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Institutional Investors and the Information Production Theory of Stock Splits

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Abstract

We make use of a large sample of transaction-level institutional trading data to test an extended version of Brennan and Hughes' (1991) information production theory of stock splits. We compare brokerage commissions paid by institutional investors before and after a split, assess the private information held by them, and relate the informativeness of their trading to brokerage commissions paid. We show that institutions make abnormal profits net of brokerage commissions by trading in splitting stocks. We also show that the information asymmetry faced by firms goes down after stock splits. Overall, our empirical results support the information production theory.

I. Introduction

The objective of this paper is to study the role of institutional investors in inducing information production about firms undergoing stock splits. A related objective is to study the relationship between the magnitude of the brokerage commissions paid by institutions and the profitability of their trading, as well as the relationship between these brokerage commissions and the information asymmetry facing the firm in the equity market. Stock splits provide a particularly appropriate context to study the above issues, because they provide a unique setting in which

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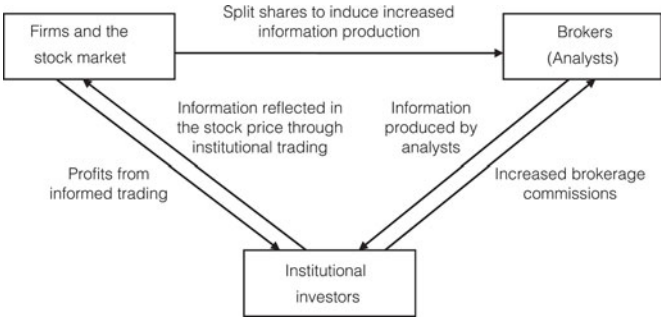
the brokerage commissions paid by institutions increase dramatically over a short period of time (as we document later); this contrasts with other economic settings where the brokerage commissions paid by institutions change gradually over a longer period of time, during which there may be significant changes in various firm characteristics as well as other aspects of the economic environment. This paper develops the first empirical analysis in the literature of the above issues and of institutional trading around stock splits in general.

The foundation of our analysis rests on the information production theory of stock splits first put forth by Brennan and Hughes (1991). Their theoretical model argues that the dependence of the brokerage commission rate on share price increases the incentive of brokerage firms to produce information about firms undergoing stock splits and, thereby, leads to an increase in the commissions paid to the brokerage firm (thus ensuring that the splitting firm's stock is priced closer to intrinsic value). We make use of an extended version of the above model of stock splits to provide a theoretical framework for developing hypotheses for our empirical tests. In particular, we explicitly introduce institutional investors into the Brennan and Hughes framework (see Figure 1, and the detailed discussion in Section III). Given that institutional investors have a long-term relationship with brokerage firms, they are likely to have significantly better access to the information produced by brokerage firms compared to retail investors. Further, given that they possess economies of scale in the analysis and use of this information, institutional investors are likely to have better incentives and ability to process the above information appropriately compared to retail investors. Thus, an important prediction of the information production theory is that institutional investors will possess superior information compared to retail investors after a stock split. Our paper, therefore, can be viewed as conducting a direct test of the information production theory of stock splits.

FIGURE 1

An Extension of Brennan and Hughes

Figure 1 graphically illustrates an extended version of Brennan and Hughes' (1991) information production theory.



There are four sets of interesting empirical research questions regarding the role of institutional investors in stock splits arising from the information production theory. The first set of research questions pertains to whether institutional investors indeed pay higher brokerage commissions (commissions paid per dollar of trading as well as total commissions paid per period) after a stock split.

A related question is whether the volume of trading by institutional investors increases or decreases after a stock split; this is an empirical question, since, given that the brokerage commissions paid by them on a stock may increase after a split, the trading volume in the stock by institutions may, in fact, decrease after a split. The second set of research questions relates to whether institutions possess an informational advantage relative to retail investors after a split. If they indeed possess such an advantage, is this informational advantage greater in stocks that generate higher brokerage commissions, as implied by the information production theory of Brennan and Hughes (1991)? A related question is whether institutions that pay higher brokerage commissions have a greater informational advantage (since they may obtain better access to the information produced by the brokerage firm and its analysts). The third set of research questions relates to the profitability of institutional trading after a split. In particular, are institutions able to realize superior profits net of brokerage commissions from trading in a stock postsplit making use of their informational advantage? This is an empirical question, given that the informational advantage (if any) possessed by institutional investors postsplit may potentially be dominated by any increase in the brokerage commissions and other trading costs paid by them. Further, do institutions paying higher brokerage commissions outperform or underperform those paying lower commissions? The fourth set of research questions relates to the impact of the information possessed by institutional investors (if any) and their trading in the firm's equity on the information asymmetry faced by the firm in the equity market. In particular, is this information asymmetry lower after a stock split? If so, is the reduction in information asymmetry after a split greater for the equity of firms for which institutions pay higher brokerage commissions after the split, as implied by the information production theory?

An alternative theory of stock splits that has been studied in the existing empirical literature is the "optimal trading range" theory, which suggests that stock splits bring the splitting firm's share price to a preferred price range, thereby improving the liquidity and marketability of the stock. We choose to focus on the information production theory rather than on the optimal trading range theory, since the latter applies primarily to retail rather than institutional investors. Note that, unlike retail investors, institutional investors do not face significant wealth constraints. Further, institutions face trading costs that are different from those of retail investors to the extent that they typically trade much larger positions, so that a lower stock price may cost institutions more in terms of brokerage commissions and other trading costs. In other words, this transactions cost aspect of splits will, if anything, make trading in splitting stocks less desirable for institutional investors postsplit. In contrast, the information production hypothesis applies primarily to institutional rather than retail investors, given institutions' better access to the information produced by the sell-side analysts employed by brokerage firms.

We make use of a detailed transaction-level institutional trading database provided by Abel Noser Solutions (New York, NY) to address the above research questions. Our data include transactions over an 11-year period from Jan. 1999 to Dec. 2009. There are 1,033 institutions in our sample. For the average split, our sample institutions collectively account for 14.6% of total trading

volume reported by the Center for Research in Security Prices (CRSP) within the first 6 months postsplit. Notably, brokerage commissions for each transaction are recorded in this data set. This enables us to directly study, for the first time in the literature, the role of institutional investors in inducing the extent of information production about firms after a stock split. We are able to compare brokerage commissions paid by institutional investors before and after a split and relate the informativeness of institutional trading to brokerage commissions paid. We are also able to compute realized institutional trading profitability net of brokerage commissions.[1]

Our paper provides a number of new results on the role of institutional investors in stock splits. We organize our empirical tests and results into four parts, corresponding to the four sets of research questions outlined above. First, we document, for the first time in the literature, that the commissions paid by institutional investors increase after a stock split. This is true regardless of whether the commissions are measured on a per-dollar traded basis or in terms of total amount of commissions paid. Further, the volume of trading by institutional investors (both the number of trades and dollar volume) increases after a stock split, despite the above increase in brokerage commissions.

Second, we study, for the first time in the literature, the informativeness of institutional trading immediately (1 month) after the split about the firm's subsequent long-term (6 months and 1 year) abnormal stock return performance. We find that institutional trading immediately after a split indeed has considerable predictive power for the firm's subsequent long-term stock return performance; however, institutional trading in a propensity-score-matched sample of nonsplitting firms over the same period does not have any such predictive power. Further, consistent with the information production theory, this predictive power of institutional trading is concentrated in stocks with higher split factors and in institutions that pay higher brokerage commissions. These results are robust to controlling for various variables capturing publicly available information. We also show that there is no such predictive power for institutional trading in splitting stocks prior to a split. The above results indicate that, by paying higher brokerage commissions in splitting stocks, institutions induce brokerage firms (and their affiliated analysts) to produce more information about these stocks and that this information is passed on to institutional investors (especially to those paying higher brokerage commissions).

Third, we study the realized profitability of institutional trading after a split, using actual transaction prices and net of brokerage commissions. We find that institutions make positive abnormal profits during the postsplit period even after taking brokerage commissions and other trading costs into account. This indicates that the informational advantage possessed by institutional investors after a split dominates the increase in brokerage commissions paid by them. Further, institutions paying higher commissions significantly outperform those paying

[1]In addition to brokerage commissions (which explicitly reduce realized profits), implicit trading costs such as implementation shortfall (Perold (1988)) could further reduce investors' realized profits. Our results account for both explicit and implicit trading costs, since we use actual transaction prices to calculate institutional investors' realized profits.

lower commissions. Thus, institutions paying higher commissions seem to be able to obtain better access to the information produced by analysts at brokerage firms, resulting in higher profitability even after accounting for the higher commissions paid by them.

Fourth, we study how trading by institutional investors in the firm's equity postsplit affects the information asymmetry faced by the firm in the equity market and how any changes in information asymmetry are linked to the brokerage commissions paid by institutions when trading in a firm's equity. We find that the information asymmetry faced by the firm decreases significantly after a split. Our results indicate that the greater the increase in brokerage commissions after a split, the greater the reduction in the information asymmetry faced by the firm. These results also support the predictions of the information production theory.

Some may argue that an alternative explanation for our results is that, rather than making use of superior information provided to them by analysts, institutions are merely mechanically buying the shares of all splitting stocks, anticipating that such stocks will experience positive abnormal returns in the year following the stock split, generating a spurious correlation between institutional net buying and subsequent stock returns.[2] In order to rule out such alternative explanations and to clearly identify the channel from higher commissions paid by institutions to brokerage analysts and from brokerage analysts to institutional trading, we perform three further tests. First, we examine whether the trading of splitting stocks by institutions that are important clients of brokers covering the stocks are particularly informative postsplit. We match the brokers in the Abel Noser Solutions institutional trading database to the brokers in the Institutional Brokers' Estimate System (IBES) and classify our institutions into connected and nonconnected institutions based on the brokerage commissions they pay to a broker that covers the splitting stock. We find that the positive relation between institutional net buying and the subsequent abnormal return postsplit is driven almost entirely by connected institutions. Second, we find that the trading of splitting stocks by connected institutions postsplit immediately before the release of analysts' initial buy and strong buy recommendations is significantly more profitable than the trading of splitting stocks by nonconnected institutions. These results provide direct evidence that brokerage houses pass on information they produce about splitting stocks to their favored institutional clients. Third, we examine improvements in the accuracy of forecasts by the same analysts covering both splitting and nonsplitting stocks. We find that analyst forecast errors decrease significantly for splitting stocks but not for nonsplitting stocks covered by the same set of analysts. We further show that improvements in forecast accuracy are greater for splits with a higher commission rate. Overall, the results from the above tests indicate that brokerage analysts produce more information about splitting stocks and give privileged access to this information

[2]This alternative explanation cannot, however, fully explain our finding that, within the sample of splitting stocks, those more heavily bought by institutions have better long-run postsplit stock return performance. Clearly, such a finding would not be generated if institutions were merely buying shares in splitting stocks across-the-board.

to institutions paying them higher brokerage commissions. These institutions, in turn, make use of this informational advantage to trade profitably in splitting stocks.

What do we learn from the above empirical results about the role of institutional investors in inducing information production about firms undergoing stock splits? Our results indicate that the incentives of outsiders to produce information about a firm are directly related to the compensation they receive from institutions for undertaking this information production. The fact that the predictive power of institutional trading is concentrated in stocks that generate higher commission revenues and in institutions that pay higher brokerage commissions after a split and the absence of such predictive power for institutional trading prior to the split lend strong support to the above conclusion, since our results show that analysts increase the extent of information production about the firm after a stock split. Further, the fact that institutional investors are able to generate positive abnormal profits after a split, even after accounting for the higher brokerage commissions that they pay postsplit, indicates that they are also made better off due to the above increase in information production.

Our paper also sheds new light on firms' motivation for splitting their stocks. The results of our empirical tests provide significant support for the information production motivation for stock splits. In particular, the decrease in information asymmetry facing splitting firms in the equity market that we document suggests that the increase in information production induced by institutional investors about firms undertaking stock splits benefits such firms as well, since this will raise their share prices and reduce their costs of external financing in the future.

The remainder of this paper is organized as follows: Section II relates the paper to the existing literature. Section III discusses related theories and develops testable hypotheses. Section IV describes the data and sample selection procedures. Section V presents our empirical tests and results. Section VI concludes with a discussion of our results.

II. Relation to the Existing Literature

Our paper lies at the intersection of two literatures. The first is the extensive literature on the role of institutional investors around various corporate events (see, e.g., Gibson, Safieddine, and Sonti (2004), who study the role of institutional investors around seasoned equity offerings, and Parrino, Sias, and Starks (2003), who study institutional trading around forced chief executive officer turnovers). The second literature our paper is connected to is the literature on stock splits. While it is well known that stock splits do not, by themselves, affect a firm's operating cash flow, several interesting effects have been documented in the financial markets around stock splits: two of these are positive abnormal announcement effects (see, e.g., Grinblatt, Masulis, and Titman (1984), Lamoureux and Poon (1987), or Brennan and Copeland (1988)) and positive abnormal long-term stock returns (see, e.g., Desai and Jain (1997) or Ikenberry and Ramnath (2002)). Our analysis showing that splitting stocks that are heavily bought by institutions earn positive long-run abnormal returns for these institutions is consistent with the above literature. There is also a literature starting with Ohlson and

Penman (1985) documenting an increase in stock return volatility around a split. Our results showing increased information production around a split may partially explain the increase in volatility documented by this literature.

The information production theory of Brennan and Hughes (1991) is one of the leading explanations that have been proposed for the economic effects of stock splits. The optimal trading range hypothesis is another leading explanation, which suggests that stock splits bring the splitting firm's share price to a preferred price range (see, e.g., Copeland (1979) or McNichols and Dravid (1990)), thereby improving the liquidity and marketability of the stock. The empirical literature so far has predominantly focused on the optimal trading range hypothesis (see, e.g., Dyl and Elliott (2006), Fernando, Krishnamurthy, and Spindt (2004), Angel (1997), and Schultz (2000)). Two other explanations that have been proposed for stocks splits are the "improved liquidity" hypothesis, which suggests that stock splits are aimed at attracting more investors to the stock and, thus, improving liquidity (see, Lin, Singh, and Yu (2009) for a recent empirical analysis), and the "catering through nominal share prices" hypothesis of Baker, Greenwood, and Wurgler (2009). In contrast to the above papers, our paper tests the information production theory of stock splits for the first time in the literature.[3]

While this is not the primary focus, our paper also contributes to the broader literature on the determinants of the extent of information production by outsiders about a firm. A number of authors have developed theoretical analyses about the incentives of outsiders to acquire information about a firm (see, e.g., Grossman (1976), Grossman and Stiglitz (1980), Diamond and Verrecchia (1981), Verrecchia (1982), Admati and Pfleiderer (1986), and Bhushan (1989a)). There have also been a number of empirical analyses regarding the extent of information production by analysts about a firm (see, e.g., Bhushan (1989b), O'Brien and Bhushan (1990), and Lang and Lundholm (1996)) and the informativeness or accuracy of the information produced (see, e.g., Frankel, Kothari, and Weber (2006)). Much of the above empirical literature has focused on the cross-sectional variation in firm characteristics that leads to differences in information production by analysts and others across these firms. In contrast to the above information production literature, our paper focuses on how a specific corporate event such as a stock split can lead to enhanced information production about a firm.

III. Theory and Hypotheses

In this section, we first briefly discuss the information production hypothesis initially put forward by Brennan and Hughes (1991) and extend it to incorporate the role of institutional investors in stock splits. We base many of our testable hypotheses on the implications of the above theory. Brennan and Hughes develop a model in which the dependence of the brokerage commission rate on firms' share prices increases the incentive of brokerage firms (and affiliated

[3]It is not our view that the information production theory is the only motivation for firms to split their stocks. Rather, we believe that the information production theory and the other theories we discuss here are complementary and not mutually exclusive explanations for stock splits.

analysts) to produce information about them after a split. The split increases the commissions paid to brokerage firms by investors, and these commissions serve to compensate brokerage firms for their cost of information production. In this context, managers of higher intrinsic value firms facing information asymmetry in the equity market have an incentive to split their firm's shares in order to induce a greater amount of information production by brokerage firms about their firm, thus ensuring that their firm's equity is priced closer to its intrinsic value.

Even though Brennan and Hughes (1991) do not make such a distinction, we extend their theoretical argument by distinguishing between institutional and retail investors in the above setting. Given that institutional investors have a long-term relationship with brokerage firms, institutional investors are likely to have significantly better access to the information produced by brokerage firms compared to retail investors. Further, given that they possess economies of scale in the analysis and use of this information, institutional investors are likely to have better incentives and ability to process the above information appropriately compared to retail investors. Thus, an important prediction of this extended version of the information production theory is that institutional investors will possess superior information compared to retail investors after a stock split. Figure 1 graphically illustrates this extended version of the information production theory.

Our first set of hypotheses deals with the brokerage commissions paid and trading volume by institutional investors around a split. In particular, does the commission rate (commissions per dollar traded) paid by institutional investors indeed increase after a split, as assumed by the information production theory of Brennan and Hughes (1991) (Hypothesis 1)? As for trading volume, on the one hand, an increase in the commission rate and other trading costs may decrease the dollar trading volume by institutional investors after the split, absent other considerations (Hypothesis 2A). On the other hand, the increase in the informational advantage possessed by institutional investors after a split may dominate the effect of a higher commission rate and other trading costs, resulting in an increase in the dollar trading volume by institutional investors after the split (Hypothesis 2B). Finally, the combined effect of the commission rate and trading volume may result in either an increase (Hypothesis 3A) or a decrease (Hypothesis 3B) in the total dollar amount of commissions paid by institutional investors after a split.[4]

Our second set of hypotheses deals with the informational advantage (if any) possessed by institutional investors after a split. The information production theory predicts that brokerage firm analysts will produce more information about the firm after a stock split becomes effective (since the commission rate increases on this day). This, in turn, implies that institutional investors will possess an

[4]It should be noted that Hypotheses 1–3 are not predictions of the model but empirical facts that need to be validated. The model does not provide us with significant guidance regarding the expected direction of results, as we also point out in the main text (in fact, Hypothesis 1 is an assumption of the model, as we note). These are, however, hypotheses that we test here and we state these as such. Establishing these empirical facts is clearly important for our tests of the predictions of the information production theory, which are emphasized in our later hypotheses.

informational advantage about the splitting stock, so that institutional trading after the split ex-date will have predictive power for the long-term returns of the stock (Hypothesis 4). Further, since the increase in the commissions generated by the trading in a splitting stock will increase with the split factor, the information production theory implies that the informational advantage of institutional investors will be greater for splitting stocks with a higher split factor, because the incentives of brokerage firms to produce information about such stocks are greater (Hypothesis 5). Finally, one would expect brokerage firms to grant institutions paying higher commissions better access to the information produced by their analysts, so that the informational advantage of these institutions after a split will be greater (Hypothesis 6).

Our third set of hypotheses deals with the realized profitability of institutional trading after a split. We would expect institutional investors to realize abnormal profits if the informational advantage they possess dominates any increase in the brokerage commissions and other trading costs paid by them after a split (Hypothesis 7). Further, if the greater informational advantage of institutions paying higher commissions (arising from brokerage firms granting these institutions better access to the information produced by them) dominates the effect of higher commission costs, we would expect them to outperform institutions paying lower commissions (Hypothesis 8).

Our fourth and final set of hypotheses deals with the information asymmetry faced by a firm in the equity market after a split. Given the increase in information production about a splitting firm and trading by institutional investors in the equity market using this information, the information production theory implies that the extent of information asymmetry faced by the firm will be lower after a split (Hypothesis 9). Further, since brokerage firms have greater incentives to produce information about stocks generating higher commissions, we would expect the above reduction in information asymmetry to be greater for the equity of firms generating a greater increase in brokerage commissions (Hypothesis 10).

IV. Data and Summary Statistics

A. Stock Split Sample

We retrieve NYSE/AMEX/NASDAQ stock splits announced during the period from Jan. 1999 to Dec. 2009 from CRSP daily files. We require the split event to have a distribution code of 5523 and the splitting shares to be ordinary common shares (share code equals 10 or 11). We are able to retrieve 2,557 splits from CRSP files, of which 139 have missing announcement dates. We manually collect these announcement dates by searching the Factiva news database. The sample with announcement dates available has 2,547 splits. After merging with Compustat, we have 2,328 splits for which accounting information is available and that have positive book equity in the fiscal year before the split announcement.

Our final sample includes 2,017 splits for which the stock is traded by our sample institutions during the 3-month period before the split announcement date.

Table 1 presents summary statistics for the sample of 2,017 stock splits. Two-for-one splits are the most common, representing 53% of the sample. About 61% of the splits are conducted by NASDAQ firms.

TABLE 1

Stock Splits by Year, Split Factor, and Stock Exchange

Table 1 reports the number of stocks in the sample, by year and split factor (Panel A) and by year and stock exchange (Panel B) that announce a stock split from 1999 to 2009. We require that the splitting firm have common stocks traded on the NYSE/AMEX/NASDAQ and that the stock be traded by our sample institutions during the 3-month period before the split announcement.

Panel A. By Year and Split Factor

Year	<2-for-1	2-for-1	>2-for-1	Total
1999	114	205	12	331
2000	76	197	21	294
2001	92	56	1	149
2002	90	73	4	167
2003	110	78	7	195
2004	118	126	8	252
2005	110	137	3	250
2006	96	99	12	207
2007	46	76	4	126
2008	10	22	3	35
2009	5	6	0	11
Total	867	1,075	75	2,017

Panel B. By Year and Stock Exchange

Year	NYSE	AMEX	NASDAQ	Total
1999	101	10	220	331
2000	86	4	204	294
2001	55	2	92	149
2002	64	8	95	167
2003	61	10	124	195
2004	100	11	141	252
2005	103	10	137	250
2006	78	8	121	207
2007	58	7	61	126
2008	14	3	18	35
2009	3	0	8	11
Total	723	73	1,221	2,017

B. Institutional Trading Data

We obtain transaction-level institutional trading data from Abel Noser Solutions, a leading execution quality measurement service provider for institutional investors. The data are similar to those used by several microstructure studies on institutional trading costs (e.g., Keim and Madhavan (1995), Conrad, Johnson, and Wahal (2001), and Jones and Lipson (2001)). This is the first paper to use institutional trading data to study institutional investors' trading behavior in stock splits.

The data cover equity trading transactions by a large sample of institutions from Jan. 1999 to Dec. 2009. For each transaction, the data include the date of the transaction, the stock traded (identified by both symbols and Committee on Uniform Security Identification Procedures), the number of shares traded, the dollar principal traded, commissions paid by the institution, and whether it is a buy or sell by the institution. The data are provided to us under the condition that the names of all institutions are removed from the data. However, identification codes are provided enabling us to separately identify all institutions. Sample institutions are either investment managers or plan sponsors. Investment managers are mutual fund families such as Fidelity Investments, Putnam Investments, and Lazard Asset Management. Examples of pension plan sponsors include the California Public Employees' Retirement System (CalPERS), the Commonwealth of Virginia, and United Airlines.

Summary statistics of the institutional trading sample are presented in Table 2. There are 1,033 institutions in our sample. The average *Total Principal Traded* is $36.27 billion, the average *Total Shares Traded* is 1.21 billion, and the average *Total Commissions Paid* is $35.49 million. For an average split, our sample

TABLE 2

Summary Statistics of the Institutional Trading Sample

Table 2 presents summary statistics of the institutional trading sample. We obtain institutional trading data from the Abel Noser Solutions for the period of Jan. 1999 to Dec. 2009. There are 1,033 institutions in our sample. Sample mean, standard deviation, 25th percentile, median, and 75th percentile are presented. *Total Principal Traded*, *Total Shares Traded*, and *Total Commissions Paid* are computed based on all U.S. domestic equity traded by institutions from Jan. 1999 through Dec. 2009. For these three variables, sample statistics are based on the cross section of sample institutions. For a given split, we compute the *Fraction of Total Postsplit Trading* as the aggregate shares traded by sample institutions divided by the aggregate CRSP volume (NASDAQ volumes are adjusted for double counting by dividing CRSP reported volumes 2) within the first 6 months postsplit. The sample statistics for *Fraction of Total Postsplit Trading* are based on the cross section of sample splits.

				Percentiles	
Variables	Mean	Median	Std. Dev.	25th	75th
Total Principal Traded ($millions)	36,274.21	1,577.44	330,512.09	347.22	7,200.58
Total Shares Traded (millions)	1,211.13	50.69	10,672.60	12.02	256.00
Total Commissions Paid ($millions)	35.49	1.55	299.45	0.32	7.51
Fraction of Total Postsplit Trading (%)	14.61	13.38	12.81	7.32	19.64

institutions collectively account for 14.61% of total trading volume reported in CRSP within the first 6 months postsplit.

V. Empirical Tests and Results

A. Pattern of Institutional Trading and Brokerage Commissions Pre- and Postsplit

The information production model of Brennan and Hughes (1991) assumes that the aggregate brokerage commission increases after splits, which incentivizes firms with favorable private information to split their shares to induce information production. As the first step of our empirical analyses, we examine the pattern of institutional trading and brokerage commissions before and after the split.

We use the 3-month period before the split announcement date as a benchmark and compare institutional trading and brokerage commissions in the 3-month period after the split ex-date with those in the presplit period. Table 3 reports the summary statistics of total commissions, as well as other commission and trading measures. Consistent with Hypothesis 1, we find that the average commission rate (commissions per dollar traded) paid by institutions increases significantly from 6.56 basis points (bps) in the presplit period to 9.59 bps in the postsplit period. Interestingly, the per-share commission stays almost the same after the split (2.47¢ per share presplit versus 2.50¢ per share postsplit). This pattern is also illustrated in Figure 2, which shows that the frequency distributions of per-share commissions paid by institutions before and after splits are very similar.[5]

[5]One question that may arise here is why brokerage firms charge institutions a per-share commission fee structure (instead of the flat fee structure that they usually charge retail investors). One possibility is that this is a convenient way for brokerage firms to charge institutions for premium services such as better trading execution (lower implicit trading costs) and better access to the information produced by brokerage firms. The cheaper flat fees they charge retail investors may not include access to these premium services. For theoretical analyses of the optimal fee structure charged by intermediaries when selling information, see, for example, Admati and Pfleiderer (1990), Allen (1990), and Brennan and Chordia (1993).

TABLE 3

Summary Statistics of Institutional Trading and Brokerage Commissions Before and After Splits

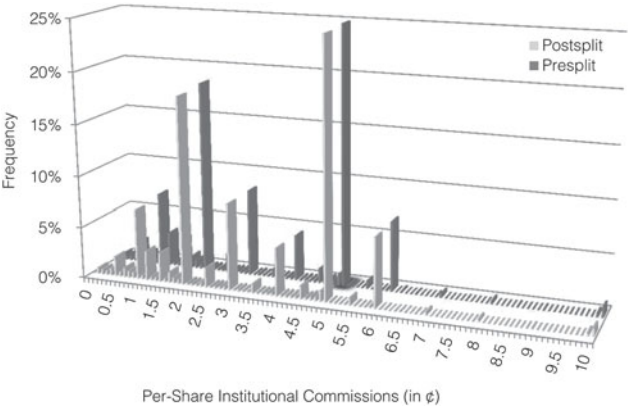
Table 3 presents mean statistics for the trading activities of 1,033 institutional investors around splits. The presplit period is the 3-month period immediately before the split announcement, and the postsplit period is the 3-month period immediately after the split ex-date. We first compute the mean statistics for each split. This table reports the average *Number of Trades*, *Turnover* (shares traded divided by CRSP reported shares outstanding), *Share Volume* (shares traded), *Dollar Volume* (shares traded multiplied by closing price), *Per-Dollar Commission* (dollar commission divided by dollar volume), *Total Dollar Commission*, and *Per-Share Commission* (dollar commission divided by number of shares traded) during the pre- and postsplit periods. We adjust presplit *Share Volume* by the split factor so that it is comparable to that in the postsplit period. The last two columns report the differences and the *t*-statistics of the null that there is no difference between the pre- and postsplit periods. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	Presplit	Postsplit	Difference	*t*-Statistics
Number of Observations	2,017	2,017		
Number of Trades	1,217.91	1,603.05	385.14	4.85***
Share Volume (1,000s)	8,565.47	8,963.21	397.74	1.95*
Dollar Volume ($millions)	327.93	389.00	61.07	5.51***
Turnover (%)	6.63	7.11	0.48	3.22***
Per-Dollar Commission (0.01%)	6.56	9.59	3.03	21.85***
Total Commission ($thousands)	137.73	251.86	114.13	13.33***
Per-Share Commission (¢)	2.47	2.50	0.03	0.86

FIGURE 2

Per-Share Institutional Commissions Before and After Stock Splits

Figure 2 presents the frequency distribution of per-share institutional commissions (in cents) in the 3-month period before split announcements (dark bars) versus that during the 3-month period after split ex-dates (gray bars). All commissions per share are rounded to the nearest 1/10th of 1¢. The distribution is truncated at 0¢ and 10¢.



These findings complement those in Schultz (2000), who presents evidence that trading costs, in the form of effective spreads, increase significantly after a stock split.

Further, the number of trades and the dollar trading volume by institutional investors also increase significantly after the split. The average dollar trading volume increases from $327.93 million in the presplit period to $389.00 million in the postsplit period. After adjusting the presplit share volume by the split factor, we show that the average share volume by institutions does not change significantly postsplit. To control for time trends in trading volume and brokerage commissions, we construct a matched sample of nonsplitting firms using a propensity-score-matching approach. Specifically, for each splitting firm, we

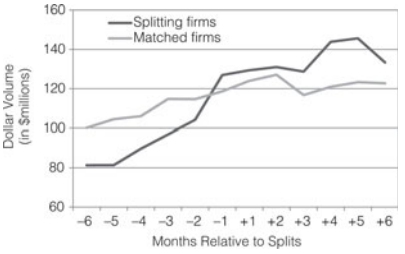
identify a matched nonsplitting firm in the same year with statistically the same size, market-to-book ratio, stock price, stock return momentum, sales growth, and industry membership. To the extent that stock return momentum and sales growth capture the growth prospects of the firm, our matching approach mitigates the concern that the change in analyst coverage and information production after splits is driven by analysts being more willing to cover successful firms. Graph A of Figure 3 shows the pattern of institutional trading in the 12-month period around splits. In the 6 months after the split is completed, institutions collectively continue to trade large dollar volumes in splitting stocks. In contrast, institutional trading in matched nonsplitting stocks does not vary as much during the same period. This evidence is inconsistent with Hypothesis 2A, but consistent with Hypothesis 2B, which suggests that informational effects dominate transaction cost considerations for institutional trading in splitting stocks postsplit.

FIGURE 3

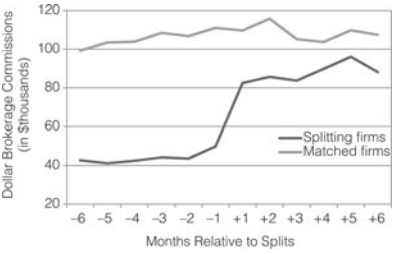
Patterns of Institutional Trading and Brokerage Commissions around Splits

Figure 3 presents the pattern of institutional trading and brokerage commissions around stock splits, including 6 months before the split announcement and 6 months after the split ex-date. We use a propensity-score-matching approach to match each splitting stock with a nonsplitting stock in the same year with the same market cap, book-to-market ratio, stock price, stock return momentum, sales growth, and industry membership. Graph A plots the dollar trading volume (in $millions) by sample institutions in splitting firms (the dark line) and in matched firms (the gray line). Graph B plots the brokerage commissions (in $thousands) paid by sample institutions in splitting firms (the dark line) and in matched firms (the gray line).

Graph A. Dollar Volume Traded by Institutions



Graph B. Brokerage Commissions Paid by Institutions



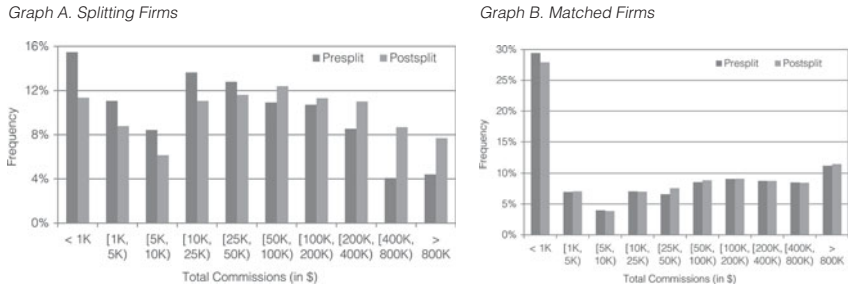
The total dollar amount of commissions paid by institutional investors also increases dramatically after the split. The average total dollar amount of commissions in the postsplit period is $251.86 thousand versus $137.73 thousand in the presplit period. Given that there are 2,017 splits in our sample, this means that sample brokerage firms receive $230 million additional commission revenues from sample institutions during the first 3 months postsplit. Graph B of Figure 3 shows the pattern of brokerage commissions in the 12-month period around splits. Not surprisingly, the commissions paid by institutions in trading matched nonsplitting stocks do not change much, whereas the commissions in trading splitting stocks increase significantly after a stock split. Our evidence lends support to Hypothesis 3A, where the combined effect of the commission rate and trading volume results in an increase in the total dollar amount of commissions paid by institutional investors after a split.

Figure 4 shows the frequency distribution of total commissions in the presplit period versus postsplit period. In particular, we compute total commissions for

FIGURE 4

Institutional Commissions Before and After Splits

Figure 4 presents the frequency distribution of total commissions paid by our sample institutions in the 3-month period before split announcements (dark bars) versus that during the 3-month period after split ex-dates (gray bars) for splitting firms (Graph A) and for matched firms (Graph B). The horizontal line is the bins for total commissions (in dollars).



each splitting stock during the 3-month period before the announcement of the split and during the 3-month period after the split ex-date. Graph A shows that, for splitting stocks, the distribution of total commissions during the presplit period is tilted toward low commissions, whereas that during the postsplit period is heavily tilted toward high commissions. For example, during the postsplit period, 7.70% of the splitting stocks generate commission revenues higher than $800,000, compared to 4.42% during the presplit period. In contrast, Graph B of Figure 4 shows that, for matched nonsplitting stocks, the frequency distributions are almost unchanged before and after. These patterns are again consistent with Hypothesis 3A that the total dollar amount of brokerage commissions increases after a split.

We run multivariate regressions to examine the determinants of the increase in brokerage commissions postsplit. Table 4 presents the results. The dependent variable in the first two columns is the natural logarithm of the total commissions paid by institutions in trading the splitting stocks in the 3-month period postsplit divided by those in the 3-month period presplit. The dependent variable in the last two columns is the percentage change in the commission rate on a per-dollar basis. The results show that the change in total commissions postsplit increases with the split factor. The economic magnitude of this effect is significant as well. For example, a 1-standard-deviation increase in the split factor (0.46) is associated with an 18% increase in total dollar commissions. Further, the change in per-dollar commissions also increases with the split factor. These results suggest that the split factor plays an important role in influencing the change in commission revenues received by brokers postsplit.

B. Predictability of Institutional Trading

Under the information production theory, the privileged access to the information produced by brokerage houses and the superior information processing ability of institutions imply that institutional trading after the split ex-date should have predictive power for the subsequent long-run returns of the stock (Hypothesis 4).

Our hypotheses suggest that institutions receive information from brokerage analysts, who produce information *after* the split is accomplished and increases in

TABLE 4

Determinants of Change in Brokerage Commissions after a Split

Table 4 presents regression analysis of the determinants of changes in brokerage commissions after a stock split. The dependent variable in the first two columns is the natural logarithm of the total commissions paid by institutions in trading the splitting stocks in the 3-month period postsplit divided by those in the 3-month period presplit. The dependent variable in the last two columns is the percentage change in the commission rate on a per-dollar traded basis postsplit. *Split Factor* is the CRSP factor to adjust shares outstanding. *Size* is the natural logarithm of the market value of equity of the splitting firm measured 2 months before the split announcement. ln(*BM*) is the natural logarithm of the ratio of market value of common equity to book value of common equity measured 2 months before the announcement. *PPE* is net plant, property, and equipment divided by total assets. *Profitability* is earnings before interest, taxes, and depreciation divided by total assets. *Leverage* is long-term debt plus preferred stock liquidating value minus deferred taxes and investment tax credits minus cash and short-term investments, all scaled by total assets. *Dividend* is a dummy variable that equals 1 for dividend-paying firms, and 0 otherwise. *Past Return* is the buy-and-hold market-adjusted abnormal return during the 1-year period before the split ex-date. *Financial* is an indicator variable that equals 1 for financial firms (Standard Industrial Classification (SIC) codes 6000–6999), and 0 otherwise. *Utility* is an indicator variable that equals 1 for utilities (SIC codes 4900–4999), and 0 otherwise. *Hi-Tech* is an indicator variable that equals 1 for firms in the high-tech industry (first two digits of SIC codes: 35, 36, 38, 73, and 87), and 0 otherwise. *Nasdaq* is an indicator variable that equals 1 for firms with stocks traded on the Nasdaq, and 0 otherwise. Year-fixed effects are included in all regressions. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Δln(Total Commissions)		% Change in Per-Dollar Commissions	
Variables	1	2	3	4
Split Factor	0.392***	0.398***	0.953**	1.078***
	(5.99)	(5.96)	(2.57)	(2.75)
Size		−0.061***		−0.157
		(2.68)		(1.17)
ln(BM)		−0.009		−0.346
		(0.18)		(1.18)
PPE		−0.099		−0.024
		(0.58)		(0.02)
Profitability		−0.042		−2.158
		(0.16)		(1.37)
Leverage		−0.040		−0.342
		(0.38)		(0.55)
Dividend		0.179**		0.087
		(2.42)		(0.20)
Past Return		−0.031		−0.368
		(0.76)		(1.53)
Financial		0.134		0.186
		(1.15)		(0.27)
Utility		−0.018		−0.117
		(0.09)		(0.10)
Hi-Tech		−0.072		0.107
		(0.93)		(0.24)
Nasdaq		−0.131*		0.438
		(1.77)		(1.01)
Constant	0.277***	0.437**	0.561	1.372
	(4.52)	(2.24)	(1.62)	(1.21)
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	1,931	1,877	1,937	1,883
Adj. R^2	0.01	0.07	0.01	0.01

brokerage commissions are realized. We examine the predictive power of institutional trading in the postsplit period and compare it to that of institutional trading in the presplit period for splitting stocks and that of institutional trading in the postsplit period for the matched nonsplitting stocks.

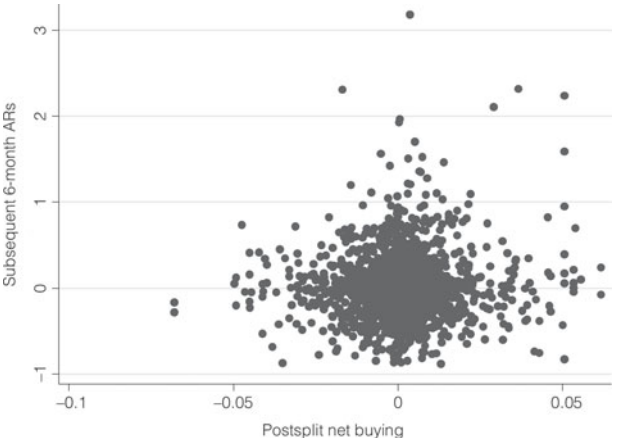
We aggregate institutional trading activities in the first month (21 trading days) after the ex-date and define institutional net buying as the number of shares purchased by institutions minus the number of shares sold by institutions, scaled by the number of shares outstanding. Institutional net buying in the first month postsplit has a mean of 0.05% and a standard deviation of 0.012. We consider two holding horizons, 6 months and 1 year, starting on the first day immediately after

the postsplit first month (i.e., the 22nd trading day following the split ex-date). We follow Barber and Lyon (1997) and choose buy-and-hold abnormal returns (BHARs), rather than cumulative abnormal returns (CARs), to measure long-term abnormal returns.[6] We use both the capital asset pricing model (CAPM) and Fama–French (1993) 3-factor model to estimate benchmark expected returns.[7] The risk-adjusted buy-and-hold return is calculated as the difference between the realized buy-and-hold return and the expected return.[8] Figure 5 presents the institutional net buying postsplit and the subsequent 6-month abnormal return in a scatter plot. In our multivariate regression, we control for a number of firm characteristics, such as the split factor, firm size, book-to-market ratio, profitability, leverage, past stock return, and dummies for dividend payers, financial firms, utility firms, technology firms, and NASDAQ firms.

FIGURE 5

Institutional Trading and Subsequent Abnormal Returns

Figure 5 presents the scatter plot of the subsequent 6-month Fama–French 3-factor-adjusted abnormal returns against institutional net buying in the first month after the split ex-date.



Institutional trading after the split seems to possess considerable predictive power for subsequent returns. Panel A of Table 5 reports the predictability results for all institutions after the split. Our interested variable is *Net Buying*, which is the number of shares purchased by institutions minus the number of shares sold by institutions, scaled by the number of shares outstanding. The coefficient on *Net Buying* obtained using both CAPM-adjusted returns and Fama–French 3-factor-adjusted returns is positive and, in most cases, significant. The economic impact of institutional trading is large as well. A 1-standard-deviation increase in institutional net buying in the first month postsplit (0.012) is associated with a 1.8–1.9 percentage point increase in the subsequent 6-month abnormal return.

[6]We repeat all our tests using CARs to measure abnormal returns, and the results are qualitatively similar to those obtaining using BHARs.

[7]Market beta and Fama–French 3-factor betas are estimated using a 1-year window that ends 3 months before the split announcement date.

[8]If a stock is delisted during a particular year, we fill the remaining months with the same size decile portfolio's returns.

The evidence is consistent with the prediction that institutions possess superior information during the postsplit period (Hypothesis 4).

TABLE 5

Institutional Trading and Subsequent Abnormal Returns

Table 5 presents regression analysis of the predictive power of institutional trading in splitting stocks after the split ex-date and compares it with that of institutional trading in splitting stocks presplit and in matched nonsplitting stocks. The dependent variable is subsequent abnormal buy-and-hold returns. We consider two holding horizons: 6 months and 1 year. The abnormal buy-and-hold return is calculated using CAPM (first three columns) and the Fama–French 3-factor model (last three columns). Panel A presents the predictability results for institutional trading in the first month after the split ex-date. Panel B compares the predictability of institutional trading in splitting stocks postsplit with that presplit by adding interaction terms combining an indicator variable for the postsplit period with all explanatory variables. Similarly, Panel C compares the predictability of institutional trading in splitting stocks postsplit with the institutional trading in matched nonsplitting stocks during the same period by adding interaction terms combining an indicator variable for the splitting stock with all explanatory variables. For brevity, we do not report the coefficients on the control variables in Panels B and C. *Net Buying* is the number of shares purchased by institutions minus the number of shares sold by institutions, scaled by the number of shares outstanding. *Split Factor* is the CRSP factor to adjust shares outstanding. *Size* is the logarithm of the market value of the equity of the splitting firm measured 2 months before the split announcement. ln(*BM*) is the natural logarithm of the ratio of book value of common equity to market value of common equity measured 2 months before the announcement. *PPE* is net plant, property, and equipment divided by total assets. *Profitability* is earnings before interest, taxes, and depreciation divided by total assets. *Leverage* is long-term debt plus preferred stock liquidating value minus deferred taxes and investment tax credits minus cash and short-term investments, all scaled by total assets. *Dividend* is a dummy variable that equals 1 for dividend-paying firms, and 0 otherwise. *Past Return* is the buy-and-hold market-adjusted abnormal return during the 1-year period before the split ex-date. *Financial* is an indicator variable that equals 1 for financial firms (SIC codes 6000–6999), and 0 otherwise. *Utility* is an indicator variable that equals 1 for utilities (SIC codes 4900–4999), and 0 otherwise. *Hi-Tech* is an indicator variable that equals 1 for firms in the high-tech industry (first 2 digits of SIC codes: 35, 36, 38, 73, and 87), and 0 otherwise. *Nasdaq* is an indicator variable that equals 1 for firms with stocks traded on the Nasdaq, and 0 otherwise. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CAPM-Adjusted			Fama–French 3-Factor-Adjusted		
Variables	6-Month	6-Month	1-Year	6-Month	6-Month	1-Year
Panel A. Institutional Net Buying in Splitting Stocks Postsplit and Subsequent Abnormal Returns						
Net Buying	1.581**	1.522**	1.846*	1.542**	1.509**	1.280
	(2.35)	(2.25)	(1.91)	(2.46)	(2.40)	(1.34)
Split Factor		0.014	0.059**		0.002	0.045*
		(0.75)	(2.17)		(0.12)	(1.67)
Size		−0.005	−0.002		0.007	0.021**
		(0.73)	(0.26)		(1.14)	(2.31)
ln(BM)		0.019	0.037*		0.009	0.007
		(1.33)	(1.81)		(0.70)	(0.33)
PPE		0.063	0.085		0.040	0.040
		(1.29)	(1.22)		(0.88)	(0.58)
Profitability		0.164**	0.299***		0.133*	0.142
		(2.17)	(2.77)		(1.90)	(1.33)
Leverage		−0.031	−0.063		−0.031	−0.072*
		(1.04)	(1.46)		(1.10)	(1.69)
Dividend		0.022	0.012		0.033*	0.032
		(1.02)	(0.40)		(1.67)	(1.08)
Past Return		0.016	−0.043**		0.016	−0.016
		(1.35)	(2.57)		(1.52)	(0.98)
Financial		0.022	0.019		0.022	−0.004
		(0.67)	(0.42)		(0.73)	(0.09)
Utility		−0.017	−0.029		−0.014	−0.019
		(0.29)	(0.35)		(0.26)	(0.23)
Hi-Tech		0.041*	0.026		0.046**	0.026
		(1.88)	(0.83)		(2.26)	(0.82)
Nasdaq		0.012	0.009		0.026	0.048
		(0.58)	(0.30)		(1.32)	(1.60)
Constant	0.033***	0.006	0.021	0.009	−0.102**	−0.185**
	(3.89)	(0.11)	(0.27)	(1.21)	(2.05)	(2.46)
Year-fixed effects	No	Yes	Yes	No	Yes	Yes
Number of Observations	2,017	2,017	2,017	2,017	2,017	2,017
Adj. R^2	0.03	0.03	0.05	0.01	0.02	0.02

(continued on next page)

TABLE 5 (continued)
Institutional Trading and Subsequent Abnormal Returns

Variables	CAPM-Adjusted 6-Month	CAPM-Adjusted 1-Year	Fama–French 3-Factor-Adjusted 6-Month	Fama–French 3-Factor-Adjusted 1-Year
Panel B. Post- versus Presplit for Splitting Stocks				
Net Buying × $Dummy_{Post}$	2.046**	1.927	1.794*	1.823
	(2.10)	(1.30)	(1.94)	(1.26)
Net Buying	−0.565	−0.203	−0.275	−0.592
	(0.82)	(0.19)	(0.42)	(0.58)
$Dummy_{Post}$	−0.221***	−0.219*	−0.242***	−0.258**
	(2.93)	(1.90)	(3.38)	(2.30)
Other Controls	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	4,031	4,031	4,031	4,031
Adj. R^2	0.05	0.06	0.03	0.01
Panel C. Splitting versus Matched Stocks after Split Ex-Date				
Net Buying × $Dummy_{Split}$	1.864*	3.954**	1.740*	2.841*
	(1.73)	(2.15)	(1.65)	(1.78)
Net Buying	−0.376	−1.823*	−0.305	−1.567*
	(0.61)	(1.74)	(0.51)	(1.72)
$Dummy_{Split}$	−0.510***	−0.877***	−0.497***	−0.745***
	(5.39)	(5.41)	(5.34)	(5.30)
Other Controls	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	3,860	3,861	3,860	3,861
Adj. R^2	0.05	0.05	0.02	0.03

It is possible that institutional trading is informative regardless of the time period considered or whether the stock has undertaken a split. To rule out these possibilities, we use two benchmarks to investigate whether the predictive power of institutional trading is unique to the postsplit period for splitting stocks. The first benchmark is the predictability of institutional trading in splitting stocks *before* the announcement date. We pool the splitting stocks postsplit with the same stocks presplit and include a dummy for the postsplit period and an interaction term for the postsplit dummy and *Net Buying*, as well as interactions for all the control variables. Panel B of Table 5 reports the results. The interaction term combining the postsplit dummy and *Net Buying* is positive in all specifications and significant for the 6-month holding horizon. The results suggest that institutions possess superior information in splitting stocks during the postsplit period compared to the presplit period. This is consistent with the information production hypothesis, since information production in splitting stocks happens after the split ex-date.[9]

The second benchmark is the predictability of institutional trading in matched nonsplitting stocks. We pool the splitting stocks postsplit with the matched nonsplitting stocks and include a dummy for the splitting stocks and an interaction

[9]Note that our result that institutional trading in splitting firms before a split has less predictive power for subsequent returns does not necessarily contradict the results in Gompers and Metrick (2001) and Yan and Zhang (2009) that there is predictive power in institutional trading averaged across *all stocks*. This is because Gompers and Metrick (2001) and Yan and Zhang (2009) conduct unconditional tests; that is, they do not partition the sample along the lines we do here.

term for the splitting dummy and *Net Buying*, as well as interactions for all the control variables. Panel C of Table 5 reports the results. The interaction term combining the split stock dummy and *Net Buying* is positive and significant in all four specifications. The results suggest that institutions possess superior information in splitting stocks postsplit compared to otherwise similar stocks. This evidence again lends support to our information production hypothesis that the increase in information production is more pronounced for splitting stocks than it is for nonsplitting stocks.

As we showed earlier, the increase in commissions postsplit is positively related to the split factor. If a higher split factor (and, hence, a greater increase in brokerage commissions) induces brokerage analysts to produce more information and pass such information to their institutional clients, one would expect that institutional trading in splitting stocks with a higher split factor should have stronger predictive power for subsequent returns. Thus, we interact the split factor with *Net Buying* in the predictability regression. The results, reported in Table 6, show that the interaction term is positive and significant for all specifications. These results suggest that a higher split factor induces more information production by analysts, which leads to more informed trading by institutions (Hypothesis 5).

We then partition our sample institutions into high- and low-commission-paying groups based on the median total commissions paid by institutions. The information production theory predicts that institutions paying high commissions are better informed than those paying low commissions (Hypothesis 6). Thus, we decompose *Net Buying* into two components: *Net Buying by High-Commission Institutions* is the net buying by institutions that pay higher than the median total commissions, and *Net Buying by Low-Commission Institutions* is the net buying by institutions that pay lower than the median total commissions. The results, reported in Table 7, show that *Net Buying by High-Commission Institutions* has a positive and significant coefficient in all specifications, whereas *Net Buying by Low-Commission Institutions* has an insignificant coefficient. This evidence is consistent with Hypothesis 6 that institutions that pay higher commissions have better access to the information produced by brokerage analysts, and thus their trading is more informative than that of those that pay low commissions.

The information production hypothesis suggests that the increase in brokerage commissions postsplit induces brokerage houses to produce more information and that institutional investors that pay high commissions are likely to receive privileged access to private information produced by brokerage analysts. This predicts that there should be an interaction effect, namely, that institutional trading should be most informative when the splitting stock experiences a large increase in commissions (through a high split factor) and when the institutions pay high commissions. Thus, we interact *Net Buying by High-Commission Institutions* and *Net Buying by Low-Commission Institutions* with the split factor. Table 8 reports the results. The interaction term combining *Net Buying by High-Commission Institutions* and the split factor is positive and significant in all specifications, whereas the interaction term combining *Net Buying by Low-Commission Institutions* and the split factor is insignificant. These results are consistent with the information production theory (Hypotheses 5 and 6).

TABLE 6

Institutional Trading after the Split Ex-Date and Subsequent Abnormal Returns: The Effect of the Split Factor

Table 6 presents a regression analysis of the predictive power of institutional trading in splitting stocks postsplit for subsequent abnormal stock returns across splits with different split factors. We focus on institutional trading in the splitting stock in the first month after the split ex-date. The dependent variable is subsequent 6-month and 1-year abnormal buy-and-hold returns. The abnormal buy-and-hold return is calculated using CAPM (first two columns) and the Fama–French 3-factor model (last two columns). Variable definitions are provided in Tables 4 and 5. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CAPM-Adjusted		Fama–French 3-Factor-Adjusted	
Variables	6-Month	1-Year	6-Month	1-Year
Net Buying × Split Factor	4.500**	5.719**	4.389**	4.777*
	(2.41)	(2.14)	(2.52)	(1.81)
Net Buying	−2.302	−3.014	−2.220	−2.779
	(1.34)	(1.22)	(1.38)	(1.14)
Split Factor	0.013	0.058**	0.001	0.044
	(0.70)	(2.13)	(0.06)	(1.63)
Size	−0.004	−0.002	0.007	0.021**
	(0.71)	(0.25)	(1.16)	(2.33)
ln(BM)	0.020	0.038*	0.010	0.007
	(1.39)	(1.86)	(0.76)	(0.37)
PPE	0.057	0.077	0.034	0.033
	(1.17)	(1.11)	(0.75)	(0.49)
Profitability	0.163**	0.298***	0.132*	0.141
	(2.16)	(2.76)	(1.88)	(1.32)
Leverage	−0.027	−0.058	−0.027	−0.068
	(0.90)	(1.33)	(0.95)	(1.58)
Dividend	0.021	0.011	0.032	0.031
	(0.99)	(0.37)	(1.64)	(1.05)
Past Return	0.017	−0.042**	0.017	−0.015
	(1.43)	(2.50)	(1.61)	(0.92)
Financial	0.018	0.015	0.019	−0.008
	(0.56)	(0.32)	(0.61)	(0.18)
Utility	−0.018	−0.030	−0.015	−0.020
	(0.31)	(0.36)	(0.28)	(0.24)
Hi-Tech	0.040*	0.025	0.045**	0.025
	(1.83)	(0.79)	(2.22)	(0.79)
Nasdaq	0.013	0.009	0.026	0.048
	(0.60)	(0.31)	(1.33)	(1.61)
Constant	0.008	0.023	−0.100**	−0.183**
	(0.15)	(0.31)	(2.01)	(2.43)
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	2,017	2,017	2,017	2,017
Adj. R^2	0.04	0.05	0.02	0.02

Finally, to directly test the information transfer from brokerage analysts to institutions, we match the brokers in the Abel Noser Solutions institutional trading database to the brokers in IBES using the broker translation file.[10] We classify our institutions into connected and nonconnected institutions based on the brokerage commissions they pay to a broker: an institution is classified as a connected institution for a broker if the institution's commission payments to the broker account for more than 5% of the broker's commission revenues during the past 12 months, and nonconnected otherwise. Thus, we decompose *Net Buying* into

[10]We thank Paul Irvine for providing us with the broker roll-up table for the Abel Noser Solutions data, which was used in our matching process and in Goldstein, Irvine, Kandel, and Wiener (2009) and Anand, Irvine, Puckett, and Venkataraman (2012).

TABLE 7

Institutional Trading after the Split Ex-Date and Subsequent Abnormal Returns: High-Commission-Paying versus Low-Commission-Paying Institutions

Table 7 presents the regression analysis of the predictive power of institutional trading in splitting stocks postsplit partitioned by brokerage commissions on the institutional level. We focus on institutional trading in the splitting stock in the first month after the split ex-date. The dependent variable is subsequent 6-month and 1-year abnormal buy-and-hold returns. The abnormal buy-and-hold return is calculated using CAPM (first two columns) and the Fama–French 3-factor model (last two columns). We aggregate the total dollar amount of commissions paid by each institution in the first month immediately after the ex-date and divide the sample institutions into two groups: institutions with higher than the median total commissions are high-commission-paying institutions, and those below the median are low-commission-paying institutions. *Net Buying by High-Commission Institutions* is the net buying by high-commission-paying institutions, and *Net Buying by Low-Commission Institutions* is the net buying by low-commission-paying institutions. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CAPM-Adjusted		Fama–French 3-Factor-Adjusted	
Variables	6-Month	1-Year	6-Month	1-Year
Net Buying by High-Commission Institutions	0.524*	0.717*	0.583**	0.870**
	(1.73)	(1.65)	(2.06)	(2.03)
Net Buying by Low-Commission Institutions	0.131	−0.189	0.253	−0.008
	(0.38)	(0.38)	(0.78)	(0.02)
Split Factor	0.015	0.059**	0.003	0.046*
	(0.77)	(2.18)	(0.16)	(1.70)
Size	−0.005	−0.003	0.007	0.021**
	(0.75)	(0.30)	(1.13)	(2.31)
ln(BM)	0.019	0.036*	0.009	0.006
	(1.29)	(1.76)	(0.66)	(0.29)
PPE	0.064	0.084	0.042	0.042
	(1.31)	(1.21)	(0.93)	(0.60)
Profitability	0.166**	0.300***	0.137*	0.145
	(2.20)	(2.78)	(1.94)	(1.36)
Leverage	−0.028	−0.060	−0.027	−0.069
	(0.94)	(1.39)	(0.97)	(1.61)
Dividend	0.020	0.010	0.031	0.031
	(0.96)	(0.35)	(1.60)	(1.04)
Past Return	0.015	−0.044***	0.016	−0.017
	(1.29)	(2.63)	(1.45)	(1.05)
Financial	0.022	0.019	0.022	−0.005
	(0.68)	(0.41)	(0.73)	(0.11)
Utility	−0.014	−0.025	−0.012	−0.017
	(0.25)	(0.30)	(0.23)	(0.21)
Hi-Tech	0.044**	0.030	0.049**	0.028
	(2.01)	(0.95)	(2.41)	(0.91)
Nasdaq	0.012	0.009	0.026	0.048
	(0.57)	(0.29)	(1.31)	(1.59)
Constant	0.069	0.038	−0.033	−0.194***
	(1.54)	(0.57)	(0.80)	(3.05)
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	2,017	2,017	2,017	2,017
Adj. R^2	0.03	0.05	0.02	0.02

two components: *Net Buying by Connected Institutions* is the net buying by institutions connected to the brokers whose analysts cover the splitting stock, and *Net Buying by Nonconnected Institutions* is the net buying by institutions that are not connected to the brokers whose analysts cover the splitting stock. We report the regression results using this new decomposition in Table 9. *Net Buying by Connected Institutions* has positive and significant coefficients in three out of four specifications, whereas *Net Buying by Nonconnected Institutions* has no significant coefficients in any of the four specifications. These results provide direct evidence that institutions receive tips from brokerage analysts

TABLE 8

Institutional Trading after the Split Ex-Date and Subsequent Abnormal Returns: Commission Interacted with the Split Factor

Table 8 presents the regression analysis of the predictive power of institutional trading by high- and low-commission-paying institutions in splitting stocks after the split ex-date across splits with different split factors. We focus on institutional trading in the splitting stock in the first month after the split ex-date. The dependent variable is the subsequent 6-month and 1-year abnormal buy-and-hold return. The abnormal buy-and-hold return is calculated using CAPM (first two columns) and the Fama–French 3-factor model (last two columns). The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CAPM-Adjusted		Fama–French 3-Factor-Adjusted	
Variables	6-Month	1-Year	6-Month	1-Year
Net Buying by High-Commission Institutions × Split Factor	1.930**	3.263***	1.631**	2.853***
	(2.50)	(2.96)	(2.27)	(2.62)
Net Buying by Low-Commission Institutions × Split Factor	−0.274	−0.493	0.164	0.610
	(0.25)	(0.31)	(0.16)	(0.39)
Net Buying by High-Commission Institutions	−1.191	−2.182**	−0.867	−1.666
	(1.59)	(2.04)	(1.24)	(1.57)
Net Buying by Low-Commission Institutions	0.328	0.168	0.114	−0.502
	(0.36)	(0.13)	(0.13)	(0.39)
Split Factor	0.006	0.045	−0.005	0.033
	(0.32)	(1.62)	(0.25)	(1.20)
Size	−0.005	−0.003	0.007	0.021**
	(0.76)	(0.31)	(1.13)	(2.31)
ln(BM)	0.017	0.034*	0.008	0.004
	(1.21)	(1.67)	(0.60)	(0.22)
PPE	0.062	0.081	0.040	0.037
	(1.27)	(1.16)	(0.87)	(0.53)
Profitability	0.168**	0.304***	0.139**	0.149
	(2.23)	(2.82)	(1.98)	(1.40)
Leverage	−0.026	−0.057	−0.026	−0.065
	(0.87)	(1.31)	(0.91)	(1.53)
Dividend	0.020	0.010	0.032	0.031
	(0.96)	(0.35)	(1.61)	(1.05)
Past Return	0.016	−0.042**	0.017	−0.016
	(1.38)	(2.53)	(1.53)	(0.97)
Financial	0.019	0.015	0.020	−0.010
	(0.60)	(0.32)	(0.65)	(0.21)
Utility	−0.014	−0.023	−0.012	−0.017
	(0.24)	(0.28)	(0.23)	(0.21)
Hi-Tech	0.044**	0.030	0.049**	0.028
	(2.02)	(0.95)	(2.40)	(0.90)
Nasdaq	0.012	0.008	0.026	0.047
	(0.56)	(0.27)	(1.29)	(1.58)
Constant	0.008	0.029	−0.101**	−0.181**
	(0.16)	(0.38)	(2.03)	(2.40)
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	2,017	2,017	2,017	2,017
Adj. R^2	0.04	0.05	0.02	0.02

regarding splitting stocks when they are important clients (in terms of commissions paid) of the brokers.

To summarize, we find evidence that institutional trading in splitting stocks has significant predictive power for subsequent long-run stock performance after a stock split. This predictive power is stronger among splitting stocks during the postsplit period than during the presplit period. It is also stronger among splitting stocks than matched nonsplitting stocks. The predictive power of postsplit institutional trading in splitting stocks mainly comes from stocks with high split factors and institutions that pay high commissions. Further, the predictive power

TABLE 9

Institutional Trading after the Split Ex-Date and Subsequent Abnormal Returns: Connected versus Nonconnected Institutions

Table 9 presents the regression analysis of the predictive power of institutional trading in splitting stocks after the split ex-date partitioned by broker-institution connections. We focus on institutional trading in the splitting stock in the first month after the split ex-date. The dependent variable is the subsequent 6-month and 1-year abnormal buy-and-hold return. The abnormal buy-and-hold return is calculated using CAPM (first two columns) and the Fama–French 3-factor model (last two columns). We classify institutions into connected and nonconnected institutions based on the brokerage commissions they pay to a broker: an institution is considered as a connected institution of a broker if the institution's commission payment to the broker accounts for more than 5% of the broker's commission revenues during the past 12 months, and nonconnected otherwise. *Net Buying by Connected Institutions* is the net buying by institutions connected to the brokers that cover the splitting stock, and *Net Buying by Nonconnected Institutions* is the net buying by institutions that are not connected to the brokers that cover the splitting stock. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CAPM-Adjusted		Fama–French 3-Factor-Adjusted	
Variables	6-Month	1-Year	6-Month	1-Year
Net Buying by Connected Institutions	1.412*	2.267**	1.173	2.610**
	(1.84)	(2.06)	(1.64)	(2.41)
Net Buying by Nonconnected Institutions	−0.097	0.402	−0.046	−0.162
	(0.17)	(0.51)	(0.09)	(0.21)
Split Factor	0.013	0.058**	0.001	0.044
	(0.70)	(2.14)	(0.07)	(1.63)
Size	−0.005	−0.002	0.007	0.021**
	(0.72)	(0.22)	(1.13)	(2.36)
ln(BM)	0.019	0.037*	0.009	0.008
	(1.35)	(1.82)	(0.71)	(0.37)
PPE	0.061	0.083	0.038	0.039
	(1.26)	(1.20)	(0.84)	(0.56)
Profitability	0.162**	0.295***	0.131*	0.139
	(2.15)	(2.74)	(1.87)	(1.30)
Leverage	−0.033	−0.066	−0.032	−0.076*
	(1.08)	(1.53)	(1.13)	(1.77)
Dividend	0.020	0.011	0.032	0.031
	(0.97)	(0.36)	(1.61)	(1.05)
Past Return	0.015	−0.043***	0.016	−0.017
	(1.29)	(2.61)	(1.47)	(1.06)
Financial	0.022	0.018	0.022	−0.005
	(0.67)	(0.38)	(0.73)	(0.12)
Utility	−0.017	−0.031	−0.013	−0.022
	(0.29)	(0.38)	(0.25)	(0.27)
Hi-Tech	0.042*	0.025	0.047**	0.025
	(1.91)	(0.80)	(2.30)	(0.79)
Nasdaq	0.013	0.009	0.026	0.049
	(0.59)	(0.31)	(1.32)	(1.62)
Constant	0.009	0.025	−0.099**	−0.182**
	(0.16)	(0.33)	(2.00)	(2.42)
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	2,017	2,017	2,017	2,017
Adj. R^2	0.03	0.05	0.01	0.02

of postsplit institutional trading in splitting stocks is concentrated among institutions that are connected to the brokers whose analysts cover the splitting stocks. These results are consistent with institutional investors having privileged access to information produced by brokerage analysts.

C. Profitability of Institutional Trading

In this subsection, we examine whether institutional investors realize abnormal trading profits in the postsplit period after taking into account commission

costs (Hypothesis 7). This could arise when the informational advantage they possess dominates the increase in the commissions and other trading costs paid by them after a split. Further, we expect that institutions that pay higher commissions outperform institutions that pay lower commissions (Hypothesis 8), which provides an incentive for institutions to trade more and pay more commissions, in turn receiving more information.

We track institutional trading in splitting stocks during the first 3 months postsplit to examine the profitability of institutional trading. We calculate two return measures for postsplit institutional trading, namely, return on buy principal and return on maximum investment. For each return measure, we calculate a raw return without risk adjustment and a risk-adjusted return by discounting the profit and the investment amount to current dollars. Specifically, return on buy principal is a simple and conservative measure, which is calculated by dividing total trading profits (raw or in current dollars) by total buy principal (raw or in current dollars). Return on maximum investment adjusts total investment (the denominator) by allowing the use of selling proceeds for later buying transactions instead of counting them as new investment. This measure more closely reflects the investment return from postsplit institutional trading. To calculate abnormal profits, we use a stock-specific discount rate to discount the raw dollar profits and investment amounts. In particular, we compute, for each splitting stock, the expected return using the Fama–French 3-factor model. Three factor-adjusted profits are calculated by discounting the raw profit back to the day before the split ex-date using the expected return from the Fama–French 3-factor model. The Fama–French 3-factor-adjusted return on buy principal equals Fama–French 3-factor-adjusted profits divided by Fama–French 3-factor-adjusted buy principal. Similarly, the Fama–French 3-factor-adjusted return on maximum investment equals the Fama–French 3-factor-adjusted profits divided by the Fama–French 3-factor-adjusted maximum investment.

To test whether institutions that pay higher brokerage commissions make more trading profits, we partition institutions trading in the splitting stock into high-commission-paying institutions and low-commission-paying institutions based on the commission rate they pay. Table 10 presents results on the profitability of postsplit institutional trading for all institutions and for high-commission-paying and low-commission-paying institutions as well. The unit of observation is a split/institution pair. Panel A of Table 10 presents the results for institutional trading in splitting stocks during the first 3 months after the split ex-date. An average institution invests $5.68 million in purchasing each splitting stock during the first 3 months following the split ex-date. The value-weighted raw return, net of commissions, is 0.29%. After adjusting for Fama–French 3 factors, the value-weighted abnormal return on buy principal is 0.32%. Thus, institutions still make abnormal profits even after accounting for the commissions they paid. Interestingly, when we divide institutions into a high- and a low-commission-paying group, high-commission-paying institutions significantly outperform their low-commission-paying counterparts. For example, they outperform by 73 bps in raw returns and 53 bps in abnormal returns, using maximum investment as the denominator. High-commission-paying institutions also trade more actively than low-commission-paying institutions ($6.21 million vs. $5.16 million in raw buy

TABLE 10

Profitability of Institutional Trading Postsplit

Table 10 reports univariate results of the profitability of institutional trading after the split ex-date. For each stock split, we divide institutions that trade the stock during the 3-month period into a high-commission-paying group and a low-commission-paying group based on per-dollar commissions measured as the ratio of brokerage commissions to dollar principal. Panel A reports the profitability of institutional trading in splitting stocks in the first 3 months after the split ex-date. Panel B reports the profitability of institutional trading in matched nonsplitting stocks in the first 3 months after the split ex-date. *Raw Buy Principal* is the sum of the actual dollar amount of all the buy transactions including commissions spent by sample institutions during the 3-month postsplit. *Raw Maximum Investment* is the maximum dollar amount committed to trading the split firms' shares during the 3-month postsplit by sample institutions. *Raw Profit* is the total raw profit earned by institutions using actual transaction prices net of commissions, with the net position marked to market at the end of the 3-month period. *Raw Return* is defined as the *Raw Profit* divided by the *Raw Amount Invested*. We use the Fama–French (FF) 3-factor model to adjust profits and investment amount. For example, FF 3-*Factor-Adjusted Profit* is computed by discounting the raw profit back to the day before the split ex-date using the benchmark return from the FF 3-factor model; and FF 3-*Factor-Adjusted Return on Buy Principal* equals FF 3-*Factor-Adjusted Profit* divided by FF 3-*Factor-Adjusted Buy Principal*. The numbers in parentheses are *t*-statistics.

Variables	All Institutions	High-Commission Institutions	Low-Commission Institutions	Test Equality
Panel A. Institutional Trading in Splitting Stocks Postsplit				
Number of Observations	117,514	58,847	58,667	
Per-Dollar Commission (0.01%)	10.00	15.85	4.17	(14.15)***
Total Commissions ($thousands)	4.66	5.88	3.45	(11.34)***
Raw Profit ($thousands)	16.95	38.38	−4.42	(1.38)
FF 3-Factor-Adjusted Profit ($thousands)	40.15	69.12	11.18	(1.70)*
Raw Buy Principal ($millions)	5.68	6.21	5.16	(4.15)***
Raw Maximum Investment ($millions)	5.30	5.92	4.69	(5.88)***
FF 3-Factor-Adjusted Buy Principal ($millions)	5.74	6.32	5.17	(4.35)***
FF 3-Factor-Adjusted Maximum Investment ($millions)	5.24	5.93	4.55	(6.22)***
Raw Return on Buy Principal (%)	0.29	0.62	−0.09	(8.14)***
	(6.92)***	(10.50)***	(1.35)	
Raw Return on Maximum Investment (%)	0.32	0.64	−0.09	(9.12)***
	(7.87)***	(11.52)***	(1.60)	
FF 3-Factor-Adjusted Return on Buy Principal (%)	0.70	1.09	0.22	(12.45)***
	(19.73)***	(21.00)***	(4.55)***	
FF 3-Factor-Adjusted Return on Maximum Investment (%)	0.75	0.65	0.12	(13.13)***
	(21.79)***	(14.10)***	(2.57)**	
Panel B. Institutional Trading in Matched Nonsplitting Stocks				
Number of Observations	98,328	49,407	48,921	
Per-Dollar Commission (0.01%)	12.20	19.43	4.90	(12.27)***
Total Commissions ($thousands)	13.42	18.14	8.65	(14.36)***
Raw Profit ($thousands)	−13.04	−7.70	−18.43	(0.19)
FF 3-Factor-Adjusted Profit ($thousands)	−21.12	−8.42	−33.95	(0.43)
Raw Buy Principal ($millions)	12.13	13.18	11.07	(3.88)***
Raw Maximum Investment ($millions)	10.11	11.44	8.76	(6.33)***
FF 3-Factor-Adjusted Buy Principal ($millions)	12.29	13.36	11.20	(3.86)***
FF 3-Factor-Adjusted Maximum Investment ($millions)	10.12	11.45	8.78	(6.12)***
Raw Return on Buy Principal (%)	−0.11	−0.06	−0.17	(1.46)
	(2.92)***	(1.14)	(3.15)***	
Raw Return on Maximum Investment (%)	−0.13	−0.07	−0.21	(1.77)*
	(3.21)***	(1.23)	(3.55)***	
FF 3-Factor-Adjusted Return on Buy Principal (%)	−0.17	−0.06	−0.30	(4.12)***
	(5.90)***	(1.55)	(7.27)***	
FF 3-Factor-Adjusted Return on Maximum Investment (%)	−0.21	−0.12	−0.54	(4.68)***
	(6.27)***	(2.65)***	(11.28)***	

principal), even though they incur much higher commissions (15.85 bps vs. 4.17 bps per dollar principal traded).

For comparison purposes, we also compute the profitability of institutional trading in matched nonsplitting stocks. Panel B of Table 10 shows that the raw return and the Fama–French 3-factor-adjusted return of institutional trading in matched nonsplitting stocks during the first 3 months postsplit are −0.11% and

−0.17%, respectively. These are consistent with our earlier results that sample institutional investors do not possess superior information in matched nonsplitting stocks.[11]

Next, we directly test whether connected institutions receive tips from brokerage analysts before the public release of analysts' initial buy and strong buy recommendations. To do so, we follow Irvine, Lipson, and Puckett (2007) and identify 4,427 buy and strong buy recommendation initiations on the splitting stocks in the first year postsplit. For each recommendation/institution pair, we classify institutions into connected and nonconnected groups based on the brokerage commissions they pay to the broker that initiates the recommendation: an institution is classified as a connected institution of a broker if the institution's commission payments to the broker account for more than 5% of the broker's commission revenues during the past 12 months, and nonconnected otherwise. We consider a 5-day window immediately before the recommendation release date (day 0), that is, from day −5 to day −1, as the trading period. We consider four different holding horizons, that is, liquidating on day 0, day 5, day 10, and day 20. We calculate the trading profit as a fraction of the position established at the end of the trading period. Table 11 reports the weighted average return of institutional trading before the release of analysts' buy and strong buy recommendation initiations in the first year postsplit. Institutional trading ahead of the release of analysts' recommendations is profitable. For example, the weighted-average return is 0.37% if the institutions liquidate their positions on the day of the release (day 0)

TABLE 11

Institutional Trading Profits before the Release of Analysts' Buy and Strong Buy Initiations Postsplit

Table 11 reports the trading profits of institutional trading before the release of analysts' buy and strong buy recommendation initiations in the first year postsplit. For each recommendation/institution pair, we classify institutions into connected and nonconnected groups based on the brokerage commissions they pay to the broker that initiates the recommendation: an institution is considered as a connected institution of a broker if the institution's commission payment to the broker accounts for more than 5% of the broker's commission revenues during the past 12 months, and nonconnected otherwise. We consider a 5-day window immediately before the recommendation release date (day 0), that is, from day −5 to day −1, as the trading period. We consider four holding horizons (i.e., liquidating at day 0, day 5, day 10, and day 20). We calculate the return as the dollar trading profit divided by the dollar amount of the position established at the end of the trading period. We report the weighted average return of institutional trading, weighted by the dollar amount of the position established at the end of the trading period. The numbers in parentheses are *t*-statistics.

Variables	All Institutions	Connected Institutions	Nonconnected Institutions	Test Equality
Number of Observations	57,579	3,759	53,820	
Return Day 0 (%)	0.37	0.54***	0.34***	(1.55)
	(7.75)	(2.91)	(6.83)	
Return Day [0, 5] (%)	0.65	0.80***	0.63***	(1.01)
	(10.58)	(3.54)	(9.68)	
Return Day [0, 10] (%)	0.53	0.96***	0.45***	(2.61)***
	(7.36)	(3.62)	(5.96)	
Return Day [0, 20] (%)	−0.13	0.80**	−0.31***	(4.70)***
	(1.55)	(2.47)	(3.45)	

[11]While more expensive brokers seem to provide slightly better advice that allows their clients to cover their higher commission costs (allowing client institutions to break even), in general, their advice seems to provide a significant advantage to their client institutions only when trading around informational events such as stock splits.

and 0.65% if they liquidate on day 5. More importantly, institutions that are connected to the broker whose analysts initiate the recommendation deliver significantly higher returns than institutions that are not connected. For example, connected institutions outperform nonconnected institutions by 0.51% (1.21%) if the positions are liquidated on day 10 (20). These results provide direct evidence that institutional investors who are important clients of brokers receive tips from the brokers' analysts before public releases of buy recommendation initiations.

In summary, the profitability of postsplit institutional trading suggests that institutional investors possess superior information about splits. In particular, institutions that pay high commissions and contribute significantly to brokers in terms of commission revenues outperform more, suggesting that they gain more privileged access to the information produced by brokerage analysts. These results are consistent with Hypotheses 7 and 8. Overall, the informational advantage that institutions possess outweighs the increase in transaction costs and the higher commissions they pay.

D. Information Production by Brokerage Firms and Brokerage Commissions

The information production theory predicts that information asymmetry faced by the firm should decrease following a split (Hypothesis 9) and that the change in information asymmetry is negatively associated with the change in brokerage commissions (Hypothesis 10). Brennan and Hughes (1991) test the latter prediction using the change in split factor as a proxy for the increase in commissions and find that changes in split factor are indeed a positive and significant predictor of increases in analyst coverage (an inverse measure of information asymmetry). In this subsection, we make use of our commission data to *directly* test this prediction. In addition, we consider information production from both quantity and quality perspectives. On the quantity side, one would expect a greater number of analysts producing information on the splitting stock after the split, because the commission increase enables brokerage firms to hire more analysts. On the quality side, one would expect that analysts produce higher quality research about the firm after the split, especially for firms that experience a greater increase in commissions. This arises because the increase in commissions could potentially provide monetary incentives for analysts to exert greater efforts in information production.

To test the relationship between commission changes and the change in information environment after splits, we retrieve analyst earnings forecast data from IBES. Specifically, for each stock split, we retrieve analyst earnings forecasts for the previous and the next fiscal year-end. If the next annual earnings announcement is within 6 months of the split ex-date, we jump ahead to the following fiscal year. If the previous annual earnings announcement is within 6 months of the split ex-date, we jump backward to the preceding fiscal year. We employ four measures for analyst forecasts. The first measure is the number of analysts following the firm. The other three measures are intended to capture the quality of analysts' information production. The second measure is the standard deviation of analysts' forecasts. The third measure is the mean-squared

error of analysts' forecasts. We measure forecast error as the absolute difference between the average forecasted earnings and the actual earnings per share divided by the price per share at the time of the forecast. The fourth measure is the coefficient of variation of analyst forecasts, which is defined as the ratio of standard deviation to the absolute value of the average of analyst forecasts. All measures are constructed using analysts' 1-year ahead earnings forecast in the last 6 months of each fiscal year. We calculate the change in each measure by taking the natural logarithm of the ratio of the postsplit value to the presplit value of the measure.

Panel A of Table 12 presents univariate results on the changes of informational measures in pre- and postsplit periods for splitting stocks versus propensity-score matched nonsplitting stocks. The number of analysts increases by 26% after splits for splitting stocks, while the number of analysts increases only by 11% for matched nonsplitting stocks, and the difference between splitting stocks and matched nonsplitting stocks is statistically significant at the 1% level. In terms of forecast quality, we find that, for splitting stocks, analyst forecast dispersion decreases by 17% postsplit, and the mean-squared error decreases by 26%, and both decreases are statistically significant compared to matched nonsplitting stocks. These results are consistent with our Hypothesis 9 that firms reduce information asymmetry they face in the equity market by splitting their shares. The change in the coefficient of variation measure is insignificant. Since the forecast quality measures may be affected by the volatility of the underlying (actual) earnings process of the splitting firms, we consider a measure of earnings volatility (i.e., standard deviation of quarterly earnings over the past 2 years). As the last row of Panel A in Table 12 shows, earnings volatility increases by 83% for splitting stocks after the split, suggesting that actual earnings become more volatile and harder to predict after splits. On the other hand, the earnings volatility of propensity-score matched nonsplitting stocks stays constant.

As a direct test of the effect of increases in commissions on information production, we regress changes in the information measures on the change in the total dollar amount of commissions paid by institutions and the change in earnings volatility. Panel B of Table 12 reports these results. The change in total commissions has a positive and significant effect on the change in the number of analysts covering the splitting stock postsplit. In the regression with the change in mean-squared error as the dependent variable, the coefficient of the change in total commissions is negative and statistically significant. These results provide support for the hypothesis that the reduction in information asymmetry after a split is greater for firms generating a greater increase in brokerage commissions (Hypothesis 10). These findings are consistent with the notion that analyst reports are more informative when commission revenues for brokerage houses are higher (Frankel et al. (2006)).[12]

We then examine improvements in individual analyst forecasts on splitting stocks postsplit relative to nonsplitting stocks. In particular, we examine instances

[12]Frankel et al. (2006) use trading volume, stock return volatility, and institutional ownership to measure the potential for brokerage profits. We provide more direct evidence that brokerage profits (through institutional trading) are related to the informativeness of analyst research.

TABLE 12

Information Production around Splits and Institutional Trading Commissions

Table 12 reports univariate (Panel A) and multivariate (Panel B) results for information production and institutional commissions around splits. For each split event, we retrieve analyst earnings forecasts for the previous and the next fiscal year-end. If the next annual earnings announcement is within 6 months of the split ex-date, we jump ahead to the following fiscal year. If the previous annual earnings announcement is within 6 months of the split ex-date, we jump backward to the preceding fiscal year. We employ four measures for analyst forecasts. The first measure is the number of analysts following the firm (*No. of Analysts*). The second measure is the standard deviation of analyst forecasts (*Dispersion*). Our third measure is the mean-squared error in the earnings forecast (*MSE*). We measure forecast errors as the absolute difference between the average forecasted earnings and the actual earnings per share divided by the price per share at the time of the forecast. Our fourth measure is the coefficient of variation of analyst forecasts (*COV*), defined as the ratio of standard deviation to the absolute value of the average of analyst forecasts. All measures are constructed using analysts' 1-year ahead earnings forecast in the last 6 months of each fiscal year. We calculate the change in each measure by taking the natural logarithm of the ratio of the postsplit value to the presplit value of the measure. We winsorize *Dispersion*, *MSE*, and *COV* at the 1% level to reduce the effects of outliers. Δln(*Commissions*) is the natural logarithm of the total commissions paid by institutions in the fiscal year following the split ex-date divided by the total commissions in the fiscal year preceding the split ex-date. *Earnings Volatility* is measured as the volatility (standard deviation) of quarterly earnings over the past 2 years. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Univariate Results

Variables	Splitting Stocks	Matched Stocks	Difference [Split − Matched]
Δln(No. of Analysts)	0.26***	0.11***	0.15***
	(21.66)	(9.06)	(8.51)
Δln(Dispersion)	−0.17***	0.08**	−0.25***
	(4.89)	(2.31)	(5.07)
Δln(MSE)	−0.26***	0.16**	−0.42***
	(3.61)	(2.08)	(3.98)
Δln(COV)	0.01	−0.05	0.06
	(0.18)	(1.10)	(0.92)
Δln(Commissions)	1.15***	0.44***	0.71***
	(29.71)	(12.79)	(13.72)
Δln(Earnings Volatility)	0.83***	0.01	0.82***
	(32.77)	(0.37)	(21.92)

Panel B. Multivariate Regression Results

Variables	Δln(No. of Analysts)	Δln(Dispersion)	ΔMSE	Δln(COV)
Δln(Commissions)	0.115***	0.021	−0.196***	−0.028
	(10.56)	(0.64)	(2.93)	(0.58)
Δln(Earnings Volatility)	−0.024*	0.151***	0.104	0.253***
	(1.77)	(3.69)	(1.27)	(5.03)
Constant	0.131***	−0.322***	−0.016	−0.151*
	(6.29)	(5.13)	(0.13)	(1.93)
Year-fixed effects	Yes	Yes	Yes	Yes
Number of Observations	1,117	1,075	1,098	753
Adj. R^2	0.10	0.03	0.03	0.06

where the same set of analysts cover a particular splitting stock before and after the split (meaning no new analysts and no discontinuing analysts). We expect that the forecast accuracy of these analysts improves more significantly on splitting stocks postsplit than on nonsplitting stocks covered by the same analysts. Further, if increased commissions induce higher quality information production, the improvement in forecast accuracy should be greater for stocks experiencing a greater increase in commissions.

Table 13 presents results on forecast errors for analysts covering both splitting and nonsplitting stocks pre- and postsplit. Panel A shows the full sample results. The average analyst forecast error decreases for splitting stocks postsplit (from 0.0037 to 0.0032). In contrast, nonsplitting stocks covered by the same set of analysts experience an increase in forecast errors (from 0.0064 to

0.0124), which suggests that analysts exert less effort in producing information on nonsplitting stocks. The difference-in-differences estimate is significant at the 1% level.

TABLE 13

Forecast Errors for Analysts Covering Both Splitting Stocks and Nonsplitting Stocks around Splits

Table 13 reports the average forecast errors ($\times 100$) for analysts covering both splitting stocks and nonsplitting stocks before and after the split. We require that the analyst cover the splitting stocks as well as the nonsplitting stocks both pre- and postsplit. We retrieve analyst earnings forecasts for the splitting stocks and nonsplitting stocks around the splits. If the next annual earnings announcement is within 6 months of the split ex-date, we jump ahead to the following fiscal year. If the previous annual earnings announcement is within 6 months of the split ex-date, we jump backward to the preceding fiscal year. We measure forecast errors as the absolute difference between the average forecasted earnings and the actual earnings per share divided by the price per share at the time of the forecast. Panel A reports the results for the full sample. Panel B partitions the sample of splits into high- and low-commission groups based on the median value of per-dollar commissions postsplit. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Presplit	Postsplit	Difference [Post − Pre]
Panel A. Full Sample			
Splitting Stocks	0.37	0.32	−0.06*
			(1.65)
Nonsplitting Stocks	0.64	1.24	0.59***
			(4.79)
Difference [Splitting − Nonsplitting]	−0.28***	−0.93***	−0.65***
	(4.77)	(8.15)	(5.11)
Panel B. High- versus Low-Commission Subsamples			
Splitting Stocks: High Commission	0.36	0.26	−0.10**
			(2.06)
Splitting Stocks: Low Commission	0.38	0.37	−0.01
			(0.25)
Difference [High − Low]	−0.02***	−0.11***	−0.09*
	(4.06)	(2.76)	(1.66)

Panel B in Table 13 partitions the sample of splits into high- and low-commission groups based on the median value of per-dollar commissions postsplit. Consistent with the information production theory, the improvements in forecasting accuracy are greater for splits with a higher level of commission rate. For example, the average forecast error decreases from 0.0036 to 0.0026 for high-commission stocks after a split, whereas that for low-commission stocks remains almost unchanged (from 0.0038 to 0.0037). These results lend further support to Hypotheses 9 and 10.

VI. Discussion of Results and Conclusion

In this paper, we have analyzed the incentives of analysts to produce information about a firm, by studying institutional trading and brokerage commissions around a specific corporate event, namely, a stock split. We make use of a large sample of transaction-level institutional trading data, which enables us to directly examine an extended version of the Brennan and Hughes' (1991) information production theory of stock splits for the first time in the literature. We were able to compare brokerage commissions paid by institutional investors before and after a split and relate the informativeness of institutional trading to brokerage

commissions paid. We were also able to compute realized institutional trading profitability net of brokerage commissions and other trading costs.

First, we find that both commissions paid and trading volume by institutional investors increase after a stock split. Second, institutional trading immediately after a split has predictive power for the firm's subsequent long-term stock return performance. Further, this predictive power is concentrated in stocks that generate higher commission revenues for brokerage firms and is greater for institutions that pay higher brokerage commissions. Third, institutions make positive abnormal profits during the postsplit period even after taking brokerage commissions and other trading costs into account. Further, institutions paying higher commissions significantly outperform those paying lower commissions. Fourth, the information asymmetry faced by firms decreases after stock splits: the greater the increase in brokerage commissions after a split, the greater the reduction in information asymmetry.

Overall, the results of our empirical analysis indicate that the incentives of outsiders to produce information about a firm are directly related to the compensation they receive for undertaking this information production. The fact that the predictive power of institutional trading is concentrated in stocks that generate higher commission revenues and in institutions that pay higher brokerage commissions after a split and the absence of such predictive power for institutional trading prior to the split lend strong support to the above conclusion, since our results show that analysts increase the extent of information production about the firm after a stock split. Further, the fact that institutional investors are able to generate positive abnormal profits after a split, even after accounting for the higher brokerage commissions that they pay postsplit, indicates that they are also made better off due to the above increase in information production. Finally, the decrease in information asymmetry facing firms in the equity market that we document after a split suggests that the above increase in information production benefits firms undertaking stock splits as well, since this will reduce their costs of raising external financing in the future.

Ikenberry and Ramnath (2002) find evidence consistent with the prediction that managers with favorable private information about their firms have an incentive to split their firms' shares. In particular, they show that analyst forecasts for the splitting firms are revised upward postsplit compared to those for matched nonsplitting firms. They also show that splitting firms are less likely to experience a drop in future earnings compared to matched nonsplitting firms. Desai and Jain (1997) as well as Ikenberry, Rankine, and Stice (1996) document significant abnormal returns postsplit, suggesting that splitting firms are undervalued. Our empirical results, in conjunction with the results of the above papers, indicate that it is indeed firms that are undervalued that engage in stock splits in order to rectify mispricing by inducing information production.

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