, which make firm performance more synchronous but also expand the knowledge base of firms in the market, induce firms to generate more innovative R&D investments, and accordingly make firm performance less synchronous (more non-synchronous) over long time horizons. The contrasting influence of R&D spillover effects increases non-synchronicity in firm performance, especially when the inside-industry M&A intensity is greater. With regard to outside-industry M&A activities, the negative relation becomes even more pronounced for an industry with greater M&A intensity. Therefore, the implications derived from two types of M&A activities in an industry-level analysis of return non-synchronicity are consistent with our main findings related to earnings non-synchronicity.

4.3 Extension by considering inter-industry M&A activities

In our main analysis, we use the impact of outside-industry M&A on firm innovation activities as a benchmark to assess the impact of inside-industry M&A on these activities. Outside-industry M&A intensity reflects the extent to which industry j is acquired by other

⁴ When we use quintile rank to measure industry M&A intensity, the coefficient is marginally significant.

industries. In this additional analysis, we consider inter-industry M&A intensity as an alternative benchmark. This measure reflects the extent to which industry j acquires firms operating in other industries. The complementary effects of externally acquired R&D and internally developed R&D suggests that inside-industry M&A intensity could induce firms in that industry to devote more R&D investments to acquiring innovations. We reasonably expect that the two R&D sources would need to link, to support such complementary effects. If an industry consists of firms that only acquire targets operating in other different industries, the complementary effect is unlikely to influence the novelty of firms' innovation activities within that industry. Our empirical evidence is consistent with this expectation. In Table 6, Panel A, we show that while the positive impact of R&D intensity on earnings non-synchronicity is increasing in the inside-industry M&A intensity, the interactive effect of R&D intensity and inter-industry M&A intensity on earnings non-synchronicity is generally insignificant. In Panel B, after controlling for the impact of goodwill, we still obtain fairly consistent results. Only inside-industry, not inter-industry, M&A intensity increases the positive association between R&D intensity and earnings non-synchronicity.

4.4 Robustness tests

4.4.1 Alternative explanation: Reverse causality. Industries composed of firms engaged in more innovative R&D activities might exhibit more inside-industry M&A activities than industries composed of firms that do not engage in a lot of innovative R&D activities. Firms in the former type of industry have strong incentives to use M&A as a mechanism to acquire novel innovations from external sources. To address the concern about such reverse causality, we conduct additional tests that examine the contemporaneous effect of industry M&A intensity on the relation between R&D intensity and earnings non-synchronicity. Similar to Brown and

Kimbrough (2011), we measure earnings non-synchronicity by estimating firm-specific regressions over the preceding, rather than forward, 20 calendar quarters, with the restriction that at least 10 quarterly observations must be available. For this different estimation period, our sample size slightly decreases, to 125,917 firm quarter observations.

Consistent with Brown and Kimbrough (2011) and our findings in Tables 3 and 4, the results in Table 7 show that the relation between R&D intensity and earnings non-synchronicity is significantly positive across three measures of industry M&A intensity. However, in contrast with our previous findings, we find no evidence that contemporaneous inside-industry M&A activity affects the positive relation between R&D intensity and earnings non-synchronicity. The coefficient on the interaction term of R&D intensity and inside-industry M&A intensity is insignificant and negative. It could be that inside-industry M&A activities intensify R&D spillover effects, making firm fundamental performance more synchronous. Another possible explanation is that we examine contemporaneous effects, meaning that the influence of M&A activities, in terms of triggering more innovative R&D investments in subsequent periods, would not have taken place yet. Accordingly, we find that inside-industry M&A fails to increase the positive relation between R&D and earnings non-synchronicity. For outside-industry M&A activities, the coefficient on the interaction term between R&D intensity and the contemporaneous outside-industry M&A dummy variable is still significantly negative, suggesting that contemporaneous outside-industry M&A intensity thus decreases the positive relation between R&D intensity and earnings non-synchronicity. These results are consistent with our previous supposition that mature industries may have less innovative R&D and be more likely to be acquired by firms from other industries.

4.4.2 Industry-specific and market-wide earnings non-synchronicity. We conduct two additional robustness tests where we use alternative estimates of earnings non-synchronicity: industry-specific and market-wide. The first column in Table 8, Panel A, reports the results of Model 2 with industry-specific earnings non-synchronicity as the dependent variable. The main results still hold; the positive relation of industry-specific earnings non-synchronicity and R&D intensity is more pronounced for firms operating in an industry with higher inside-industry M&A intensity, relative to other industries in that year. This positive relation is attenuated for firms from an industry with outside-industry M&A intensity above the median. Consistent with the results in Tables 3 and 4, the coefficient on the interaction term between R&D intensity and the inside-industry M&A decile rank variable is significantly positive; the coefficient on the interaction term between R&D intensity and the outside-industry M&A decile rank variable is significantly negative.

In the second column in Table 8, Panel A, we present the results of a similar analysis, except that in this case, we substitute market-wide earnings non-synchronicity for industry-specific earnings non-synchronicity. Consistent with the results of our prior analysis, the coefficient on the interaction term between R&D intensity and the inside-industry M&A decile rank variable is positive but insignificant, and the coefficient on the interaction term between R&D intensity and the outside-industry M&A decile rank variable is significantly negative. Yet we fail to find evidence of a first-order positive relation between market-wide earnings non-synchronicity and R&D intensity. The positive association between earnings non-synchronicity and goodwill and separable recognized intangibles, as documented by Brown and Kimbrough (2011), also turns negative. These findings suggest that when adopting a differentiation strategy by investing in intangibles, firms focus more on differentiating themselves from industry peers,

rather than from firms operating in other industries, to obtain competitive advantages. The evidence also implies that earnings by a firm's industry peers are a more relevant benchmark for determining firm-specific earnings non-synchronicity.

4.4.3 Alternative classification scheme for inside- and outside-industry M&A activities.

In line with Phillips and Zhdanov (2013), we use segment-level information to classify M&A activities as inside or outside. An M&A is classified as inside industry if the 3-digit SIC code of one segment of the target firm matches the 3-digit SIC code of one segment of the acquirer. With this method, more M&A activities get classified as inside-industry M&A. The results in Table 8, Panel B, are consistent with our findings derived from the original classification scheme of M&A activities. The positive relation between earnings non-synchronicity and R&D intensity is more pronounced for firms in an industry with relatively higher inside-industry M&A intensity. Even if the increase in novelty of R&D activities driven by industry M&A activities only stems from a specific segment, that increase in innovation still is reflected in the firm's overall earnings.

5. Conclusions

We investigate how the association between earnings non-synchronicity and firm-level R&D investment intensity differs as a function of industry-level M&A intensity. The active M&A markets facilitate an exchange of ideas within the industries, inducing more innovation activities. According to the complementarity effect documented in economic theories, the combination of internally developed and externally acquired innovations enhances the novelty of innovations generated by firms. Furthermore, due to R&D spillover effects, this complementarity can potentially influence R&D investments from those firms in the same industry that do not actually participate in M&A transactions. Earnings non-synchronicity likely increases with the

degree of innovativeness of R&D investments, and we find that the positive relation between R&D intensity and earnings non-synchronicity is more pronounced for firms in an industry with higher inside-industry M&A intensity for that year. We also find that outside-industry M&A intensity has an opposite impact on the positive association between R&D intensity and earnings non-synchronicity. The positive relation diminishes as outside-industry M&A intensity increases.

These findings thus provide insights related to the implications of R&D spending for future earnings at a broader scope. In addition to examining the impact of R&D investments on earnings levels and variability at the firm level, we consider how certain industry-level characteristics affect the earnings impact of firm-specific R&D investments. Investments in intangibles and R&D have grown increasingly important in the modern economy (Lev, 2001), suggesting the strong need to refine extant analyses of R&D investments. By investigating not only quantitative but also qualitative attributes of R&D activities, we can gain more accurate assessments of the economic impact of R&D on earnings.

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Appendix

Variable Definitions

Most variables and definitions come from Brown and Kimbrough (2011) and Phillips and Zhdanov (2013).

Variable	Definition
<i>noncommon</i>	Earnings non-synchronicity (Section 3.2)
<i>noncommonind</i>	Industry-specific earnings non-synchronicity (Section 3.2)
<i>noncommonmkt</i>	Market-wide earnings non-synchronicity (Section 3.2)
<i>noncommon_ret</i>	Return non-synchronicity (Section 3.2)
<i>insidemaavg</i>	Past 3-year average of value of M&A activity involving acquirers from the same industry, scaled by book value of the assets in the industry
<i>Dinsidemaavg</i>	For each calendar year, if an industry's <i>insidemaavg</i> is greater than or equal to the median value of inside M&A intensity cross-sectionally, <i>Dinsidemaavg</i> equals 1, and 0 otherwise.
<i>Decileinsidemaavg</i>	Decile rank of <i>insidemaavg</i> for each calendar year. The value is rescaled between 0 and 1.
<i>Qinsidemaavg</i>	Quintile rank of <i>insidemaavg</i> for each calendar year. The value is rescaled between 0 and 1.
<i>outsidemaavg</i>	Past 3-year average of value of M&A activity involving acquirers from a different industry, scaled by the book value of the assets in the industry
<i>Doutsidemaavg</i>	For each calendar year, if an industry's <i>outsidemaavg</i> is greater than or equal to the median value of outside M&A intensity cross-sectionally, <i>Doutsidemaavg</i> equals 1, and 0 otherwise.
<i>Decileoutsidemaavg</i>	Decile rank of <i>outsidemaavg</i> for each calendar year. The value is rescaled between 0 and 1.
<i>Qoutsidemaavg</i>	Quintile rank of <i>outsidemaavg</i> for each calendar year. The value is rescaled between 0 and 1.
<i>intersidemaavg</i>	Past 3-year average of value of M&A activity involving target firms from a different industry, scaled by the book value of the assets in the industry
<i>Dintersidemaavg</i>	For each calendar year, if an industry's <i>intersidemaavg</i> is greater than or equal to the median value of outside M&A intensity cross-sectionally, <i>Dintersidemaavg</i> equals 1, and 0 otherwise.
<i>Decileintersidemaavg</i>	Decile rank of <i>intersidemaavg</i> for each calendar year. The value is rescaled between 0 and 1.
<i>Qintersidemaavg</i>	Quintile rank of <i>intersidemaavg</i> for each calendar year. The value is rescaled between 0 and 1.
<i>SEPRBLINT</i>	Average asset intensity for separable recognized intangibles over the estimation period for computing <i>noncommon</i> . Asset intensity for separable recognized intangibles = (Compustat item SEPRBL)/(ATQ+ RDCAP). RDCAP is a self-constructed unamortized estimate of R&D capital.
<i>GDWLINT</i>	Average goodwill intensity over the estimation period for computing <i>noncommon</i> . Goodwill intensity = (Compustat item GDWL)/ (ATQ+

	RDCAP).
<i>RDINT</i>	Average R&D intensity over the estimation period for computing <i>noncommon</i> . $R\&D\ intensity = (Compustat\ item\ RDCAP) / (ATQ + RDCAP)$.
<i>MB</i>	Average market-to-book value ratio over the estimation period for computing <i>noncommon</i> .
<i>MVE</i>	Average market value of equity over the estimation period for computing <i>noncommon</i> .
<i>MKTSHARE</i>	Average market share over the estimation period for computing <i>noncommon</i> . Market share is firm sales divided by total sales of firms in the same two-digit SIC code.
<i>STDROA</i>	Standard deviation of return on assets over the estimation period for computing <i>noncommon</i> .
<i>DIVERS</i>	Average quarterly sales-based Herfindahl index of firm diversification over the estimation period for computing <i>noncommon</i> . Data from the business segment data set of Segment Compustat.
<i>HERF</i>	Average quarterly sales-based Herfindahl index at the industry level over the estimation period for computing <i>noncommon</i> .
<i>LEVERAGE</i>	Average leverage ratio over the estimation period for computing <i>noncommon</i> . $Leverage\ ratio = Compustat\ item\ DLTQ / Compustat\ item\ CEQQ$
<i>REG</i>	Dummy variable equal to 1 if firm <i>i</i> is a financial institute (2-digit SIC: 62) or in a regulated industry (2-digit SIC: 49), and 0 otherwise.
<i>NIND</i>	Average number of firms used to compute industry return on assets over the estimation period for computing <i>noncommon</i> .
<i>NREV</i>	Average annual number of issuances and revisions of one-year ahead earnings forecasts from analysts over the estimation period for computing <i>noncommon</i> .
<i>deltainst</i>	Average annual net change in the fraction of shares held by institutional investors (=net change in institutional holdings/total annual trading volume) over the estimation period for computing <i>noncommon</i> .
<i>trades</i>	Average absolute value of the difference between the fraction of shares purchased by insiders and the fraction of shares sold by insiders over the estimation period for computing <i>noncommon</i> .

Table 1
Industry distribution

2-digit SIC	Industry name	Total firm-years	Percent
1	Agricultural production crops	306	0.23
2	Agriculture production livestock and animal specialties	26	0.02
7	Agricultural services	75	0.06
8	Forestry	48	0.04
10	Metal mining	1,563	1.2
12	Coal mining	178	0.14
13	Oil and gas extraction	4,779	3.65
14	Mining and quarrying of nonmetallic minerals	287	0.22
15	Building construction	785	0.6
16	Heavy construction	395	0.3
17	Construction special trade contracts	319	0.24
20	Food and kindred products	2,699	2.06
21	Tobacco products	123	0.09
22	Textile mill products	709	0.54
23	Apparel	1,113	0.85
24	Lumber and wood products, except furniture	701	0.54
25	Furniture and fixtures	757	0.58
26	Paper and allied products	1,284	0.98
27	Printing, publishing, and allied industries	1,459	1.12
28	Chemicals and allied products	9,387	7.18
29	Petroleum refining and related industries	896	0.69
30	Rubber and miscellaneous plastic products	1,349	1.03
31	Leather and leather products	421	0.32
32	Stone, clay, glass, and concrete products	668	0.51
33	Primary metal industries	1,730	1.32
34	Fabricated metal products, except machinery and transportation equipment	1,741	1.33
35	Industrial and commercial machinery and computer equipment	7,394	5.65
36	Electronic and other electrical equipment and components	9,606	7.35
37	Transportation equipment	2,619	2
38	Measuring instruments, photographic, medical and optical goods	7,613	5.82
39	Miscellaneous manufacturing	1,214	0.93
40	Railroad transportation	360	0.28
41	Local and suburban transit	54	0.04
42	Motor freight transportation and warehousing	807	0.62
44	Water transportation	671	0.51
45	Air transportation	806	0.62
46	Pipelines, except natural gas	81	0.06
47	Transportation services	333	0.25

48	Communications	3479	2.66
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2-digit SIC	Industry name	Total firm-years	Percent
49	Electric, gas, and sanitary services	5,339	4.08
50	Wholesale trade-durable goods	1,619	1.36
51	Wholesale trade-nondurable goods	1,548	1.18
52	Building materials	273	0.21
53	General merchandise stores	802	0.61
54	Food stores	787	0.6
55	Automotive dealers and gasoline service stations	448	0.34
56	Apparel and accessory stores	1,146	0.88
57	Home furniture, furnishing, and equipment stores	611	0.47
58	Eating and drinking places	1,793	1.37
59	Miscellaneous retail	2,006	1.53
60	Depository institutions	11,511	8.8
61	Nondepository credit institutions	1,186	0.91
62	Security and commodity brokers, dealers	1,639	1.25
63	Insurance carriers	3,616	2.77
64	Insurance agents	551	0.42
65	Real estate	1,285	0.98
67	Holding and other investment offices	5,374	4.11
70	Hotels	531	0.41
72	Personal services	340	0.26
73	Business services	11,509	8.8
75	Automotive repair	231	0.18
76	Miscellaneous repair	79	0.06
78	Motion pictures	763	0.58
79	Amusement and recreation services	1,023	0.78
80	Health services	2,008	1.54
82	Educational services	422	0.32
83	Social services	160	0.12
86	Membership organization	1	0
87	Engineering, accounting, research, management, and related services	2,012	1.54
	Total	130,768	100

Table 2
Descriptive Statistics and Correlations

This table presents the descriptive statistics. Table 1 Panel A presents the descriptive statistics of the variables in our regression analysis. Table 1 Panel B presents the correlation coefficients of these variables. The list of variables definitions is provided in Appendix A.

Panel A: Descriptive Statistics

Variable	Obs	Mean	Std Dev	25th Pctl	Median	75th Pctl
<i>noncommon</i>	130,768	1.521	1.440	0.524	1.404	2.376
<i>noncommonind</i>	130,768	2.969	2.273	1.380	2.596	4.155
<i>noncommonmkt</i>	130,768	2.847	2.234	1.284	2.440	3.971
<i>noncommon_ret</i>	98,709	2.169	1.421	1.165	2.022	3.003
<i>insidemaavg</i>	130,768	0.044	0.057	0.006	0.023	0.061
<i>Dinsidemaavg</i>	130,768	0.507	0.500	0.000	1.000	1.000
<i>Decileinsidemaavg</i>	130,768	0.550	0.288	0.300	0.500	0.800
<i>Qinsidemaavg</i>	130,768	0.601	0.284	0.400	0.600	0.800
<i>outsidemaavg</i>	130,768	0.077	0.151	0.008	0.027	0.074
<i>Doutsidemaavg</i>	130,768	0.511	0.500	0.000	1.000	1.000
<i>Decileoutsidemaavg</i>	130,768	0.551	0.286	0.300	0.600	0.800
<i>Qoutsidemaavg</i>	130,768	0.599	0.282	0.400	0.600	0.800
<i>intersidemaavg</i>	130,768	0.081	0.243	0.004	0.014	0.043
<i>Dintersidemaavg</i>	130,768	0.516	0.500	0.000	1.000	1.000
<i>Decileintersidemaavg</i>	130,768	4.492	2.876	2.000	4.000	7.000
<i>Qintersidemaavg</i>	130,768	0.599	0.285	0.400	0.600	0.800
<i>SEPRBLINT</i>	130,768	0.033	0.072	0.000	0.002	0.029
<i>log(1+SEPRBLINT)</i>	130,768	0.030	0.063	0.000	0.002	0.029
<i>GDWLINT</i>	130,768	0.055	0.103	0.000	0.002	0.060
<i>log(1+GDWLINT)</i>	130,768	0.049	0.088	0.000	0.002	0.058
<i>RDINT</i>	130,768	0.058	0.106	0.000	0.000	0.075
<i>log(1+RDINT)</i>	130,768	0.052	0.091	0.000	0.000	0.072
<i>MB</i>	130,768	2.880	3.560	1.214	1.825	3.034
<i>log(MB)</i>	130,768	0.693	0.776	0.194	0.602	1.110
<i>MVE</i>	130,768	1,938.700	5,996.100	42.411	185.400	931.900
<i>log(MVE)</i>	130,768	5.342	2.164	3.747	5.222	6.837
<i>MKTSHARE</i>	130,768	0.011	0.031	0.000	0.001	0.006
<i>STDROA</i>	130,768	0.031	0.035	0.010	0.020	0.039
<i>DIVERS</i>	130,768	0.861	0.210	0.743	1.000	1.000
<i>log(1+DIVERS)</i>	130,768	0.614	0.123	0.556	0.693	0.693
<i>HERF</i>	130,768	0.086	0.070	0.042	0.062	0.101
<i>log(1+HERF)</i>	130,768	0.081	0.061	0.041	0.060	0.096
<i>LEVERAGE</i>	130,768	0.283	0.247	0.055	0.242	0.455
<i>log(1+LEVERAGE)</i>	130,768	0.232	0.185	0.053	0.216	0.375

<i>REG</i>	130,768	0.053	0.225	0.000	0.000	0.000
<i>NIND</i>	130,768	286.000	230.300	83.111	242.300	426.800
<i>log(NIND)</i>	130,768	5.217	1.060	4.420	5.490	6.056
<i>NREV</i>	98,709	22.318	33.168	0.941	8.579	29.600
<i>log(1+NREV)</i>	98,709	2.143	1.539	0.663	2.260	3.421
<i>deltainst</i>	98,709	0.144	0.450	0.041	0.082	0.152
<i>log(1+deltainst)</i>	98,709	0.111	0.113	0.041	0.079	0.141
<i>trades</i>	98,709	0.046	1.110	0.001	0.004	0.017
<i>log(1+trades)</i>	98,709	0.022	0.056	0.001	0.004	0.017

Table 2
Descriptive Statistics and Correlations

Panel B: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(1) <i>noncommon</i>	1.00	0.00	-0.13	-0.10	0.03	0.00	-0.01	0.00	0.01	0.03	0.02	-0.01	-0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.01	0.03	0.03
(2) <i>log(MB)</i>	0.01	1.00	0.27	-0.04	0.20	0.03	-0.09	-0.12	-0.05	0.13	0.33	0.15	0.09	0.31	0.18	0.18	0.18	0.19	0.10	0.09	0.11	0.11
(3) <i>log(MVE)</i>	-0.12	0.23	1.00	0.64	-0.35	-0.25	-0.14	0.16	0.11	-0.04	0.12	0.22	0.24	-0.05	0.00	-0.06	-0.07	-0.07	-0.18	-0.12	-0.15	-0.15
(4) <i>MKTSHARE</i>	-0.06	0.01	0.40	1.00	-0.24	-0.30	0.28	0.31	0.05	-0.56	-0.07	0.11	0.20	-0.29	-0.15	-0.10	-0.14	-0.13	-0.05	-0.01	-0.04	-0.04
(5) <i>STDROA</i>	0.04	0.23	-0.30	-0.11	1.00	0.04	0.14	-0.27	-0.09	-0.08	0.24	0.02	-0.01	0.30	0.19	0.24	0.24	0.25	0.25	0.21	0.25	0.25
(6) <i>log(1+DIVERS)</i>	0.00	0.05	-0.27	-0.18	0.11	1.00	-0.02	-0.12	-0.08	0.16	-0.13	-0.19	-0.24	-0.02	0.02	0.02	0.03	0.03	-0.05	-0.06	-0.06	-0.06
(7) <i>log(1+HERF)</i>	0.00	-0.08	-0.11	0.29	0.06	-0.01	1.00	0.00	-0.20	-0.59	-0.10	-0.07	0.03	-0.17	-0.18	-0.12	-0.13	-0.12	0.13	0.08	0.10	0.11
(8) <i>log(1+LEVERAGE)</i>	0.00	-0.08	0.15	0.15	-0.20	-0.10	0.02	1.00	0.14	-0.14	-0.18	0.02	0.05	-0.35	-0.16	-0.15	-0.16	-0.17	-0.14	-0.13	-0.14	-0.14
(9) <i>REG</i>	0.01	-0.05	0.10	-0.03	-0.06	-0.06	-0.11	0.14	1.00	-0.06	-0.15	-0.05	-0.09	-0.17	-0.12	-0.14	-0.13	-0.13	-0.15	-0.15	-0.16	-0.17
(10) <i>log(NIND)</i>	0.03	0.13	-0.04	-0.40	0.00	0.11	-0.60	-0.13	-0.01	1.00	0.21	0.04	-0.03	0.37	0.16	0.10	0.14	0.13	-0.05	-0.06	-0.05	-0.06
(11) <i>log(1+INTANGINT)</i>	0.02	0.32	0.10	-0.02	0.17	-0.08	-0.13	-0.16	-0.12	0.19	1.00	0.59	0.59	0.63	0.28	0.21	0.25	0.25	0.21	0.19	0.22	0.23
(12) <i>log(1+SEPRBLINT)</i>	0.01	0.12	0.13	0.03	0.07	-0.10	-0.03	0.05	-0.02	-0.01	0.57	1.00	0.42	0.15	0.13	0.07	0.09	0.09	0.08	0.10	0.11	0.10
(13) <i>log(1+GDWLINT)</i>	-0.01	0.08	0.19	0.09	0.01	-0.18	0.00	0.04	-0.06	-0.05	0.65	0.26	1.00	0.07	0.13	0.03	0.05	0.05	0.11	0.13	0.13	0.13
(14) <i>log(1+RDINT)</i>	0.03	0.35	-0.08	-0.13	0.21	0.10	-0.19	-0.34	-0.12	0.37	0.59	-0.01	-0.05	1.00	0.25	0.23	0.27	0.27	0.19	0.15	0.18	0.19
(15) <i>insidemaavg</i>	0.01	0.12	-0.03	-0.07	0.11	0.02	-0.09	-0.12	-0.10	0.07	0.24	0.12	0.12	0.19	1.00	0.77	0.90	0.88	0.58	0.44	0.54	0.52
(16) <i>Dinsidemaavg</i>	0.02	0.17	-0.06	-0.09	0.16	0.04	-0.14	-0.14	-0.14	0.13	0.24	0.10	0.07	0.24	0.59	1.00	0.87	0.85	0.44	0.40	0.45	0.44
(17) <i>Decileinsidemaavg</i>	0.03	0.18	-0.08	-0.12	0.16	0.05	-0.16	-0.15	-0.13	0.17	0.27	0.11	0.09	0.27	0.74	0.87	1.00	0.98	0.54	0.46	0.56	0.55
(18) <i>Qinsidemaavg</i>	0.03	0.18	-0.08	-0.12	0.16	0.04	-0.15	-0.16	-0.13	0.16	0.27	0.12	0.09	0.27	0.71	0.85	0.98	1.00	0.53	0.46	0.55	0.54
(19) <i>outsidemaavg</i>	0.02	0.02	-0.12	-0.02	0.07	-0.02	0.10	-0.04	-0.07	-0.13	0.07	0.07	0.08	-0.01	0.42	0.20	0.27	0.26	1.00	0.81	0.94	0.92
(20) <i>Doutsidemaavg</i>	0.01	0.08	-0.13	-0.07	0.12	-0.04	0.02	-0.12	-0.15	-0.03	0.18	0.09	0.14	0.09	0.36	0.40	0.46	0.46	0.43	1.00	0.87	0.85
(21) <i>Decileoutsidemaavg</i>	0.03	0.10	-0.16	-0.10	0.15	-0.04	0.03	-0.13	-0.16	-0.02	0.21	0.11	0.16	0.12	0.44	0.45	0.55	0.55	0.58	0.87	1.00	0.98
(22) <i>Qoutsidemaavg</i>	0.03	0.10	-0.16	-0.09	0.15	-0.04	0.04	-0.13	-0.17	-0.03	0.22	0.11	0.16	0.12	0.44	0.44	0.55	0.54	0.55	0.85	0.98	1.00

Note: Pearson correlation coefficients are presented above the diagonal. Spearman correlation coefficients are presented below the diagonal. If p-value is equal to or lower than 0.05, then the correlation coefficients are marked as bold.

**Table 3 The Effect of Inside Industry M&A Activities and Outside Industry M&A Activities
on the Relation between R&D intensity and Earnings Non-Synchronicity**

Model 1: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + RDINT)_{i,t} + \beta_6 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + Controls + \varepsilon_{it}$

This table presents results of testing the effect of inside and outside industry M&A activities on the association between R&D intensity and earnings non-synchronicity. ‘*insidemaavg*’ is measured as *Dinsidemaavg*, *Decileinsidemaavg*, *Qinsidemaavg* respectively in Column (1), Column (2), and Column (3). ‘*outsidemaavg*’ is measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Model	(1)Dummy			(2)Decile			(3)Quintile		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	1.8914	25.10	<.0001	1.8401	23.76	<.0001	1.8215	23.29	<.0001
<i>insidemaavg</i>	0.0315	2.01	0.0445	0.0293	0.94	0.3470	0.0281	0.92	0.3551
<i>outsidemaavg</i>	0.0058	0.37	0.7101	0.0700	2.23	0.0255	0.0835	2.70	0.0069
<i>log(1+SEPRBLINT)</i>	0.3481	2.99	0.0028	0.3318	2.84	0.0045	0.3283	2.81	0.0050
<i>log(1+GDWLINT)</i>	0.2059	2.45	0.0141	0.1792	2.12	0.0337	0.1697	2.01	0.0442
<i>log(1+RDINT)</i>	0.4707	3.30	0.0010	0.4668	1.86	0.0630	0.5248	1.92	0.0548
<i>log(1+RDINT) × insidemaavg</i>	0.0806	0.54	0.5919	1.0585	3.65	0.0003	1.0365	3.50	0.0005
<i>log(1+RDINT) × outsidemaavg</i>	-0.7494	-5.64	<.0001	-1.8898	-5.99	<.0001	-1.8827	-5.82	<.0001
<i>log(MB)</i>	0.0676	6.81	<.0001	0.0659	6.63	<.0001	0.0655	6.59	<.0001
<i>log(MVE)</i>	-0.0983	-22.22	<.0001	-0.0974	-21.96	<.0001	-0.0970	-21.86	<.0001
<i>MKTSHARE</i>	-0.1441	-0.42	0.6766	-0.1090	-0.32	0.7524	-0.1115	-0.32	0.7468
<i>STDROA</i>	-0.2605	-1.15	0.2491	-0.2255	-1.00	0.3194	-0.2329	-1.03	0.3039
<i>log(1+DIVERS)</i>	-0.4169	-6.49	<.0001	-0.4146	-6.45	<.0001	-0.4099	-6.37	<.0001
<i>log(1+HERF)</i>	0.3931	2.55	0.0107	0.4245	2.76	0.0059	0.4239	2.75	0.0059
<i>log(1+LEVERAGE)</i>	0.1751	4.28	<.0001	0.1785	4.36	<.0001	0.1816	4.43	<.0001
<i>REG</i>	0.1753	4.23	<.0001	0.1808	4.37	<.0001	0.1831	4.43	<.0001
<i>log(NIND)</i>	0.0475	5.05	<.0001	0.0493	5.22	<.0001	0.0495	5.26	<.0001
Number of Observations	130,768			130,768			130,768		
Adjusted R-square	0.0208			0.0210			0.0210		

**Table 4 The Effect of Inside and Outside Industry M&A Activities on the Relation between R&D Intensity and Earnings Non-synchronicity
(Controlling the Interaction Terms between Goodwill and M&A Intensity)**

Model 2: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} \times insidemaavg_{j,t} + \beta_6 \log(1 + GDWLINT)_{i,t} \times outsidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} + \beta_8 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + Controls + \varepsilon_{it}$

This table presents results of testing the effect of inside and outside industry M&A activities on the association between R&D intensity and earnings non-synchronicity after controlling for the impact of goodwill. ‘*insidemaavg*’ is measured as *Dinsidemaavg*, *Decileinsidemaavg*, *Qinsidemaavg* respectively in Column (1), Column (2), and Column (3). ‘*outsidemaavg*’ is measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Model	(1)Dummy			(2)Decile			(3)Quintile		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	1.8804	24.70	<.0001	1.8214	23.07	<.0001	1.8000	22.53	<.0001
<i>insidemaavg</i>	0.0330	1.86	0.0629	0.0198	0.56	0.5723	0.0230	0.67	0.5010
<i>outsidemaavg</i>	0.0142	0.80	0.4215	0.0995	2.81	0.0049	0.1109	3.19	0.0014
$\log(1+SEPRBLINT)$	0.3442	2.96	0.0031	0.3238	2.77	0.0056	0.3208	2.75	0.0060
$\log(1+GDWLINT)$	0.3354	2.34	0.0194	0.4341	2.04	0.0413	0.4815	2.06	0.0395
$\log(1+GDWLINT) \times insidemaavg$	-0.0436	-0.30	0.7669	0.1330	0.47	0.6405	0.0505	0.18	0.8572
$\log(1+GDWLINT) \times outsidemaavg$	-0.1611	-1.07	0.2838	-0.5246	-1.82	0.0684	-0.5028	-1.74	0.0812
$\log(1+RDINT)$	0.4719	3.31	0.0009	0.4688	1.87	0.0618	0.5256	1.92	0.0543
$\log(1+RDINT) \times insidemaavg$	0.0828	0.55	0.5843	1.0860	3.73	0.0002	1.0580	3.56	0.0004
$\log(1+RDINT) \times outsidemaavg$	-0.7616	-5.69	<.0001	-1.9352	-6.10	<.0001	-1.9197	-5.92	<.0001
$\log(MB)$	0.0672	6.76	<.0001	0.0656	6.59	<.0001	0.0651	6.54	<.0001
$\log(MVE)$	-0.0982	-22.18	<.0001	-0.0972	-21.90	<.0001	-0.0968	-21.80	<.0001
<i>MKTSHARE</i>	-0.1522	-0.44	0.6594	-0.1224	-0.35	0.7230	-0.1255	-0.36	0.7162
<i>STDROA</i>	-0.2684	-1.19	0.2356	-0.2348	-1.04	0.3005	-0.2440	-1.08	0.2822
$\log(1+DIVERS)$	-0.4152	-6.46	<.0001	-0.4120	-6.40	<.0001	-0.4070	-6.32	<.0001
$\log(1+HERF)$	0.3909	2.54	0.0112	0.4192	2.72	0.0065	0.4183	2.72	0.0066
$\log(1+LEVERAGE)$	0.1748	4.27	<.0001	0.1791	4.37	<.0001	0.1821	4.45	<.0001
<i>REG</i>	0.1761	4.25	<.0001	0.1819	4.40	<.0001	0.1844	4.46	<.0001
$\log(NIND)$	0.0484	5.12	<.0001	0.0505	5.32	<.0001	0.0508	5.36	<.0001

Number of Observations	130,768	130,768	130,768
Adjusted R-square	0.0208	0.0211	0.0211

**Table 5 The Effect of Inside Industry M&A Activities and Outside Industry M&A Activities
on the Relation between R&D intensity and Returns Non-Synchronicity**

Model 2: $NONCOMMON_RET_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} \times insidemaavg_{j,t} + \beta_6 \log(1 + GDWLINT)_{i,t} \times outsidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} + \beta_8 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + Controls + \varepsilon_{it}$

This table presents results of testing the effect of inside and outside industry M&A activities on the association between R&D intensity and returns non-synchronicity after controlling for the impact of goodwill. ‘*insidemaavg*’ is measured as *Dinsidemaavg*, *Decileinsidemaavg*, *Qinsidemaavg* respectively in Column (1), Column (2), and Column (3). ‘*outsidemaavg*’ is measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Model	(1)Dummy			(2)Decile			(3)Quintile		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	3.1326	36.69	<.0001	3.1272	35.26	<.0001	3.1353	34.87	<.0001
<i>insidemaavg</i>	-0.0669	-3.30	0.0010	-0.1063	-2.62	0.0088	-0.1034	-2.64	0.0084
<i>outsidemaavg</i>	-0.0088	-0.48	0.6341	0.0407	1.06	0.2911	0.0284	0.75	0.4528
$\log(1+SEPRBLINT)$	0.3605	2.79	0.0054	0.3476	2.68	0.0073	0.3535	2.73	0.0064
$\log(1+GDWLINT)$	0.0028	0.02	0.9847	-0.2122	-1.00	0.3171	-0.2348	-1.01	0.3143
$\log(1+GDWLINT) \times insidemaavg$	0.4293	2.72	0.0066	1.1355	3.61	0.0003	1.0357	3.39	0.0007
$\log(1+GDWLINT) \times outsidemaavg$	-0.4351	-2.67	0.0077	-0.7878	-2.48	0.0131	-0.6986	-2.22	0.0266
$\log(1+RDINT)$	-0.8755	-5.63	<.0001	0.0112	0.04	0.9661	0.2126	0.74	0.4576
$\log(1+RDINT) \times insidemaavg$	0.3712	2.42	0.0157	0.9149	3.10	0.0020	0.5249	1.73	0.0828
$\log(1+RDINT) \times outsidemaavg$	-0.8285	-6.17	<.0001	-2.9726	-9.52	<.0001	-2.6214	-8.26	<.0001
$\log(MB)$	0.1718	15.18	<.0001	0.1712	15.09	<.0001	0.1721	15.16	<.0001
$\log(MVE)$	-0.2942	-43.01	<.0001	-0.2945	-42.89	<.0001	-0.2942	-42.81	<.0001
<i>MKTSHARE</i>	1.5523	4.87	<.0001	1.5949	5.02	<.0001	1.5919	5.02	<.0001
<i>STDROA</i>	-0.5307	-2.31	0.0210	-0.5528	-2.40	0.0164	-0.5628	-2.44	0.0146
$\log(1+DIVERS)$	0.1356	2.04	0.0418	0.1391	2.09	0.0370	0.1459	2.19	0.0287
$\log(1+HERF)$	0.6755	4.06	<.0001	0.6986	4.20	<.0001	0.6868	4.13	<.0001
$\log(1+LEVERAGE)$	0.0307	0.69	0.4932	0.0289	0.64	0.5194	0.0328	0.73	0.4645
<i>REG</i>	-0.0878	-2.50	0.0123	-0.0760	-2.16	0.0307	-0.0767	-2.18	0.0292
$\log(NIND)$	0.0916	9.32	<.0001	0.0929	9.44	<.0001	0.0916	9.30	<.0001
<i>noncommon</i>	0.0671	16.37	<.0001	0.0666	16.25	<.0001	0.0670	16.33	<.0001
$\log(1+NREV)$	-0.1160	-13.76	<.0001	-0.1163	-13.78	<.0001	-0.1166	-13.81	<.0001
$\log(1+deltainst)$	1.0221	14.55	<.0001	1.0248	14.56	<.0001	1.0266	14.58	<.0001
$\log(1+trades)$	1.2387	9.41	<.0001	1.2261	9.32	<.0001	1.2274	9.32	<.0001

Number of Observations	98,709	98,709	98,709
Adjusted R-square	0.3006	0.3014	0.3009

**Table 6 Panel A The Effect of Inside Industry, Outside Industry, and Inter-Industry M&A Activities
on the Relation between R&D intensity and Earnings Non-Synchronicity**

Model 3: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 intersidemaavg_{j,t} + \beta_4 \log(1 + SEPRBLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} + \beta_6 \log(1 + RDINT)_{i,t} + \beta_7 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_8 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} \times intersidemaavg_{j,t} + Controls + \varepsilon_{it}$

This table presents results of testing the effect of inside, outside, and inter-industry M&A activities on the association between R&D intensity and earnings non-synchronicity. ‘*insidemaavg*’ is measured as *Dinsidemaavg*, *Decileinsidemaavg*, *Qinsidemaavg* respectively in Column (1), Column (2), and Column (3). ‘*outsidemaavg*’ and ‘*intersidemaavg*’ are measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Model	(1)Dummy			(2)Decile			(3)Quintile		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	1.8671	24.67	<.0001	1.8163	23.36	<.0001	1.7882	22.68	<.0001
<i>insidemaavg</i>	0.0148	0.92	0.3576	-0.0095	-0.29	0.771	-0.0021	-0.07	0.9477
<i>outsidemaavg</i>	-0.0139	-0.87	0.3829	0.0123	0.37	0.7117	0.0399	1.22	0.2227
<i>intersidemaavg</i>	0.0619	3.97	<.0001	0.0131	4.22	<.0001	0.1012	3.30	0.001
<i>log(1+SEPRBLINT)</i>	0.3340	2.87	0.0042	0.3264	2.79	0.0052	0.3208	2.74	0.0061
<i>log(1+GDWLINT)</i>	0.1878	2.23	0.0255	0.1728	2.05	0.0406	0.1611	1.91	0.0565
<i>log(1+RDINT)</i>	0.3929	2.47	0.0134	0.2441	0.93	0.3516	0.2941	1.00	0.3168
<i>log(1+RDINT)× insidemaavg</i>	0.1077	0.71	0.4808	0.9754	3.25	0.0012	0.9531	3.08	0.0021
<i>log(1+RDINT)× outsidemaavg</i>	-0.6785	-5.09	<.0001	-1.9549	-6.04	<.0001	-1.9269	-5.90	<.0001
<i>log(1+RDINT)× intersidemaavg</i>	0.0072	0.05	0.9564	0.0629	1.91	0.0565	0.4817	1.52	0.1279
<i>log(MB)</i>	0.0664	6.70	<.0001	0.0649	6.54	<.0001	0.0648	6.53	<.0001
<i>log(MVE)</i>	-0.0975	-22.05	<.0001	-0.0969	-21.88	<.0001	-0.0966	-21.78	<.0001
<i>MKTSHARE</i>	-0.1154	-0.33	0.7379	-0.0571	-0.17	0.8686	-0.0733	-0.21	0.8319
<i>STDROA</i>	-0.2714	-1.20	0.23	-0.2361	-1.04	0.2972	-0.2494	-1.10	0.2713
<i>log(1+DIVERS)</i>	-0.4021	-6.25	<.0001	-0.3970	-6.16	<.0001	-0.3937	-6.11	<.0001
<i>log(1+HERF)</i>	0.4082	2.64	0.0082	0.4610	2.98	0.0029	0.4472	2.90	0.0038
<i>log(1+LEVERAGE)</i>	0.1767	4.32	<.0001	0.1775	4.34	<.0001	0.1825	4.46	<.0001
<i>REG</i>	0.1776	4.29	<.0001	0.1817	4.39	<.0001	0.1829	4.42	<.0001
<i>log(NIND)</i>	0.0472	5.01	<.0001	0.0498	5.27	<.0001	0.0503	5.32	<.0001

Number of Observations	130,768	130,768	130,768
Adjusted R-square	0.0211	0.0216	0.0214

**Table 6 Panel B The Effect of Inside Industry, Outside Industry, and Inter-Industry M&A Activities
on the Relation between R&D intensity and Earnings Non-Synchronicity**

Model 4: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 intersidemaavg_{j,t} + \beta_4 \log(1 + SEPRBLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} + \beta_6 \log(1 + GDWLINT)_{i,t} \times insidemaavg_{j,t} + \beta_7 \log(1 + GDWLINT)_{i,t} \times outsidemaavg_{j,t} + \beta_8 \log(1 + GDWLINT)_{i,t} \times intersidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} + \beta_{10} \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_{11} \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + \beta_{12} \log(1 + RDINT)_{i,t} \times intersidemaavg_{j,t} + Controls + \varepsilon_{it}$

This table presents results of testing the effect of inside, outside, and inter-industry M&A activities on the association between R&D intensity and earnings non-synchronicity after controlling for the impact of goodwill. ‘*insidemaavg*’ is measured as *Dinsidemaavg*, *Decileinsidemaavg*, *Qinsidemaavg* respectively in Column (1), Column (2), and Column (3). ‘*outsidemaavg*’ and ‘*intersidemaavg*’ are measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Model	(1)Dummy			(2)Decile			(3)Quintile		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	1.8541	24.21	<.0001	1.7968	22.68	<.0001	1.7596	21.84	<.0001
<i>insidemaavg</i>	0.0125	0.68	0.4968	-0.0369	-0.99	0.3207	-0.0227	-0.63	0.5308
<i>outsidemaavg</i>	-0.0068	-0.38	0.7038	0.0273	0.73	0.4663	0.0528	1.44	0.1492
<i>intersidemaavg</i>	0.0696	3.95	<.0001	0.0174	5.07	<.0001	0.1412	4.14	<.0001
$\log(1+SEPRBLINT)$	0.3299	2.83	0.0046	0.3189	2.73	0.0063	0.3133	2.68	0.0073
$\log(1+GDWLINT)$	0.3539	2.31	0.0208	0.4790	2.24	0.0252	0.6283	2.57	0.0101
$\log(1+GDWLINT) \times insidemaavg$	0.0161	0.11	0.9138	0.4198	1.44	0.1498	0.3020	1.05	0.2958
$\log(1+GDWLINT) \times outsidemaavg$	-0.1294	-0.84	0.3996	-0.1410	-0.44	0.6588	-0.1486	-0.48	0.6339
$\log(1+GDWLINT) \times intersidemaavg$	-0.1463	-1.01	0.3125	-0.0914	-2.98	0.0029	-0.8433	-2.79	0.0053
$\log(1+RDINT)$	0.3942	2.48	0.0131	0.2457	0.94	0.3483	0.2911	0.99	0.3216
$\log(1+RDINT) \times insidemaavg$	0.1174	0.76	0.446	1.0248	3.39	0.0007	0.9923	3.19	0.0014
$\log(1+RDINT) \times outsidemaavg$	-0.6882	-5.13	<.0001	-1.9959	-6.14	<.0001	-1.9574	-5.97	<.0001
$\log(1+RDINT) \times intersidemaavg$	-0.0026	-0.02	0.9847	0.0601	1.82	0.0688	0.4626	1.46	0.1443
$\log(MB)$	0.0659	6.64	<.0001	0.0646	6.49	<.0001	0.0643	6.47	<.0001
$\log(MVE)$	-0.0974	-22.00	<.0001	-0.0968	-21.84	<.0001	-0.0964	-21.74	<.0001
<i>MKTSHARE</i>	-0.1260	-0.37	0.7148	-0.0698	-0.20	0.8397	-0.0860	-0.25	0.803
<i>STDROA</i>	-0.2828	-1.25	0.2114	-0.2550	-1.12	0.2607	-0.2702	-1.19	0.2341
$\log(1+DIVERS)$	-0.4006	-6.23	<.0001	-0.3963	-6.15	<.0001	-0.3916	-6.07	<.0001
$\log(1+HERF)$	0.4061	2.63	0.0086	0.4576	2.96	0.0031	0.4436	2.87	0.0041
$\log(1+LEVERAGE)$	0.1764	4.32	<.0001	0.1776	4.35	<.0001	0.1828	4.47	<.0001
<i>REG</i>	0.1783	4.31	<.0001	0.1829	4.43	<.0001	0.1843	4.46	<.0001
$\log(NIND)$	0.0483	5.10	<.0001	0.0511	5.37	<.0001	0.0519	5.47	<.0001

Number of Observations	130,768	130,768	130,768
Adjusted R-square	0.0212	0.0219	0.0215

Table 7 Contemporaneous Effect of Inside and Outside Industry M&A on the Relation between R&D intensity and Earnings Non-synchronicity

Model 2: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} \times insidemaavg_{j,t} + \beta_6 \log(1 + GDWLINT)_{i,t} \times outsidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} + \beta_8 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + Controls + \varepsilon_{it}$

This table presents results of robustness tests of the contemporaneous effect of inside and outside industry M&A activities on the association between R&D intensity and earnings non-synchronicity. This additional test aims to address the alternative explanation of reverse causality. ‘*insidemaavg*’ is measured as *Dinsidemaavg*, *Decileinsidemaavg*, *Qinsidemaavg* respectively in Column (1), Column (2), and Column (3). ‘*outsidemaavg*’ is measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Model	(1)Dummy			(2)Decile			(3)Quintile		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	1.6756	22.68	<.0001	1.6489	21.53	<.0001	1.6375	21.10	<.0001
<i>insidemaavg</i>	0.0033	0.19	0.8505	-0.0233	-0.67	0.5044	-0.0112	-0.33	0.7425
<i>outsidemaavg</i>	0.0058	0.33	0.7393	0.0602	1.72	0.0848	0.0587	1.72	0.0861
$\log(1+SEPRBLINT)$	0.5315	4.62	<.0001	0.5306	4.61	<.0001	0.5281	4.58	<.0001
$\log(1+GDWLINT)$	0.4697	2.89	0.0039	0.5887	2.46	0.014	0.6664	2.52	0.0118
$\log(1+GDWLINT) \times insidemaavg$	-0.0557	-0.34	0.7322	-0.2060	-0.65	0.5159	-0.3279	-1.05	0.2915
$\log(1+GDWLINT) \times outsidemaavg$	-0.2940	-1.73	0.0831	-0.3730	-1.15	0.2504	-0.3398	-1.05	0.2922
$\log(1+RDINT)$	0.7052	4.40	<.0001	1.1661	4.41	<.0001	1.1281	3.92	<.0001
$\log(1+RDINT) \times insidemaavg$	-0.0587	-0.36	0.7219	-0.1482	-0.49	0.6273	-0.3009	-0.97	0.3320
$\log(1+RDINT) \times outsidemaavg$	-0.6532	-4.68	<.0001	-1.2745	-3.89	<.0001	-0.9271	-2.83	0.0047
$\log(MB)$	0.0303	2.98	0.0028	0.0304	2.99	0.0028	0.0301	2.97	0.0030
$\log(MVE)$	-0.0951	-21.24	<.0001	-0.0946	-21.07	<.0001	-0.0943	-20.98	<.0001
<i>MKTSHARE</i>	-0.1631	-0.49	0.6250	-0.1462	-0.44	0.6616	-0.1437	-0.43	0.6670
<i>STDROA</i>	0.4826	2.09	0.037	0.4634	2.00	0.0455	0.4523	1.95	0.051
$\log(1+DIVERS)$	-0.3258	-5.22	<.0001	-0.3125	-5.00	<.0001	-0.3094	-4.95	<.0001
$\log(1+HERF)$	0.2891	1.99	0.0463	0.2585	1.77	0.0762	0.2621	1.80	0.0719
$\log(1+LEVERAGE)$	0.2811	6.74	<.0001	0.2839	6.80	<.0001	0.2863	6.86	<.0001
<i>REG</i>	0.0874	2.10	0.0356	0.0921	2.22	0.0267	0.0941	2.26	0.0235
$\log(NIND)$	0.0653	6.95	<.0001	0.0657	6.97	<.0001	0.0656	6.96	<.0001

Number of Observations	125,917	125,917	125,917
Adjusted R-square	0.0210	0.0208	0.0207

Table 8 Robustness Checks

Model 1: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + RDINT)_{i,t} + \beta_6 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + Controls + \varepsilon_{it}$

Model 2: $NONCOMMON_{it} = \beta_0 + \beta_1 insidemaavg_{j,t} + \beta_2 outsidemaavg_{j,t} + \beta_3 \log(1 + SEPRBLINT)_{i,t} + \beta_4 \log(1 + GDWLINT)_{i,t} + \beta_5 \log(1 + GDWLINT)_{i,t} \times insidemaavg_{j,t} + \beta_6 \log(1 + GDWLINT)_{i,t} \times outsidemaavg_{j,t} + \beta_7 \log(1 + RDINT)_{i,t} + \beta_8 \log(1 + RDINT)_{i,t} \times insidemaavg_{j,t} + \beta_9 \log(1 + RDINT)_{i,t} \times outsidemaavg_{j,t} + Controls + \varepsilon_{it}$

Panel A presents results of robustness tests of the effect of inside and outside industry M&A activities on the association between R&D intensity and earnings non-synchronicity. The additional tests are conducted by employing alternative measures of earnings non-synchronicity. ‘*insidemaavg*’ is measured as *Decileinsidemaavg*, ‘*outsidemaavg*’ is measured in the same manner. The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Panel B presents results of robustness tests of the effect of inside and outside industry M&A activities on the association between R&D intensity and earnings non-synchronicity. The additional test is conducted by using alternative classification schemes for M&A activities. ‘*insidemaavg*’ is measured as *Decileinsidemaavg*, The list of variables definitions is provided in Appendix A. Standard errors are clustered by firm.

Panel A: Alternative Measures of Earnings Non-Synchronicity: Industry-Specific v.s. Market-Wide Earnings Non-Synchronicity

Dependent variable:	Industry-specific (<i>noncommonind</i>)			Market-wide (<i>noncommonmkt</i>)		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	3.2802	26.90	<.0001	3.4428	32.23	<.0001
<i>insidemaavg</i>	0.0288	0.52	0.6010	0.1391	2.91	0.0036
<i>outsidemaavg</i>	0.2278	4.18	<.0001	-0.0977	-1.93	0.0531
<i>log</i> (1+ <i>SEPRBLINT</i>)	0.7092	4.11	<.0001	-0.1724	-1.05	0.2949
<i>log</i> (1+ <i>GDWLINT</i>)	0.8481	2.54	0.0112	-0.5716	-1.84	0.0661
<i>log</i> (1+ <i>GDWLINT</i>)× <i>insidemaavg</i>	0.2418	0.56	0.5748	0.4783	1.11	0.2674
<i>log</i> (1+ <i>GDWLINT</i>)× <i>outsidemaavg</i>	-0.8978	-2.04	0.0412	0.1523	0.35	0.7264
<i>log</i> (1+ <i>RDINT</i>)	0.5646	1.49	0.1369	0.3272	0.86	0.3913
<i>log</i> (1+ <i>RDINT</i>)× <i>insidemaavg</i>	2.1688	4.88	<.0001	0.5946	1.38	0.1669
<i>log</i> (1+ <i>RDINT</i>)× <i>outsidemaavg</i>	-3.5587	-7.58	<.0001	-1.9364	-4.13	<.0001
Control	Yes			Yes		
Number of Observations	130,768			130,768		
Adjusted R-square	0.0197			0.0065		
Panel B: Alternative Classification Scheme for Inside Industry and Outside Industry M&A Activities						
Model	(1)			(2)		
	Coeff	t-stat	p-value	Coeff	t-stat	p-value
Intercept	1.8741	25.11	<.0001	1.8569	24.65	<.0001
<i>insidemaavg</i>	-0.0117	-0.81	0.417	-0.0037	-0.22	0.823
<i>outsidemaavg</i>	0.0162	1.13	0.2603	0.0223	1.36	0.1737

<i>log(1+SEPRBLINT)</i>	0.3686	3.17	0.0015	0.3634	3.13	0.0018
<i>log(1+GDWLINT)</i>	0.2098	2.51	0.0121	0.3873	2.79	0.0053
<i>log(1+GDWLINT)× insidemaavg</i>				-0.1664	-1.21	0.2263
<i>log(1+GDWLINT)× outsidemaavg</i>				-0.1298	-0.94	0.3487
<i>log(1+RDINT)</i>	0.5563	3.33	0.0009	0.5533	3.31	0.0009
<i>log(1+RDINT)× insidemaavg</i>	0.3225	1.99	0.0464	0.3170	1.95	0.0512
<i>log(1+RDINT)× outsidemaavg</i>	-0.9824	-7.28	<.0001	-0.9869	-7.27	<.0001
Control	Yes			Yes		
Number of Observations	130,768			130,768		
Adjusted R-square	0.0210			0.0210		