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Institutional trading, information production, and corporate spin-offs

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ABSTRACT

We use a large sample of transaction-level institutional trading data to analyze, for the first time in the literature, the role of institutional investors as producers of information around corporate spin-offs. Our results may be summarized as follows. First, there is a significant imbalance in post-spin-off institutional trading between the equity of new parent firms versus subsidiaries, suggesting that spin-offs increase institutional investors' welfare by relaxing a trading constraint. This imbalance in institutional trading is driven by differences in information asymmetry across the two spun-off firm divisions. Second, institutional trading around spin-offs has significant predictive power for the announcement effect of a spin-off and for post-spin-off long-run stock returns. Third, institutional investors are able to realize significant abnormal profits by trading in the subsidiary firm equity in the first quarter post-spin-off. Overall, we show that spin-offs enhance information production by institutional investors, who profit from this enhanced information production.

1. Introduction

The objective of this paper is to study institutional trading around corporate spin-offs, and thereby analyze whether spin-offs increase the extent of information production about the divisions of firms undergoing spin-offs.[2] Practitioners and academics have argued that spin-offs help to "unlock hidden value". [3] Further, a number of empirical papers have documented positive abnormal returns for the equity of firms announcing spin-offs (spin-off announcement effect). However, the precise mechanism underlying such value gains from spin-off activity has long remained controversial. One possible mechanism underlying these value gains relates to increased information production by outsiders about the intrinsic value of the divisions of firms undergoing spin-offs (from before to after spin-offs). For example, Chemmanur and Liu (2011) show that, in a setting with asymmetric information between firm insiders and outsiders regarding a firm's intrinsic value, an undervalued firm can improve its stock price through a spin-off. They demonstrate that a spin-off will lead to an increase in information production by institutional investors about the divisions of the firm, so

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[2] The number of firms announcing spin-offs has increased recently. As noted by *Fortune* magazine in a recent article (November 7, 2011), there were twenty firms with equity listed on the NYSE or the NASDAQ announcing spin-offs in 2011 (till October), including such well-known names as Kraft, Conoco Phillips, Expedia, McGraw-Hill, and Sara Lee; this compares with only 13 such spin-offs in all of 2010 and only 12 in 2009.

[3] Many firms claim that the objective of their proposed spin-offs is to "unlock value". Consider, for example, the following article in the *Financial Times* (October 25, 2005) which noted, commenting on Cendant's proposed spin-off: "Cendant's planned split echoes moves by other large conglomerates such as Viacom, the media group, to spin off units in order to 'unlock value' for investors."

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that, in equilibrium, firm insiders with favorable private information (i.e., with undervalued equity) will choose to conduct a spin-off, increasing their firm's share price. However, there has been no empirical analysis so far on the role of institutional investors as producers of information about firms undergoing corporate spin-offs. We propose to fill this gap in the literature by making use of a large sample of transaction-level institutional trading data to conduct the first such analysis.

Some interesting questions that arise in the above context are the following. First, do spin-offs benefit institutional investors by relaxing the trading constraint that existed prior to the spin-off? Second, do institutional investors engage in significant information production in spin-off firms, thereby achieving an informational advantage over retail investors? In particular, is trading by institutional investors around spin-offs driven by the information advantage they possess about the new parent firm and its subsidiary, or is it driven solely by considerations of portfolio rebalancing based on the different characteristics of the new parent and subsidiary? Third, are institutional investors able to take advantage of any private information they possess about firms undergoing spin-offs to generate abnormal profits? To the best of our knowledge, these and related questions have not been addressed by the existing literature. We propose to answer these questions in the current study. Throughout this paper, we will refer to the pre-spin-off combined firm as "parent"; the new spun-off firm as "subsidiary", and the parent firm post-spin-off as "new parent". The "new parent" takes on the identity of "parent" and is traded under the same stock symbol and CUSIP. Therefore, when we refer to "parent equity/stock", it could refer to the same equity before and after spin-off completion, except when we specifically need to refer to parent firm equity in the post-spin-off period, where we will refer to it as "new parent equity."

Both the academic and practitioner literature has conjectured that breaking up a conglomerate into "pure play" companies may benefit institutional investors such as mutual funds in several ways, while simultaneously resulting in an increase in the share price of the firm conducting the spin-off. [4] The theoretical analysis of Chemmanur and Liu (2011) shows that, in a setting with asymmetric information between firm insiders and outsiders regarding the firm's true value, an undervalued firm can improve its stock price through a spin-off. A related model by Habib et al. (1997) indicates that in a setting where informed institutions have different levels of private information about the (new) parent versus subsidiary, a spin-off allows informed outsiders to trade to the optimal extent (and direction) in the two firms involved, whereas they are constrained to trade the combined firm under a single equity prior to spin-off completion. Nanda and Narayanan (1999) develop a model of corporate spin-offs in which spin-offs help outsiders disentangle the cash flows arising from the two divisions involved.

This empirical study is motivated by the above theoretical models driven by considerations of information production and informed trading by institutions around corporate spin-offs. These information-based models have several implications for institutional trading. First, they imply that spin-offs relax an institutional trading constraint existing prior to the spin-off. As such, institutional trading in the new parent and subsidiary will be significantly different from each other. Second, the difference in institutional trading in the equities of the new parent and the subsidiary will be directly related to the difference in the extent of information asymmetry characterizing these two firms, after controlling for differences in other characteristics between the two firms. Third, institutional trading in the parent firm will have predictive power for the short-term abnormal stock return upon a spin-off announcement (the "announcement effect" from now on). Fourth, institutional trading in the shares of the parent and subsidiary will have predictive power for the long-run equity returns from these two stocks as well as for the long-run operating performance of the two firms involved. Finally, if institutions indeed have private information, they should be able to generate abnormal profits from trading in the equity of the subsidiary.[5]

To test the above implications of information asymmetry-based models, we make use of a large sample of proprietary transaction-level institutional trading data. Our data includes transactions from January 1999 to December 2004, which were originated from 531 different institutions (with a total annualized trading principal of $4.61 trillion over all U.S. equities). The sample institutions engaged in about 16%, in terms of dollar value, of the CRSP reported trading volume in the shares of firms undergoing spin-offs. With this dataset, we are able to track institutional trading in the shares of these spin-off firms both before and after spin-off completion. For the post-spin-off subsidiaries, we break down institutional trading into two categories, namely, institutional share allocation sales (i.e., selling of shares allocated to the institutions' account through the pro-rata distribution in a spin-off), and post-spin-off institutional secondary market trading (i.e., buying and selling of shares by institutions in the secondary market after the spin-off). This allows us to analyze the trading pattern and profitability for these two categories of transactions separately.

Our paper develops a number of new results on the role of institutional investors as information producers around corporate spin-offs. These can be summarized as follows. The first set of results deals with institutional trading imbalance: we find a significant imbalance in post-spin-off institutional trading between new parents and subsidiaries. Thus, in the first three months immediately following the spin-off completion, over 46% of the trading by institutions in post-spin-off new parent-subsidiary pairs was originated in opposite directions (buy versus sell). Even for trading in the same direction, institutions concentrated their trading heavily in one firm (new parent or subsidiary) rather than trading symmetrically in both firms (*see* Fig. 1). We interpret this significant trading imbalance as evidence that spin-offs improve institutional investors' trading welfare by relaxing a trading

[4] For example, an article in the *Financial Times* (October 28, 2005) explicitly attributed a shift in (institutional) investor preference to the breakups of conglomerates: "But a new backlash against conglomerates suggests a more lasting shift in investor preferences may be taking place—driven in part by the growing influence of hedge funds and private equity houses. In public markets, big has rarely appeared less beautiful. In the U.S., the most visible sign is the break-up of companies such as Cendant, the sprawling leisure group behind Avis rental cars and the Orbitz travel website, which this week announced a four-way demerger to try to lift its flagging share price."

[5] Given that the new parent takes on the identity of the pre-spin-off combined firm, it is difficult to cleanly identify the point in time at which the parent shares were acquired by institutions. Therefore, separating out institutional share allocation sales from pure post-spin-off trading, and, consequently, analyzing the profitability of institutional trading in the parent becomes problematic. On the other hand, given that the equity of the spun-off subsidiary is listed independently only after the spin-off, we are able to easily separate institutional share allocation sales from pure post-spin-off trading in the subsidiary firms' shares. Therefore, we confine our empirical analysis of the pattern and profitability of post-spin-off institutional trading to the equity of the subsidiary.

constraint that existed prior to the spin-off. Further, we find that this imbalance increases corresponding to the difference in information asymmetry between the post-spin-off new parent and subsidiary (controlling for other differences between the new parent and subsidiary such as risk or future growth prospects, whether they are dividend payers, and their index membership): institutional investors purchased more equity in the post-spin-off firm facing a higher extent of information asymmetry. This indicates that a significant fraction of trading by institutional investors immediately after the spin-off is driven by their information advantage relative to retail investors.

The second set of results is associated with the predictive power of institutional trading around corporate spin-offs. First, institutional trading in the parent firm two months prior to a spin-off announcement has significant predictive power for the announcement effect of a spin-off. Second, institutional trading in the subsidiary immediately after spin-off completion also has predictive power for its subsequent long-term stock returns and operating performance. This predictive power is greater when the subsidiary's size constitutes only a smaller fraction of the pre-spin-off parent firm's size (see Figs. 2, 3, and 4). Third, institutional trading in the parent equity also has predictive power for subsequent long-term stock returns; however, this predictive power is weaker than in the case of a subsidiary. Overall, the above results indicate that institutional investors have considerable private information about firms undergoing spin-offs, and provide further support for the information production role of institutional investors.

The third set of results deals with the pattern and profitability of institutional trading in the subsidiary firm's equity after spin-off completion. We separate post-spin-off institutional trading in the subsidiary into two categories—pure post-spin-off trading (i.e., buying and selling of the subsidiary's stock in the secondary (open) market), and institutional share allocation sales (i.e., sales of subsidiary shares obtained through the pro-rata distribution in spin-offs). We provide evidence that institutional investors are able to realize superior profits by trading in the equity of the subsidiary in the secondary market during the first quarter after spin-off completion. Further, institutional investors' trading profit in the subsidiary declines over time, which suggests that their information advantage is mostly confined to the immediate post-spin-off period. Of the total allocation sales of subsidiary shares by institutional investors in the first year post-spin-off, 70% occurs within the first quarter. This is the first research study to document the above results on the realized profitability of institutional trading around corporate spin-offs, as well as the pattern of share allocation sales post-spin-off.

What do the above results tell us overall about the role of institutional investors as producers of information about firms undergoing corporate spin-offs? First, we confirm that institutions indeed have an information advantage over retail investors regarding the future prospects of the firms involved in spin-offs. Further, this information advantage is greater for subsidiaries compared to that for (new) parent firms: the smaller the subsidiary as a fraction of the (pre-spin-off) parent firm, the greater the information advantage. This information advantage is greatest immediately after the spin-off, with the private information of institutional investors gradually incorporated into the post-spin-off firms' equity prices over time. Second, our results indicate that spin-offs do indeed relax a trading constraint that existed prior to the spin-off on institutional investors. We show that institutions take advantage of this relaxation of their trading constraint by trading differently in the new parent and subsidiary. A significant proportion of these trading differences are motivated by differences in the information advantage that institutions have with respect to the new parent versus that with respect to the subsidiary. Third, we show that institutions are able to use their information advantage to realize abnormal profits by trading in the secondary market in the equity of the subsidiary firm immediately after spin-off completion.

The contribution of this paper is thus three-fold. First, it sheds considerable light on the role of institutional investors as producers of information in corporate spin-offs. In particular, our results are consistent with the notion that spin-offs induce

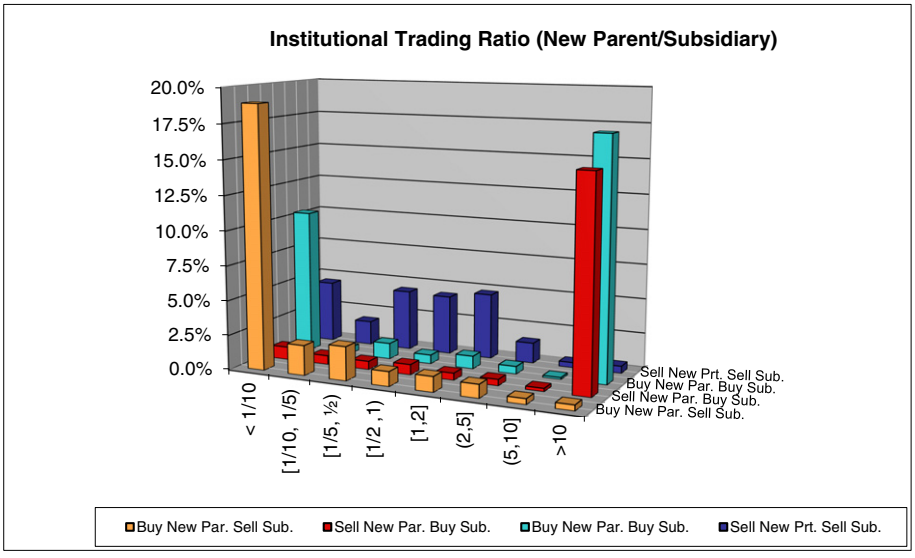

Fig. 1. Institutional trading ratio of post-spin-off new parents versus subsidiaries.

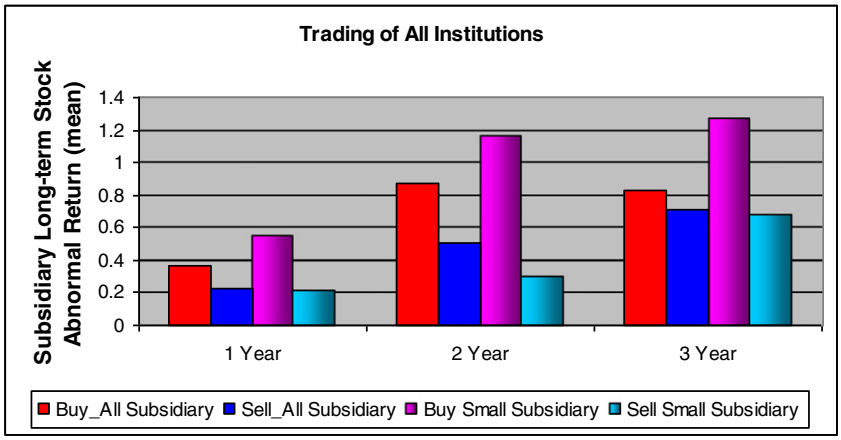

Fig. 2. Institutional trading and subsidiaries' subsequent long-term stock abnormal returns.

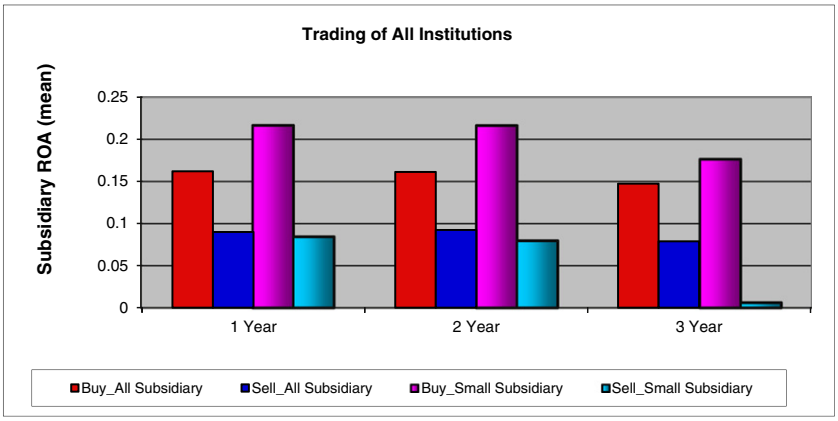

Fig. 3. Institutional trading and subsidiaries' subsequent operating performance.

institutional investors to significantly increase the extent of their information production about the various divisions of the conglomerate firm, which, in turn, allows the firm to reduce the undervaluation of one or more of these divisions, thus "unlocking hidden value." Second, our results show that a significant proportion of the value-gains from spin-offs accrue to institutional investors as a reward for their increased information production about the divisions of spin-off firms. Third, this paper extends the literature on institutional trading around various corporate events by identifying some of the precise settings in which they are able to profit from producing information.

The remainder of this study is organized as follows: Section 2 discusses the related literature. Section 3 summarizes the underlying theory and develops testable hypotheses; Section 4 describes the data and measures of institutional trading that we use in our empirical analysis; Section 5 presents the algorithm used for separating out subsidiary share allocation sales from pure post-spin-off trading in the subsidiary; Section 6 presents empirical tests and results; and Section 7 concludes.

2. Relation to the existing literature

This research is related to several strands in the current body of literature. The theoretical papers most closely linked to this study are those that develop a rationale for spin-offs based on how they reduce the extent of asymmetric information between firm insiders and outsiders, and help to unearth hidden value: e.g., Chemmanur and Liu (2011), Habib et al. (1997), Nanda and Narayanan (1999).[6] Several empirical studies have focused on value increases arising from corporate spin-offs, and have documented positive announcement effects, positive abnormal long-term stock returns, and increased operating performance, respectively; see, e.g., Hite and Owers (1983), Miles and Rosenfeld (1983), Schipper and Smith (1983) on announcement effects of spin-offs; Cusatis et al. (1993) on long-term stock returns; Daley et al. (1997), Desai and Jain (1999) on long-term operating performance. Chemmanur et al. (2014) demonstrate that the efficiency of the plants constituting a firm improves on average

[6] There are several other theoretical models of spin-offs based on considerations other than asymmetric information: see, e.g., Aron (1991), and Chemmanur and Yan (2004).

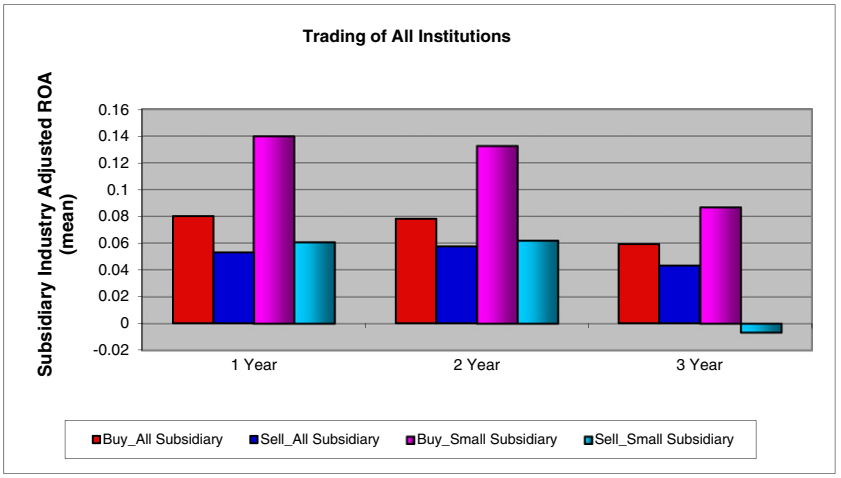

Fig. 4. Institutional trading and subsidiaries' subsequent industry-adjusted operating performance.

following corporate spin-offs, and identifies the precise sources of these efficiency improvements. McNeil and Moore (2005) investigate the linkage between changes in firm value and changes in capital allocation efficiency following spin-offs. Gilson et al. (2001) empirically document that there is an increase in analyst coverage of firms following spin-offs and other stock break-ups. In addition, both Huson and MacKinnon (2003) and Desai and Savickas (2010) show increased idiosyncratic volatility of parent firms following spin-offs. Several studies have tested alternative theories of corporate spin-offs; see, e.g., Ahn and Denis (2004), Burch and Nanda (2003), Dittmar and Shivdasani (2003), and Krishnaswami and Subramaniam (1999). There are also significant studies on the capital structure of post-spin-off firms (Dittmar, 2004; Parrino, 1997).

This research study is also related to the emerging literature on institutional trading around various corporate events: see, e.g., Parrino et al. (2003) who study the role of institutional investors around forced CEO turnovers; Gibson et al. (2004) and Chemmanur et al. (2009) who study institutional trading around SEOs. Brown and Brooke (1993) explore the selling price pressure by institutional investors in the spin-off firms due to the rebalancing needs arising from investment restrictions faced by institutional investors. Abarbanell et al. (2003) study the noninformation-based preference-induced trading by institutional investors around corporate spin-offs. They find some evidence on institutional investors rebalancing their portfolios due to fiduciary constraints and investment styles. However, none of the above-mentioned studies examine the information content of institutional trading around corporate spin-offs or the role of institutional investors as information producers about firms undergoing spin-offs, which is our distinctive focus here.

3. Theory and hypotheses

In this section, we will briefly summarize the relevant theory, and develop hypotheses for our empirical tests. It is important to emphasize at the outset that, while we discuss various models at some length, our objective is not to test any specific model, but rather, various hypotheses regarding the role of institutional investors in spin-offs. Note also that, while our focus is on institutional investors as information producers, we also control for other factors that drive institutional trading around spin-offs.

Chemmanur and Liu (2011) model how spin-offs can potentially lead to an increase in information production by institutional investors and their affiliated analysts about each of the divisions constituting a conglomerate firm. In their model, there are two types of institutional investors who can produce information about a conglomerate firm with two divisions, A and B. Type 1 investors have expertise (lower information production cost) for producing information about division A of the combined firm and a significantly higher cost of producing information about division B. Conversely, type 2 investors have expertise only for producing information about division B, and a significantly higher cost of producing information about division A. Prior to the spin-off, type 1 institutional investors producing information about division A and trading in the combined firm's stock using this information are subject to considerable "noise" arising from their lack of precise information about division B. This noise reduces type 1 institutional investors' expected profit from producing information about division A of the conglomerate firm. Similarly, type 2 investors' lack of precise information about division A reduces their expected profit from producing information about division B. Spin-offs decrease the "noise" by allowing each institutional investor to concentrate their investment only on the stock of the firm (division) about which they have private information, thus increasing their expected profit and, therefore, their incentive to produce information about that particular division. As such, spin-offs increase information production about both divisions relative to the level of information production existing prior to the spin-off. From now onwards, we will refer to the above hypothesis as the information production hypothesis.[7]

[7] In developing hypotheses related to information production, we rely primarily on the theoretical analysis by Chemmanur and Liu (2011). This is because, while other models like Nanda and Narayanan (1999) and Habib et al. (1997) have also argued that spin-offs improve firm value by reducing information asymmetry between firm insiders and outsiders, the latter papers do not model information production by outsiders around corporate spin-offs.

The information production hypothesis generates several testable predictions. The first predication is that, while some institutional investors will have private information solely about the new parent, others will have private information only about the subsidiary. Therefore, institutional investors trading activity in the subsidiary will be noticeably different from those trading in the new parent firm. A given institutional investor will trade predominantly in the new parent or in the subsidiary, but not in both. This is the first hypothesis we test:

H1. (Institutional trading imbalance)

Upon the separation of the new parent and subsidiary, there will be a significant imbalance in post-spin-off institutional trading in the equity of the new parent and in the subsidiary.

The information production hypothesis suggests that institutional investors will choose to trade in such a way as to maximize their expected profit from trading on their private information. They will choose to trade in those spin-off stocks (either new parent or subsidiary) where their information advantage relative to ordinary (uninformed) investors is the greatest. Under the information production hypothesis, institutional investors will have greater expertise in producing information (i.e., greater informational advantage with respect to ordinary investors) about one of the two firms resulting from a spin-off. Consequently, the extent of the imbalance between institutional trading in the new parent and in the subsidiary will be greater as the difference in information asymmetry between the new parent and subsidiary is greater. This leads to our second hypothesis:

H2. (Institutional trading imbalance and information asymmetry)

The extent of the institutional trading imbalance between the firms in a spin-off will be positively related to the difference in the extent of information asymmetry faced by (uninformed) investors in the equity of these firms.

The information production hypothesis also has testable implications regarding the information content of institutional trading around corporate spin-offs. First, since the theory predicts that institutional investors will have an informational advantage over ordinary (uninformed) investors about the parent and subsidiary following a spin-off, institutional trading will have predictive power for their future stock returns both in the short run (announcement effect) and in the long run. Further, assuming that institutions are able to use their superior knowledge to pick better performing spin-off firms, their trading will have predictive power for the long-run operating performance of these firms.

H3. (Predictive power for the announcement effect)

Trading by institutional investors with private information in the parent firm immediately prior to spin-off announcement will have predictive power for the announcement effect of a spin-off.

H4. (Predictive power for long-run stock returns and operating performance)

Trading by institutional investors with private information in the equity of the parent and subsidiary respectively will have predictive power for the long-term post-spin-off stock returns and operating performance of these firms.

Second, the information production hypothesis predicts that, the smaller the post spin-off firm as a fraction of the conglomerate firm, the greater the increase in information production by institutional investors about that firm.[8] This implies that institutional trading in a smaller subsidiary (or new parent) will have greater predictive power for the future stock returns of that subsidiary (or new parent). This gives rise to the following testable prediction:

H5. (Predictive power and the relative size of a spun-off firm)

The smaller the subsidiary (or new parent) as a fraction of the parent firm, the greater the predictive power of institutional trading for the future stock returns of that firm and its future operating performance.

The information production theory also generates a testable hypothesis regarding the profitability of institutional trading around corporate spin-offs. If institutional investors have an informational advantage over retail investors about the subsidiary's future performance, one would expect them to generate superior profits from such informed trading. This gives rise to the following testable hypothesis:

H6. (Profitability of post-spin-off institutional trading)

Institutional investors will be able to generate superior profits by trading in the equity of the subsidiary post spin-off.

[8] This prediction is formally derived in the theoretical analysis of Chemmanur and Liu (2011).

4. Data and measures of institutional trading

In this section, we describe the data and sample selection procedures, and construct measures of institutional trading. Section 4.1 describes the spin-off sample and presents descriptive statistics. Section 4.2 describes the institutional trading sample and presents descriptive statistics. Section 4.3 describes the construction of various institutional trading measures used in our empirical analysis.

4.1. Spin-off sample

The spin-off sample covers firms with a spin-off distribution between January 1999 and December 2004. Our sample is obtained from three sources. We first obtain all the spin-offs listed in the Securities Data Corporation's (SDC) mergers and acquisitions database. Separately, we use the CRSP database to identify all distribution events during the period with distribution codes starting with 37. The two sources provide the initial sample of spin-offs. We then use FACTIVA news search to further verify the characteristics of these spin-offs, and to obtain additional information such as the public announcement date. Following the spin-off literature, we focus our sample on tax-free spin-offs where the parents control at least 80% of the share interests in the subsidiaries before the distribution. We also delete from our sample equity carve-outs, two-stage spin-offs, merger motivated spin-offs, spin-offs where tracking stocks for the spun-off units already existed, spin-offs that are ADRs, spin-offs with concurrent security offerings, and spin-offs of close-end funds and REITs. The parents, new parents, and subsidiaries should be covered by the CRSP and COMPUSTAT database in order to be included in our final sample. This procedure resulted in a total of 66 spin-off events.[9]

Table 1 provides the pattern of spin-off events over the six years covered by our sample, and the descriptive statistics of the firms before and after spin-off completion. The yearly occurrence of spin-off events during this sample period is generally higher than that reported in previous studies on spin-offs.[10] Of the 66 parent firms prior to the distribution, sample institutions actively engaged in the trading of 56 firms during the period starting from three months prior to the spin-off announcement to the day before the spin-off distribution.[11]

For the firm characteristic descriptions provided in Table 1, other than the market capitalization that is measured on the day of the spin-off distribution, all other measures are based on end-of-fiscal-year information from COMPUSTAT and IBES in the last year prior to the distribution. The post-spin-off measures are based on the information available at the end of the first fiscal year following the distribution. Market capitalization of the new parent and subsidiary equals the closing price of these firms' shares times the total number of shares outstanding at the spin-off distribution date.[12] The sum of the market capitalization of the new parent and the subsidiary gives the market capitalization of the pre-spin-off parent firm. Subsidiaries are in general smaller than the new parents are. On average, our sample new parents are three times the size of their respective subsidiaries, based on book assets or on market capitalization; this is similar to that reported in previous studies. The market-to-book ratio and the return-on-assets ratio of new parents are also generally higher than those of subsidiaries, both in terms of means and medians. This could be driven by spin-offs that are motivated by divesting poorly performing units. Since we do not have separate sales information on new parents and subsidiaries before spin-offs, we proxy the sales growth rates of the new parents and subsidiaries using their three-digit SIC industry median sales growth rates. The mean and median industry-level sales growth rates of the subsidiaries are slightly higher than those of the new parents. As for analysts, the new parents continue to receive similar analyst coverage as the parent firms before the distribution, with a mean (median) of 9.4 (7) analysts following the company as reported by IBES, while the subsidiaries receive less than half the analyst coverage as their parents, with a mean (median) following of 4.6 (2).[13] The mean and median analyst forecast error (analyst forecast standard deviation) are computed only for the subsample for which there is at least one (two) analyst(s) issuing an earnings forecast for the firm.

4.2. Institutional trading sample

We use proprietary 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, such as Conrad et al. (2001), Jones and Lipson (2001), and studies on institutional trading around corporate events, such as Chemmanur et al. (2009).

[9] In four events, the parents had simultaneous distributions of two independent subsidiaries, instead of one. Two parents had follow-on spin-offs which were part of the restructuring plan announced at the same time as the first spin-off distributions. We exclude these follow-on distributions from our sample.

[10] For example, there are a total of 146 pure spin-offs during the 1965–1988 period reported in Cusatis et al. (1993). Similarly, during the 1979–1996 period, there are 106 spin-off events by 95 parents reported in Burch and Nanda (2003). This averages six spin-off events per year. The occurrence of spin-off events per year almost doubled during our sample period compared with the early years, reflecting the increased level of spin-off activity in recent years.

[11] The 10 firms not traded by sample institutions are smaller, with lower market-to-book ratio and lower return-on-assets than the 56 traded firms. Similarly, their post-spin-off entities that retain such characteristics are also not traded by sample institutions. The characteristics of these firms suggest that sample institutions may choose not to actively trade in the equities of these firms primarily out of regulatory and liquidity concerns.

[12] When the distribution is after market close, the next trading day is the first day that parent and subsidiary begin their separate listings. In these cases, we treat the effective distribution date as the next trading day.

[13] The analyst coverage reported here for our sample parents and subsidiaries is similar to that documented in early studies that specificly study analyst coverage pre- and post- corporate spin-offs, e.g. Gilson et al. (2001).

Table 1
Descriptive statistics of spin-off sample. This table presents the yearly distribution of spin-offs over the sample period, and the descriptive statistics of firm characteristics for the parents, new parents and subsidiaries. Market capitalization of the new parent and subsidiary equals the stock closing price times the total shares outstanding at the effective spin-off distribution date. The sum of the market capitalization of the new parent and subsidiary is the market capitalization of the pre-spin-off parent firm. All other pre-spin-off data are based on the end-of-fiscal-year information from COMPUSTAT and IBES in the last year prior to the spin-off distribution, while the post-spin-off data are based on the first end-of-fiscal-year information following the spin-off distribution. Book asset is the data item 6 from COMPUSTAT. Market-to-book ratio is the ratio of the market value of assets to the book value of assets. Return on assets is the operating income before depreciation as a percentage of total assets. Industry-level sales growth is the median sales growth rate within the same three-digit SIC industry. Number of analysts following, analyst forecast error, and analyst forecast standard deviation are from the IBES analyst earnings forecasts database.

Year of spin-off distribution	Number of parents	Traded by sample institutions	Number of subsidiaries	Traded by sample institutions
1999	16	14	19	15
2000	16	14	17	16
2001	8	5	8	6
2002	8	6	8	6
2003	9	8	9	7
2004	9	9	9	7
Total	66	56	70	57

	Pre-spin-off Parent firm	Post-spin-off New parent	Post-spin-off Subsidiary
Number of observations	66	66	70
Book asset ($Mil)			
Mean	11707.510	9129.116	3223.853
Median	2002.197	1343.512	549.964
Market capitalization ($Mil)			
Mean	11736.100	10156.440	1489.395
Median	2469.888	1140.105	300.790
Market-to-book ratio			
Mean	0.414	0.574	0.349
Median	0.104	0.093	-0.029
Return on assets			
Mean	0.040	0.063	0.026
Median	0.014	0.016	0.010
Industry-level sales growth			
Mean	0.087	0.090	0.105
Median	0.059	0.082	0.093
Number of analysts following			
Mean	9.852	9.448	4.586
Median	7	7	2
Analyst forecast error			
Mean	0.229	0.383	0.222
Median	0.043	0.051	0.053
Analyst forecast standard deviation			
Mean	0.103	0.063	0.065
Median	0.020	0.020	0.020

The data covers equity-trading transactions by a large sample of institutions from January 1999 to December 2004. For each transaction, the data includes date of activity, the stock traded (identified by both symbols and CUSIPs), daily closing price of the stock, number of shares traded, dollar principal traded, commissions paid by the institution, and whether it was 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 records. However, identification codes are provided, which enabled us to separately identify all sample institutions as either investment managers or plan sponsors. Investment managers are mostly mutual fund families such as Fidelity Investments. An example of plan sponsors is the California Public Employees' Retirement System (CalPERS). Going forward, we will refer to these two classes of institutions as "investment managers" and "plan sponsors," respectively. In order to track institutional trading in spin-offs over time, institutions with less than one year continuous trading data during the sample period were removed; seven institutions that never traded any sample firms were also deleted from the sample. The final institutional trading sample comprises transactions originated from 531 institutions.

Table 2 provides a description of our institutional trading data. The sample institutions' total annualized principal traded over all U.S. equities is $4.61 trillion, with an average at $8.7 billion. In the empirical analysis, when we control for institution size, we estimate institution size based on their annualized principal traded, assuming an annual turnover rate of 50%. The distribution of the annualized principal traded by sample institutions is much skewed, causing the sample mean to be a great deal larger than the median, particularly within the plan sponsor group. This is due to a large number of small plan sponsors covered in the sample, which also leads to a greater number of plan sponsors (450) than investment managers (81). On average, the sample investment managers trade much more than the sample plan sponsors do. In terms of the sample institutions' trading in spin-off companies, during the three months prior to the public announcements and ending the day before spin-off distribution, the

Table 2
Descriptive statistics of institutional trading sample. This table presents descriptive statistics of the sample institutions with at least one-year continuous trading data from January, 1999 through December, 2004. Seven institutions without any trading in the sample spin-off firms during the period starting three months before the spin-off announcement and ending one year after the spin-off distribution are excluded. Annualized principal traded is computed based on all U.S. domestic equity traded by the sample institutions from January, 1999 through December, 2004. Percentage of trading in parent equals the aggregate trading principal in the parent by sample institutions during the period starting three months before the spin-off announcement and ending the day before spin-off distribution divided by the aggregate trading principal in the parent firms reported in CRSP during the same period. Percentage of trading in new parent (subsidiary) equals the aggregate trading principal in the post-spin-off new parents (subsidiaries) by sample institutions during the one year following spin-off distribution divided by the aggregate trading principal in these firms reported in CRSP during the same period.

	All institutions	Investment managers	Plan sponsors
Number of institutions	531	81	450
Annualized principal traded ($ million)			
Mean	8,689.59	38,422.79	3,337.61
Median	517.81	5,706.11	373.24
Total	4,614,170.47	3,112,246.24	1,501,924.23
Percentage of trading in parent (%)			
Mean	16.40	13.19	3.21
Median	16.93	14.20	2.98
Percentage of trading in new parent (%)			
Mean	15.34	11.84	3.50
Median	16.04	12.15	2.91
Percentage of Trading in Subsidiary (%)			
Mean	18.04	14.51	3.53
Median	14.79	12.34	2.45

sample institutions' total dollar value trading in the parent firms accounts for 16.4% of the CRSP reported trading volume in these firms. In the one year following spin-off distribution, the sample institutions' total dollar value trading in the new parents and subsidiaries accounts for 15.84% and 18.04% of the CRSP reported trading volume in these firms, respectively. Therefore, even though our institutional trading data does not cover all investment managers and plan sponsors involved in U.S. equity trading, the breadth of the coverage is reasonably large. We therefore believe that our sample is an adequate representation of the U.S. investment manager and plan sponsor industry.

4.3. Measures of institutional trading

In our analysis, we use two sets of measures of institutional trading. The first set of measures we use captures the extent of institutional trading in any given firm, and will be referred to as "institutional net buy" or simply "net buy". We construct institutional net buy over different trading periods for each institution and spin-off firm pair (parent firm prior to distribution, and new parent and subsidiary post-spin-off, respectively). The institutional net buy during any particular trading period in any firm is calculated as the total shares bought minus the total shares sold by an institution during that trading period in that firm divided by the total shares outstanding. Thus, we define:

$$Net\ \ Buy = \frac{Number\ \ of\ \ Shares\ \ Bought - Number\ \ of\ \ Shares\ \ Sold}{Shares\ \ Outstanding}. \tag{1}$$

Thus, the net buy measures the percentage increase (or decrease) of an institution's share ownership in any given firm during the specified trading period when net buy is positive (or negative). For a pre-spin-off parent firm, we separately track two variables: *Pre-Ann Netbuy* defined as institutional net buy during the period starting from two months before the spin-off announcement and ending at two trading days before the announcement; and *Post-Ann Netbuy* defined as institutional net buy during the period starting from the spin-off announcement (including the one trading day before the actual announcement date to account for any information leakage) to the day before the spin-off distribution. For each new parent and subsidiary, we track the variable *Post-Spin Netbuy*, defined as institutional net buy during the three months immediately following spin-off distribution.

The second set of measures we use captures the imbalance in institutional trading between the new parent and subsidiary subsequent to a spin-off completion. If an institution continues to trade in the new parent and subsidiary in the proportion of their shares outstanding after the spin-off, we refer to this trading as "balanced." Institutional trading imbalance measures the deviation from such balanced trading. We construct two measures of institutional trading imbalance from our net buy measures. The first measure is the ratio of the post-spin-off net buy by institutions in the new parent over that in the subsidiary, defined as:

$$Trading\ \ Ratio = \frac{Net\ \ Buy\ \ in\ \ the\ \ NewParent}{Net\ \ Buy\ \ in\ \ the\ \ Subsidiary}. \tag{2}$$

The second measure we use is the difference in net buy between the new parent and the subsidiary, defined as:

$$DifNetBuy = Net\ Buy\ in\ New\ Parent – Net\ Buy\ in\ Subsidiary. \quad (3)$$

Consider a parent that distributes 100% of its share interest in the subsidiary in a spin-off. After the distribution, if an institution still trades proportionally in the new parent and subsidiary as in the pre-spin-off firm, the ratio of the post-spin-off net buy will equal to one with a positive sign, while the difference in the post-spin-off net buy will equal zero. Since our sample parents distribute at least 80% of their interest in their subsidiaries during the spin-off (100% in most occasions), the above defined ratio of the post-spin-off net buys in the new parent and subsidiary should be close to one with a positive sign. Similarly, the difference in the net buy should be close to zero for an institution which does not have a strong preference for one post-spin-off firm over the other and, hence, trades in the equities of the new parent and subsidiary in a fashion similar to their trading in the equity of the pre-spin-off firm. In such a case, the trading is considered "balanced."

5. Distinguishing between institutional subsidiary share allocation sales and pure post-spin-off trading

After the spin-off distribution, the new parent and the subsidiary become entities independent from each other. Generally, the new parent maintains trading under the listing of the parent firm's stock, and the subsidiary becomes a newly listed stock.[14] Therefore, for the subsidiaries, as long as our sample institutions are included in the institutional trading database before the listing date of the subsidiary (normally the same day as the distribution date, or the next trading day when the distribution is made after the market close), we can track all the trading of a particular institution in a subsidiary's stock from the very beginning. Hence, for the subsidiary, shares sold in each sell-side transaction that we observe come either from a pro-rata distribution through the spin-off (hereafter referred to as "subsidiary share allocation sales") or from secondary market purchases after the spin-off.[15] This feature enables us to distinguish between subsidiary share allocation sales by institutions, and "pure" secondary market buying and selling by institutions.

For each sample subsidiary distributed between January 1999 and December 2003, we continuously track trading by sample institutions for one full year starting on the first trading day (the effective distribution date). This enables us to infer institutional subsidiary share allocation sales within the first year post-spin-off using the algorithm detailed in the Appendix A, even though we do not have direct data on share allocations from spin-offs. Simply put, the basic idea behind the algorithm is that, at any point in time, when shares sold exceed shares bought, these shares are classified as allocation sales.

Our institutional trading data provides us with the exact price paid for the shares bought or sold, as well as the commission paid for each of these transactions. Thus, we can track all of the cash flows associated with these trades and study realized institutional trading profit, which will shed further light on our information production hypothesis. We study the realized trading profitability of institutional pure secondary market trading and spin-off share allocation sales separately because of the inherently different nature and informational structure of these trades.[16] We measure institutional trading profitability in each quarter during the first post-spin-off year to further examine the duration for which institutional investors are able to enjoy their information advantage regarding spin-offs, and the timing of this information advantage. When calculating the profitability of share allocation sales, we use the closing stock price on the spin-off distribution date to measure the initial investment cost of the shares that institutions receive from spin-off distribution.

6. Empirical tests and results

In this section, we discuss the empirical methodology used to test our hypotheses and present our empirical results. Section 6.1 includes the results of our empirical tests regarding the institutional trading imbalance between the new parent and subsidiary. Section 6.2 presents the predictive power of institutional trading around corporate spin-offs for the short-term and long-term stock returns following spin-offs. Section 6.3 presents our results on the predictive power of institutional trading on the operating performance of subsidiaries. Section 6.4 presents the profitability of post-spin-off institutional secondary market trading, as well as the pattern of share allocation sales.

[14] Note that two stage spin-offs (where the parent firm first conducts a carve-out of the subsidiary and spins off the listed subsidiary afterwards) and subsidiaries listed as tracking stocks prior to spin-offs are excluded from our sample. Therefore, all subsidiaries in our spin-off sample are only listed after the distribution. In a few cases, a when-issued market existed a few days (with a maximum of two weeks) prior to the distribution date. However, trading activity in the when-issued market was low and none of the sample institutions traded in the subsidiaries' equity in the when-issued market. Thus, when we refer to the first trading day of the subsidiaries in this paper, we mean the first trading day since spin-off distribution. The trading days during the when-issued period in the few cases where such a market existed can be ignored due to no trading from sample institutions.

[15] The statement is true assuming no short sales. To the best of our knowledge, there are a very limited number of short sale transactions in our transaction-level institutional trading data.

[16] In a spin-off, the parent shareholders receive the subsidiary shares via a pro-rata distribution. Therefore, the amount of shares an investor receives via the distribution depends on her share position in the pre-spin-off firm. The portfolio position resulting from a spin-off distribution usually does not match an investor's targeted holding in the subsidiary. Therefore, an investor may sell the distributed shares if she does not want a position in the subsidiary. In contrast, an institution will buy more shares in a subsidiary from the post-spin-off secondary market only if she has favorable information about the subsidiary's stock.

6.1. Imbalance in post-spin-off institutional trading between new parent and subsidiary

We first examine whether institutional investors trade the shares of the post-spin-off new parent and subsidiary differently by analyzing institutions' relative trading magnitudes in the shares of the new parent versus those of the subsidiary. After demonstrating that there is a significant institutional trading imbalance between the new parent and subsidiary (H1), we then test whether this trading imbalance is related to the potential information advantage that institutions have over retail investors after controlling for other factors that are generally linked to institutional trading preferences (H2).

As described in Section 4.3, for each institution's trading in the shares of the new parent and subsidiary during the three months following a spin-off distribution, we calculate the ratio of the post-spin-off net buy in the new parent over that in the subsidiary. The sign of the post-spin-off net buy indicates the net trading direction, with a positive sign for buying and a negative sign for selling. Each institution's trading activity in a new parent and respective subsidiary pair is counted as one trading ratio observation. If trading across the post-spinoff firm pairs is "balanced", the trading ratio is expected to be close to one (recall that net buy is normalized by firm's total shares outstanding). The distribution of institutional trading ratios can be expected to follow a symmetric distribution with a mean around one, if any deviation from balanced trading arises from purely idiosyncratic considerations (i.e., driven by white noise).[17] In Table 3 and Fig. 1, we document the distribution of the institutional trading ratio over two dimensions: the magnitude of the ratio in absolute number, and the trading direction. Two important results can be observed. First, over 46% of the trading from all sample institutions (40% for the investment manager sub-sample, and 47% for the plan sponsor sub-sample) is on opposite sides of buying and selling of the new parent subsidiary pair. Second, for the institutional trading of the firm pairs that are on the same side of buying or selling, most institutional investors concentrate their trading in one firm, while trading significantly less in the other. Overall, the pattern of institutional trading in the new parent-subsidiary pair presented in Table 3 and Fig. 1 is consistent with a significant imbalance in institutional trading across the shares of the post-spin-off firms, supporting H1. This significant trading imbalance post-spin-off suggests that spin-offs improve institutional investors' trading welfare by relaxing a trading constraint that existed prior to the spin-off.

Next, we analyze whether this trading imbalance is related to the potential information advantage that institutions have over retail investors after controlling for other factors that are generally linked to institutional trading preferences. We employ the following multivariate regression framework (new parent and subsidiary pair i and institution j):

$$\begin{aligned} DifNetBuy_{ij} = {} & \alpha + \beta_1 DifNumest_i + \beta_2 DifForerr_i + \beta_3 DifStdev_i + \beta_4 DifBeta_i + \beta_5 DifIdiosynRisk_i + \beta_6 DifIndGrowth_i \\ & + \beta_7 DifMkbk_i + \beta_8 DifROA_i + \beta_9 DifDiv_i + \beta_{10} DifSP500_i + \beta_{11} PosImb * InstSize_j + \beta_{12} NegImb * InstSize_j + \varepsilon_{ij}, \end{aligned} \quad (4)$$

where the dependent variable $DifNetBuy_{i,j}$ is the difference in the post-spin-off net buy by institution j across the ith spin-off new parent and subsidiary pair. All the independent variables measure differences in characteristics across the new parent and the subsidiary (as suggested by the variable name following *Dif-*), other than the institutional size control (*InstSize*) that interacts with the sign of the imbalance: *PosImb* (*NegImb*) equals 1 if *DifNetbuy* is positive (negative), and 0 otherwise. The error term ε_{ij} is clustered on spin-offs. To test the information production hypothesis (H2), we use the IBES analyst earnings forecast data at the end of the first fiscal year following the spin-off distribution to construct three variables that proxy for the difference in the extent of information asymmetry between the relevant pair of firms: difference in the number of analysts following (*DifNumest*), difference in analyst forecast error (*DifForerr*), and difference in analyst forecast standard deviation (*DifStdev*). For firms where the extent of information asymmetry is higher (as captured by fewer number of analysts following, larger analyst forecast error, and larger standard deviation in analyst forecast), the potential information advantage of institutional investors over retail investors will be higher; so that we expect greater institutional trading in these firms. Therefore, institutional trading imbalance is expected to be negatively related to the difference in the number of analysts following, and positively related in the differences in analyst forecast error and analyst forecast standard deviation.

Institutional trading imbalance may also arise due to reasons other than private information on the part of investors. For example, the desire of institutional investors such as investment managers to better manage the risk of their own portfolios ("risk management") may also generate a trading imbalance, since different institutional investors may have specific preferences over exposure to market risks and idiosyncratic risks. Therefore, the difference in institutional trading between the new parent and the subsidiary resulting from a spin-off could arise due to the difference in the risk characteristics of the two firms. To control for this, we decompose the risk measure of the new parents and subsidiaries into market risk and idiosyncratic risk, and control for differences in beta risk (*DifBeta*) and idiosyncratic risk (*DifIdiosynRisk*) across the underlying shares of the new parent and subsidiary, respectively.

Besides risk preferences, institutional trading imbalance may occur due to the desire of institutional investors to make pure play investments in the equity of the individual firms resulting from a spin-off. For example, growth funds may prefer to invest in high-growth firms, while value funds may prefer to invest the in lower growth but undervalued firms (which may generate more reliable cash flows) resulting from spin-offs. Since many U.S. mutual funds are marketed to investors as "growth funds" or "value funds," splitting conglomerates into pure play firms may make the shares of the resulting firms more attractive to these funds, thereby increasing demand for the shares of both new parent and subsidiary. To capture the "pure play" induced

[17] Of course, the specific form of this distribution will vary depending upon additional assumptions one makes about the factors (e.g., liquidity or hedging demand) driving institutional investors' trades in the new parent versus subsidiary. The point we are making here is that there is no reason to expect a systematic deviation from a symmetric distribution with a mean value around one for the ratio of trades in the parent versus subsidiary unless the spin-off is relaxing a trading constraint.

Table 3
Institutional Trading Imbalance of Post-spin-off New Parents versus Subsidiaries: Univariate Results. This table presents the distribution of institutional trading directions and relative magnitude in the new parents and subsidiaries during the first three months immediately following spin-off distribution. The unit of observation is each spin-off new parent-subsidiary/institution pair. For each sample institution, its trading ratio in a spin-off is measured as its total net purchase or net sale in the new parent during the first three months immediately following the spin-off over its total net purchase or net sale in the corresponding subsidiary during the same trading period. The net purchase or net sale is the total institutional net buying in shares (net purchase if positive, net sale if negative) as a percentage of the total shares outstanding. Panel A shows the distribution of the trading pattern of all sample institutions that traded the new parents or subsidiaries during the first three months following spin-offs. Panel B and Panel C show the distribution of the trading pattern of the investment managers and plan sponsors subsamples, respectively.

Trading Ratio: New Parent/ Subsidiary	Buy New Parent Sell Subsidiary	Sell New Parent Buy Subsidiary	Buy New Parent Buy Subsidiary	Sell New Parent Sell Subsidiary	Total
Panel A: All Institutions					
<1/10	18.89%	0.92%	10.36%	4.47%	34.64%
[1/10, 1/5)	2.16%	0.64%	0.46%	1.75%	5.02%
[1/5, ½)	2.44%	0.60%	1.15%	4.38%	8.57%
[1/2 ,1)	1.06%	0.74%	0.64%	4.28%	6.73%
[1,2]	1.11%	0.51%	0.92%	4.74%	7.28%
(2,5]	0.97%	0.46%	0.55%	1.47%	3.45%
(5,10]	0.41%	0.23%	0.14%	0.37%	1.15%
>10	0.41%	15.06%	17.18%	0.51%	33.16%
Total	27.45%	19.16%	31.41%	21.97%	100.00%
Panel B: Investment Managers					
<1/10	10.83%	1.59%	9.55%	6.05%	28.03%
[1/10, 1/5)	2.23%	1.91%	0.64%	1.27%	6.05%
[1/5, ½)	2.23%	0.96%	1.27%	5.41%	9.87%
[1/2 ,1)	0.64%	1.27%	1.27%	4.14%	7.32%
[1,2]	2.55%	1.27%	1.59%	5.10%	10.51%
(2,5]	0.00%	0.64%	0.96%	1.91%	3.50%
(5,10]	0.00%	0.00%	0.64%	1.27%	1.91%
>10	1.91%	12.74%	16.88%	1.27%	32.80%
Total	20.38%	20.38%	32.80%	26.43%	100.00%
Panel C: Plan Sponsors					
<1/10	20.25%	0.81%	10.50%	4.20%	35.76%
[1/10, 1/5)	2.15%	0.43%	0.43%	1.83%	4.85%
[1/5, ½)	2.48%	0.54%	1.13%	4.20%	8.35%
[1/2 ,1)	1.13%	0.65%	0.54%	4.31%	6.62%
[1,2]	0.86%	0.38%	0.81%	4.68%	6.73%
(2,5]	1.13%	0.43%	0.48%	1.40%	3.45%
(5,10]	0.48%	0.27%	0.05%	0.22%	1.02%
>10	0.16%	15.46%	17.23%	0.38%	33.23%
Total	28.65%	18.96%	31.18%	21.22%	100.00%

trading preferences, we include the difference in market-to-book ratio (*DifMkbk*) and difference in industry median sales growth rates (*DifIndGrowth*) of the new parent and subsidiary as our explanatory variables (we use industry level sales growth since we do not have pre-spin-off divisional sales data to construct the firm-level sales growth rate for the new parent and subsidiary).[18] [19]

Since accounting profitability has been shown to be an important variable that concerns investors, the difference in expected profitability across the new parent and the subsidiary may also potentially affect institutional trading preferences. In our analysis, we use the difference in return-on-assets measured at the end of the first fiscal year following spin-off completion (*DifROA*) to proxy for the expected difference in profitability between the two firms. Finally, clientele type of preferences for cash dividends and index membership could also lead to differences in institutional trading preferences across the new parent and subsidiary; therefore, we also control for the difference in whether there is regular cash dividend payouts (*DifDiv*) and the difference in S&P 500 index membership between new parents and subsidiaries (*DifSP500*).[20]

[18] Institutional investors' preference to manage their own risk is also cited as a factor that led to the Cendant spin-off as well as other spin-offs. To quote an article regarding the Cendant spin-off in the *Financial Times* (October 28, 2005): "Henry Silverman, chief executive of Cendant, argues that the rise of hedge funds has undermined one of the greatest attractions of big diversified companies: their ability to manage risk and produce consistent earnings. These most active of traders would rather allocate assets themselves than outsource the risk to company managers. 'Investors don't want portfolios (from companies) anymore,' he says. Fund managers have long claimed they prefer to allocate assets among sectors rather than leave it to conglomerates, but hedge funds take this to a new extreme by actively seeking out volatility and risk in order to offset it against investments elsewhere. … Cendant - which had been carefully constructed to balance risk across sectors and different stages of the economic cycle - says it came to have more than half its shares held by hedge funds, leaving it little choice but to give them the more focused investment opportunities they crave."

[19] For example, regarding the spin-off of Viacom from CBS, an article in *The New York Times* (December 26, 2005) pointed out that "Viacom is to continue to build its portfolio of cable channels overseas…That strategy is aimed at highlighting the fast-growing cable network business. Meanwhile, CBS is taking steps to make its stock more attractive to value investors, those who seek reliable income and dividends rather than rapid growth."

[20] In the results here, the DifDiv is the difference in two dummy variables that equal 1 if the new parent and subsidiary pay cash dividends, respectively, and 0 otherwise. In alternative specifications, we measure the differences in cash dividend payout using the difference in dividend yields across the two firms. We also relax the index membership definition from S&P 500 to S&P 1500. Our results remain qualitatively the same in these alternative specifications.

The regression analysis results on our entire sample is presented in Table 4. We also separately analyze our investment manager sub-sample and plan sponsor sub-sample, given that the roles played by these two groups of institutional investors in spin-offs may differ somewhat. To conserve space, the results on the subsample analysis are omitted in some tables, and are available upon request. Whenever there is some difference in the subsample analysis from the tabulated results based on the entire sample, we will discuss them as untabulated results.

According to H2, the institutional trading imbalance in the new parent-subsidiary pair will be greater as the difference in information asymmetry between the paired firms becomes greater. We test this hypothesis by examining the relationship between institutional trading imbalance and the difference in the extent of information asymmetry between the new parent and subsidiary pair. The rationale underlying the above hypothesis is that the incremental value of private information by institutions (and hence the incentive to produce information) regarding a division will be higher if the division is characterized by greater information asymmetry. Consistent with H2, the sign of the coefficients on the three information asymmetry variables consistently suggest that our sample institutions trade more in the equity of the post-spin-off firm characterized by higher information asymmetry. These results confirm that institutions have a greater informational advantage in trading in post-spin-off firms facing a greater extent of information asymmetry between firm insiders and uninformed outside (retail) investors.

For the risk measure, the coefficient on *DifBeta* is positive and statistically significant at the 1% level across regression specifications for the whole sample and for the investment manager sub-sample, and between the 5% to 10% significance level depending on specifications for the plan sponsor sub-sample. The coefficient on *DifIdiosynRisk* is negative and statistically significant at the 5% or 10% level in different specifications for the whole sample and for the investment manager sub-sample, but is not statistically different from zero for the plan sponsor sub-sample. Overall, the results suggest that sample institutions purchase more of the equity in the post-spin-off division with higher beta risk and lower idiosyncratic risk. These results also suggest that institutions prefer to allocate their investment across risk profiles which are different from those chosen by the pre-spin-off parent firm.

The evidence on "pure play" induced institutional trading preferences is weak. Neither the coefficient on the difference in sales growth or on the difference in market-to-book ratio is statistically significant. As for differences in profitability, the coefficient on the difference in return-on-assets is positive and statistically significant at the 5% or 10% level in different specifications for the whole sample and for the investment manager sub-sample, but is not statistically different from zero for the plan sponsor sub-sample. This indicates that sample institutions, particularly investment managers, buy more of the post-spin-off firm's shares with higher profitability. As for cash dividend characteristics and S&P index membership, institutions do not appear to have systematic trading preferences based on these two variables.

Overall, our results indicate that there is a significant imbalance in institutional trading between the new parent and subsidiary pair immediately following a spin-off. This imbalance can be at least partially explained by differences in information asymmetry, controlling for other factors such as preferences in systematic risk, idiosyncratic risk, and profitability between the new parent and subsidiary firm pairs.

6.2. Predictive power of institutional trading around corporate spin-offs

In this section, we further examine whether institutional investors possess private information about corporate spin-offs and trade accordingly, by studying the predictive power of institutional trading. We first examine the predictive power of institutional trading on the spin-off announcement effect (H3). We run different specifications of the following multivariate regression (spin-off i and institution j):

$$\begin{aligned} AnnCAR_i = {} & \alpha + \beta_1 Pre{-}Ann\,Netbuy_{i,j} + \beta_2 Pre{-}Ann\,Netbuy_{i,j} * UnbalSplit_i + \beta_3 Pre{-}Ann\,Netbuy_{i,j} * InstSize_j + \beta_4 AnnSize_i \\ & + \beta_5 AnnMKBK_i + \beta_6 AnnROA_i + \beta_7 |DifIndGrowth_i| + \beta_8 Hitek_i + \varepsilon_{i,j}, \end{aligned} \tag{5}$$

where the dependent variable $AnnCAR_i$ is the announcement period (covering day −1 to +1) cumulative abnormal return of the ith parent, in percentage units. The key independent variable of interest is *Pre-Ann Netbuy*$_{i,j}$, which is the total net buy of institution j on the ith spin-off parent during the two-month trading period ending (but not including) the day before the announcement (we exclude the day before the announcement since it is included in the announcement period which covers days −1 to +1).[21] According to H3, the coefficient β_1 is expected to be positive and significant, i.e., the greater the institutional net buy in the shares of a spin-off parent firm during the pre-announcement period, the higher the announcement abnormal returns. *UnbalSplit* is a dummy variable that equals one if the larger post-spin-off firm is more than twice the size of the smaller post-spin-off firm in terms of market capitalization (to capture whether the spin-off is "unbalanced"), and zero otherwise. The information production hypothesis predicts that institutional investors will have greater information advantage regarding unbalanced spin-offs (i.e., they engage in more information production about such spin-offs). To test this prediction, we include the *Pre-Ann Netbuy* interacted with *UnbalSplit* in some specifications. In other specifications, we also include *Pre-Ann Netbuy* interacted with the institutional size variable (*Pre-Ann Netbuy***IntSize*) to control for the institutional size effect on the magnitude of institutional net buy. Other firm characteristic variables, which have been shown to be related to spin-off announcement effects in the literature, are included as controls. All of the regression specifications include year dummies and are clustered on spin-offs.

[21] We have also extended the pre-announcement trading period to three months. The results are similar but weaker than the two-month trading period results we report here.

Table 4
Institutional trading imbalance of post-spin-off new parents versus subsidiaries: multivariate results. This table presents the OLS regression analysis of the institutional trading imbalance of the post-spin-off new parents and subsidiaries. The unit of observation is the spin-off/institution pair. The dependent variable is the difference in the net buy as a percentage of the post-spin firms' (new parent and subsidiary) total shares outstanding over the first three months immediately following the spin-off, i.e. Netbuy in New Parent–Netbuy in Subsidiary, winsorized at 1 and 99 percentile. DifROA is the difference in industry adjusted return-on-assets between the new parents and subsidiaries. DifMKBK is the difference in industry adjusted market-to-book ratio at the time of spin-off distribution between the new parents and subsidiaries. DiflndGrowth is the difference in the industry median sales growth rates between the new parents and subsidiaries. DifNumest, DifForerr, and DifStdev are the differences in the number of analysts following, in the analyst forecast error, and in the analyst forecast standard deviation, between the new parents and subsidiaries. DifBeta and DifldiosynRisk are the differences in beta risk and idiosyncratic risk (measured as the standard deviation of the return residuals) between the new parents and subsidiaries. DifDiv is the difference in regular cash dividend payout or not (a dummy variable that is equal to 1 if the equity pays regular cash dividends, and 0 otherwise) between the new parents and subsidiaries. DifSP500 is the difference in S&P 500 membership (equal to 1 if the equity belongs to the S&P 500 index, and 0 otherwise) between the new parents and subsidiaries. InstSize is the size of institution estimated from annual trading principal. PosImb and NegImb are dummy variables, equal to 1 if the trading imbalance (dependent variable) is positive or negative, respectively, and 0 otherwise. P-values are in parentheses. The p-values are based on White's robust standard errors, and cluster on spin-offs. Statistical significance is indicated by *** for 1% level, ** for 5% level, and * for 10% level.

Dependent Var: DifNetBuy										
DifBeta	0.0386***	0.0439***	0.0343***	0.0396***	0.0439***	0.0450***	0.0457***	0.0445***	0.0436***	0.0447***
	[0.001]	[0.000]	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
DifldiosynRisk	−0.8427	−0.9956	−0.4921	−0.5208	−1.1020*	−0.9127	−1.0227*	−1.1073*	−1.0311*	−1.1435*
	[0.191]	[0.104]	[0.481]	[0.438]	[0.070]	[0.133]	[0.075]	[0.053]	[0.089]	[0.053]
DifNumest	−0.0011**	−0.0008	−0.0013**	−0.0009*	−0.0006	−0.0005	−0.0006	−0.0007	−0.0006	−0.0007
	[0.043]	[0.197]	[0.013]	[0.093]	[0.261]	[0.349]	[0.292]	[0.228]	[0.248]	[0.233]
DifForerr		0.0145*		0.0105	0.0176**	0.0158**	0.0134*	0.0140**	0.0163**	0.0144**
		[0.053]		[0.120]	[0.014]	[0.044]	[0.060]	[0.045]	[0.031]	[0.044]
DifStdev			0.0278	0.0313						
			[0.456]	[0.362]						
DiflndGrowth					0.0575			0.0429	0.0565	0.0422
					[0.129]			[0.231]	[0.127]	[0.251]
DifMKBK						0.0012			0.0012	−0.0006
						[0.523]			[0.534]	[0.779]
DifROA							0.0470**	0.0439**		0.0475*
							[0.020]	[0.032]		[0.058]
DifDiv	0.0050	0.0027	0.0008	−0.0016	0.0025	0.0042	0.0096	0.0082	0.0028	0.0085
	[0.549]	[0.721]	[0.924]	[0.855]	[0.739]	[0.558]	[0.213]	[0.294]	[0.692]	[0.294]
DifSP500	0.0045	0.0037	0.0028	0.0042	0.0038	0.0042	0.0007	0.0003	0.0034	0.0002
	[0.562]	[0.626]	[0.733]	[0.605]	[0.616]	[0.585]	[0.937]	[0.974]	[0.652]	[0.982]
PosImb * InstSize	0.0046***	0.0048***	0.0049***	0.0049***	0.0048***	0.0048***	0.0048***	0.0048***	0.0048***	0.0048***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
NegImb * InstSize	−0.0037***	−0.0043***	−0.0037***	−0.0049***	−0.0044***	−0.0044***	−0.0044***	−0.0044***	−0.0044***	−0.0044***
	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	−0.0004	−0.0042	0.0072	0.0061	−0.0073	−0.0083	−0.0117	−0.0107	−0.0073	−0.0111
	[0.965]	[0.644]	[0.479]	[0.524]	[0.415]	[0.368]	[0.214]	[0.251]	[0.420]	[0.248]
Observations	1976	1880	1502	1496	1859	1859	1859	1859	1859	1859
R-squared	0.336	0.352	0.319	0.352	0.344	0.344	0.345	0.345	0.344	0.345

We report the regression results in Table 5 based on the whole sample, and on the investment manager and plan sponsor subsamples separately.

Regressions (1) and (5) in Table 5 show that institutional pre-announcement net buy is positively related to the announcement effect; the coefficient on the *Pre-Ann Netbuy* is statistically significant at the 1% level for the whole sample (regression 1) and for the investment manager sub-sample (regression 5). For the plan sponsor sub-sample (regression 9), the coefficient is negative, but not statistically significant. When we control for the institutional size effect, the coefficients on the *Pre-Ann Netbuy* remain qualitatively the same as without the control, as shown under regressions (2), (6), and (10) in Table 5. When we add the variable *Pre-Ann Netbuy * Unbalsplit* in the specifications, the coefficient on *Pre-Ann Netbuy * Unbalsplit* is statistically significant for the whole sample, and for the investment manager sub-sample, while the coefficient on *Pre-Ann Netbuy* alone is no longer statistically significant. This indicates that most of the predictive power of institutional trading on the spin-off announcement effect comes from unbalanced spin-offs, originated primarily by the investment managers. Overall, our findings presented in Table 5 suggest that trading by institutional investors has predictive power for the announcement effect of the spin-off, consistent with H3. This implies that institutional investors may learn about the impending restructuring announcement by the firm prior to the public announcement. Moreover, they can produce private information regarding the potential effect of the restructuring plan on equity value (as reflected in the announcement return) and trade accordingly to profit from the potential short-run appreciation in the firm's share price due to the spin-off announcement.

To test the predictive power of institutional trading on the long-run stock return performance of the subsidiary and the new parent (H4 and H5), we use the following regression framework (subsidiary i and institution j):

$$\begin{aligned} Abret_i = {} & \alpha + \beta_1 Pre{-}Ann\ Netbuy_{i,j} + \beta_2 Pre{-}Ann\ Netbuy_{i,j} * SmallSub_i + \beta_3 Post{-}Ann\ Netbuy_{i,j} \\ & + \beta_4 Post{-}Ann\ Netbuy_{i,j} * SmallSub_i + \beta_5 Post{-}SpinNetbuy_{i,j} + \beta_6 Post{-}SpinNetbuy_{i,j} * SmallSub_i \\ & + \beta_7 SubSize_i + \beta_8 SubKBK_i + \beta_9 SameInd2_i + \beta_{10} Pre{-}Spin{-}off\ ROA_i + \beta_{11} SubIndGrowth + \beta_{12} Sub\_tech_i + \varepsilon_{i,j}, \end{aligned} \tag{6}$$

Table 5
Institutional pre-announcement trading and the announcement effect of spin-offs. This table presents the OLS regression analysis of the relationship between institutional pre-announcement trading and the announcement effect of spin-offs. The unit of observation is parent/institution pair. The dependent variable is the announcement period (announcement day [−1,1]) abnormal return benchmarked by Fama–French 5 × 5 size and book-to-market portfolios, in percentage unit. Pre-Ann Netbuy is the institution's net purchase in shares (buy–sell) as a percentage of the total shares outstanding of the parent firms in the period starting two months before the spin-off announcement and ending two trading days before the spin-off announcement date, in percentage unit. Pre-Ann Netbuy * UnbalSplit equals Pre-Ann Netbuy if the split of the firm is unbalanced (i.e., UnbalSplit equals 1), which is defined as the market capitalization of the larger post-spin-off entity accounting for at least 67% of the total market capitalization of the pre-spin-off combined firm, and 0 otherwise. Pre-Ann Netbuy * IntSize equals Pre-Ann Netbuy times IntSize, where IntSize is the estimated size of the institution, measured in $Billion unit. Annsize is the size of the parent firm at the spin-off announcement, measured as the natural logarithm of the market capitalization (in $Million unit). AnnMKBK is the industry adjusted market-to-book ratio of the parent firm at the spin-off announcement, adjusted by subtracting the industry median market-to-book ratio. AnnROA is the industry adjusted return-on-assets of the parent firm measured at the end of the fiscal year immediately before the spin-off announcement, adjusted by subtracting the industry median return-on-assets, in percentage unit. |DifIndGrowth| is the difference in the industry median sales growth rates at the spin-off announcement between the two industries where the new parent and subsidiary belong to, in absolute value. The industry median values are all measured at the 3-digit SIC level, including all the firms covered by the COMPUSTAT database. Hitek is a dummy variable and equals 1 if the parent firm is in the hi-tech industry, and 0 otherwise. The definition of hi-tech industry is the same as in Loughran and Ritter (2004). Regression (1)–(4) are based on all the sample institutions that traded the spin-off firms. Regression (5)–(8) and regression (9)–(12) are restricted to the sub-samples of investment managers and plan sponsors, respectively. Year fixed effect is included in all the regressions. The sample firms consist of 45 spin-off firms which were traded by sample institutions during the period from three months before the spin-off announcement to six months post spin-off completion, had announced and completed a spin-off between March 1999 and December 2004, and had valid information from COMPUSTAT and CRSP to be matched to a Fama-French benchmark portfolio. P-values are in parentheses. The p-values are based on White's robust standard errors, clustering on pre-spin-off combined firms. Statistical significance is indicated by *** for 1% level, ** for 5% level, and * for 10% level.

	All institutions				Investment managers				Plan sponsors			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pre-Ann Netbuy	2.800***	3.452***	−2.118	−1.641	2.889***	4.404***	−1.653	−0.583	−2.128	−4.364	−7.113	−7.194
	[0.000]	[0.000]	[0.421]	[0.526]	[0.000]	[0.003]	[0.387]	[0.765]	[0.481]	[0.250]	[0.380]	[0.374]
Pre-Ann Netbuy * UnbalSplit			5.131*	5.614**			4.719**	5.431***			6.279	3.977
			[0.052]	[0.035]			[0.015]	[0.008]			[0.453]	[0.647]
Pre-Ann Netbuy * IntSize		−0.008		−0.011		−0.018		−0.02		0.022		0.019
		[0.469]		[0.382]		[0.320]		[0.315]		[0.103]		[0.181]
Annsize	0.741	0.741	0.742	0.741	0.178	0.167	0.182	0.17	0.823	0.824	0.823	0.824
	[0.434]	[0.434]	[0.433]	[0.434]	[0.850]	[0.859]	[0.845]	[0.855]	[0.394]	[0.393]	[0.393]	[0.393]
AnnMKBK	−0.43	−0.431	−0.428	−0.429	−0.107	−0.137	−0.112	−0.147	−0.457	−0.458	−0.454	−0.456
	[0.871]	[0.871]	[0.872]	[0.872]	[0.968]	[0.960]	[0.967]	[0.957]	[0.865]	[0.865]	[0.866]	[0.865]
AnnROA	−0.061	−0.06	−0.061	−0.06	0.004	0.007	0.004	0.008	−0.07	−0.071	−0.071	−0.071
	[0.766]	[0.767]	[0.765]	[0.766]	[0.983]	[0.969]	[0.982]	[0.967]	[0.735]	[0.734]	[0.734]	[0.734]
|DifIndGrowth|	30.882**	30.878**	30.924**	30.923**	33.709***	33.681***	33.943***	33.946***	30.467**	30.468**	30.479**	30.475**
	[0.012]	[0.012]	[0.012]	[0.012]	[0.008]	[0.008]	[0.008]	[0.007]	[0.013]	[0.013]	[0.013]	[0.013]
Hitek	10.941***	10.939***	10.956***	10.955***	11.485***	11.474***	11.544***	11.540***	10.816***	10.821***	10.824***	10.825***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]	[0.003]	[0.003]	[0.004]	[0.004]
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2549	2549	2549	2549	331	331	331	331	2218	2218	2218	2218
R-squared	0.376	0.377	0.377	0.377	0.4	0.402	0.402	0.405	0.375	0.375	0.375	0.375

where the independent variable is the subsidiary's abnormal stock return over the one-year, two-year, and three-year holding period, starting from the fourth month post-spin-off (these returns are measured for holding periods immediately after the trading periods when the institutional net buy is measured). These abnormal returns are measured as the subsidiary's raw buy-and-hold return minus the buy-and-hold return on the Fama–French 5 × 5 size and book-to-market matched portfolio during the same holding period.[22] Subsidiary firm characteristics such as size, market-to-book ratio, industry-level sales growth rate, and whether the subsidiary is in a high tech industry are also included as control variables. The pre-spin-off parent's profitability (*Pre-Spin-off ROA*) and whether the spin-off is a refocus attempt (*SameInd2*, a dummy variable that equals 1 if the subsidiary and new parent belong to the same 2-digit SIC industry, and 0 otherwise) also capture the underlying motivation of the spin-off to some extent and, hence, may indirectly relate to the post-spin-off performance of the two firms; therefore, we also include them as control variables. We examine the predictive power of institutional net buy during three non-overlapping trading periods around the spin-off—for the two months prior to spin-off announcement (*Pre-Ann Netbuy*), the period starting from the day before announcement to the day before spin-off distribution (*Post-Ann Netbuy*), and the three months following the spin-off distribution (*Post-Spin Netbuy*).[23] To test H5, which states that the smaller the subsidiary (or new parent) as a fraction of the combined firm, the greater the predictive power of institutional trading for its long-term stock return, we interact those institutional trading variables with the *SmallSub* dummy. The *SmallSub* variable equals 1 if the subsidiary's market capitalization is less than 25% of the combined firm's total market capitalization and 0 otherwise. The 25% cut-off point roughly corresponds to the median of a subsidiary firm's size in our sample as a fraction of the combined firm's size. We use similar regression specifications for the parents' long-term stock return analysis (with all *Sub-* variables being substituted by *Prt-* variables in Eq. (6)). However, we use a 0.5 cut-off point for the small new parent dummy (*SmallPrt*), instead of 0.25.[24]

Table 6 presents our multivariate analysis results on the predictive power of institutional trading on subsidiaries' long-term stock return performance. For the institutional net buy variables during the three different trading periods discussed earlier, only the coefficient on the post-spin-off net buy (*Post-Spin Netbuy*) is positive and statistically significant. When we interact those institutional net buy variables with the *SmallSub* dummy, the coefficient on *Post-Spin Netbuy * SmallSub* is positive and statistically significant at the 5%–10% level across specifications, while the coefficient on the *Post-Spin Netbuy* alone is no longer significant. This means that the predictive power of institutional trading in the three months post-spin-off is mostly confined to the group of relatively smaller subsidiaries. Overall, the above results are consistent with H4 and H5. That is, institutional trading in the equity of the subsidiary firm immediately post-spin-off has predictive power for the long-run stock return performance of the subsidiary (H4). Moreover, this predictive power is greater when the subsidiary constitutes only a small fraction of the pre-spin-off conglomerate firm, in which case there will be a greater increase in information production by institutional investors induced by the spin-off (H5). Among the control variables we use for explaining the subsidiary's long-term stock return performance, the refocusing dummy (*Sameind2*), and the combined firm's return-on-assets (*Pre-spin-off ROA*) are both positively related to the subsidiary's long-term stock return performance.

Table 7 presents our multivariable analysis on the predictive power of institutional trading on the parent firm's long-term stock return performance. For parents (recall that the new parent trades under the same equity as the parent), the predictive power of institutional trading on long-term stock return performance is weaker than that for subsidiaries. Further, the predictive power of institutional trading is only confined to spin-offs with smaller new parents i.e., when the market capitalization of the new parent is less than 50% of the parent firm. Thus, institutional trading in parents after the spin-off announcement but before the spin-off completion (*Post-Ann Netbuy * SmallPrt*) is positively related to the small new parents' abnormal long-term stock return (*see* column 4). Institutional trading in new parents after spin-off completion (*Post-Spin Netbuy * SmallPrt*) also has predictive power for the small new parents' subsequent abnormal long-term stock return (*see* column 6). While institutional trading in parents before the announcement (*Pre-Ann Netbuy * SmallPrt*) is positively related to the small new parent's long-term stock return performance, when combined with the institutional trading during both the post-announcement and the post-spin-off periods, the coefficient on the *Pre-Ann Netbuy * SmallPrt* is no longer significant for the one-year, two-year, and three-year new parents' post-spin-off abnormal long-term stock returns. This is caused by the collinearity between the *Pre-Ann Netbuy* and *Post-Spin Netbuy* within the small parents' subsample.[25] When we separately examine the investment manager and plan sponsor sub-samples, the predictive power of institutional trading for small new parents comes mostly from the investment manager sub-sample. The above results suggest that for spin-off firms that divest more than half of their equity value, there is significant information production from institutional investors regarding the future performance of the remaining business (the new parent). Further, institutional investors begin trading in the combined firm's equity using their acquired knowledge as soon as they produce the information. Finally, investment managers seem to have more private information regarding the further performance of post-spin-off firms than plan sponsors.

[22] In an earlier version, we also estimated the abnormal return using a market model. Our regression results using the abnormal returns estimated by the market model are quite similar.

[23] The three periods respectively correspond to the time that institutional investors learn about the possible spin-off (but not with certainty), the period that the spin-off is announced and detailed information about the divestiture is discussed by the firm (though the divisions are still traded under the same share of stock), and the period that institutions can start to trade in the individual firms' shares separately.

[24] We have to relax the definition of the new parent being small because in most cases in a spin-off, the new parents are larger than the subsidiaries. If we use the same cut-off point, of the 66 spin-offs in our sample (56 traded by sample institutions), only 5 new parents (4 traded by sample institutions) belong to the group with less than 25% of the size of their combined firms' market capitalization, which is too small a group for our empirical analysis.

[25] The pair-wise correlation between *Pre-Ann Netbuy* and *Post-Spin Netbuy* within the small parents sub-sample is 62.3% and statistically significant at 1%. The correlations between other institutional trading variables measured during the different trading periods are in general below 40%.

Table 6
Institutional trading and subsidiaries' subsequent long-term abnormal stock returns. This table presents the OLS regression analysis of the relationship between institutional trading and the subsidiaries' subsequent long-term abnormal stock returns. The unit of observation is subsidiary/institution pair. The dependent variable is the subsidiaries' long-term size and book-to-market benchmarked abnormal stock returns subsequent to the first three months post-spin-off distribution, in percentage unit. Netbuy is the institution's net purchase in shares (buy–sell) as a percentage of the total shares outstanding, in percentage unit. Pre-Ann Netbuy, Post-Ann Netbuy and Post-Spin Netbuy, respectively, denote the net buy during the two months before the spin-off announcement and ending two trading days before the announcement, during the one day before the spin-off announcement to the one day prior to the spin-off distribution, and during the first three months following the spin-off distribution. Netbuy * SmallSub equals the corresponding trading period Netbuy if the subsidiary is less than 25% of the total market capitalization of the pre-spin-off parent firm, and 0 otherwise. PostSpin Netbuy * IntSize equals PostSpin Netbuy times IntSize, where IntSize is the estimated size of the institution, measured in $Billion unit. Subsize is the size of subsidiary, measured as the natural logarithm of the market capitalization (in $Million unit). SubMKBK is the industry adjusted market-to-book ratio of the subsidiary, measured at the first fiscal year-end post-spin-off, adjusted by subtracting the industry median market-to-book ratio. Sameind2 equals 1 if the subsidiary belongs to the same 2-digit SIC industry as the new parent, and 0 otherwise. Pre-spin-off ROA is the industry adjusted return-on-assets of the pre-spin-off parent firm measured at the end of the fiscal year immediately before the spin-off, adjusted by subtracting the industry median return-on-assets, in percentage unit. SubIndGrowth is the subsidiary's industry median growth rate of sales. The industry median values are all measured at the 3-digit SIC level, including all firms covered by the COMPUSTAT database. Sub_tech is a dummy variable and equals 1 if the subsidiary is in the hi-tech industry, and 0 otherwise. The definition of hi-tech industry is the same as in Loughran and Ritter (2004). Prt Post-Spin Netbuy is the institution's net purchase in shares (buy–sell) as a percentage of the total shares outstanding of the corresponding new parent in the first three months post spin-off distribution, in percentage unit. Year fixed effect is included in all the regressions. The sample consisted of 41 spin-off subsidiaries which were traded by sample institutions during the first three months post-spin-off, in the period between January, 1999 and December, 2004, and which have data available on CRSP and COMPUSTAT immediately post-spin-off. P-values are in parentheses. The p-values are based on White's robust standard errors, clustering on spin-off firms. Statistical significance is indicated by *** for 1% level, ** for 5% level, and * for 10% level.

	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret2yr	Abret2yr	Abret3yr	Abret3yr
Post-Spin Netbuy					7.262**	−5.478	−8.475	−3.243	11.714**	−4.663	9.455**	−2.13
					[0.036]	[0.438]	[0.318]	[0.662]	[0.042]	[0.778]	[0.044]	[0.901]
Post-Spin Netbuy * SmallSub						15.160*	19.304**	15.796**		29.549**		25.373*
						[0.063]	[0.041]	[0.050]		[0.025]		[0.069]
Post-Spin Netbuy * IntSize								−0.028		−0.089		−0.1
								[0.503]		[0.498]		[0.423]
Pre-Ann Netbuy	−1.622	2.591					5.543					
	[0.741]	[0.746]					[0.604]					
Pre-Ann Netbuy * SmallSub		−8.893					4.12					
		[0.420]					[0.743]					
Post-Ann Netbuy			−10.798	−6.573			−8.625					
			[0.126]	[0.272]			[0.187]					
Post-Ann Netbuy * SmallSub				−13.298			−14.885					
				[0.372]			[0.317]					
Subsize	4.968	4.937	5.131	5.004	4.965	4.794	4.9	4.803	14.57	14.138	27.269	26.779
	[0.411]	[0.415]	[0.395]	[0.405]	[0.411]	[0.428]	[0.412]	[0.431]	[0.181]	[0.197]	[0.107]	[0.115]
SubMKBK	8.823	8.846	8.812	8.821	8.781	8.85	8.856	8.833	7.846	8.002	−4.718	−4.527
	[0.212]	[0.211]	[0.213]	[0.213]	[0.213]	[0.209]	[0.211]	[0.212]	[0.306]	[0.299]	[0.586]	[0.601]
Sameind2	54.284***	54.254***	54.363***	54.399***	54.146***	54.385***	54.533***	54.443***	54.060*	54.597*	67.763**	68.187**
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.004]	[0.004]	[0.083]	[0.080]	[0.044]	[0.043]
Pre-spin-off ROA	0.778*	0.779*	0.779*	0.781*	0.784*	0.795*	0.798*	0.794*	1.656**	1.678**	2.895***	2.911***
	[0.060]	[0.060]	[0.060]	[0.060]	[0.058]	[0.055]	[0.054]	[0.056]	[0.026]	[0.024]	[0.004]	[0.004]
SubIndGrowth	−25.016	−25.379	−26.397	−25.721	−27.411	−26.294	−26.303	−25.984	−140.33	−137.166	53.355	55.922
	[0.786]	[0.784]	[0.775]	[0.781]	[0.767]	[0.774]	[0.775]	[0.777]	[0.310]	[0.318]	[0.758]	[0.744]
Sub_tech	24.937	25.003	25.085	25.168	25.443	25.391	25.623	25.416	−23.297	−23.535	−13.679	−13.997
	[0.456]	[0.455]	[0.451]	[0.450]	[0.444]	[0.445]	[0.439]	[0.445]	[0.633]	[0.630]	[0.774]	[0.769]
Prt Post-Spin Netbuy								−1.622		2.257		4.078
								[0.804]		[0.793]		[0.568]
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1178	1178	1178	1178	1178	1178	1178	1178	1002	1002	900	900
R-squared	0.469	0.47	0.471	0.471	0.472	0.473	0.476	0.473	0.541	0.543	0.553	0.555

Overall, our results on the predictive power of institutional trading in spin-offs suggest that institutions possess significant private information regarding the short-run and long-run stock returns of firms undergoing spin-offs. Moreover, they exploit this information advantage by trading on their private information before that information is publicly realized. Our results show that, as postulated by the information production hypothesis, the increase in information production due to a spin-off is greatest when one of the two firms involved in the spin-off (new parent or subsidiary) is significantly smaller than the other.

6.3. Predictive power of post-spin-off institutional trading for the operating performance of the subsidiary

In Section 6.2, we showed that institutional trading has predictive power for the short-term and long-term stock returns in corporate spin-offs. The predictive power of institutional trading is especially strong for the post-spin-off long-term stock

Table 7
Institutional trading and parent long-term abnormal stock returns. This table presents the OLS regression analysis of the relationship between institutional trading and the spin-off parents' abnormal stock returns (Note: the parent and new parent is traded under the same stock). The unit of observation is parent/institution pair. The dependent variable is the parent's long-term size and book-to-market benchmarked abnormal stock returns subsequent to the first three months post-spin-off distribution, in percentage unit. Netbuy is the institution's net purchase in shares (buy–sell) as a percentage of the total shares outstanding, in percentage unit. Pre-Ann Netbuy, Post-Ann Netbuy and Post-Spin Netbuy, respectively, denote the net buy during the two months before the spin-off announcement and ending two trading days before the announcement, during the one day before the spin-off announcement to the one day prior to the spin-off distribution, and during the first three months following the spin-off distribution. Netbuy * SmallPrt equals the corresponding trading period Netbuy if the new parent is less than 50% of the total market capitalization of the pre-spin-off combined firm, and 0 otherwise. Post-Spin Netbuy * IntSize equals Post-Spin Netbuy times IntSize, where IntSize is the estimated size of the institution, measured in $Billion unit. Prtsize is the size of new parent, measured as the natural logarithm of the market capitalization (in $Million unit). PrtMKBK is the industry adjusted market-to-book ratio of the new parent, measured at the first fiscal year-end post-spin-off, adjusted by subtracting the industry median market-to-book ratio. Sameind2 equals 1 if the subsidiary belongs to the same 2-digit SIC industry as the new parent firm, and 0 otherwise. Pre-spin-off ROA is the industry adjusted return-on-assets of the pre- spin-off combined firm measured at the end of the fiscal year immediately before the spin-off, adjusted by subtracting the industry median return-on-asset, in percentage unit. PrtIndGrowth is the new parent's industry median growth rate of sales. The industry median values are all measured at the 3-digit SIC level, including all firms covered by the COMPUSTAT database. Prt_tech is a dummy variable and equals 1 if the new parent is in the hi-tech industry, and 0 otherwise. The definition of hi-tech industry is the same as in Loughran and Ritter (2004). Sub Post-Spin Netbuy is the institution's net purchase in shares (buy–sell) as a percentage of the total shares outstanding of the corresponding subsidiary in the first three months post-spin-off distribution, in percentage unit. Year fixed effect is included in all the regressions. The sample firms consisted of 41 spin-off parents (and the corresponding new parent post-spin-off) which were traded by sample institutions during the first three months post-spin-off, in the period between January, 1999 and December, 2004, and which have data available on CRSP and COMPUSTAT immediately post-spin-off. P-values are in parentheses. The p-values are based on White's robust standard errors, clustering on spin-off firms. Statistical significance is indicated by *** for 1% level, ** for 5% level, and * for 10% level.

	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret1yr	Abret2yr	Abret2yr	Abret2yr	Abret3yr	Abret3yr
Pre-Ann Netbuy	3.333	−1.043					−1.197			−1.69		−11.528
	[0.466]	[0.802]					[0.770]			[0.686]		[0.193]
Pre-Ann Netbuy * - SmallPrt		28.594**					25.524			−8.412		−23.373
		[0.020]					[0.239]			[0.790]		[0.469]
Post-Ann Netbuy			1.756	−0.321			−0.331		−2.366	−2.592	−1.215	−0.687
			[0.601]	[0.935]			[0.933]		[0.465]	[0.429]	[0.736]	[0.843]
Post-Ann Netbuy * - SmallPrt				6.993*			7.335*		16.326***	16.313***	14.137**	13.013**
				[0.098]			[0.075]		[0.002]	[0.001]	[0.043]	[0.041]
Post-Spin Netbuy					−2.223	−3.323	−3.305	−2.924		−2.981		1.012
					[0.559]	[0.383]	[0.381]	[0.454]		[0.441]		[0.820]
Post-Spin Netbuy * - SmallPrt						35.407**	12.64	98.043**		107.675**		130.033**
						[0.017]	[0.711]	[0.035]		[0.048]		[0.011]
Prtsize	0.993	0.95	0.977	0.98	0.99	1.018	0.949	11.366	11.208	11.377	14.195	14.427
	[0.894]	[0.898]	[0.896]	[0.895]	[0.894]	[0.891]	[0.899]	[0.223]	[0.237]	[0.224]	[0.155]	[0.144]
PrtMKBK	8.804	8.808	8.833	8.814	8.866	8.874	8.831	12.230*	12.159*	12.210*	14.499**	14.576**
	[0.139]	[0.139]	[0.138]	[0.139]	[0.138]	[0.137]	[0.139]	[0.059]	[0.060]	[0.059]	[0.024]	[0.023]
Sameind2	5.227	5.282	5.275	5.344	5.29	5.341	5.392	−3.699	−3.764	−3.506	−22.625	−22.074
	[0.709]	[0.706]	[0.706]	[0.703]	[0.706]	[0.703]	[0.700]	[0.860]	[0.859]	[0.868]	[0.463]	[0.470]
Pre-spin-off ROA	−0.85	−0.846	−0.849	−0.849	−0.85	−0.853	−0.848	−2.303**	−2.290**	−2.306**	−3.530***	−3.538***
	[0.200]	[0.202]	[0.201]	[0.201]	[0.200]	[0.198]	[0.202]	[0.015]	[0.016]	[0.015]	[0.009]	[0.009]
PrtIndGrowth	117.774	116.441	117.306	116.651	117.633	117.319	116.034	252.795**	252.013**	251.007**	412.463*	408.805*
	[0.136]	[0.140]	[0.137]	[0.139]	[0.136]	[0.136]	[0.142]	[0.020]	[0.021]	[0.021]	[0.054]	[0.055]
Prt_tech	20.694	20.59	20.678	20.605	20.722	20.497	20.477	21.271	21.848	21.031	31.139	29.849
	[0.427]	[0.429]	[0.428]	[0.429]	[0.427]	[0.432]	[0.434]	[0.493]	[0.488]	[0.498]	[0.391]	[0.402]
Sub Post-Spin Netbuy	−1.492	−2.514	−1.582	−1.607	−1.527	−2.13	−2.491	−0.831	1.042	−0.895	2.717	0.371
	[0.590]	[0.418]	[0.551]	[0.551]	[0.579]	[0.471]	[0.421]	[0.806]	[0.690]	[0.793]	[0.293]	[0.913]
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2600	2600	2600	2600	2600	2600	2600	2138	2138	2138	1775	1775
R-squared	0.1	0.101	0.1	0.1	0.1	0.1	0.101	0.267	0.263	0.269	0.311	0.319

performance of subsidiaries, in particular, where the subsidiary is relatively small in size compared to the parent. In this section, we further examine whether trading by institutional investors also predicts the operating performance of subsidiaries following the spin-off.

In accordance with Desai and Jain (1999) and Daley et al. (1997), we use the ratio of operating cash flows to total assets as the measure of operating performance (ROA). For each subsidiary, we examine the raw operating performance, as well as the industry-adjusted operating performance for the three years following spin-off completion. The industry adjusted ROA is defined as the difference between the firm's ROA and the median ROA of COMPUSTAT firms in the same three-digit SIC code industry in the same year. We compare the operating performance of subsidiaries that experienced an aggregated net buying from our sample institutional investors in the first three months immediately following spin-off completion to the operating performance of subsidiaries that experienced an aggregated net selling from our sample institutional investors. Similarly, as in Section 6.2, we

further make this comparison with the sub-sample of subsidiaries that are less than 25% in size of pre-spin-off parent firms. Figs. 3 and 4 show a similar pattern as in Fig. 2 where we examine the post-spin-off long-term stock return performance and institutional trading. For the three years following spin-off, the subsidiaries that experience aggregate net buying from institutional investors during the immediate three months following spin-off completion on average have better operating performance, raw or industry adjusted, than those that experienced aggregate net selling by institutions. Within the small subsidiary sub-sample, the difference in operating performance between the two groups is even more dramatic.

Table 8 reports the average ROA and industry adjusted ROA for the groups of subsidiaries as shown in Figs. 3 and 4. For each ROA measure and each group, we also report the test statistic for the mean of operating performance being different from zero. We can see from Table 8 that, for the subsidiaries that experienced aggregate net buying from institutional investors during the immediate three months following spin-off completion, their operating performance in the three years post-spin-off is significantly higher than zero, even after adjusting for the median level of industry operating performance. While the industry adjusted operating performance for the subsidiaries that experienced net selling by institutions not only is lower than the previous group, but also is not statistically significantly different from zero. The above results on institutional trading and subsidiaries' post-spin-off operating performance suggest that at least some of the institutional investors' information advantage is derived from their ability to predict potential superior operating performance in post-spin-off firms.

6.4. Profitability of post-spin-off institutional trading and the pattern of institutional share allocation sales

The results presented in Sections 6.2 and 6.3 suggest that institutional investors have considerable private information about firms undergoing spin-offs. In particular, institutional investors' trading in the equity of the subsidiary after the spin-off has predictive power in the subsidiary firm's subsequent long-run stock return performance and operating performance. In this section, we further examine whether institutional investors are able to realize superior profits by trading in the equity of the subsidiaries using their private information. As discussed in Section 5, since the nature and information structure reflected in institutional secondary market trading and spin-off share allocation sales are quite different, we analyze the profitability of these two types of trades separately.

6.4.1. Profitability of post-spin-off institutional trading in subsidiary shares

Post-spin-off institutional secondary market buying and selling captures the voluntary trading action of sample institutions, and captures the institutional investors' private information more systematically than spin-off share allocation sales. Table 9 presents post-spin-off institutional secondary market trading profitability in each quarter during the one year following a spin-off distribution. The raw institutional trading return (*TrdRet*) reported in Table 9 is defined as the total raw profit earned by institutions during the reported trading quarter divided by the total raw principal invested, using actual transaction prices net of commissions, with the net position marked to market at the beginning and end of each post-spin-off quarter. The quarterly buy-and-hold returns of these subsidiaries are also reported as a benchmark for comparison. Benchmark-adjusted returns are calculated by discounting all cash flows to their dollar equivalent on the first day post-spin-off (the effective distribution date) using the size and book-to-market matched Fama–French benchmark portfolio return during the corresponding trading period. All return measures reported in Table 9 are annualized.

Table 8
Institutional trading and subsidiaries' operating performance post-spin-off. This table reports subsidiary operating performances during the three year post-spin-off for the sample of subsidiaries that experienced net buying and net selling from our sample institutions, respectively. The institutional trading is the total net buying (buys minus sells) by institutions during the first three months immediately after spin-off completion. A positive net buying from institutions is categorized as net buy, and a negative net buying from institutions is categorized as net sell. The operating performance (ROA) is the ratio of operating cash flows to total assets. The industry adjusted ROA is the difference between the firm's ROA and the median ROA of COMPUSTAT firms in the same 3-digit SIC code industry in the same year. Panel A is based on all sample subsidiaries that are covered in COMPUSTAT and either have a net buying or net selling from sample institutions. Panel B further restricts that the subsidiary is relatively small to the pre-spin-off parent firm, i.e., the size of the subsidiary is less than 25% of the size of the pre-spin-off parent firm. *P*-value for the t-test that the sample mean is equal to zero is reported in parentheses. Statistical significance is indicated by *** for 1% level, ** for 5% level, and * for 10% level.

Year post-spin-off	Institutional Trading	Number of obs.	ROA		Industry Adjusted ROA	
			Mean	T-test of mean = 0 (*p*-value)	Mean	T-test of mean = 0 (*p*-value)
Panel A: All spun-off subsidiaries						
+1	Net buy	19	0.1620***	(0.0002)	0.0803*	(0.0692)
+2	Net buy	19	0.1612***	(0.0001)	0.0783*	(0.0543)
+3	Net buy	17	0.1473***	(0.0001)	0.0593*	(0.0651)
+1	Net sell	23	0.0899**	(0.0253)	0.0531	(0.2021)
+2	Net sell	23	0.0923***	(0.0049)	0.0576	(0.1000)
+3	Net sell	19	0.0788	(0.3434)	0.0432	(0.5771)
Panel B: Small spun-off subsidiaries						
+1	Net buy	11	0.2166***	(0.0019)	0.1398*	(0.0535)
+2	Net buy	11	0.2164***	(0.0012)	0.1325*	(0.0539)
+3	Net buy	11	0.1764***	(0.0006)	0.0866*	(0.0715)
+1	Net sell	13	0.0844	(0.1548)	0.0605	(0.3771)
+2	Net sell	13	0.0797	(0.1169)	0.0617	(0.2793)
+3	Net sell	13	0.0062	(0.9562)	−0.0067	(0.9502)

Table 9
Profitability of post-spin-off institutional trading in the subsidiaries. This table presents the univariate results of the profitability of institutional secondary market trading in the subsidiaries over the one-year period (split by four quarters) post-spin-off. The unit of observation is the subsidiary/institution pair. The sample includes 57 subsidiaries which were distributed during the period from January, 1999 to December, 2003, were present in COMPUSTAT and CRSP immediately following spin-off distribution, and have valid information to be matched to a Fama–French 5 × 5 benchmark portfolio. Institutional trading profitability (return) is reported based on the post-spin-off secondary market trading, excluding allocation sales. All return measures for the post-spin-off quarters are annualized, and reported in means. For annualized raw return measures, TrdRet is the total raw profit earned by institutions using actual transaction prices net of commissions, with the net position marked to market at the beginning and end of the post-spin-off quarters divided by the total raw principal invested for the post-spin-off trading times the investment duration. B&HRet is the buy and hold raw returns of all the 57 spin-off subsidiaries in the post-spin-off quarters, value-weighted by market capitalization. Difference is the difference in means between the institutional trading return (TrdRet) and the buy & hold return (B&HRet) of subsidiaries. The p-value for testing whether the difference in means is different from zero is in parentheses. All return measures in the Annualized Benchmark-Adjusted Return section (right four columns) are adjusted by discounting the raw cash flows used in the raw return measures back to the spin-off distribution day using the size and book-to-market matched Fama–French benchmark portfolio returns during the corresponding trading period. Statistical significance is indicated by *** for 1% level, ** for 5% level, and * for 10% level.

Post-spinoff	Annualized raw return				Annualized benchmark-adjusted return			
Quarter	TrdRet	B&HRet	Difference	P-value	TrdRet	B&HRet	Difference	P-value
Panel A: All Institutions								
1	0.472	−0.006	0.477**	(0.021)	0.438	0.032	0.407**	(0.029)
2	0.304	0.318	−0.014	(0.921)	0.230	0.253	−0.023	(0.895)
3	0.344	0.206	0.138	(0.319)	0.239	0.264	−0.025	(0.837)
4	−0.187	0.133	−0.320**	(0.032)	−0.015	0.349	−0.363***	(0.009)
Panel B: Investment managers								
1	0.464	−0.006	0.469**	(0.034)	0.420	0.032	0.388*	(0.053)
2	0.274	0.318	−0.044	(0.789)	0.239	0.253	−0.013	(0.943)
3	0.351	0.206	0.146	(0.323)	0.227	0.264	−0.037	(0.768)
4	−0.176	0.133	−0.309**	(0.042)	0.012	0.349	−0.337**	(0.019)
Panel C: Plan sponsors								
1	0.512	−0.006	0.518**	(0.015)	0.531	0.032	0.500***	(0.010)
2	0.419	0.318	0.101	(0.511)	0.194	0.253	−0.058	(0.742)
3	0.308	0.206	0.102	(0.469)	0.298	0.264	0.034	(0.778)
4	−0.224	0.133	−0.357**	(0.018)	−0.107	0.349	−0.455***	(0.001)

First, post-spin-off institutional secondary market trading in the equity of subsidiaries out-performs a naïve buy-and-hold strategy in the first quarter post-spin-off. Both in raw and market-adjusted return terms, the difference between institutional trading returns and the subsidiary buy-and-hold returns in the first quarter post-spin-off is positive and statistically significant at the 5% level as reported in Table 9. This is also true for the investment manager and plan sponsor sub-samples. The magnitude of the institutional trading return in the first quarter by itself is also economically significant (around 45% in annualized terms, raw or benchmark-adjusted, which translates to roughly 11% appreciation in the money invested in the first quarter). This suggests that institutional investors can profit substantially from trading in the equity of the subsidiary immediately post-spin-off using their private information. Further, institutional investors' secondary market trading profit in subsidiaries declines over time. While sample institutional investors still realize positive returns in their secondary market trading in subsidiaries during the second and third quarter post-spin-off, they do not statistically out-perform a naïve buy-and-hold strategy during these periods. The above return patterns suggest that institutional investors' private information regarding spun-off subsidiaries is gradually incorporated into these firms' share price, and their informational advantage while trading in the equity of these subsidiaries declines over time.

6.4.2. Pattern and profitability of institutional subsidiary share allocation sales

We begin with documenting the pattern of institutional share allocation sales over time, and briefly discuss the profitability of these institutional share allocation sales. On eight occasions in our sample, the share allocation sales were originated from block owners (institutions that obtained more than 5% ownership in the shares of the subsidiaries through the spin-off). Since equity sales from block-owners are more likely to be motivated by control issues rather than private information regarding share value, we report the pattern and profitability of share allocation sales both for the whole sample and for the sample excluding block owners. We will focus our discussion below on the share allocation sales results based on the analysis excluding block owners.

Table 10 displays the pattern of institutional subsidiary share allocation sales over the one year period following spin-off completion. We report the percentage of the first year share allocation sales in each of the four quarters following a spin-off, both on an equal-weighted basis (where each institution/subsidiary pair is weighted equally), and on a value-weighted basis (where the weight is the dollar value of the allocated shares, valued at the market close on the effective distribution date of each spin-off). On an equal-weighted basis, of the total allocation sales of subsidiary shares by institutional investors in the first year post-spin-off, over 70% occurs within the first quarter after the spin-off. The sales pattern on the value-weighted basis for the non-block-owner sample is similar to that on an equal-weighted basis.[26]

[26] Since on an equal-weighted basis, a block-owner in a subsidiary gets the same weight as a small shareholder, the allocation sales result on the equal-weighted basis is almost the same with or without the presence of the eight block-owner cases. Hence, we only report the allocation sales pattern on an equal-weighted basis for the whole sample in Table 10.

Table 10
Patterns of institutional share allocation sales of subsidiaries. This table presents results on institutional share allocation sales of the subsidiaries. Sales of subsidiary share allocations are tracked for each institution/subsidiary pair for one year (252 trading days) following the spin-off distribution. QtrSale is the percentage sale of the first-year allocation sales in the corresponding quarters post-spin-off. TotSale is the cumulative sale of the allocations from the day of spin-off distribution until the end of the quarters post-spin-off. Both equal weighted (EW) and dollar value weighted (VW) means of the allocation sales are reported in the table. The VW exclu. 5% Blockowner column reports the dollar value weighted allocation sales of institution/subsidiary pairs excluding block-owners whose first-year cumulative share allocation sales exceed 5% of the subsidiary's total shares outstanding. Panel A reports the results for the full sample of the institution/subsidiary pairs. Panel B and Panel C report the results for the sub-samples of investment managers and plan sponsors, respectively.

Post-spinoff	EW		VW		VW exclu. 5% blockowner	
Quarter	QtrSale (%)	TotSale (%)	QtrSale (%)	TotSale(%)	QtrSale (%)	TotSale(%)
Panel A: All Institutions						
1	70.50%	70.50%	37.52%	37.52%	65.32%	65.32%
2	12.54%	83.04%	10.59%	48.11%	20.62%	85.94%
3	11.19%	94.24%	33.92%	82.03%	10.51%	96.44%
4	5.76%	100.00%	17.97%	100.00%	3.56%	100.00%
Panel B: Investment managers						
1	72.05%	72.05%	33.64%	33.64%	68.80%	68.80%
2	11.74%	83.79%	9.38%	43.02%	22.36%	91.15%
3	9.05%	92.84%	37.26%	80.29%	7.77%	98.92%
4	7.16%	100.00%	19.71%	100.00%	1.08%	100.00%
Panel C: Plan sponsors						
1	70.26%	70.26%	58.04%	58.04%	58.04%	58.04%
2	12.66%	82.93%	16.99%	75.03%	16.99%	75.03%
3	11.53%	94.45%	16.23%	91.26%	16.23%	91.26%
4	5.55%	100.00%	8.74%	100.00%	8.74%	100.00%

We track the trading profitability of these institutional share allocation sales during the first year post-spin-off using the subsidiary's first trading day closing price as the investment cost. In untabulated results, of the allocation sales from non-block-owners, the shares sold early are not profitable, while the sales in the last quarter bring fairly high positive returns, especially for the investment manager subsample. Overall, our share allocation sales results suggest that institutional investors sell off subsidiary shares allocated to them in a spin-off soon after the distribution when they do not have favorable private information about the subsidiary's shares. On the other hand, they hold shares of subsidiary firms in which they have favorable private information for a longer investment horizon, making a significant profit from these shares.

7. Conclusion

Using a large sample of proprietary transaction-level institutional trading data, we empirically analyze, for the first time in the literature, the role of institutional investors as producers of information about firms undergoing corporate spin-offs. We find a significant imbalance in post-spin-off institutional trading between new parent firms and their subsidiaries, and identify the determinants leading to this imbalance in institutional trading in these post-spin-off firm pairs. Our findings suggest that spin-offs increase institutional investors' trading welfare by relaxing a trading constraint that existed prior to the spin-off. We also find that institutional trading around spin-offs has significant predictive power for the announcement effect of a spin-off, and for post-spin-off long-term stock returns. Moreover, institutional investors are able to realize abnormal profits by trading in the equity of the subsidiary in the first quarter after spin-off completion. The last two sets of findings suggest that institutional investors engage in information production about firms undergoing corporate spin-offs and possess private information about these firms. This information advantage is shown to be greatest immediately after spin-off completion, with the private information of institutional investors gradually getting incorporated into the post-spin-off firms' equity prices over time. Overall, our results are consistent with spin-offs enhancing the extent of information production by institutional investors about various divisions of pre-spin-off firms, and a significant proportion of the value gains from spin-offs accruing to institutional investors as a reward for this enhanced information production.

It should be noted that the focus of this study is primarily on the information production role of institutions around corporate spin-offs. Aside from the information production role explored in this paper, institutions may carry out other functions as well, such as the monitoring and/or activist role as discussed in Gillan and Starks (1998, 2003). However, we do not study this monitoring role of institutions in this paper, given that our data consists mostly of institutions that are unlikely to play such a role (so that our data is not suitable to analyze this role). We leave it to future researchers to study the monitoring role of institutions in corporate spin-offs.

Appendix A. Algorithm for identifying spin-off share allocation sales

For each subsidiary/institution pair, we implement the following algorithm recursively every day starting from the subsidiary stock's first trading day ($t = 1$) to trading day 252 ($t = 252$). It is important to note that the algorithm needs to be implemented recursively because the inferences are "path dependent." For example, if an institution sells 100 shares of a subsidiary on the first day and then buys 500 shares of the same subsidiary on the second day, the 100 shares sold on the first day is classified as share

allocation sales. However, if the order of these two trades is revered (i.e., the institution buys 500 shares on the first day and then sells 100 shares on the second day), the 100 shares sold is not classified as allocation sales (in this case, both trades are classified as post-spin-off trading). For each subsidiary/institution pair, we calculate the number of shares bought on day t, $N_B(t) = \sum_{j=1}^{B_t} N_B(j)$ where B_t is the number of buy trades in the subsidiary for the institution on day t, and $N_B(j)$ is the number of shares bought in the jth trade. Similarly, the number of shares sold on day t is $N_S(t) = \sum_{j=1}^{S_t} N_S(j)$. The change in subsidiary position on day t is the institution's net daily trading:

$$\Delta\mathrm{POS}(t) = N_B(t) - N_S(t). \tag{A.1}$$

Unfortunately, we cannot calculate the total subsidiary position, because we do not have direct share allocation data from the spin-offs. We can, however, calculate the cumulative institutional position in the subsidiary from post-spin-off trading:

$$POS_{POSTSPINOFF}(t) = POS_{POSTSPINOFF}(t-1) + \Delta\mathrm{POS}_{POSTSPINOFF}(t), \tag{A.2}$$

where

$$POS_{POSTSPINOFF}(0) = 0,$$

and

$$\Delta\mathrm{POS}_{POSTSPINOFF}(t) = \max(\Delta\mathrm{POS}(t), -POS_{POSTSPINOFF}(t-1)).$$

The subsidiary share allocation shares sold on day t is:

$$N_S^{ALLO}(t) = -\min(0, POS_{POSTSPINOFF}(t-1) + \Delta\mathrm{POS}(t)). \tag{A.3}$$

And shares bought and sold in "pure" post-spin-off trading, excluding share allocation sales, are:

$$\begin{aligned} N_B^{POSTSPINOFF}(t) &= N_B(t) \\ N_S^{POSTSPINOFF}(t) &= N_S(t) - N_S^{ALLO}(t) \ . \end{aligned} \tag{A.4}$$

The above algorithm implies that shares purchased in the secondary market are used to offset shares sold first, and are not considered subsidiary share allocation sales. In other words, only those shares sold over and above what the institution bought in the secondary market are counted as share allocation sales. This is consistent with the rules used by the Depository Trust Company's (DTC) IPO Tracking System (Aggarwal, 2003). By identifying subsidiary share allocation sales, we effectively separate institutional trading in the shares of subsidiaries into two categories: share allocation sales and post-spin-off trading. We then proceed to analyze them separately.

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