

Parent and Subsidiary Earnings Announcements and Parent and Subsidiary Valuation

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Abstract—A firm's earnings announcements are an important source of value relevant information to market participants. They are, however, only one such source of information. The study reported in this paper involves another source of information: the earnings announcements within pairs of parents and their majority-held subsidiaries. We examine both firms' security price reactions to both firms' earnings announcements for evidence of information flows within the pairs of firms. We find significant parent and subsidiary price reactions at their own earnings announcements only when the announcement is the first within a parent-subsidiary pair. The implication is that the first earnings announcement pre-empts some of the information released by the later announcing firm. In addition, parent firms also exhibit significant price reactions to subsidiary earnings announcements when subsidiaries announce earnings first. The magnitude of the parent price reactions suggests that incremental information is conveyed in the subsidiary earnings announcement regarding the earnings of the parents' non-subsidiary assets. The implication of this information transfer is that subsidiary earnings are particularly valuation-relevant to parent firm shareholders.

1. Introduction

This study is concerned with the information content of parent and subsidiary earnings announcements. Our first focus is on the contribution of parent and subsidiary earnings announcements to each firm's information environment. Research related to information environment suggests that the greater the information available about a firm, the smaller the price reaction at its earnings announcements. Shores (1990) and Grant (1980) show firms traded over-the-counter have larger price reactions to earnings releases than do firms listed on the New York Stock Exchange (NYSE).

In addition, Bamber (1987), Freeman (1987), and Atiase (1985) show firm size is inversely related to the unanticipated information released in earnings announcements. The implication is that more information about NYSE and larger-sized firms reaches market participants prior to their earnings releases.

Although information environment studies find significant relations between price reactions to earnings releases and variables expected to proxy for prior information releases, the studies do not

examine specific prior information releases. The earnings of parents and their subsidiaries allow such an investigation because parent earnings are the sum of the earnings from its consolidated assets, of which subsidiary assets form a part. Subsidiary earnings announcements, therefore, convey some of the same information conveyed in parent earnings announcements. Similarly, parent earnings announcements convey some of the same information conveyed in subsidiary earnings announcements.

The information environment of subsidiary firms, therefore, includes the information releases of their parents. The direct relation between parent and subsidiary earnings suggests that each firm's earnings announcement is a particularly relevant source of information about the other firm's earnings.

Our second focus is on the incremental contribution of subsidiary earnings to parent valuation. Specifically, we examine whether subsidiary earnings convey information about the parent firms' non-subsidiary earnings, an issue that extends studies of information transfers (Freeman and Tse, 1992; Clinch and Sinclair, 1987; and Foster, 1981). Information transfers assume that earnings within industries are correlated. Thus, market participants can infer implications for earnings of other firms when one firm in an industry announces earnings. Information transfers will occur within a parent-subsidiary pair when a subsidiary announces earnings and market participants infer implications for earnings of the parent's non-subsidiary assets.

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Of course, this will occur if market participants can model the contribution of subsidiary earnings to the earnings of the portfolio of parent assets. For example, if subsidiary assets are similar in use to other parent assets, which is likely given that subsidiaries are acquired as part of an overall business strategy, subsidiary earnings could provide a reliable signal of the earnings from those other assets.¹

The parent-subsidiary pair provides a unique setting to investigate information transfers because a parent's market value is the sum of the market values of its assets, including the market value of its proportionate ownership in its subsidiary. *Ceteris paribus*, the change in parent value from subsidiary earnings, in the absence of an information transfer, will be equal to the change in subsidiary value from the release of subsidiary earnings times the parent's ownership share. An information transfer, on the other hand, suggests that the change in parent value from the release of subsidiary earnings will not equal the parent's portion of the change in subsidiary value because of the information conveyed to parent shareholders regarding the parent's non-subsidiary earnings. In this study, therefore, we are able to examine information content and information transfers within the economic entity of a parent-subsidiary pair.²

The next section develops the hypotheses addressed in the paper. Section 3 describes the sample selection criteria, the variables used in the study, and the regression models. Results are presented in Section 4 and the last section provides a summary and a discussion of the results.

2. Hypotheses

2.1. The information content hypotheses

Earnings changes, on average, are associated with price changes (Beaver, Clarke and Wright, 1979). Because parent earnings are the sum of the earnings from its consolidated assets, of which subsidiary assets are a portion, subsidiary earnings announcements convey some of the same information conveyed in parent earnings announcements. As both parent and subsidiary earnings provide information relevant to parent valuation, we expect that both parent earnings changes and subsidiary earnings changes result in parent price changes.

¹ Information transfers could also occur when parents own diversified assets. All that is required is that market participants can model the contribution of subsidiary earnings to the earnings of the parent's portfolio of assets.

² Although the two firms are separate legal entities, the parent-subsidiary relationship is an economic entity because the parent's majority ownership gives it control over the operating, financing and investing policies of its subsidiary.

We also expect that subsidiary earnings announcements provide information relevant to subsidiary valuation. The relation between parent earnings announcements and subsidiary valuation, however, will depend on the ability of market participants to disaggregate parent earnings. If market participants can disaggregate parent earnings and infer subsidiary information, then parent earnings will have valuation relevance for the remaining subsidiary shareholders. As both subsidiary and parent earnings can provide information relevant to subsidiary valuation, we expect that both subsidiary earnings changes and parent earnings changes result in subsidiary price changes.

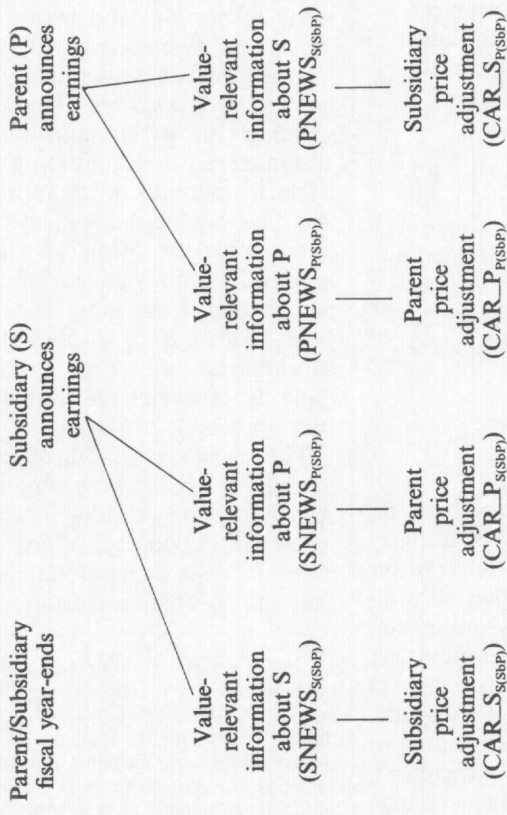
When parent and subsidiary earnings are released on different dates, however, the earnings announcements of the first announcing firm will affect the unanticipated information released in the second earnings announcement. Market participants will update their valuations of a parent firm when their subsidiary releases earnings prior to the parent's earnings announcement. The parent's earnings, therefore, which have value relevance to both the parent and the subsidiary shareholders, will be more informative than they otherwise would be if the parent's earnings had been released second. Similarly, market participants will update their valuation of a subsidiary when its parent releases earnings prior to the subsidiary's earnings announcement. Panels A and B of Figure 1 illustrate the two possible orders of earnings announcements within a parent-subsidiary pair. Panel A illustrates when a subsidiary announces earnings before its parent and Panel B illustrates when a parent announces earnings before its subsidiary.

The two types of earnings announcers (parent and subsidiary) and the two possible orders of announcement (parent first and subsidiary first) result in eight possible information flows. To keep track of the logic of our hypotheses when our regression variables are explained later in the paper, Figure 1 also includes our variable nomenclature. We denote the earnings information released by each firm as NEWS, with labels for both the source and the target of the earnings information. The source of the earnings is the announcing firm, either the parent (P) or the subsidiary (S). Thus, PNEWS represents the information released in parent earnings announcements and SNEWS represents the information released in subsidiary earnings announcements.

The target is the firm whose value will be updated by the information released in the earnings announcement. We designate targets with either subscript P (signifying that the information released is relevant to parent valuation) or subscript S (signifying that the information released is relevant to subsidiary valuation). PNEWS_p and SNEWS_p, therefore, represent parent and subsidi-

Figure 1
Illustration of the information content hypotheses

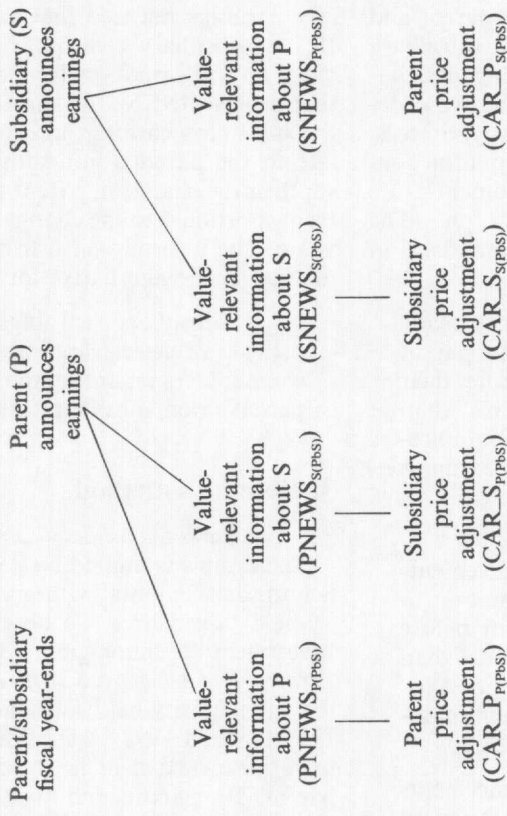
Panel A: Subsidiary announces earnings before Parent (SbP)



Panel C: Information Content Hypotheses

- H_{A1}: SNEWS_{S(SbP)}
- H_{A2}: PNEWS_{P(SbP)}
- H_{A3}: SNEWS_{S(SbP)} < PNEWS_{P(SbP)}
- H_{A4}: SNEWS_{S(SbP)} > PNEWS_{P(SbP)}

Panel B: Parent announces earnings before Subsidiary (PbS)



- PNEWS_{P(PbS)}
- SNEWS_{S(PbS)}
- PNEWS_{P(PbS)}
- SNEWS_{S(PbS)}

ary earnings releases relevant to parent valuation, and $PNEWS_S$ and $SNEWS_S$ represent parent and subsidiary earnings releases relevant to subsidiary valuation. We add the subscript timing designations (SbP) or (PbS) to identify the relative order of the earnings announcements in our hypotheses.

Panel C of Figure 1 shows the information content hypotheses using the variable nomenclature described in the preceding paragraph. The information content hypotheses are formalised in the alternative form as:

H_{A1} : Parent earnings announcements provide more value relevant information to parent shareholders when they occur before their subsidiary's earnings announcements than when parent company earnings announcements occur after their subsidiary's earnings announcements (i.e. $PNEWS_{P(PbS)} > PNEWS_{P(SbP)}$).

H_{A2} : Subsidiary earnings announcements provide more value relevant information to parent shareholders when they occur before their parent's earnings announcements than when subsidiary earnings announcements occur after their parent's earnings announcements (i.e. $SNEWS_{P(PbS)} > SNEWS_{P(SbP)}$).

H_{A3} : Subsidiary earnings announcements provide more value relevant information to subsidiary shareholders when they occur before their parent's earnings announcements than when subsidiary earnings announcements occur after their parent's earnings announcements (i.e. $SNEWS_{S(SbP)} > SNEWS_{S(PbS)}$).

H_{A4} : Parent earnings announcements provide more value relevant information to subsidiary shareholders when they occur before their subsidiary's earnings announcements than when parent company earnings announcements occur after their subsidiary's earnings announcements (i.e. $PNEWS_{S(PbS)} > PNEWS_{S(SbP)}$).

2.2. The information transfer hypothesis

The information content hypotheses focus on the information content of parent and subsidiary earnings announcements. The information transfer hypothesis extends that focus to whether subsidiary earnings provide incremental information relevant to the parent's non-subsidiary earnings. A maintained hypothesis is that a parent's market value is the sum of the market value of its assets. A change in subsidiary market value attributed to the release of subsidiary earnings, therefore, should be accompanied by an equivalent change in the parent's market value.

Consider, however, the relation between subsidiary earnings released first and parent valuation. If the subsidiary's earnings announcement provides any information for parent valuation over that represented by the subsidiary's price change, the subsidiary earnings information is likely to relate to the parent's non-subsidiary operations. If so, then the change in parent market value will not be proportional to the change in subsidiary market value. The information transfer hypothesis is formalised in the alternative form as:

H_{A5} : Subsidiary earnings announcements provide value-relevant information to parent shareholders regarding the earnings from the parent's non-subsidiary assets.

3. Research method

3.1. The parent-subsidiary sample

The sample is limited by the availability of publicly-traded parents with publicly-traded majority-held subsidiaries. To obtain the sample, CDA Investment Technologies's *Spectrum 5* and the *Directory of Corporate Affiliations* were examined for any majority-held subsidiaries during the years 1983 through 1992. A subsidiary was classified as majority-owned if at least 50.1% was held by its parent. The parents and their majority-owned subsidiaries were selected if both were listed on either the NYSE or the AMEX during the period of majority ownership, and majority ownership existed for at least two consecutive years.

This procedure identified 81 parent-subsidiary pairs. The *Wall Street Journal Index (WSJI)* was searched for parent and subsidiary firm-specific announcements. Eliminating the firm pairs where either the parent's or the subsidiary's earnings data was unavailable reduced the sample by 41 pairs. Other parent-subsidiary pairs consistently announced earnings concurrently. Eliminating those pairs reduced the sample to 27 parent-subsidiary pairs.³ Panel A of Table 1 lists the parents and subsidiaries and their industry affiliations and Panel B illustrates the results of the sample selection process.

The earnings announcement dates of the remaining 27 pairs were obtained from the *WSJI*. Any parent or subsidiary earnings announcement made within two days of any other announcement, either its own or its affiliate's, was excluded from the sample. These exclusions caused the number of

³ For comparison, Holderness and Sheehan (1988) found 29 publicly-traded subsidiaries with publicly-traded parents. Holderness and Sheehan (1988) and also Schipper and Smith (1986) discuss reasons for the existence of publicly-traded majority-owned subsidiaries, including providing external financing for subsidiary investment projects, attaching managerial compensation to subsidiary market value, and keeping founders or family members involved.

Table 1
The sample and the results of the selection process

Panel A: The parent and subsidiary firms

Parent firms	Parent SIC	Ownership %	Subsidiary firms	Subsidiary SIC
American Capital	6522	66	Transcapital Financial	6711
American Maize Products	2046	58	American Fructose	2046
American Motor Inns	7011	81	Universal Communications	4811
Artra Group	3691	73	Lori Corporation	3861
Ashland Oil	2911	65	Ashland Coal	1222
Berkshire Hathaway	2064	80	Wesco Financial	6122
Chyron Corporation	3662	60	C M X Corporation	3861
Clabir Corporation	3351	83	AmBrit	2024
Clabir Corporation	3351	51	General Defense	3356
Clabir Corporation	3351	76	Isaly	5812
D W G Corporation	6711	51	Southeastern Public Service	2097
Electro Audio	3613	82	Technodyne	3679
Helm Resources	4941	51	Bamberger Polymers	2641
Intermark	3462	52	Mission West Financial	6162
Intermark	3462	52	Anthem Electronics	5065
Katy Industries	6711	52	HMW Industries	3873
Loews Corporation	2111	83	C N A Financial	6321
Murphy Oil	2911	59	Ocean Drilling & Exploration	1381
National Patent	2821	90	International Hydron	3851
Newmont Mining	1382	89	Foote Mineral	3313
Pacific Gas & Electric	4911	51	Pacific Gas Transmission	4922
Pacificorp	4911	91	Nerco	1111
Primerica Corporation	3411	83	American Capital	6522
Primerica Corporation	3411	81	Musicland Group	5733
Standard Shares	6712	51	Pittway Corporation	3499
Starrett Housing	1622	80	Levitt Corporation	1521
Thermo Electron	3621	80	Thermedics	2834

Panel B: The selection process

Initial parent-subsidiary sample ^a	81
Parent-subsidiary pairs excluded because of missing earnings data	(41)
Parent-subsidiary pairs excluded because of confounded announcements	(13)
Parent-subsidiary pairs represented in final sample	27
Total number of parent earnings announcements	206
Total number of subsidiary earnings announcements	235

^aThe shares represent majority ownership positions. Both the parent and subsidiary are required to be listed on the NYSE or AMEX.

parent and subsidiary announcements to slightly differ, even though the same firm pairs are represented in both samples. The final sample contains 206 parent and 235 subsidiary unconfounded earnings announcement dates. The earnings announcement dates were analysed to determine the parent and subsidiary announcement order. For the 206 parent earnings announcements, 44 occurred prior to and 162 occurred after the subsidiary disclosed its earnings. For the 235 subsidiary earnings announcements, 191 occurred prior to and 44 occurred after the parent disclosed its earnings. The median number of days between parent and subsidiary earnings announcements is seven.

3.2. Security returns

Standard event study methods are used to calculate parent and subsidiary abnormal security returns for each of the earnings announcement dates. The return generating mechanism assumed is:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \quad (1)$$

Abnormal security returns are defined as

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), \quad (2)$$

where:

R_{it}	=	return for security i at time t ,
R_{mt}	=	return on the CRSP value-weighted market portfolio at time t ,
$\hat{\alpha}_i, \hat{\beta}_i$	=	regression coefficients,
e_{it}	=	residual for security i at time t , and
AR_{it}	=	the abnormal security return for security i at time t .

The estimation period is day -240 to day -2 , with the *WSJI* announcement date defined as day 0. The *CRSP* daily returns file and the *CRSP* value-weighted market index were used as sources of returns data. AR_{it} is calculated for the day before and the day of each announcement appearing in the *WSJI* and summed to yield a cumulative two-day abnormal security return (CAR).⁴ We label the two-day returns in a manner similar to our labelling of earnings information.

3.3. Earnings news

An investigation of the valuation effects of parent and subsidiary earnings announcements requires four measures of earnings news. Two of the measures represent parent and subsidiary news from their own earnings, and the remaining two

⁴ To test the sensitivity of the results of this procedure, a risk-adjusted return was calculated using a different method. Each firm was assigned to one of 10 aggregate portfolios based on the firm's beta, calculated for the prior calendar year using the method found in Scholes and Williams (1977). Then risk-adjusted daily returns were calculated by subtracting the average return of the appropriate beta portfolio from the raw return for that firm. The results using this approach are similar to those reported later in the study.

In addition, we investigated whether our results were affected by thinly-traded subsidiaries. We collected daily trading volume during the 240-day estimation period and the two-day announcement period from the *CRSP* tapes for each subsidiary. Next we arbitrarily identified a subsidiary as not actively traded if there were no shares traded for at least 24 days (10%) during the 240-day estimation period. Of the 27 subsidiaries, six were identified as not actively traded. To assess the effect of these thinly-traded subsidiaries on our regression results we repeated each of the subsequent regressions involving a subsidiary price change after deleting these six subsidiary firms. The results of these replications are similar to those presented in the paper. Finally, there were no instances in which a subsidiary's price change was calculated for a two-day announcement period for which there were no shares traded.

Finally, our results could also be affected by the size of and differences in the size of the parents and subsidiaries in our sample. To investigate the effect of size on our regressions we added as independent variables first the log of the market value of common equity, and second the market value ratio (market value of the subsidiary owned by the parent divided by the market value of the parent). The replications involving both of these variables produced results similar to those reported in the paper.

measures represent news from each others' earnings. To compute the four measures, earnings change variables are first calculated for each parent and subsidiary earnings announcement. Earnings changes are calculated using a seasonal random walk model with quarterly earnings per share of one year earlier designated as expected earnings. The earnings change variables are calculated as follows:

$$ECHANGE_{P(S)} = EPS_{P(S), T} - EPS_{P(S), T-4}, \quad (3)$$

where:

$ECHANGE_{P(S)}$	=	the parent (P) or subsidiary (S) quarterly change in earnings from one year earlier, and
$EPS_{P(S)}$	=	actual reported parent or subsidiary earnings per share in quarters T and $T-4$.

3.4. Parent and subsidiary news from their own earnings announcements

To reflect the impact of the parent and subsidiary earnings change on their own share prices, the applicable *ECHANGE* variables are standardised by beginning of the quarter share price. Thus:

$$PNEWS_P = \frac{ECHANGE_P}{P_P} \text{ and } SNEWS_S = \frac{ECHANGE_S}{P_S}, \quad (4)$$

where:

$PNEWS_P$	=	the parent news from its own (consolidated) earnings,
$SNEWS_S$	=	the subsidiary news from its own earnings, and
$P_{P(S)}$	=	the parent (P) or subsidiary (S) security price on the first day of the quarter.

3.5. Parent news from subsidiary earnings announcements

To reflect the impact of the subsidiaries' earnings changes on their parents' share prices, subsidiary earnings changes are modified to reflect the relation between subsidiary earnings and parent valuation. The earnings changes are first multiplied by the number of outstanding subsidiary shares and the ownership percentage to provide a proxy for the subsidiary earnings allocated to the parent and then divided by the number of out-

standing parent shares for a parent per share measure.⁵ Finally, the per share measure is standardised by beginning of the quarter share price. Thus:

$$SNEWS_P = \frac{ECHANGES_S * SSHARES * OP}{P_P}, \quad (5)$$

where:

- SNEWS_P = parent news from subsidiary earnings,
- S(P)SHARES = the number of subsidiary (parent) common shares outstanding, and
- OP = the percentage of subsidiary shares owned by the parent.

3.6. Subsidiary news from parent earnings announcements

The subsidiary news available from parent earnings is not clear because subsidiary earnings are aggregated with other parent earnings. In this study, we assume that subsidiary earnings news inferred from parent earnings is proportional to the ratio of the parent's share of the subsidiary's market value to the parent's market value. The resulting news variable is again standardised by beginning of the quarter share price. Thus:

$$PNEWS_S = \frac{ECHANGE_P * \frac{MV_S * OP}{MV_P}}{P_S}, \quad (6)$$

3.7 The information content regression models

Two sets of regression models test the relation between parent and subsidiary earnings releases and parent and subsidiary security returns while controlling for announcement timing. The regression models use a method of combining related regressions with a dummy variable as described in Neter, Wasserman and Kutner (1983: 337-339). The first set of regressions (equations 7 and 8) investigates parent valuation in testing Hypotheses 1 and 2. Equation 7 compares parent share price effects to parent earnings announcements occurring

before and occurring after their subsidiaries announce earnings (H_{A1}). Equation 8 compares parent share price effects to subsidiary earnings announcements occurring before and occurring after their parents announce earnings (H_{A2}).

$$CAR_{P_P} = \alpha + \beta_1(PNEWS_P) + \beta_2(D1 * PNEWS_P) + e \quad (7)$$

$$CAR_{P_S} = \alpha + \beta_1(SNEWS_P) + \beta_2(D2 * SNEWS_P) + e \quad (8)$$

Expected signs (+) (-)

where:

- CAR_{P_P} = parent cumulative two-day abnormal security return at its own earnings announcement,
- CAR_{P_S} = parent cumulative two-day abnormal security return at its subsidiary's earnings announcement,
- PNEWS_P = parent news from parent earnings,
- SNEWS_P = parent news from subsidiary earnings,
- D1 = a dummy variable equalling one if the parent earnings announcement occurs after the subsidiary announcement and zero otherwise, and
- D2 = a dummy variable equalling one if the subsidiary earnings announcement occurs after the parent announcement and zero otherwise.

In equation 7, the β_1 coefficient represents the relation between parent abnormal returns and their own earnings announcements when the parent announces first. The β_2 coefficient represents the difference in that relation when the parent announces earnings after its subsidiary. Thus, β_1 represents the $PNEWS_{P(PbS)}$ and β_2 represents the difference between the $PNEWS_{P(PbS)}$ and the $PNEWS_{P(SbP)}$. In a similar manner, β_1 in equation 8 represents the $SNEWS_{P(SbP)}$ and β_2 represents the difference between the $SNEWS_{P(SbP)}$ and the $SNEWS_{P(PbS)}$.

The second set of regressions investigates subsidiary valuation in testing Hypotheses 3 and 4. Equation 9 compares subsidiary share price effects to subsidiary earnings announcements occurring before and occurring after their parents announce earnings (H_{A3}). Equation 10 compares subsidiary share price effects to parent earnings announce-

⁵ The actual earnings recognised by the parent reflect the elimination of intercompany profits. We assume, for purposes of this study, that the nature of the eliminations is unavailable to market participants at the time of a parent or subsidiary earnings announcement. In addition, a review of each firm's Securities and Exchange Commission 10-K filing found no significant customer relationships within any of the parent-sub-sidiary pairs.

ments occurring before and occurring after their subsidiaries announce earnings (H_{A4}).

$$CAR_{S_S} = \alpha + \beta_1(SNEWS_S) + \beta_2(D2 * SNEWS_S) + e \quad (9)$$

$$CAR_{S_P} = \alpha + \beta_1(PNEWS_S) + \beta_2(D1 * PNEWS_S) + e \quad (10)$$

Expected signs (+) (-)

where:

- CAR_{S_S} = subsidiary cumulative two-day abnormal security return at its own earnings announcement,
 CAR_{S_P} = subsidiary cumulative two-day abnormal security return at its parent's earnings announcement,
 $SNEWS_S$ = subsidiary news from subsidiary earnings,
 $PNEWS_S$ = subsidiary news from parent earnings, and
 $D1$ and $D2$ are as previously defined.

In equation 9, β_1 represents the relation between subsidiary abnormal returns and their own earnings announcements when the subsidiary announces first, and β_2 represents the difference in that relation when the subsidiary announces earnings after its parent. Thus, β_1 represents the $SNEWS_{S(SbP)}$ and β_2 represents the difference between the $SNEWS_{S(SbP)}$ and the $SNEWS_{S(PbS)}$ illustrated by Figure 1. In equation 10, β_1 represents the $PNEWS_{S(SbP)}$ and β_2 represents the difference between the $PNEWS_{S(SbP)}$ and the $PNEWS_{S(PbS)}$.

Parent and subsidiary earnings announcements are expected to have own-firm and cross-firm implications when they are the first announcement within a parent-subsidary pair. The β_1 s are therefore expected to be positive in all four regressions. Our hypotheses predict that parent and subsidiary earnings will have more own-firm and cross-firm valuation implications when they are the first release of earnings within the parent-subsidary pair. As the β_2 coefficients represent the difference in the price-earnings relations between announcements made first and announcements made second, the β_2 s are expected to be negative in all four regressions.

3.8. The information transfer regression model

The information transfer hypothesis predicts that subsidiary earnings have value relevance for parents' non-subsidiary assets. We employ a two-stage regression to test this hypothesis. A two-stage regression approach has been used in prior research to investigate whether a particular vari-

able provides additional explanatory power over that contained in another variable. For example, Beaver, Griffin and Landsman (1982) use a two-stage regression methodology to determine whether an earnings variable based on Accounting Series Release No. 190 (replacement cost earnings) provides incremental information content over that provided by historical cost earnings.⁶

Equations 11a and 11b present the two stages in our information transfer regression model. We limit our analysis to the 191 subsidiary announcements occurring first in the parent-subsidary pairs because information transfers are most likely before the parent announces its own earnings.

$$\text{First Stage: } SNEWS_{P(SbP)} = \alpha + \beta_1(\text{Relative_Size} * CAR_{S_S}) + \text{RESID} \quad (11a)$$

$$\text{Second Stage: } CAR_{P_S} = \alpha + \beta_1(\text{Relative_Size} * CAR_{S_S}) + \beta_2 \text{RESID} + e \quad (11b)$$

The variables in equations 11a and 11b are as defined in the information content hypotheses with the exception of *Relative_Size* and *RESID*. *Relative_Size* adjusts CAR_{S_S} to correspond to the contribution of subsidiary price changes to parent price changes. This adjustment is needed because the parents own less than 100% of the subsidiaries in our sample and because the parent and subsidiaries are of different sizes. This adjustment is accomplished using a procedure in Graham and Lefanowicz (1996) that adjusts CAR_{S_S} by the parent's ownership percent multiplied by the ratio of subsidiary market value to parent market value, referred to as *Relative_Size*.⁷

In the first stage, we regress the earnings news applicable to the parent from the subsidiary's earnings announcement ($SNEWS_{P(SbP)}$) on the *Relative_Size* adjusted subsidiary price change ($\text{Relative_Size} * CAR_{S_S}$). *RESID* is the residual obtained from the first stage regression and therefore represents the information in $SNEWS_{P(SbP)}$ not

⁶ As highlighted in Beaver, Griffin and Landsman (1984), there are three econometrically equivalent approaches to testing the significance of an added explanatory variable: (1) an F-test on the reduction in residual variance from adding the additional variable; (2) a single regression with both variables included as explanatory variables; and (3) a two-stage regression approach. They argue that the two-stage is preferable in their setting of historical cost and replacement cost earnings because it focuses on the incremental nature of replacement cost earnings.

⁷ Graham and Lefanowicz (1996) calculate the *Relative_Size* adjustment factor to equate the returns of investors and investees, but the factor is equally applicable to parent and subsidiary pairs. If the return (R) to a subsidiary (S) at time $t+1$ is defined as $R_{S,t+1} = (\text{Value}_{S,t+1} - \text{Value}_{S,t}) / (\text{Value}_{S,t})$, then the return to the parent will be $R_{P,t+1} = \text{OP}(\text{Value}_{S,t+1} - \text{Value}_{S,t}) / (\text{Value}_{P,t})$. Solving for $(\text{Value}_{S,t+1} - \text{Value}_{S,t})$ for the return to a subsidiary and substituting the result into the return to the parent produced $R_{P,t+1} = (R_{S,t+1})(\text{OP})(\text{Value}_{S,t} / \text{Value}_{P,t})$.

explained by Relative_Size adjusted CAR_{S_S} . RESID, therefore, is by construction uncorrelated with Relative_Size* CAR_{S_S} . The second stage regresses the parent's price change (CAR_{P_S}) on Relative_Size* CAR_{S_S} and RESID. If Hypothesis 5 holds and the information applicable to parents from subsidiary earnings provides incremental information, β_2 will be significantly different from zero.⁸

4. Results

4.1. Descriptive statistics

Table 2 presents descriptive statistics for the parent and subsidiary pairs and the variables used in this study. The ownership percentage ranges from 51.00 to 91.00 with a mean of 69.22 and a median of 70.64. The market values of both types of firms are relatively large, ranging from \$27m to \$15,498m with a median of \$508m for parents, and from \$15m to \$13,344m with a median of \$147m for subsidiaries. The market value ratios—subsidiary market value owned by the parent divided by parent market value—have a mean of 0.301, a median of 0.249, and a range from 0.018 to 0.780. The market value ratios show the subsidiaries are a significant portion of the parents' market values although the median market value ratio of 0.249 implies parents own substantial other assets.

Panels B and C present descriptive statistics of the cumulative abnormal returns and earnings news variables around parent and subsidiary earnings announcements. The median values for the returns variables and the earnings variables are essentially zero in both panels. The ranges of the returns variables in both panels are similar, although somewhat larger at subsidiary earnings announcements than at parent earnings announcements. The ranges of the four earnings variables are also generally similar except for the smaller range of the subsidiary news to subsidiary valuation (SNEWS_S) variable.

⁸ Insightful readers will note that our two-stage regression does not capture the interdependencies among changes in parent and subsidiary earnings and share prices. Consider, for example, that equations 11a and 11b imply the two related equations:

$$CAR_{P_S} = \alpha + \beta_1 SNEWS_P + \beta_2 \text{Relative_Size} * CAR_{S_S} + \varepsilon \quad (12a)$$

and

$$\text{Relative_Size} * CAR_{S_S} = a + b_1 SNEWS_P + e. \quad (12b)$$

The simultaneous determination of both CAR_{P_S} and Relative_Size* CAR_{S_S} by SNEWS_P suggests that our analysis should be extended to a system of simultaneous equations (the 3SLS estimation technique described in Theil (1971: 508–513, for example). Simultaneous equation estimation, however, requires that equation 12b contain a variable which does not occur in equation 12a, a condition not met in our system (Theil 1971: 430). It is possible, therefore, that interdependencies remain that are not compensated for by our two-stage regression and thus our parameter estimates are inconsistent.

4.2. Parent price-earnings relations: tests of Hypotheses 1 and 2

Table 3 presents the regressions of parent abnormal security returns on measures of parent and subsidiary earnings news. The coefficients relating parent security returns to parent earnings announcements made first (β_1 in Panel A) and to subsidiary earnings announcements made first (β_1 in Panel B) are both positive and significant ($t = 1.70$, $p\text{-value} \leq 0.0450$ and $t = 9.43$, $p\text{-value} \leq 0.0001$).⁹ The significant positively signed β_1 coefficients show the importance of both parent and subsidiary earnings announcements to parent valuation. This suggests subsidiary earnings have valuation implications similar to parent earnings.¹⁰ In addition, the adjusted R^2 of 27.6% suggests subsidiary earnings add an especially important source of information to market participants' knowledge of parent earnings.

The results in Table 3 show the price-earnings relations depend upon which firm announces earnings first. The coefficients representing differences in the price-earnings relations between parent announcements made before and after subsidiary announcements (β_2 in Panel A) and subsidiary announcements made before and after parent announcements (β_2 in Panel B) are both negative and significant ($t = -2.16$, $p\text{-value} \leq 0.0159$ and $t = -1.78$, $p\text{-value} \leq 0.0382$).

Recall that Hypotheses 1 and 2 formalised our expectation that parent and subsidiary earnings announcements made first provide more value-relevant information than do announcements made second. Because the sum of β_1 and β_2 econometrically is equivalent to the price-earnings relations at announcements occurring second, the signifi-

⁹ The results of these and subsequent regressions are not adversely affected by either multicollinearity or outliers. The standard cutoff rules identified in Belsley, Kuh and Welsch (1980) do not indicate any unduly influential observations.

The regression results, however, are possibly affected by interdependencies caused by multiple observations for each parent-subsidiary pair. If interdependencies are present, low variations in correlations within the pairs cause a downward bias in the estimates of the standard errors. For this reason, the standard errors in the regressions were recalculated using a method developed in Froot (1989). The Froot technique averages the observed standard errors within each parent-subsidiary pair. The resulting adjusted standard errors are qualitatively similar to those reported in the tables, thus suggesting the results are not affected by interdependencies within the parent-subsidiary pairs.

¹⁰ It is also possible that these results occur because the firms' production processes and security returns are related regardless of any investment relation. King (1966) and Livingston (1977) find that security returns of firms within the same industry are positively related. In addition, Foster (1981) and Clinch and Sinclair (1987) find that firms with similar products have correlated security returns around their earnings announcements. The regressions are replicated after excluding any of the pairs in which both parent and subsidiary have the same two-digit SIC codes. The results of the replication are qualitatively similar to those shown in the paper.

Table 2
Descriptive statistics of selected parent and subsidiary variables^a

	Mean	Median	Standard deviation	Maximum	Minimum
<i>Panel A: Parent and subsidiary attributes (N=27)</i>					
Ownership percentage	69.22	70.64	14.47	91.00	51.00
Market value - subsidiary	\$995	\$147	\$2,720	\$13,344	\$15
Market value - parent	\$2,642	\$508	\$4,199	\$15,498	\$27
Market value ratio	0.301	0.249	0.223	0.780	0.018
<i>Panel B: Parent earnings announcement variables (N=206)</i>					
CAR _p	0.001	-0.001	0.044	0.199	-0.184
CAR _s	0.004	0.000	0.044	0.211	-0.215
PNEWS _p	-0.003	-0.000	0.093	0.538	-0.680
PNEWS _s	0.007	-0.000	0.071	0.581	-0.409
<i>Panel C: Subsidiary earnings announcement variables (N=235)</i>					
CAR _s	0.006	-0.000	0.052	0.235	-0.209
CAR _p	-0.002	-0.002	0.055	0.343	-0.391
SNEWS _s	-0.005	0.000	0.040	0.141	-0.199
SNEWS _p	-0.007	0.000	0.087	0.569	-0.967

^aOwnership percentage is the percentage of voting shares of the subsidiary held by the parent.

Market value equals the number of common shares outstanding times the closing price per share plus the book value of debt (shown in millions).

Market value ratio equals the market value of the subsidiary multiplied by the percentage ownership and divided by the market value of the parent.

CAR_p = parent cumulative two-day abnormal security return at its own earnings announcement.

CAR_s = subsidiary cumulative two-day abnormal security return at its parent earnings announcement.

PNEWS_p = parent news from parent earnings

PNEWS_s = subsidiary news from parent earnings.

CAR_s = subsidiary cumulative two-day abnormal security return at its own earnings announcement.

CAR_p = parent cumulative two-day abnormal security return at its subsidiary earnings announcement.

SNEWS_s = subsidiary news from subsidiary earnings.

SNEWS_p = parent news from subsidiary earnings.

cant negatively signed β_2 coefficients suggest support for those two hypotheses.

An F-test of whether the sum of β_1 and β_2 in Panel A ($0.2639 + -0.3431$) equals zero rejects the null hypothesis of no difference ($F = 5.53$, $p\text{-value} \leq 0.0196$). This suggests a negative price reaction to parent earnings announcements when parent earnings are announced second. We investigate the negative relation further in the next section. An F-test of whether the sum of β_1 and β_2 in Panel B ($0.3309 + -2.4847$) equals zero finds no significant price-earnings relation when a parent announces after its subsidiary ($F = 2.37$, $p\text{-value} \leq 0.1243$).¹¹

¹¹ Even though the two coefficients appear quite different, their sum is not significantly different from zero. This may be due to either a small earnings change variance or to the small number of observations for subsidiaries announcing earnings after the parent. Analysis of the data shows that the earnings news variables represented in this coefficient only range from -0.02 to $+0.02$. The relatively small number of observations

This suggests no new valuation relevant information is released for parent shareholders from subsidiary earnings announcements made after a parent has released its own earnings.

4.3. Parent price reactions to non-subsidiary earnings

Because the parents' earnings include more than their subsidiaries' earnings, the inverse reaction (shown in Panel A, Table 3) when parent earnings are announced second could be attributed to either their subsidiaries' earnings or to the parents' non-subsidiary earnings. To directly tie parent price changes to the announcement of non-subsidiary earnings, we update the expectations of parent earnings to reflect the new information conveyed

represented by this coefficient ($n = 44$) may, however, partially explain the small variance.

Table 3
The relation between parent abnormal security returns and parent earnings announcements and subsidiary earnings announcements^a

Panel A: parent returns around parent earnings announcements

$$CAR_P_p = \alpha + \beta_1(PNEWS_p) + \beta_2(D1 * PNEWS_p) + e$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	0.0020	0.65	0.5158 ^b	0.003
β_1	+	0.2639	1.70	0.0450 ^c	0.155
β_2	-	-0.3431	-2.16	0.0159 ^c	0.159

n = 206; F = 4.22; p-value < 0.0160; adjusted R² = 0.031

Panel B: Parent returns around subsidiary earnings announcements

$$CAR_P_s = \alpha + \beta_1(SNEWS_p) + \beta_2(D2 * SNEWS_p) + e$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	-0.0003	-0.11	0.9130 ^b	0.003
β_1	+	0.3309	9.43	0.0001 ^c	0.035
β_2	-	-2.4847	-1.78	0.0382 ^c	1.396

n = 235; F = 45.722; p-value ≤ 0.0001; adjusted R² = 0.276

- ^a CAR_{P_p} = parent cumulative two-day abnormal security return surrounding its own earnings announcements.
 CAR_{P_s} = parent cumulative two-day abnormal security return surrounding its subsidiary's earnings announcements.
 PNEWS_p = parent earnings news calculated as the change in parent quarterly earnings per share from one year earlier divided by parent beginning of quarter share price.
 SNEWS_p = parent earnings news calculated as the change in subsidiary quarterly earnings per share from one year earlier, multiplied by the number of subsidiary shares outstanding and the ownership percent and divided by the number of parent shares outstanding and by parent beginning of quarter share price.
 D1 = a dummy variable equalling one if the parent earnings announcement occurs after the subsidiary announcement and zero otherwise.
 D2 = a dummy variable equalling one if the subsidiary earnings announcement occurs after the parent announcement and zero otherwise.

^b Two-tailed

^c One-tailed

when a parent announces earnings second. This variable is calculated by subtracting the earlier announced subsidiary earnings applicable to the parents from the parent's earnings change (i.e. PNEWS_p - SNEWS_p). We then regress the parent's price changes on the updated parent earnings. The results are shown in Table 4.

The coefficient representing the updated parent earnings news (β_1) is not significant ($t = -1.28$, p-value ≤ 0.2014). This suggests market participants are receiving no unanticipated information about parents' other earnings when the parent announces earnings after its subsidiary. It follows

that the earnings expectations of parent shareholders were updated prior to the parents' earnings announcements. Of course, one possible source of information updating parent shareholders' earnings expectations is the prior subsidiary earnings announcement.¹²

¹² A similar regression with updated subsidiary news (relevant to the regression in Panel B of Table 3) was run with no significant results. In addition, both Table 3 regressions were run after substituting updated parent news (Panel A) and updated subsidiary news (Panel B) for the second announcing firm earnings variables. Finally, separate regressions for the four

Table 4
The relation between parent abnormal security returns and updated parent earnings^a

$$\text{CAR}_P = \alpha + \beta_1(\text{UPNEWS}_p) + e$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	0.0029	0.82	0.4136 ^b	0.004
β_1	+	-0.0560	-1.28	0.2014 ^b	0.044

n = 162; F = 1.646; p-value ≤ 0.2014; adjusted R² = 0.004

^a CAR_P = parent cumulative two-day abnormal security return surrounding its own earnings announcements.

UPNEWS_p = parent earnings news calculated as the difference between the change in parent earnings attributable to the parent from the change in subsidiary earnings and parents' announced earnings, divided by parent beginning of quarter share price (i.e. PNEWS_p - SNEWS_p).

^b Two-tailed

4.4. Subsidiary price-earnings relations: tests of Hypotheses 3 and 4

Table 5 represents the regressions of subsidiary abnormal security returns on parent and subsidiary measures of earnings news. The regression results in Panel A provide support for our third hypothesis as well as providing further evidence that announcements made first release more information than do announcements made second. The coefficient representing subsidiary earnings news for subsidiary earnings announcements made first (β_1) is positive and highly significant (t = 3.62, p-value ≤ 0.0002). The coefficient representing the difference in price-earnings relations when subsidiary earnings are announced after their parents' earnings (β_2) is negative and significant (t = -1.79, p-value ≤ 0.0375). An F-test of whether the sum of β_1 and β_2 (0.3357 + -0.3860) equals zero fails to find a significant price-earnings relation for subsidiary announcements made second (F = 0.07, p-value ≤ 0.7968).

Even though the results in Panel A suggest that subsidiary shareholders update their earnings expectations when parent earnings are announced, the results in Panel B show no significant relation between parent earnings announcements and subsidiary abnormal security returns. The lack of significance of this regression is puzzling, but may reflect the difficulty market participants have in disaggregating subsidiary earnings from parent earnings announcements.¹³ Thus, our two-day announcement window may not be long enough

announcement types (parent–subsidiary, first–second) were run. All of these regression results are qualitatively similar to the ones shown in Table 3.

¹³ An analysis of the *WSJ* announcements indicates that no separate subsidiary earnings information was released in the parent earnings announcements.

to capture the assimilation of information by subsidiary shareholders. The result also may be caused by our misspecification of the news variable. Alternate specifications of the subsidiary earnings variable calculated from parent earnings, however, do not improve the significance of the regression.¹⁴

4.5. Parent price changes at subsidiary earnings announcements: test of Hypothesis 5

Table 6 presents the results of the two-stage regression testing for information transfers when a subsidiary announces before its parent. The first stage regresses subsidiary earnings on subsidiary price changes with the residual, RESID, used as an explanatory variable in the second stage. The second stage regresses parent price changes on the Relative_Size adjusted subsidiary price changes and the residual from the first stage.

The results of the second stage regression show considerable support for information transfers and for our fifth hypothesis. Both of the variables significantly explain parents' price changes at their subsidiaries' earnings announcements. The coefficient for subsidiary abnormal security returns (β_1) is positive and highly significant (t = 8.05, p-value ≤ 0.0001), suggesting that a large part of the parents' returns are related to the returns of their subsidiaries. The coefficient for the portion of subsidiary earnings not explained by the subsidiary return (β_2) is also positive and highly significant (t = 4.79, p-value ≤ 0.0001).

¹⁴ Regressions run with updated subsidiary news as the second announcement (Panel A) and updated parent news as the second announcement (Panel B) obtain results qualitatively similar to the regressions shown in Table 5.

Table 5
The relation between subsidiary abnormal security returns and subsidiary earnings announcements and parent earnings announcements^a

Panel A: Subsidiary returns around subsidiary earnings announcements

$$CAR_{S_p} = \alpha + \beta_1(SNEWS_t) + \beta_2(D2 * SNEWS_t) + e$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	0.0069	2.06	0.0408 ^b	0.003
β_1	+	0.3357	3.62	0.0002 ^c	0.093
β_2	-	-0.3860	-1.79	0.0375 ^c	0.216

n = 235; F = 6.583; p-value \leq 0.0017; adjusted R² = 0.046

Panel B: Subsidiary returns around parent earnings announcements

$$CAR_{S_p} = \alpha + \beta_1(PNEWS_t) + \beta_2(D1 * PNEWS_t) + e$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	0.0041	1.31	0.1916 ^b	0.003
β_1	+	0.2987	1.00	0.1587 ^c	0.298
β_2	-	-0.2942	-0.98	0.1652 ^c	0.302

n = 206; F = 0.507; p-value \leq 0.6028; adjusted R² = 0.00

^a CAR_{S_t} = subsidiary cumulative two-day abnormal security return surrounding its own earnings announcements.

CAR_{S_p} = subsidiary cumulative two-day abnormal security return surrounding its parent's earnings announcements

SNEWS_t = subsidiary earnings news calculated as the change in subsidiary quarterly earnings per share from one year earlier divided by subsidiary beginning of quarter share price.

PNEWS_t = subsidiary earnings news calculated as the parent earnings change multiplied by the ratio of the market values of the subsidiary to the parent multiplied by the ownership percent all divided by subsidiary beginning of quarter share price.

D1 = a dummy variable equalling one if the parent earnings announcement occurs after the subsidiary announcement and zero otherwise.

D2 = a dummy variable equalling one if the subsidiary earnings announcement occurs after the parent announcement and zero otherwise.

^b Two-tailed

^c One-tailed

The sign and significance of β_2 suggests that subsidiary earnings convey significant incremental information above the subsidiaries' abnormal security returns. Finally, the second stage regression is highly significant (F = 43.871, p-value \leq 0.0001) and has an adjusted R² of 31%. This implies that 31% of the variance in parent returns when their subsidiaries announce earnings is explained by the combination of subsidiary returns and the incremental information conveyed in subsidiary earnings announcements.

5. Concluding remarks

Accounting researchers have long studied the relation between earnings releases and security prices. No research to date, however, specifically examines the association between earnings announcements and parent and subsidiary valuation. Because subsidiary earnings are part of parent earnings, subsidiary earnings announcements can pre-empt some of the information in subsequent parent earnings announcements. Similarly, parent

Table 6
Two-stage regression investigating the relation between parent abnormal security returns and subsidiary earnings announcements and subsidiary abnormal security returns when the subsidiary announces prior to the parent^a

$$\text{First stage: } \text{SNEWS}_p = \alpha + \beta_1(\text{Relative_Size} * \text{CAR_S}_s) + \text{RESID}$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	-0.0121	-2.42	0.0163 ^b	0.005
β_1	+	1.3027	13.65	0.0001 ^c	0.095

n = 191; F = 186.269; p-value \leq 0.0001; adjusted R² = 0.49

$$\text{Second stage: } \text{CAR_P}_s = \alpha + \beta_1(\text{Relative_Size}^*) + \beta_2 \text{RESID} + e$$

Parameters	Expected sign	Estimates	t-statistic	P-value	Standard error
Intercept	?	-0.0057	-1.63	0.1056 ^b	0.004
β^1	+	0.5416	8.05	0.0001 ^c	0.067
β_2	?	0.2458	4.79	0.0001 ^b	0.051

n = 191; F = 43.871; p-value \leq 0.0001; adjusted R² = 0.31

^a SNEWS_p = parent earnings news calculated as the change in subsidiary quarterly earnings per share from one year earlier multiplied by the number of subsidiary shares outstanding and the ownership percent and divided by the number of parent shares outstanding and by parent beginning of quarter share price.

CAR_S_s = subsidiary cumulative two-day abnormal security return surrounding its own earnings announcements

Relative_Size = equals the parent's ownership percent multiplied by the ratio of subsidiary market value to parent market value.

RESID = the residual or error term from regressing SNEWS_p on $(\text{Relative_Size} * \text{CAR_S}_s)$.

CAR_P_s = parent cumulative two-day abnormal security return surrounding its subsidiary's earnings announcements

^b Two-tailed

^c One-tailed

earnings announcements can pre-empt some of the information conveyed in subsequent subsidiary earnings announcements.

This study, therefore, examines parent price reactions to their own and to their subsidiary's earnings announcements, and subsidiary price reactions to their own and to their parent's earnings announcements. By connecting the affiliated firms' earnings announcements, we provide evidence on (1) the extent that prior announcements affect the informativeness of later earnings announcements and (2) the extent that subsidiary earnings have implications for earnings from parents' non-sub-sidiary assets.

This study provides an empirical link between parent valuation and subsidiary earnings. For parents with publicly-traded subsidiaries, one source of value-relevant information appears to be the earnings reports of their subsidiaries. Furthermore, our regressions of security price movements

against earnings change variables indicate that price changes occur with the first earnings announcement whether it is the parent's or the subsidiary's.

Parent announcements following subsidiary announcements, however, and subsidiary announcements following parent announcements have little information content. This is a result indicative of the effects of sequential information flows on a firm's valuation, consistent with the theoretical model of Holthausen and Verrecchia (1988). As such, our evidence of parent and subsidiary price-earnings relations is generalisable to all sequential information releases.

Subsidiary earnings announcements occurring first appear particularly informative to parent shareholders. This suggests a stronger relation between earnings announcements and abnormal returns than previously found in price-earnings studies. For parents without 100% ownership of

their subsidiaries, subsidiary earnings announcements may pre-empt much of the information released in parent earnings reports. Additionally, the information conveyed in subsidiary earnings appears relevant to the valuation of parent's non-subsidiary assets. The information transfer accompanying subsidiary earnings announcements may partially explain the negative relation found in prior studies between firm size and price-earnings relations if larger firms are more likely to have subsidiaries.

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