# Do Private Company Targets that Hire Big 4 Auditors Receive Higher Proceeds?*

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## 1. Introduction

This study examines the impact of Big 4 auditor choice on sale proceeds of controlling interests in U.S. private firms.[1] Prior research, such as Becker, DeFond, Jiambalvo, and Subramanyam 1998 and Francis, Maydew, and Sparks 1999, suggests that Big 4 auditors provide higher audit quality than

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1. We use "Big 4 auditor" throughout the paper to refer to the largest international accounting firms that exist over our sample period 1995–2004. Prior to 1998, there were six of these accounting firms. The Big 6 became the Big 5 in 1998 when Price Waterhouse merged with Coopers & Lybrand to form PricewaterhouseCoopers. The Big 5 became the Big 4 in 2002 when Arthur Andersen ceased to exist as an entity.

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non–Big 4 auditors for U.S. public companies. Further, Big 4 auditors reduce the cost of equity capital (Khurana and Raman 2004), the cost of debt capital (Mansi, Maxwell, and Miller 2004; Pittman and Fortin 2004), and increase initial public offering (IPO) proceeds (Willenborg 1999) for U.S. public companies. Prior research has not examined the impact of audit choice on perceived audit quality for U.S. private companies that sell all of their shares or assets. Relative to U.S. public companies, private companies in our sample are small and have poor information environments. Hence, the private company setting is an especially important one when examining the relation between Big 4 auditor choice and perceived audit quality.

Recent empirical work supports the existence of a private company discount (PCD). Koeplin, Sarin, and Shapiro (2000) and Officer (2007) estimate the PCD to be in the 17 percent to 20 percent range for the valuation models used in our primary empirical analysis. Our corresponding estimates of 20 percent to 40 percent, based on a new multivariate estimation procedure that we introduce into the literature, are higher. The primary focus of our study, however, is to explore whether the PCD declines when the private seller engages a Big 4 auditor, consistent with higher quality audits. Such a finding would point to at least one explanation for the PCD, namely, the information quality facing the buyer. A lower PCD for private sellers engaging a Big 4 auditor implies higher sale proceeds for such firms. Using the PCD approach, the dollar value decrease in enterprise value for our representative firm due to not hiring a Big 4 auditor ranges from $2.0 to $3.2 million for stock-purchased private firms and from $1.9 to $2.9 million for asset-purchased private firms. These are substantial amounts, given that the representative private firm with a Big 4 auditor has a median enterprise value ranging from $14 to $18 million for stock purchases and from $10 to $12 million for asset purchases.

We employ a second approach to explore the direct impact of Big 4 auditor choice on private-firm sale proceeds that excludes public firms in our estimation. Using this approach, for a representative private firm in a stock-purchase (asset-purchase) transaction, the dollar value decrease in enterprise value due to not hiring a Big 4 auditor ranges from $3.9 to $5.2 million (from $2.6 to $3.1 million). Again, the amounts are substantial. Either approach thus suggests a pronounced impact of Big 4 auditor choice on the sale proceeds of U.S. private companies.

To further explore explanations for our Big 4 auditor ''premium'', we assembled leading valuation practitioners in a round-table session to solicit their opinions regarding Big 4 audit quality in a private company acquisition setting. The rationale for asking the experts is that they regularly appraise these deals and should be aware of audit quality differences, if they exist. As a caveat, the opinions are just that, rather than facts, but the discussions do identify important correlated omitted variables that future research can take into account when testing for and seeking to explain Big 4 effects. These discussions indicate that participants believe that Big 4 auditors do provide

higher quality audits, and that the due diligence process is easier and less likely to result in downward price adjustments. It was also pointed out that private companies with a Big 4 auditor are more likely to have strong internal controls, appropriate levels of accounting personnel, other high-quality advisors (such as an investment bank), and a well-planned-in-advance sale. These companies are also less likely to have potential contingent tax liabilities. Of interest, because many buyers will not consider purchasing a company with poor-quality accounting systems and financial statements, the number of potential buyers is correlated with the hiring of a Big 4 auditor. Even if a private company were to successfully engage a Big 4 auditor, our results document the benefits in terms of proceeds, but do not capture the costs of hiring a Big 4 auditor. Examples of these costs include the higher price of a Big 4 auditor, more sophisticated information systems, as well as more and better-qualified accounting personnel. Participants also noted, in their opinion, that private company owners do not always act optimally, either because they are less sophisticated or, perhaps, because they are overconfident in their ability to manage the sale process.

We highlight that these practitioner insights extend beyond explaining the Big 4 auditor impact on valuation multiples and could provide alternative explanations for the effects of a Big 4 auditor in other settings. For example, if a Big 4 auditor is positively correlated with better information systems, more financial expertise, and a better managed company, then audit quality or auditor selection, the two most common explanations in the literature for a Big 4 effect, are not the only reasons why firms that hire a Big 4 auditor have lower cost of (debt or equity) capital.

We contribute to the literature in a number of ways. Our primary contribution is to show that valuation multiples are higher for private firms with a Big 4 auditor. We demonstrate that the reason for the discount paid for private firms relative to public firms goes beyond simple differences in liquidity as many people believe (e.g., Sloan 2002; Officer 2007). We note that the IPO evidence on Big 4 equity or debt pricing effects may not extrapolate to our private-sale setting, where information environments are especially poor, relative to companies that go IPO. For example, there is no offering document subject to the scrutiny of the Securities and Exchange Commission (SEC) or being reviewed by analysts and media. In addition, an IPO company is far more likely to make significant investments in improving corporate governance and internal controls over financial reporting prior to going public, all with the anticipation of experiencing fundamentally higher levels of oversight. Our results provide private sellers with empirical evidence regarding the potential impact of auditor choice on deal proceeds and contribute to the literature examining the impact of auditor choice on the cost of capital.

Second, this article presents a rigorous study of the PCD in the context of controlling interests, which is needed because, as Pratt (2001, 173) argues, the existing analysis is neither comprehensive nor thorough enough

to answer once and for all the question of whether private-firm controlling interests sell for less. Our multivariate approach, which controls for other determinants of value and alternative data sources, complements and improves on the extant PCD literature. For example, the existing studies use a matched-pair approach. Although this approach has some advantages, one significant disadvantage is the additional restrictions in the sample selection process, which using our data results in a sample that is less than half that of our multivariate method. Our large sample helps to ensure that results better extrapolate to the population of private firms. Our results should be of particular interest to valuation practitioners. For example, The National Association of Certified Valuation Analysts (NACVA 2008), whose members specialize in the valuation of small and medium-sized enterprises, describe helpful research as follows: "Any research relating to the value of privately held enterprises or that helps reconcile the difference between public and private companies would be of particular interest."

Section 2 contains our literature review and presents our hypotheses. Section 3 describes our sample, while section 4 discusses our research methods and results. Section 5 summarizes the discussion at our round-table session. Section 6 concludes.

## 2. Literature review and hypotheses

Private firms are different from public firms along a number of dimensions that potentially affect firm valuation. Recent empirical work supports the existence of a PCD. Koeplin, Sarin, and Shapiro (2000) employ 84 matched pairs of private and public acquisitions in the United States between 1984 and 1998 and estimate a PCD of 20 percent for *EV/EBITDA* but none for *EV/SALES*. *EV* is the enterprise value. It is defined as the sale price of the firms' equity plus total liabilities less current liabilities and hence it represents the entire firm value (i.e., the asset value) as opposed to just the equity value. *SALES* is total sales and *EBITDA* is earnings before interest, taxes, and depreciation and amortization. Using a matched-pairs approach and 1979–2003 data for unlisted targets, Officer (2007) estimates a PCD of 17 percent to 18 percent for the *EV/EBITDA* and *EV/SALES* models, respectively.[2] While there is a growing consensus in the literature that a PCD exists on average, the explanation for the discount remains an open question.

Less demand for financial information leads to less sophisticated accounting systems and weaker internal controls, all of which increases the unintentional errors in private-firm earnings. Private firms also potentially

2. Several empirical studies, including Chang 1998, Ang and Kohers 2001, Fuller, Netter, and Stegemoller 2002, and Draper and Paudyal 2006, provide indirect evidence of a PCD by comparing public company bidder returns at the announcement of takeover proposals for private relative to public targets. Consistent with paying lower prices for private targets, acquirer abnormal returns at the time of the announcement are higher if the target is a private as opposed to a public company.

have innate characteristics that can lead to higher information risk. For example, consistent with private firms' smaller size, the product and market scope of private firms is more limited. This leads to private firms being less diversified and hence experiencing more variability in sales and operating cash flows (innate factors identified and used by Dechow and Dichev 2002 and Francis, LaFond, Olsson, and Schipper 2005).

The empirical literature documents the lower quality of earnings for private firms in general, although there are some exceptions (e.g., Beatty, Ke, and Petroni 2002).[3] In our setting, public and private sellers face similar income-increasing earnings management incentives. Ball and Shivakumar (2005) show that U.K. financial reporting for private firms is less conservative than for public firms due to different market demands, regulation notwithstanding. Burgstahler, Hail, and Leuz (2006) find earnings management is more pervasive in private firms across European countries. Katz (2006) finds U.S. firms that have publicly traded debt are less conservative if their equity is not publicly traded. Similar to these studies, our sample firms all prepare financial statements using the same standards (in our case, U.S. generally accepted accounting principles). The Ball and Shivakumar, Burgstahler et al., and Katz studies, however, are made possible by the fact that European private firms or U.S. firms with public debt submit their financial statements to country regulators and hence their financial statements are, in essence, public documents. In contrast, there is no regulatory oversight of our sample of U.S. private firms and hence regulatory monitoring and enforcement will be absent.[4]

The primary difference, however, between these studies and our setting is that our sample firms are being sold. In this setting, firm managers have incentives to take actions that increase their sale price. If management expects price to be a positive function of earnings, firms could manage accruals upwards. A large number of papers have studied earnings management around large transactions, such as the acquisition of target firms consistent with our study.[5] The actual evidence of earnings management

3. Beatty et al. (2002) observe more earnings management affecting reported earnings trends for public relative to private banks and argue that private banks have fewer incentives to engage in such behavior.

4. While the financial statements of the private firms in our sample eventually enter the public domain via acquirers' SEC filings (which allows us to study them), at the time of the negotiations and transaction with the acquirer the statements are private.

5. Studies that examine earnings management around mergers and acquisitions include Easterwood 1998, Christie and Zimmerman 1994, Erickson and Wang 1999, Louis 2004, and Powell and Stark 2005. Studies that examine other large transactions include management buyouts (DeAngelo 1986; Perry and Williams 1994), IPOs, (Aharony, Lin, and Loeb 1993; Friedlan 1994; Teoh, Welch, and Wong 1998a; Teoh and Wong 2002; Ball and Shivakumar 2008), seasoned equity offerings (Teoh, Welch, and Wong 1998b; Rangan 1998; Shivakumar 2000; Teoh and Wong 2002; Marquardt and Wiedman 2004), stock splits (Louis and Robinson 2005), and employee stock option reissues (Coles, Hertzel, and Kalpathy 2006).

around large transactions is mixed. For example, Teoh et al. (1998a) show that IPO firms adopt income-increasing accruals. Ball and Shivakumar (2008), on the other hand, challenge these results and argue that the Teoh, Welsh, and Wong (1998a) results are unreliable for a variety of reasons. Ball and Shivakumar (2008) find no evidence of earnings management around the IPO for a sample of U.K. firms.

Auditors are especially important for private firms that are being sold. Auditors provide independent verification of manager-prepared financial statements and express their opinions on the management's assertions. Audit quality is defined in terms of the level of assurances – the probability that financial statements contain no material omissions or misstatements (Palmrose 1988). Prior literature suggests that Big 4 auditors in the United States have incentives to provide high-quality audits. Big 4 auditors have large reputation capital and have more to lose in litigations because of their "deep pockets" (DeAngelo 1981). Big 4 auditors are more likely to be sued and suffer costly litigation damages. Thus, Big 4 auditors would provide higher-quality audits in order to reduce litigation risk and to protect their brand name reputation (DeAngelo 1981; Becker et al. 1998).

Prior research generally suggests that Big 4 auditors are perceived to provide higher audit quality than non–Big 4 auditors. Khurana and Raman (2004) utilize the ex ante cost of equity capital and examine whether Big 4 auditors are perceived as providing higher-quality audits (relative to non–Big 4 auditors) in the United States and in the less litigious (but economically similar) countries. They find that a Big 4 audit is associated with a lower ex ante cost of equity capital for auditees in the United States but not in Australia, Canada, or the United Kingdom. Their results suggest that the estimated cost of equity capital decreases by 30 basis points, amounting to savings of $0.5 million annually, if a non–Big 4 auditee were to switch to using a Big 4 auditor.[6] Other studies show that large auditors increase IPO proceeds. Beatty (1989) shows that private firms who undergo an IPO and are audited by a more reputable auditor have lower initial equity returns (consistent with receiving a higher IPO price) than IPO firms with a less reputable auditor. Balvers, McDonald, and Miller (1988) find that, relative to non–Big 8 auditors, Big 8 auditors on average reduce the level of underpricing by approximately four percent. Willenborg (1999) finds that, for IPO proceeds in excess of $6 million, underpricing is greater for non-national auditees.

Researchers show that Big 4 auditees have a lower cost of debt capital for U.S. publicly traded companies, again suggesting higher perceived Big 4 audit quality. Mansi et al. (2004) examine the role of auditors from the

6. Khurana and Raman (2004) show that the coefficient on *Big 4* dummy variable is −0.003 (see their Table 3) and that the median size for non–Big 4 auditees is $170 million. The average non–Big 4 auditee will thus save $0.51 million (= −0.003 × $170 million) by hiring a Big 4 auditor.

perspective of bondholders and show that firms audited by a Big 4 auditor have a 63-basis-point lower cost of debt capital. They also find that the relation between auditor characteristics and the cost of debt is most pronounced for firms with debt that is noninvestment grade. This suggests that the role of auditors is more important as firm information risk increases. Pittman and Fortin (2004) focus on recent IPOs and examine the impact of auditor choice on debt pricing in the early public years after the IPO when firms are lesser known. They find that retaining a Big 6 auditor, which can reduce debt-monitoring costs by enhancing the credibility of financial statements, enables young firms to lower their borrowing costs. In particular, companies hiring a Big 6 auditor have an interest rate that is 143 basis points lower. They also provide evidence that choosing a Big 6 auditor affects firms' interest rates less over time and particularly benefits firms with short private histories, consistent with the information effect of auditor quality being important when information environments are poor.

While a maintained assumption of audit quality studies is that Big 4 audit quality is in fact truly higher, there are contrary findings as well (e.g., Petroni and Beasley 1996).[7] Researchers have provided direct evidence that large auditors provide higher quality audits than small auditors. Francis et al. (1999) report that Big 4 auditors constrain aggressive and opportunistic reporting by U.S. public companies. They find that both absolute discretionary accruals and income-increasing discretionary accruals are lower for Big 6 auditees than for non–Big 6 auditees. In addition, for small, nonventure-backed IPOs, Weber and Willenborg (2003) find that the pre-IPO opinions of larger auditors are more predictive of post-IPO stock delistings.

Only two other studies have examined whether a Big 4 pricing differential exists for private companies, both involving the impact of Big 4 auditors on the cost of debt capital. For a sample of private U.S. companies issuing public bonds to qualified institutional buyers under SEC Rule 144A, Fortin and Pitman (2007) find no significant difference in the bond yield spread or credit ratings between Big 4 and non–Big 4 auditees. In contrast, for a sample of private Korean companies for which audits are voluntary, Kim, Simunic, Stein, and Yi (2010) demonstrate that, for the years prior to the 1997 Asian financial crisis, loan interest rates are lower for Big 4 compared to non–Big 4 auditees. Although not a pricing differential study, Chaney, Jeter, and Shivakumar (2004) find no audit fee premium for Big 4 auditors, once self-selection factors are controlled for, using a sample of private U.K companies. To the extent that audit fees reflect audit quality, their findings suggest no audit quality differentiation between Big 4 and non–Big 4 audited private companies. Thus, the Big 4 audit quality evidence for

7. For a sample of property and casualty insurance companies, Petroni and Beasley (1996) find no systematic differences in claim loss reserve accuracy or bias between Big 8- and non–Big 8-audited firms.

private companies is mixed. Further, no evidence exists for private sellers of equity or assets. Our study seeks to fill these voids.

We highlight that the IPO evidence on Big 4 equity or debt pricing effects may not extrapolate to private sellers of equity or assets, a setting where information environments are especially poor, relative to companies doing an IPO. There is no offering document subject to the scrutiny of the SEC or being reviewed by analysts and media. Compared to a private company sale, an IPO company is far more likely to make significant investments in improving corporate governance and internal controls over financial reporting prior to going public, all with the anticipation of experiencing fundamentally higher levels of oversight. In addition, as documented later, private firms have innate earnings characteristics that imply a generally poorer information environment for private relative to public targets. Thus, the private seller setting is one where Big 4 choice potentially matters considerably, in terms of reducing information risk, suggesting the potential for large auditor-choice effects. This difference in information environments represents a fertile environment for examining Big 4 pricing differentials and may explain why we document Big 4 pricing premiums that are large relative to the extant Big 4 literature based on IPOs.

Given the above discussion, our hypothesis is stated as follows:

HYPOTHESIS. *Ceteris paribus, Big 4 auditors increase the proceeds of private firms.*

We note here that our hypothesis is based in part on findings in the extant literature. The discussion of our empirical results with practitioners, which we present in section 5, has led to additional reasons and insight into why this relation is expected to hold.

Our study includes both stock- and asset-purchase private-firm transactions. Our motivation for including asset purchases is as follows. It is intuitive and widely accepted among both practitioners and academics that information risk is lower for an assets-only deal, compared to buying shares, because with the former the buyer is not responsible for any unrecorded liabilities. Thus, the costs of doing due diligence are lower for assets-only deals. It is empirically interesting to explore whether Big 4 price differential effects hold for asset purchases. Though information risk is lower for asset purchases, addressing these risks via a high-quality audit is still an important aspect of the deal because the buyer must be satisfied with the valuation assertions regarding acquired net assets. Thus, asset-purchase deals represent an interesting benchmark sample for comparison with stock purchases.

## 3. Data sources and sample selection

The source of our private-firm valuation data is *Pratt's Stats*® published by Business Valuation Resources (BVR). It includes financial statement

and transactional details on the sale of privately held firms for the period 1994–2005. This database is routinely used by intermediaries, such as accounting firms, investment banks, and business brokers that represent buyers or sellers in these transactions. The data itself is collected from two sources. First, the same intermediaries that use the data in their valuation analysis contribute details of completed transactions to the database. Second, data is collected from regulatory filings, in which public firms acquiring private firms disclose these transactions in SEC filings such as 8-Ks.

The available data in *Pratt's Stats*® include the firm's identity (e.g., firm name, industry classification, country location), summary information from the firm's most recent financial statements (e.g., net sales, cost of goods sold, interest expense, taxes, net income, trade receivable, inventory, fixed assets, total assets, current liabilities, total liabilities, income statement date, and balance sheet date), and details about the acquisition transaction (e.g., buyer firm name, equity price, enterprise value, detailed sale terms, sale date, stock versus asset sale). For parsimony, given that only a small number of observations are for non-U.S. firms, we limit our sample to U.S. private firms.

Although *BVR* provides a comprehensive set of selected financial information to satisfy the needs of practitioners, we manually collect private firms' financial statement data from the SEC filings of the U.S. acquirers because BVR does not collect all the information required for this study. For example, BVR collects no information from the cash flow statement, but we require operating cash flow (in particular, to calculate the derived accruals measure) for our accrual quality and pricing tests. As another example, we require the name of the auditor to determine auditor size. Furthermore, BVR's income statement information is for the most recent annual fiscal period, but balance sheet information is provided for the most recent fiscal quarter prior to the acquisition, which may not be the fourth fiscal quarter. To fairly evaluate income and balance sheet information in our tests, we require the balance sheet at the end of the annual fiscal period. Last, our tests require us to calculate changes in certain annual measures, and so we require not only the most recent but also the prior year's annual financial statements.

U.S. public acquirers normally file 8-K or 8-K/A forms with the SEC within 15 days of an acquisition. BVR records the date of the filing and the buyer Central Index Key (CIK), which is the unique number that the SEC's computer system assigns to corporations that file disclosure documents with the SEC. BVR does not normally provide these data to users, but kindly supplied them to us given our academic research purpose. The CIK, along with the recorded date, enables us to quickly and precisely access the 8-K or 8-K/A filings of the public acquirers on the SEC's EDGAR website for each private-firm observation. For a small number of firms we cannot locate the appropriate SEC filing, or the filing simply

does not contain the financial statement data we require. We exclude these firms from the sample. A number of variables we collect are already provided in the *Pratt's Stats*® data set. Given the novelty of the *Pratt's Stats*® data set and the absence of previous academic research using the data, we manually collect this same information from the SEC filings of the acquirer in order to check the integrity of BVR's SEC-data-collection process. With few exceptions, all data in *Pratt's Stats*® match with our hand-collected data. If there is a difference, we reexamine the source SEC filing and reconcile the difference with representatives from BVR. There is no systematic pattern to the errors. Given this checking and reconciliation process, we are confident that both *Pratt's Stats*® SEC data and our hand-collected data is of high quality. This manual process restricts our sample of private firms to those purchased by public U.S. firms, and those with financial statement data for the two fiscal years prior to the acquisition.

Our comparable sample of public transactions is taken from the *Thomson Financial SDC* database of mergers and acquisitions.[8] All public transactions are structured as stock purchases. The sample includes U.S. public-firm targets acquired by other U.S. public firms over the corresponding time period of our private-firm sample. We limit our analysis to *SDC* firms in which the buyer holds 100 percent controlling interest after the transaction. This data is directly comparable to the private firm transactions, which also represent the purchase of 100 percent controlling interests. Our focus on controlling interests allows us to abstract from the issue of minority-interest discounts. While the *SDC* database includes selected financial statement data, it does not contain all the data we need for our tests. We use a combination of programming and manual processes to match the *SDC* data with COMPUSTAT, using firms' ticker symbol, name, and fiscal year. We use financial statement data in *SDC* to verify the match with COMPUSTAT. We obtain all financial statement data from COMPUSTAT. Public firms with insufficient *C*OMPUSTAT data are excluded from the analysis.

Last, we combine the private firms of *Pratt's Stats*® and the public firms of *SDC* into one data set. We restrict our sample to firms with positive book value of equity and positive sales. We exclude financial institutions from our sample to avoid the confounding effects of these highly regulated industries.[9] We also require enough data to estimate the variables used in our tests. After applying all the restrictions discussed above,

8. While *SDC* will include some information on the acquisition of private firms, it infrequently includes financial statement information at a level comparable with its public acquisitions. Also, because Thomson Financial does not indicate the source of its information, it is extremely difficult for us to verify the integrity of this data.

9. According to Burgstahler and Eames 2003, financial firms are subject to earnings-management incentives that are more complex due to regulation and other factors. See also, for example, Rosner 2003.

our sample consists of 3,196 firms, of which 673 are private stock sales, 274 are private asset sales, and 2,249 are public stock sales. Most of our analysis uses a slightly smaller sample (664 and 271 private stock and asset sales, respectively, and 2,225 public stock sales) because we delete the top and bottom 0.5 percent of dependent variables in our tests.

Table 1 contains descriptive statistics for our sample of private stock-purchase targets (columns 1 to 3) and private asset-purchase targets (columns 4 to 6) relative to public targets (columns 7 to 9). Francis et al. (2005) argue that smaller firms, and firms with greater cash flow and sales volatility, longer operating cycles, and greater incidence of losses have poor innate accruals quality that imply higher information risk. We first focus on comparing private stock-purchase targets with public targets. These private firms demonstrate several innate characteristics associated with lower accruals quality, relative to public stock purchases. For example, such firms are smaller. Private (public) firms' median total assets is \$8.7 (\$131.1), median total sales is \$15.8 (\$130.1) and median *EBITDA* is \$1.5 (\$13.1) million. The cross-sectional standard deviation of *Sales Turnover* (sales/total assets) and *Operating Cash Flow* (net cash flow from operations scaled by total assets) for private firms are about double that for public firms. It should be pointed out that private stock targets have a shorter median operating cycle (75.6 versus 92.3 days) and a lower incidence of losses (27 versus 36 percent), consistent with higher innate accruals quality for private targets. The median private (public) firm leverage is 5 (16) percent of total assets. Less debt for private firms implies weaker monitoring by creditors.[10] In addition, 59 (93) percent of private (public) firms, respectively, are audited by a Big 4 auditor. A comparison of private asset-purchase targets (in columns 4 to 6) to public targets demonstrates very similar patterns. On balance, we view the descriptive evidence as consistent with a poorer information environment for private relative to public targets. This becomes important for our later tests, in which we document Big 4 pricing premiums that are large relative to the extant Big 4 literature based on public companies.

A comparison of private transactions structured as stock purchases (in columns 1 to 3) versus asset purchases (in columns 4 to 6) reveals that there are no large differences in private company characteristics such as size, growth, profitability, and so on. For example, the median *Sales* and *EBITDA* for stock purchases are \$15.8 and \$1.5, respectively, compared to \$13.8 and \$1.2 million for asset purchases.

10. Theoretical studies view third-party lenders (such as banks) as insiders, who can enhance a borrowing firm's value by reducing information asymmetries or by monitoring firm performance (e.g., Fama 1985; Berlin and Loeys 1988). We also expect creditors to more likely transact with firms that have less information asymmetry and are easier to monitor. Our Table 6 tests show that controlling for leverage does not change our inferences.

TABLE 1
Descriptive statistics on sample firms

| Variable | Private Firms (Stock Purchases) ($n$ = 673) | | | Private Firms (Asset Purchases) ($n$ = 274) | | | Public Firms (Stock Purchases) ($n$ = 2,249) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean (1) | Median (2) | Std. Dev. (3) | Mean (4) | Median (5) | Std. Dev. (6) | Mean (7) | Median (8) | Std. Dev. (9) |
| *Assets* | 23.14* | 8.67* | 41.36* | 32.03* | 7.24* | 79.10** | 803.73 | 131.09 | 2,387.56 |
| *Sales* | 40.47* | 15.83* | 66.50* | 42.39* | 13.82* | 85.05* | 665.21 | 130.11 | 1,874.12 |
| *EBITDA* | 2.78* | 1.45* | 7.92* | 3.53* | 1.15* | 11.04* | 91.10 | 13.14 | 296.91 |
| *Working Capital* | 0.34* | 0.36* | 0.28* | 0.17* | 0.02* | 2.28* | 0.47 | 0.50 | 0.25 |
| *Sales Growth* | 0.42* | 0.16* | 0.99* | 0.53* | 0.10 | 2.40* | 0.30 | 0.11 | 0.74 |
| *Sales Turnover* | 2.34* | 2.08* | 1.50* | 2.51* | 2.21* | 1.72* | 1.13 | 1.00 | 0.77 |
| *Profit Margin* | −0.17** | 0.09 | 1.39* | −0.06 | 0.10 | 1.11* | −0.06 | 0.10 | 0.80 |
| *ROA* | 0.14* | 0.19* | 0.44* | 0.10* | 0.10** | 0.54* | 0.05 | 0.11 | 0.24 |
| *Operating Cash Flow* | 0.08* | 0.11* | 0.41* | 0.16* | 0.13* | 0.44* | 0.03 | 0.07 | 0.18 |
| *Loss* | 0.27* | 0.00* | 0.45** | 0.27* | 0.00* | 0.44 | 0.36 | 0.00 | 0.48 |
| *Leverage* | 0.13* | 0.05* | 0.17* | 0.11* | 0.02* | 0.18* | 0.23 | 0.16 | 0.22 |
| *Operating Cycle Days* | 84.02* | 75.62* | 54.32* | 80.34* | 69.82* | 61.71 | 101.45 | 92.27 | 59.94 |
| *Capital Intensity* | 0.21* | 0.08* | 0.41* | 0.23* | 0.09* | 0.52* | 0.48 | 0.19 | 0.77 |
| *Big4* | 0.59* | 1.00* | 0.49* | 0.53* | 1.00* | 0.50* | 0.93 | 1.00 | 0.26 |

(The table is continued on the next page.)

TABLE 1 (Continued)

**Notes:**

This table provides descriptive statistics for our sample of 3,196 (673 stock-purchased private, 274 asset-purchased private, and 2,249 public) firms. The mean, median, and standard deviation is reported by type of firm. Asterisks indicate that the private firm value is significantly different than the corresponding public firm value. The source of data for private firms is *Pratt's Stats*® and manually collected financial statement data from the acquirer's SEC filings. The sources of data for public firms are from *Thomson Financial SDC* and COMPUSTAT.

* Significant at the 0.01 level (two-tailed).

** Significant at the 0.05 level (two-tailed).

*Variable definitions*. All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *Assets* is total assets. *Sales* is total sales. *EBITDA* is earnings before interest, taxes, and depreciation and amortization. *Working Capital* is current assets minus current liabilities scaled by total assets. *Sales Growth* is the percentage change in the annual sales. *Sales Turnover* is *Sales* divided by *Assets*. *Profit Margin* is *EBITDA* divided by *Sales*. *ROA* is *EBITDA* divided by *Assets*. *Operating Cash Flow* is the net cash flow from operations scaled by total assets. *Loss* is an indicator variable that equals 1 if income before extraordinary items is less than zero, and 0 otherwise. *Leverage* is the ratio of total liabilities less current liabilities to total assets. *Operating Cycle Days* is the days of inventory (365 × Inventory/[*Sales* − *EBITDA*]) plus days of accounts receivable (365 × Receivables/*Sales*). *Capital Intensity* is property, plant, and equipment divided by *Sales*. *Big4* is an indicator variable that equals 1 if the auditor is a Big 4 audit firm, and 0 otherwise.

Table 2 reports a similar set of descriptive statistics when all three groups of firms (private stock purchase, private asset purchase, and public deals) are partitioned into Big 4- and non–Big 4-audited firms.[11] We conjecture that the Big 4 auditor indicator variable used in our valuation multiple tests is proxying for, among other constructs, higher innate accruals quality, consistent with the Big 4 auditor variable capturing lower firm risk as argued by Clarkson and Simunic 1994. To shed light on this idea, panel A of Table 2 compares innate accrual quality characteristics identified in Francis et al. 2005, across Big 4 and non–Big 4 private stock-purchase targets. On the one hand, private stock-purchase targets without a Big 4 auditor are smaller (median asset size is $5.8 million, compared to $12.7 million for Big 4-audited targets), a factor which points to lower innate earnings quality. On the other hand, private stock targets without a Big 4 auditor have a lower cross-sectional standard deviation of operating cash flows scaled by total assets (0.32 compared to 0.47 for Big 4 clients) and fewer losses (19 percent, compared to a loss incidence of 33 percent, for Big 4 clients), factors which point to higher innate accruals quality for private firms without a Big 4 auditor. For private asset-purchase targets, panel B reveals no significant differences in the cross-sectional standard deviation of scaled operating cash flows or the incidence of losses, across the Big 4 and non–Big 4 groups, although the median operating cycle is shorter and firm size is larger for firms with a Big 4 auditor. From this evidence, there is no simple innate accruals quality explanation for our Big 4 auditor price premium among private firms. This is important because it implies that a private target can receive a high purchase price per dollar of fundamental by making strategic choices, such as hiring a Big 4 auditor. Innate earnings quality, in contrast, is something the firm cannot control. For public firms, panel C reveals that, compared to firms not audited by a Big 4 auditor, Big 4-audited firms are larger and have higher sales turnover and leverage.

## 4. Research methods and results

### *Estimating the PCD*

#### *Tests*

In contrast to the matched-pair approach in Koeplin et al. 2000 and Officer 2007, we introduce into the literature a multivariate approach to estimating the PCD that controls for valuation differences unrelated to whether the firm is private or public. Consistent with classical valuation theory, we view

11. Reputable auditors is a broader construct than simply whether the auditor is one of the four largest auditing firms in the United States, as we define our empirical measure. Reputable auditors potentially include other large national auditors and auditors who are leaders in their region or their industry. Nevertheless, all Big 4 audit firms are reputable and our Big 4 versus non–Big 4 dichotomy should capture effects attributable to varying auditor reputation.

TABLE 2
Descriptive statistics on sample firms without and with Big 4 Auditor

**Panel A:** Private firms (stock purchases)

| | Without Big 4 Auditor ($n$ = 276) | | | With Big 4 Auditor ($n$ = 397) | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Median | Std. Dev. | Mean | Median | Std. Dev. |
| *Assets* | 12.45 | 5.78 | 20.58 | 30.57* | 12.73* | 49.74* |
| *Sales* | 27.33 | 11.52 | 41.50 | 49.61* | 20.33* | 78.13* |
| *EBITDA* | 2.26 | 1.11 | 4.65 | 3.15 | 2.00** | 9.54* |
| *Working Capital* | 0.34 | 0.35 | 0.27 | 0.35 | 0.37 | 0.29 |
| *Sales Growth* | 0.31 | 0.16 | 0.58 | 0.49** | 0.16 | 1.19* |
| *Sales Turnover* | 2.66 | 2.37 | 1.55 | 2.11* | 1.76* | 1.43 |
| *Profit Margin* | 0.04 | 0.08 | 0.72 | −0.31* | 0.09 | 1.70* |
| *ROA* | 0.21 | 0.20 | 0.32 | 0.08* | 0.17* | 0.50* |
| *Operating Cash Flow* | 0.13 | 0.11 | 0.32 | 0.04* | 0.10 | 0.47* |
| *Loss* | 0.19 | 0.00 | 0.39 | 0.33* | 0.00* | 0.47* |
| *Leverage* | 0.12 | 0.04 | 0.16 | 0.13 | 0.05 | 0.18 |
| *Operating Cycle Days* | 83.08 | 73.09 | 56.41 | 84.67 | 76.77 | 52.87 |
| *Capital Intensity* | 0.18 | 0.06 | 0.38 | 0.23*** | 0.10* | 0.43** |

**Panel B:** Private firms (asset purchases)

| | Without Big 4 Auditor ($n$ = 128) | | | With Big 4 Auditor ($n$ = 146) | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Median | Std. Dev. | Mean | Median | Std. Dev. |
| *Assets* | 16.12 | 4.44 | 55.85 | 45.96* | 11.51* | 92.89* |
| *Sales* | 21.84 | 11.16 | 33.51 | 60.40* | 20.05* | 109.24* |
| *EBITDA* | 2.03 | 0.93 | 6.41 | 4.84** | 1.57** | 13.77* |
| *Working Capital* | 0.30 | 0.04 | 3.32 | 0.05 | 0.02* | 0.35* |
| *Sales Growth* | 0.36 | 0.11 | 1.79 | 0.68 | 0.09* | 2.83* |
| *Sales Turnover* | 2.73 | 2.46 | 1.70 | 2.32** | 1.98 | 1.72 |
| *Profit Margin* | 0.05 | 0.11 | 0.76 | −0.15 | 0.10 | 1.34* |
| *ROA* | 0.15 | 0.13 | 0.58 | 0.06 | 0.07** | 0.50*** |
| *Operating Cash Flow* | 0.21 | 0.17 | 0.46 | 0.11** | 0.10** | 0.41 |
| *Loss* | 0.24 | 0.00 | 0.43 | 0.29 | 0.00 | 0.46 |
| *Leverage* | 0.12 | 0.03 | 0.17 | 0.11 | 0.02 | 0.18 |
| *Operating Cycle Days* | 84.41 | 72.08 | 66.78 | 76.76 | 68.24*** | 56.89*** |
| *Capital Intensity* | 0.23 | 0.08 | 0.56 | 0.23 | 0.11 | 0.49 |

(The table is continued on the next page.)

TABLE 2 (Continued)

**Panel C:** Public firms

| | Without Big 4 Auditor ($n$ = 161) | | | With Big 4 Auditor ($n$ = 2,088) | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Median | Std. Dev. | Mean | Median | Std. Dev. |
| *Assets* | 117.86 | 37.79 | 440.01 | 856.62* | 143.28* | 2,467.03* |
| *Sales* | 128.37 | 43.05 | 346.59 | 706.61* | 142.20* | 1,936.52* |
| *EBITDA* | 16.88 | 2.47 | 86.57 | 96.83* | 14.63* | 306.47* |
| *Working Capital* | 0.44 | 0.48 | 0.27 | 0.48 | 0.50 | 0.25 |
| *Sales Growth* | 0.18 | 0.10 | 0.52 | 0.31** | 0.11 | 0.75* |
| *Sales Turnover* | 1.35 | 1.25 | 0.79 | 1.11* | 0.97* | 0.76 |
| *Profit Margin* | 0.01 | 0.08 | 0.55 | −0.06 | 0.10** | 0.82* |
| *ROA* | 0.06 | 0.09 | 0.24 | 0.05 | 0.11 | 0.24 |
| *Operating Cash Flow* | 0.04 | 0.07 | 0.17 | 0.03 | 0.07 | 0.18 |
| *Loss* | 0.38 | 0.00 | 0.49 | 0.36 | 0.00 | 0.48 |
| *Leverage* | 0.18 | 0.12 | 0.19 | 0.23* | 0.17* | 0.22* |
| *Operating Cycle Days* | 106.05 | 93.31 | 63.83 | 101.10 | 92.20 | 59.63 |
| *Capital Intensity* | 0.40 | 0.15 | 0.78 | 0.48 | 0.19* | 0.77 |

**Notes:**

This table reports descriptive statistics for our sample of 3,196 firms. Panels A to C report the mean, median, and standard deviation for 673 stock-purchased private firms, 274 asset-purchased private firms, and 2,249 public firms, respectively. Each panel partitions the firms into those with and without a Big 4 auditor. Asterisks indicate that the value for a firm with a Big 4 auditor is significantly different than the corresponding value for a firm without a Big 4 auditor. The source of data for private firms is *Pratt's Stats*® and manually collected financial statement data from the acquirer's SEC filings. The sources of data for public firms are from *Thomson Financial SDC* and COMPUSTAT.

* Significant at the 0.01 level (two-tailed).

** Significant at the 0.05 level (two-tailed).

*** Significant at the 0.10 level (two-tailed).

*Variable definitions.* All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *Assets* is total assets. *Sales* is total sales. *EBITDA* is earnings before interest, taxes, and depreciation and amortization. *Working Capital* is current assets minus current liabilities scaled by total assets. *Sales Growth* is the percentage change in the annual sales. *Sales Turnover* is *Sales*

(The table is continued on the next page.)

TABLE 2 (Continued)

divided by *Assets*. *Profit Margin* is *EBITDA* divided by *Sales*. *ROA* is *EBITDA* divided by *Assets*. *Operating Cash Flow* is the net cash flow from operations scaled by total assets. *Loss* is an indicator variable that equals 1 if income before extraordinary items is less than zero, and 0 otherwise. *Leverage* is the ratio of total liabilities less current liabilities to total assets. *Operating Cycle Days* is the days of inventory (365 × Inventory/[*Sales* − *EBITDA*]) plus days of accounts receivable (365 × Receivables/*Sales*). *Capital Intensity* is property, plant, and equipment divided by *Sales*.

firm value to be positively related to the level and expected growth of cash flows, and negatively related to the riskiness of the cash flows. We rely on selected financial accounting information to proxy for these valuation dimensions.

We frame this analysis in terms of valuation multiples. Our focus is on *EV/EBITDA* and *EV/SALES* multiples, two ratios that are also examined by Officer 2007 and are widely used to value firms (Kaplan and Ruback 1995; Bhojraj and Lee 2002; Lie and Lie 2002; Liu, Nissim, and Thomas 2002; Mukherjee, Kiymaz, and Baker 2004). While *EV/EBITDA* is used more often in practice (Finnerty and Emery 2004; Yoo 2006), the *EV/SALES* multiple has a number of advantages. For a practical matter, because multiples are restricted to positive values, the latter can be used for firms with negative values of *EBITDA*, which leads to a sample that is larger and better represents the population of firms (see, e.g., Bhojraj and Lee 2002 for a discussion of this issue). In our particular setting of mergers and acquisitions, the acquirer is anticipating synergies (e.g., personnel reductions, technology consolidations, etc.) and potentially making appropriate adjustments when determining the value of the target. Other adjustments for private firms will include abnormal management compensation and perks, as well as abnormal rent. These adjustments are not observable and are likely focused on operating expenses, which increase the noise in *EBITDA* more than in sales. For similar reasons related to unobservable normalization adjustments, inferences from a *P/E* model are likely to be less reliable than either the *EBITDA*- or *SALES*-related models, so we exclude this model from our tests. Last, we exclude the price-to-book-value-of-equity model because it produces implausible results (see Officer 2007).

In our analyses, we use *EBITDA/EV* and *SALES/EV* as dependent variables. Beatty, Riffe, and Thompson (1999) discuss the advantage of inverse multiples when using the method of comparables. The accounting variable is considered a noisy measure for the expected cash flow, and placing it in the denominator leads to estimated coefficients that are positively biased. However, estimated coefficients are unbiased if the accounting

variable is placed in the numerator. The multivariate models that we employ are:

$$iEBITDA/EV = \alpha_0 + \alpha_1 Private + \alpha_2 Target\ Size + \alpha_3 Sales\ Growth + \varepsilon \quad (1),$$

$$iSALES/EV = \alpha_0 + \alpha_1 Private + \alpha_2 Target\ Size + \alpha_3 Sales\ Growth + \alpha_4 R\&D + \alpha_5 Profit\ Margin + \varepsilon \quad (2)$$

*Private* is an indicator variable that equals one if the firm is privately held and zero otherwise. *Target Size* is the log of the target's total assets. *Sales Growth* is the percentage change in the target's annual sales. *R&D* is the target's research and development expense divided by sales. *Profit Margin* is the target's *EBITDA* divided by sales. This multivariate analysis is conducted on an intra-industry-year level in order to control for industry and year effects and facilitate pooling across our sample. That is, for each two-digit SIC industry and year, we use COMPUSTAT data to identify the COMPUSTAT median value of dependent and independent variables. We subtract the respective COMPUSTAT median from the raw value.[12] To indicate this industry-year adjustment we add the prefix *i* to the dependent variable name. If the dependent variable is industry-adjusted then so are the continuous independent variables.[13]

*Target Size* and *Sales Growth* serve as proxies for risk and growth, respectively, and their inclusion as covariates should assist in controlling for these important dimensions of firm value. To the extent that part of the firms' growth and risk is associated with its industry membership, our industry adjustment also assists in controlling for these dimensions. In the case of *EV/SALES*, we include *R&D* as an additional proxy for growth. We also take into account the role of profitability (i.e., profit margin) for sales multiples. We exclude these two variables from (1) because of the mechanical relation between these two variables and *EBITDA*. The coefficient on the *Private* indicator variable captures the mean difference in the respective multiple between private and public firms, which we expect to be positive given that we employ inverted multiples as the dependent variables.

Consistent with other research on valuation multiples (e.g., Koeplin et al. 2000; Beatty et al. 1999), we restrict the sample to observations in

12. Industry-year medians for the valuation multiple estimated using COMPUSTAT data use exchange-traded market prices, which reflect the value of minority interest in that firm. Hence, these medians disregard any valuation premium for control. This source of "noise", however, is the same for both our private and public sample firms and should be neutral to the analysis.

13. Our results are robust to alternative specifications that control for industry effects. For example, in untabulated analysis we do not industry-adjust any variables but include the industry-year median multiple as a separate explanatory variable. As another example, in untabulated analysis we estimate separate industry and year fixed effects. Estimated coefficients on the *Private* indicator variable remain similar.

which *EBITDA* is positive when estimating (1). For both equations, we delete the top and bottom 0.5 percent (winsorize the top and bottom 1 percent) of the dependent variables (independent variables), calculated separately for the private and public samples.

*Results for stock purchases*

We first examine univariate differences, which are presented in panel A of Table 3. Focusing initially on *EBITDA/EV*, the mean variables are 0.135 and 0.090, for private and public firms, respectively. The difference in mean (median) *EBITDA/EV* across the two samples is 0.045 (0.026). These differences are positive as expected and statistically significant, consistent with the existence of a PCD. The difference in mean (median) *SALES/EV* is 0.450 (0.360), which is also positive and statistically significant, corroborating the *EBITDA/EV* results.

Panel B of Table 3 presents the results of our multivariate tests. Most of the coefficients on our control variables are statistically significant in the predicted direction. After partialling out the effects of these value drivers on the valuation multiple (and hence facilitating the ceteris paribus assumption) we focus on the *Private* indicator variable. The estimated coefficient on *Private* is 0.053 and 0.247 for the *EBITDA/EV* and *SALES/EV* models, respectively, which are comparable in magnitude to the univariate-estimated differences.

To assess the economic interpretation of these differences, in columns 1 and 2 of panel C we calculate the PCD using the multiples. In the case of *EV/EBITDA*, for example, we use the following equation:

$$PCD = \frac{(EV/EBITDA_{Public} - EV/EBITDA_{Private})}{EV/EBITDA_{Public}} \quad (3).$$

For the PCD univariate analysis, we use the mean multiple for the respective sample of private and public firms. For the PCD multivariate analysis, we calculate the predicted multiple using the coefficients from the panel B regressions and the median private-firm values for each variable. To predict the private-firm (public-firm) multiple, the *Private* indicator variable is set to one (zero). The predicted enterprise value is median *EBITDA* (or median *SALES* as appropriate) multiplied by the predicted multiple. As shown in columns 1 and 2 of panel C, the PCD for stock-purchased private targets implied by the *EBITDA/EV* and *SALES/EV* multiples range from 20 percent to 40 percent. These percentage discounts in multiples translate to a value decrease of $3.0 to $11.4 million for private firms due to not being a public company.[14]

14. An additional reason (beyond the estimated difference in multiples) why the estimated dollar value of the PCD varies across columns is because the sample of firms for each calculation varies, which causes the median *EBITDA* or *Sales* dollar value used in the calculation to vary.

TABLE 3
Analysis of private company discount

**Panel A:** Univariate analysis of private firm (stock purchase) and public firm multiples

| | Predicted Sign | *EBITDA/EV* (1) | *SALES/EV* (2) |
|---|---|---|---|
| **Private Firms** | | | |
| Mean | | 0.135 | 1.370 |
| Median | | 0.105 | 0.904 |
| No. of Obs. | | 555 | 664 |
| **Public Firms** | | | |
| Mean | | 0.090 | 0.920 |
| Median | | 0.079 | 0.544 |
| No. of Obs. | | 1,743 | 2,225 |
| **Difference** | | | |
| Mean (*t*-statistic) | + | 0.045* (11.23) | 0.450* (7.60) |
| Median (*z*-statistic) | + | 0.026* (8.37) | 0.360* (9.41) |

**Panel B:** Multivariate analysis of private firm (stock purchase) and public firm multiples

| | Predicted Sign | *iEBITDA/EV* (1) | *iSALES/EV* (2) |
|---|---|---|---|
| Intercept | | −0.012* (−6.08) | 0.161* (6.05) |
| *Private* | + | 0.053* (10.59) | 0.247* (3.66) |
| *Target Size* | − | 0.001 (0.61) | −0.061* (−4.08) |
| *Sales Growth* | − | −0.015* (−4.11) | −0.152* (−5.02) |
| *R&D* | − | | −0.497* (−6.07) |
| *Profit Margin* | − | | −0.094* (−2.60) |
| Adj. $R^2$ | | 0.075 | 0.048 |
| No. of Obs. | | 2,298 | 2,889 |

**Panel C:** Value decrease for private firms due to not being a public company

| | Private Firms (Stock Purchases) | | Private Firms (Asset Purchases) | |
|---|---|---|---|---|
| | *EV/EBITDA* (1) | *EV/SALES* (2) | *EV/EBITDA* (3) | *EV/SALES* (4) |
| **Univariate Analysis** | | | | |
| Mean Public Multiple | 11.11 | 1.09 | 11.11 | 1.09 |
| Mean Private Multiple | 7.41 | 0.73 | 6.04 | 0.59 |
| Private Company Discount (%) | 33.3% | 32.8% | 45.6% | 45.9% |

(The table is continued on the next page.)

TABLE 3 (Continued)

| | Private Firms (Stock Purchases) | | Private Firms (Asset Purchases) | |
|---|---|---|---|---|
| | *EV/EBITDA* (1) | *EV/SALES* (2) | *EV/EBITDA* (3) | *EV/SALES* (4) |
| **Multivariate Analysis** | | | | |
| **Predicted Multiple** | | | | |
| Public Company | 12.46 | 0.99 | 9.88 | 0.82 |
| Private Company | 7.51 | 0.79 | 6.05 | 0.65 |
| Private Company Discount (%) | 39.7% | 20.2% | 38.8% | 20.7% |
| **Predicted Enterprise Value ($M)** | | | | |
| Public Company | $28.55 | $15.40 | $17.66 | $11.43 |
| Private Company | $17.20 | $12.38 | $10.82 | $9.03 |
| Private Company Discount | $11.35 | $3.02 | $6.84 | $2.40 |

**Notes:**

This table presents an analysis of the relation between private- and public-firm valuation multiples. Panel A provides the mean, median, and difference between private firms (stock-purchases) and public firms for the *EBITDA/EV* and *SALES/EV* variables. Panel B presents the results of the following regression models using the pooled sample of private stock-purchase firms and public firms:

$$iEBITDA/EV = \alpha_0 + \alpha_1 Private + \alpha_2 Target\ Size + \alpha_3 Sales\ Growth + \varepsilon$$

$$iSALES/EV = \alpha_0 + \alpha_1 Private + \alpha_2 Target\ Size + \alpha_3 Sales\ Growth + \alpha_4 R\&D + \alpha_5 Profit\ Margin + \varepsilon$$

Panel C provides an estimate of the value decrease for private firms due to not being a public company. The private company discount (PCD) calculations for private stock-purchase firms based on the panel A univariate analysis and panel B multivariate analysis are shown in columns 1 and 2. The same analysis using the pooled sample of public and private asset-purchase firms is shown in columns 3 and 4. The PCD univariate analysis uses the mean multiple for each sample of firms. In the multivariate analysis, the multiple is predicted using the coefficients from the panel B regressions and the median private-firm values for each variable. To predict the private-firm (public-firm) multiple the *Private* indicator variable is set to one (zero). The predicted enterprise value is median *EBITDA* (or median Sales) multiplied by the predicted multiple.

* Significant at the 0.01 level (one-tailed).

(The table is continued on the next page.)

TABLE 3 (Continued)

*Variable definitions*. All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *EBITDA* is earnings before interest, taxes, and depreciation and amortization. *EV* (enterprise value) is the sale price of firm's equity plus total liabilities less current liabilities. *EBITDA/EV* is the ratio of *EBITDA* to *EV*. *SALES/EV* is the ratio of total sales to *EV*. *Private* is an indicator variable that equals 1 if the firm is privately held, and 0 otherwise. *Target Size* is the log of total assets. *Sales Growth* is the percentage change in the target's annual sales. *R&D* is research and development expense divided by sales. *Profit Margin* is *EBITDA* divided by total sales. *Leverage* is the ratio of total liabilities less current liabilities to total assets. The prefix *i* indicates that the variable is industry-adjusted by subtracting the respective COMPUSTAT industry-year median value from the raw value. If the dependent variable is industry-adjusted then so are the continuous independent variables.

*Results for asset purchases*

For parsimony, we estimate but do not tabulate the analogous analysis to that of panels A and B for private asset-purchased firms. Columns 3 and 4 in panel C of Table 3 present the results of our univariate and multivariate PCD calculations for asset purchases. While the univariate estimates of 45.6 percent and 45.9 percent for the *EV/EBITDA* and *EV/SALES* models, respectively, are higher, the multivariate estimates of 38.8 percent and 20.7 percent for the two models are close to the corresponding estimates of the PCD for stock purchases. These multivariate percentage discounts translate to a dollar value discount of $2.4 to $6.8 million. We place more emphasis on the multivariate tests because they include controls for expected growth and risk. We conclude that stock and asset purchases experience similar PCD's in the range of 20 percent to 40 percent.

*Differences between our inferences regarding the PCD and those in the extant literature*

Our study complements the analysis of Officer 2007, who estimates a PCD for the *EBITDA* model that is smaller than ours.[15] To reconcile the difference in results, which could be attributable to differences in our methods or our sample, we conduct the following analysis.

We start by replicating Officer's 2007 matched-portfolio method on our sample of stock sales.[16] For each private target, we form a portfolio of

15. Our estimate is also greater than that of Koeplin et al. (2000), who in a study of 84 firms find a 20 percent PCD for *EV/EBITDA* but none for *EV/SALES*. We focus our discussion on the Officer 2007 study because of its larger and more current sample.

16. Officer (2007) has two types of sample firms. His stand-alone private targets are comparable to our stock-purchase sample. He also studies unlisted subsidiaries of public companies. He does not study asset sales.

comparable acquisitions of publicly traded targets (sampling with replacement), where comparable acquisitions are in the same two-digit SIC code as the private target, have enterprise value within ±20 percent of the enterprise value for the private target, and are announced within a three-year calendar window centered on the announcement of the private target's acquisition date. For each private-firm target, Officer calculates the percentage difference between acquisition multiples for the private firm and the average multiple for the comparable public-firm portfolio.

Our original sample of private-firm stock purchases is 673 observations (see Table 1). Of these, restricting the sample to positive values of *EBITDA* leaves 561 observations for the *EBITDA* models. The sales model uses the full sample. We are able to find at least one public-firm match for 348 and 487 private targets when using the *EBITDA* and *Sales* models, respectively. Of each of these two models, respectively, an additional 81 and 217 observations were dropped because they exceeded Officer's 2007 limit on how great a private company premium is allowed (i.e., if the premium is greater than 100 percent the observation is dropped).[17] The actual variation across multiples is quite high, in part because some accounting fundamentals are modest, leading to small denominators, and hence very large multipliers. Given the large variation in multiples across both private and public companies, the chance of exceeding the 100 percent percentage difference cutoff on a per-observation basis is hence also high. This truncation illustrates one difference between Officer's approach and ours. He estimates percentage differences by firm and discards large differences, whereas we calculate one average discount from our regression equation. It is not necessary for us to discard large positive percentage differences. Our approach thus leads to using larger samples, which in our case means a sample size that is more than double the one that uses his method. This helps to ensure that our results extrapolate to the population of private firms, a limitation that Officer specifically discusses regarding his approach.

As indicated in row 2 of Table 4, using Officer's 2007 matched-portfolio approach on a subsample of our firms the average percentage discounts are 20.9 percent and 13.8 percent for the two models. These estimates correspond reasonably closely to the 17.2 percent and 18.2 percent that Officer reports for his sample (see row 1 of Table 4). Thus, despite the differences in samples, our average PCD estimates are similar to his when we use his methods on our sample.

17. An additional 4 and 5 observations for the *EBITDA* and *Sales* models, respectively, were dropped because of the trimming required when calculating the Table 4 row 3 multivariate regression estimates. Untabulated analysis indicates that, if these observations were not dropped, the Table 4 row 2 PCD results would be 21.4 percent and 13.9 percent for the two respective models, which are similar to the tabulated Table 4 row 2 results.

TABLE 4
Reconciliation of private company discount

| | *EV/EBITDA* | | *EV/SALES* | |
|---|---|---|---|---|
| | PCD (1) | No. of Private Firm Obs. (2) | PCD (3) | No. of Private Firm Obs. (4) |
| (1) Officer (2007, p. 583) | 17.2% | 111 | 18.2% | 308 |
| (2) Officer matched-portfolio method using this study's data | 20.9% | 263 | 13.8% | 265 |
| (3) This study's multivariate regression method and data but limited to the matched-portfolio observations | 42.4% | 263 | 40.2% | 265 |
| (4) From Table 3 | 39.7% | 555 | 20.2% | 664 |

**Notes:**

This table reconciles the private company discount % (PCD) of stock sales from Table 3 with that in Officer 2007. The first row presents the PCD as presented by Officer 2007. In the second row, we use the matched-pair method as in Officer but using our sample data. This includes matching each private-firm observation with a portfolio of public firms' transactions that have the same two-digit SIC code as the private target, have an enterprise value of within 20 percent of the private target's enterprise value, and were announced in the three-calendar-year window centered on the announcement of the private target's acquisition date. A PCD is calculated for each private-firm observation. As in Officer, we discard observations for which the percent difference in multiples between that reported for the private target and the average for the portfolio of comparable acquisitions is greater than +100 percent. The tabulated PCD is the mean of the remaining observations. The third row provides the PCD as calculated in Table 3 using our multivariate method but restricted to the same data as in our Row 2 matched-pair tests. The last row presents the PCD results from panel C of Table 3. The first and third column shows the PCD, while the second and fourth columns shows the number of observations.

*Variable definitions*. All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *EBITDA* is earnings before interest, taxes, and depreciation and amortization. *EV* (enterprise value) is the sale price of firm's equity plus total liabilities less current liabilities. *EBITDA/EV* is the ratio of *EBITDA* to *EV*. *SALES/EV* is the ratio of total sales to *EV*.

For these same private-firm observations in row 2, we use our multivariate approach to estimate the PCD and present these in row 3. This will illustrate the difference due to method. For each regression, our sample of public firms is taken from the set of public firms used in the matched-portfolio method. Each public firm is allowed to enter the sample once, which results in using 502 and 743 public firms in the *EBITDA* and *Sales* models, respectively. Applying our multivariate regression approach, we obtain PCD estimates for the *EV/EBITDA* and *EV/SALES* models of 42.4 percent and 40.2 percent, respectively, which produce a larger PCD than using Officer's 2007 approach. Given that each method uses the same underlying data, these results imply that our different method is the primary explanation for why our PCD results differ from Officer's.

While it is difficult to precisely decompose methodological differences, we believe that the difference in PCD estimates is due to controlling for multiple value drivers at once rather than just industry, time, and size. Hence, an advantage of our multivariate approach is the ability to explore in one empirical model the impact of multiple potential explanations for valuation multiples, the inputs to the PCD. In contrast, this is difficult to do using Officer's 2007 matched-portfolio approach. For example, Officer attributes the PCD to liquidity. Our larger sample size and method enables us to explore the effects of Big 4 auditor choice incremental to liquidity effects. We document that both a liquidity proxy and an information risk proxy, Big 4, explain valuation multiples. As another example, Officer does not control for private firms' systematically higher growth rates. Another advantage of our approach is that we use inverse multiples as our dependent variables, which as mentioned above, is our way to address the significant variability in valuation multiples.

The last row of Table 4 presents our Table 3 PCD calculations for comparison. The difference between rows 3 and 4 represents the change in PCD when we eliminate the sample restrictions associated with the matched-portfolio approach. In the case of the *EBITDA* model, this difference is small; so this sample expansion has little effect. For the *Sales* model, the PCD decreases substantially, which produces a PCD that is not so different from Officer's results.

In addition, we view our overall 20 percent to 40 percent PCD estimate to be reasonable given the practitioner literature. Damodaran (2005, 17) reports that conventional practice is to apply an average PCD of 20 percent to 30 percent. Beatty et al. (1999) document the existence of a PCD for tax valuations of private firms, as applied by the courts. For the 31 estate and gift tax cases they examine, the average PCD assessed as appropriate by judges is 25 percent. If one uses real-world average PCDs as a benchmark, Officer's 2007 estimates of the average PCD are too low, while our estimates are closer to this benchmark. We now turn to the impact of Big 4 auditor choice on valuation multiples.

***Big 4 Auditor analysis using combined sample of private and public companies***

In this section we examine the relation between private-firm valuation multiples and Big 4 auditor choice. We augment the regression model discussed above with two additional variables: a Big 4 indicator variable and an interaction of the Big 4 indicator variable with the private company indicator variable. Panel A of Table 5 presents the results of estimating the *EBITDA/EV* and *SALES/EV* regression models in a pooled sample of public and private targets. Column 1 of panel A shows the regression results of the *EBITDA/EV* model using the sample of private stock-purchase and public targets. The coefficient on *Private*, 0.049, represents the discount in multiples received for stock-purchased private firms without a Big 4 auditor compared to public firms without a Big 4 auditor, and is comparable to the estimated coefficient on *Private* (0.053) reported in Table 3. The coefficient on *Big4* is significantly negative, consistent with multiples being higher for public targets that hire a Big 4 auditor compared to public targets that do not. The coefficient on the *Big4* × *Private* interaction variable is not significant, which is consistent with private targets that hire a Big 4 auditor experiencing a multiple premium that is similar to the Big 4 auditor premium of public targets.

Column 2 reports similar results for the *SALES/EV* multivariate regression model. The *Private* coefficient is positive and statistically significant, consistent with a PCD. The *Big4* coefficient is negative consistent with a premium for public targets that hire a Big 4 auditor. In addition, the coefficient on the *Big4* × *Private* interaction is negative and statistically significant, indicating that the premium private targets experience for hiring a Big 4 auditor is larger than the Big 4-auditor premium of public targets. Similar inferences follow for the columns 3 and 4 results for asset-purchased private targets. The *Private* coefficients are positive and statistically significant. The *Big4* and the *Big4* × *Private* interaction coefficients are negative and generally statistically significant, consistent with a Big 4-auditor multiple premium for public targets and an even larger Big 4-auditor multiple premium for private targets.

Panel B of Table 5 shows the percentage and dollar value decrease in proceeds for private firms due to not hiring a Big 4 auditor.[18] For stock-purchased private firms, the percentage discount in multiples of *EV/EBITDA* and *EV/SALES* due to not hiring a Big 4 auditor is 11.2 percent and 23.6 percent, respectively. For asset-purchased private firms, the percentage discount in multiples of *EV/EBITDA* and *EV/SALES* due to not hiring a Big 4 auditor is 23.3 percent and 18.1 percent, respectively. For stock-purchased private firms, the dollar value decrease in enterprise value

18. We calculate the predicted private-firm multiples for panel B of Table 5 as well as for panel B of Table 6 in an analogous way to that in panel C of Table 3. We use the coefficients from the respective regressions and the median private-firm values for each variable. The predicted enterprise value is median *EBITDA* (or median *Sales* as appropriate) multiplied by the predicted multiple.

TABLE 5
Analysis of private company valuation multiples and Big 4 Auditor: Using sample of private and public companies

**Panel A:** Multivariate analysis

| | | Private Firms (Stock Purchases) and Public Firms | | Private Firms (Asset Purchases) and Public Firms | |
|---|---|---|---|---|---|
| | Predicted Sign | *iEBITDA/EV* (1) | *iSALES/EV* (2) | *iEBITDA/EV* (3) | *iSALES/EV* (4) |
| Intercept | | 0.004 (0.61) | 0.315* (3.19) | −0.001 (−0.17) | 0.238** (2.47) |
| *Private* | + | 0.049* (5.45) | 0.339* (2.73) | 0.080* (8.28) | 0.431* (3.01) |
| *Big4* | − | −0.017** (−2.30) | −0.154*** (−1.51) | −0.011*** (−1.58) | −0.093 (−0.94) |
| *Big4 × Private* | − | 0.001 (0.12) | −0.181*** (−1.31) | −0.033* (−2.87) | −0.226*** (−1.32) |
| *Target Size* | − | 0.002*** (1.46) | −0.047* (−3.03) | −0.002** (−2.19) | −0.092* (−5.79) |
| *Sales Growth* | − | −0.015* (−4.00) | −0.147* (−4.87) | −0.024* (−6.75) | −0.010 (−0.44) |
| *R&D* | − | | −0.494* (−6.02) | | −0.635* (−6.81) |
| *Profit Margin* | − | | −0.104* (−2.89) | | −0.133* (−3.04) |
| Adj. $R^2$ | | 0.079 | 0.053 | 0.132 | 0.062 |
| No. of Obs. | | 2,298 | 2,889 | 1,966 | 2,496 |

(The table is continued on the next page.)

TABLE 5 (Continued)

**Panel B:** Value decrease for private firms due to not hiring a Big 4 Auditor

| | Private Firm (Stock Purchases) | | Private Firm (Asset Purchases) | |
|---|---|---|---|---|
| | *EV/EBITDA* (1) | *EV/SALES* (2) | *EV/EBITDA* (3) | *EV/SALES* (4) |
| **Predicted Multiple** | | | | |
| Big 4-Audited Private Company | 7.92 | 0.89 | 6.94 | 0.72 |
| Non–Big 4-Audited Private Company | 7.03 | 0.68 | 5.32 | 0.59 |
| Non–Big 4 Auditor Discount (%) | 11.2% | 23.6% | 23.3% | 18.1% |
| **Predicted Enterprise Value ($M)** | | | | |
| Big 4-Audited Private Company | $18.14 | $13.83 | $12.41 | $10.02 |
| Non–Big 4-Audited Private Company | $16.10 | $10.66 | $9.51 | $8.14 |
| Non–Big 4 Auditor Discount | $2.04 | $3.17 | $2.90 | $1.88 |

**Notes:**

This table presents an analysis of the relation between private-firm valuation multiples and Big 4 Auditor. Panel A presents the results of estimating the following two regressions. Columns 1 and 2 use the sample of stock-purchased private firms and public firms. Columns 3 and 4 use the sample of asset-purchased private firms and public firms.

$$iEBITDA/EV = \alpha_0 + \alpha_1\ Private + \alpha_2\ Big4 + \alpha_3\ Big4 \times\ Private + \alpha_4\ Target\ Size + \alpha_5\ Sales\ Growth + \varepsilon$$

$$iSALES/EV = \alpha_0 + \alpha_1\ Private + \alpha_2\ Big4 + \alpha_3\ Big4 \times\ Private + \alpha_4\ Target\ Size + \alpha_5\ Sales\ Growth + \alpha_6\ R\&D + \alpha_7\ Profit\ Margin + \varepsilon;$$

(The table is continued on the next page.)

TABLE 5 (Continued)

Panel B provides an estimate of the value decrease for private firms due to not hiring a Big 4 auditor, for stock and asset purchases, and using the *EV/EBITDA* and *EV/SALES* models. The private-firm multiple is predicted using the coefficients from the panel A regressions and the median private-firm values for each variable. The *Private* indicator variable is set to one. To predict the private-firm multiple for firms with (without) a Big 4 auditor the *Big4* indicator variable is set to one (zero). The predicted enterprise value is median *EBITDA* (or median *SALES*) multiplied by the predicted multiple.

* Significant at the 0.01 level (one-tailed).

** Significant at the 0.05 level (one-tailed).

*** Significant at the 0.10 level (one-tailed).

*Variable definitions*. All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *EBITDA* is earnings before interest, taxes, and depreciation and amortization. *EV* (enterprise value) is the sale price of firm's equity plus total liabilities less current liabilities. *EBITDA/EV* is the ratio of *EBITDA* to *EV*. *SALES/EV* is the ratio of total sales to *EV*. *Private* is an indicator variable that equals 1 if the firm is privately held, and 0 otherwise. *Big4* is an indicator variable that equals 1 if the auditor is a Big 4 audit firm, and 0 otherwise. *Target Size* is the log of total assets. *Sales Growth* is the percentage change in annual sales. *R&D* is research and development expense divided by total sales. *Profit Margin* is *EBITDA* divided by total sales. The prefix *i* indicates that the variable is industry-adjusted by subtracting the respective COMPUSTAT industry-year median value from the raw value. If the dependent variable is industry-adjusted then so are the continuous independent variables.

due to not hiring a Big 4 auditor under *EBITDA/EV* and *SALES/EV* models is $2.0 million and $3.2 million, respectively. For asset-purchased private firms, the dollar value decrease in enterprise value due to not hiring a Big 4 auditor under the *EBITDA/EV* and *SALES/EV* models is $2.9 million and $1.9 million, respectively.

***Big 4 auditor analysis using only sample of private companies***

A limitation of our Table 5 analyses is that private and public firms are pooled together and hence it is possible that the *Private* and/or *Big4* indicator variables are proxying for firm risk not adequately controlled for in the empirical model. To supplement our analyses, we estimate *EBITDA/EV* and *SALES/EV* multivariate regressions using only private firms, which avoids including the public targets that are vastly different in size (and risk). We augment the regression models with a *Big4* indicator variable and estimate each equation for stock-purchased and asset-purchased private firms separately. We then compare inferences about the decline in proceeds due to not hiring a Big 4 auditor for private targets to the corresponding inferences obtained in Table 5.

Even for this private-target-only analysis, there is still a concern that the *Big4* indicator variable is proxying for firm characteristics related to self-selection that confound our audit quality interpretation of what the Big 4 auditor variable is capturing. Accordingly, we supplement our regressions with a two-stage Heckman self-selection model. In the first stage, we develop a Big 4 auditor selection model for all private targets (separately for the stock- and asset-purchase samples) choosing explanatory variables consistent with Chaney et al. 2004, a model that was developed to examine auditor choice for private companies.[19] The dependent variable is Big 4 auditor choice and the independent variables are log of total assets, sales turnover, leverage, current ratio, quick ratio, return on assets (ROA), and a loss indicator.[20] The untabulated results for the first-stage models indicate that the probability that a private target chooses a Big 4 auditor is increasing in firm size and decreasing in ROA for firms that report a loss, the latter result being observed for stock purchases only. Our percentage correctly classified ranges from 68 percent to 69 percent, which is quite close to the 69 percent fit measure reported by Chaney et al. In the second stage, we control for firm characteristics related to auditor selection by including the Inverse Mills ratio in the empirical model. The ratio is significant in our

19. Our inferences are robust to other models of auditor choice. For example, untabulated analysis indicates that using a model in the spirit of Francis et al. 1999 does not change any inferences. In other untabulated tests, we control for industry and year fixed effects in the first-stage Heckman procedure using the Chaney et al. 2004 and Francis et al. 1999 models.

20. We exclude the Chaney variable *Export*, which is sales outside the firm's country, because this information or alternate measures of geographic dispersion are not available from our private-firm database.

*SALES/EV* model for asset purchases, suggesting that selection factors have an influence in at least one of our models.

Table 6 presents an analysis of the relation between private-firm valuation multiples and Big 4 auditor choice using a private-firm-only sample. Column 1 of panel A shows the regression results of the *EBITDA/EV* model for stock-purchased private firms. The coefficient on *Big4*, −0.030, represents a negative shift in *EBITDA/EV* for stock-purchased private firms with a Big 4 auditor, relative to those without a Big 4 auditor. Thus the implied multiple of *EV/EBITDA* is larger for stock-purchased private firms that employ a Big 4 auditor relative to those that do not. Column 2 reports similar results for the *EBITDA/EV* multivariate regression model that contains the Inverse Mills ratio from our first-stage auditor selection model. The coefficient on the Inverse Mills ratio variable is not significantly different from zero, and hence there is no empirical evidence that self-selection affects our inferences. Columns 3 and 4 show the regression results of the *SALES/EV* model in stock-purchased private firms. The coefficients on *Big4* of −0.556 and −0.544 for columns 3 and 4, respectively, represent a negative shift in *SALES/EV* for stock-purchased private firms with a Big 4 auditor, relative to those without a Big 4 auditor. Thus the implied multiple of *EV/SALES* is larger for stock-purchased private firms that employ a Big 4 auditor relative to those that do not.

Similar inferences follow for asset-purchased private firms. Columns 5 and 6 show that the coefficient on *Big4* is significantly negative, suggesting that the implied multiple of *EV/EBITDA* is larger for asset-purchased private firms that employ a Big 4 auditor relative to those that do not. Columns 7 and 8 show that the coefficients on *Big4* are negative and significantly different from zero, suggesting that the implied multiple of *EV/SALES* is larger for asset-purchased private firms that employ a Big 4 auditor relative to those that do not.[21]

Panel B of Table 6 shows the percentage and dollar value decreases for private firms due to not hiring a Big 4 auditor. For stock-purchased private firms, the percentage discount in multiples of *EV/EBITDA* and *EV/SALES* due to not hiring a Big 4 auditor is 20.2 percent and 34.7 percent, respectively. For asset-purchased private firms, the percentage discount in multiples of *EV/EBITDA* and *EV/SALES* due to not hiring a Big 4 auditor

21. We conduct some additional untabulated analysis that incorporates information about the acquirer and deal terms. We investigate eight additional factors: (a) Earnouts: whether the acquirer's payment to the target includes a future payment that is contingent on performance, (b) Cash payments: whether the acquirer's payment for the target consists of only cash, (c) Creation of a new block holder: whether the value of the stock payment portion of the transaction scaled by the acquirer's market capitalization is greater than 5 percent, (d) Acquirer size, (e) Related firm acquisitions: whether the primary business of the acquirer and the target are in the same industry, (f) Acquirer Tobin's *Q*, (g) Existence of an employee agreement, and (h) Existence of a non-compete agreement. In all cases, our inferences are robust to the inclusion of these factors in our tests.

TABLE 6
Analysis of private company valuation multiples and Big 4 Auditor: Using sample of private companies

**Panel A:** Multivariate analysis

| | Pred. | Private Firm (Stock Purchases) | | | | Private Firm (Asset Purchases) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *iEBITDA/EV* | | *iSALES/EV* | | *iEBITDA/EV* | | *iSALES/EV* | |
| | Sign | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Intercept | | 0.095* (6.58) | 0.086* (4.64) | 1.440* (7.71) | 1.332* (5.78) | 0.070* (2.80) | 0.065* (2.10) | 1.196* (3.42) | 2.047* (4.76) |
| *Big4* | – | −0.030* (−2.77) | −0.023* (−2.23) | −0.556* (−4.03) | −0.544* (−3.89) | −0.040** (−2.14) | −0.039* (−2.06) | −0.503** (−1.92) | −0.508** (−1.98) |
| *Leverage* | – | −0.046** (−1.65) | −0.036 (−1.26) | −1.284* (−3.59) | −1.359* (−3.67) | 0.033 (0.68) | 0.030 (0.55) | 0.091 (0.14) | 1.260*** (1.68) |
| *Working Capital* | – | −0.009 (−0.71) | −0.007 (−0.53) | −0.430* (−2.98) | −0.405* (−2.73) | 0.025 (1.01) | 0.028 (1.12) | 0.180 (0.52) | 0.029 (0.08) |
| *Target Size* | – | 0.015* (4.18) | 0.013* (2.16) | 0.187* (4.14) | 0.225* (3.43) | −0.006 (−1.13) | −0.005 (−0.59) | 0.044 (0.56) | −0.288** (−2.27) |
| *Sales Growth* | – | 0.021** (1.86) | 0.010 (1.11) | −0.032 (−0.43) | −0.027 (−0.36) | −0.037** (−1.91) | −0.011* (−2.06) | 0.118** (2.12) | 0.121** (2.21) |
| *R&D* | – | | | −0.392** (−1.95) | −0.368*** (−1.81) | | | −0.503 (−0.84) | −0.540 (−0.92) |
| *Profit Margin* | – | | | −0.042 (−0.60) | −0.054 (−0.74) | | | 0.055 (0.31) | 0.095 (0.54) |
| *Inverse Mills Ratio* | | | −0.003 (−0.10) | | 0.305 (0.80) | | 0.007 (0.13) | | −2.370* (−3.30) |
| Adj. $R^2$ | | 0.028 | 0.017 | 0.065 | 0.064 | 0.033 | 0.031 | 0.017 | 0.052 |
| No. of Obs. | | 555 | 554 | 664 | 660 | 223 | 223 | 271 | 271 |

(The table is continued on the next page.)

TABLE 6 (Continued)

**Panel B:** Value decrease for private firms due to not hiring a Big 4 Auditor

| | Private Firm (Stock Purchases) | | Private Firm (Asset Purchases) | |
|---|---|---|---|---|
| | *EV/EBITDA* (1) | *EV/SALES* (2) | *EV/EBITDA* (3) | *EV/SALES* (4) |
| **Predicted Multiple** | | | | |
| Big 4-Audited Private Company | 8.42 | 0.96 | 6.79 | 0.79 |
| Non–Big 4-Audited Private Company | 6.72 | 0.62 | 5.34 | 0.57 |
| Non–Big 4 Auditor Discount (%) | 20.2% | 34.7% | 21.4% | 28.4% |
| **Predicted Enterprise Value ($M)** | | | | |
| Big 4-Audited Private Company | $19.29 | $14.93 | $12.14 | $10.95 |
| Non–Big 4-Audited Private Company | $15.40 | $9.74 | $9.55 | $7.84 |
| Non–Big 4 Auditor Discount | $3.89 | $5.19 | $2.59 | $3.11 |

**Notes:**

This table presents an analysis of the relation between private-firm valuation multiples and Big 4 Auditor using only the sample of private firms. Panel A presents the results of estimating the following two regressions, with and without the Inverse Mills ratio, for stock-purchased and asset-purchased private firms.

$$iEBITDA/EV = \alpha_0 + \alpha_1\, Big4 + \alpha_2\, Leverage + \alpha_3\, Working\ Capital + \alpha_4\, Target\ Size + \alpha_5\, Sales\ Growth + \alpha_6\, Inverse\ Mills\ Ratio + \varepsilon$$

$$iSALES/EV = \alpha_0 + \alpha_1\, Big4 + \alpha_2\, Leverage + \alpha_3\, Working\ Capital + \alpha_4\, Target\ Size + \alpha_5\, Sales\ Growth + \alpha_6\, R\&D + \alpha_7\, Profit\ Margin + \alpha_8\, Inverse\ Mills\ Ratio + \varepsilon$$

The Inverse Mills ratio is taken from an untabulated first-stage auditor selection model. Panel B provides an estimate of the value decrease for private firms due to not hiring a Big 4 auditor, for stock and asset purchases, and using the *EV/EBITDA* and *EV/SALES* multiples. The private-firm multiple is predicted using the coefficients from the panel A regressions and the median private-firm values for each variable. To predict the private-firm multiple for firms with (without) a Big 4 auditor the *Big4* indicator variable is set to 1 (0). The predicted enterprise value is median *EBITDA* (or median *SALES*) multiplied by the predicted multiple.

(The table is continued on the next page.)

TABLE 6 (Continued)

* Significant at the 0.01 level (one-tailed).

** Significant at the 0.05 level (one-tailed).

*** Significant at the 0.10 level (one-tailed).

*Variable definitions.* All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *EBITDA* is earnings before interest, taxes, and depreciation and amortization. *EV* (enterprise value) is the sale price of firm's equity plus total liabilities less current liabilities. *EBITDA/EV* is the ratio of *EBITDA* to *EV*. *SALES/EV* is the ratio of total sales to *EV*. *Big4* is an indicator variable that equals 1 if the auditor is a Big 4 audit firm, and 0 otherwise. *Leverage* is the ratio of total liabilities less current liabilities to total assets. *Working Capital* is current assets minus current liabilities scaled by lagged total assets. *Target Size* is the log of total assets. *Sales Growth* is the percentage change in annual sales. *R&D* is research and development expense divided by total sales. *Profit Margin* is *EBITDA* divided by total sales. *Inverse Mills Ratio* is computed using the estimates of a first-stage probit model (following Heckman 1979) that models the probability of using a Big 4 auditor. The prefix *i* indicates that the variable is industry-adjusted by subtracting the respective COMPUSTAT industry-year median value from the raw value. If the dependent variable is industry-adjusted then so are the continuous independent variables.

is 21.4 percent and 28.4 percent, respectively. For stock-purchased private firms, the dollar value decrease in enterprise value due to not hiring a Big 4 auditor under *EBITDA/EV* and *SALES/EV* models is $3.9 million and $5.2 million, respectively. For asset-purchased private firms, the dollar value decrease in enterprise value due to not hiring a Big 4 auditor under *EBITDA/EV* and *SALES/EV* models is $2.6 million and $3.1 million, respectively. These estimates of "deal value reduction" due to not hiring a Big 4 auditor are larger but nonetheless comparable to those obtained in Table 5.

***Sensitivity analysis: Effect of nonlinear estimation on discounts***

Our multivariate regression methodology used in Tables 3, 5, and 6 assumes a linear relation between valuation multiples and proxies for risk and growth. If these relations are nonlinear, our *Private* and *Big4* indicator variables may be picking up effects due to nonlinearity. As a sensitivity analysis, the first row of each panel in Table 7 presents the PCD results from an untabulated rank regression in which each independent variable is replaced by its percentile. The second row of each panel in Table 7 presents the PCD results from an untabulated piece-wise linear (i.e., spline) regression as in Greene 2000 (322–25). There are five segments per independent variable, where each threshold is the 20th, 40th, 60th, and 80th percentile of that variable. Panel A of Table 7 indicates a PCD range from 17 percent to 41 percent, close to the 20 percent to 40 percent range reported for our linear multivariate models in panel C of Table 3. Panel B of Table 7 indicates that the percentage discount in multiples due to not hiring a Big 4 auditor ranges from 11 percent to 27 percent, close to the 11 percent to 24 percent range reported in panel B of Table 5 using a sample of private and public companies. Panel C of Table 7 indicates that the percentage discount in multiples due to not hiring a Big 4 auditor ranges from 18 percent to 40 percent, close to the 20 percent to 35 percent range reported in panel B of Table 6 using a sample of private companies only.[22] In summary, our inferences concerning the PCD and its explanation are robust to these nonlinear effects.

***Analysis of difference in private company accruals with and without a Big 4 auditor***

In Tables 5 and 6 we document evidence consistent with a dollar value decrease in sale proceeds due to not hiring a Big 4 auditor. As mentioned above, an important idea in the literature is that Big 4 auditors provide higher-quality audits. We now present more direct — accrual-based —

22. A third way to handle nonlinearity is to explore the Big 4 explanation for the PCD using Officer's 2007 matched-portfolio approach, which does not employ linear regression. In untabulated tests using Officer's method we observe higher average PCDs for non–Big 4- compared with Big 4-audited private targets. The results are in the expected direction and significant for the *EV/SALES* model for stock and asset purchases. The differences are not significant for the *EV/EBITDA* model for stock and asset purchases.

TABLE 7
Sensitivity analysis: Effect of nonlinear estimation on discounts

| | Private Firm (Stock Purchases) | | Private Firm (Asset Purchases) | |
|---|---|---|---|---|
| | *EV/EBITDA* (1) | *EV/SALES* (2) | *EV/EBITDA* (3) | *EV/SALES* (4) |
| **Panel A:** Private company discount (%) as in Table 3, panel C | | | | |
| From rank regression | 37.7% | 17.4% | 40.5% | 25.6% |
| From piece-wise linear regression | 40.5% | 24.9% | 35.1% | 24.3% |
| **Panel B:** Non–Big 4 auditor discount (%) as in Table 5, panel B | | | | |
| From rank regression | 10.5% | 27.3% | 23.9% | 23.6% |
| From piece-wise linear regression | 14.8% | 27.1% | 22.0% | 24.0% |
| **Panel C:** Non–Big 4 auditor discount (%) as in Table 6, panel B | | | | |
| From rank regression | 18.2% | 40.4% | 21.0% | 30.8% |
| From piece-wise linear regression | 21.6% | 40.2% | 23.4% | 32.9% |

**Notes:**

This table presents discounts based on estimation of nonlinear multivariate models. Panel A provides the private company discount percentage analogous to that in panel C of Table 3. Panels B and C provide the non–Big 4 auditor discount percentage analogous to that in panel B of Tables 5 and 6, respectively. The first row of each panel presents the results from an untabulated rank regression in which each independent variable is ranked into 100 groups (i.e., percentiles). The second row of each panel presents the results from an untabulated piece-wise linear (i.e., spline) regression as in Greene 2000 (322–25). In this regression, there are five segments per independent variable, where each threshold (or knot) is the 20th, 40th, 60th, and 80th percentile of that variable.

evidence to support this claim. As an important caveat, our accrual tests are crude and only suggestive of the role of Big 4 auditors in enhancing accruals quality. We refrain from widely used accruals expectations models, including the performance-matched accruals approach of Kothari, Leone, and Wasley 2005. Existing research has shown (see Liu 2008) that such models are likely to identify more positive abnormal accruals for firms in the early stages of their life cycle, due to firm growth and related investments in working capital that cannot readily be controlled for when generating expectations of normal accruals absent earnings management from public firms that are in a much later stage of their life cycle. Thus, we opt for a simpler approach that compares total accruals across private sellers of comparable scale in which the only variable being manipulated is Big 4 auditor choice.

Accruals are defined as the difference between earnings and operating cash flow and are commonly used in the literature as an (albeit rough) measure of the quality of earnings.[23] We use a raw (i.e., unadjusted) measure and a measure adjusted by subtracting the respective industry-year value. In our setting, where the incentives for income-increasing accruals are clear, the less positive (or more negative) the observed accruals, the more conservative, and hence the higher quality of, earnings. We compare the accruals of private sellers with and without a Big 4 auditor. A multivariate regression analysis, in which we control for other determinants of accruals, such as leverage, size, and sales growth, is also employed.[24]

Panel A of Table 8 indicates that, for private company stock purchases, sellers with a Big 4 auditor tend to have accruals that are more negative, consistent with accruals quality being higher. Focusing on raw accruals, the first column shows that mean accruals are −0.022 and −0.064 for non–Big 4 and Big 4 auditees, respectively, with the difference of 0.042 being statistically significant. Similar inferences follow for the second column, which employs industry-adjusted accruals. Panel A reveals no significant difference in accruals across Big 4- and non–Big 4-audited asset purchases.

Panel B of Table 8 supplements the panel A univariate analyses in two ways. First, we control for other sources of monitoring such as creditors, proxied by firm debt, and in addition control for accrual drivers such as target size and sales growth. Second, as a benchmark we also estimate a regression in which we substitute operating cash flows for accruals as the dependent variable to explore whether the *Big4* indicator variable is simply standing in for omitted firm characteristics that drive both accruals and operating cash flows. In other words, if *Big4* affects accruals but not operating cash flows, our accrual quality explanation is enhanced. The first three columns of panel B report the results for private stock-purchase targets. The first column indicates that the coefficient on firm leverage of −0.124 is statistically significant, consistent with creditors monitoring accruals. More importantly, the coefficient on the *Big4* indicator variable, −0.048, is statistically significant and suggests that Big 4 auditors constrain accruals in a way that is unexplained by monitoring of creditors and other accrual drivers. The second column of Table 8 indicates that qualitatively similar results hold for industry-adjusted accruals. The coefficient on the *Big4* indicator variable is −0.045 and significant. The third column shows that *Big4* is not associated with operating cash flows, boosting the validity of our accrual quality explanation. Consistent with our univariate evidence, the rest of the

23. A lack of historical data for private firms precludes the possibility of using standard time-series models to estimate abnormal accruals.

24. Given the lack of comparability of accruals across firms in vastly different stages of their life cycle, as explained in the text above, we conduct but do not tabulate the corresponding accruals analysis for our public acquisition targets. We find no significant difference in accruals between Big 4- and non–Big 4-audited public targets.

TABLE 8
Analysis of difference in accruals between firms with and without Big 4 auditor

**Panel A:** Univariate analysis

| | Private Firms (Stock Purchases) | | Private Firms (Asset Purchases) | |
|---|---|---|---|---|
| | *Accruals* (1) | *iAccruals* (2) | *Accruals* (3) | *iAccruals* (4) |
| **Without Big 4 Auditor** | | | | |
| Mean | −0.022 | 0.020 | −0.070 | −0.027 |
| No. of Obs. | 274 | 274 | 126 | 126 |
| **With Big 4 Auditor** | | | | |
| Mean | −0.064 | −0.022 | −0.040 | 0.003 |
| No. of Obs. | 390 | 390 | 145 | 145 |
| **Difference** | | | | |
| Mean (*t*-statistic) | 0.042** (2.48) | 0.042** (2.54) | −0.030 (−0.55) | −0.030 (−0.55) |

**Panel B:** Multivariate analysis

| | Pred. Sign | Private Firms (Stock Purchases) | | | Private Firms (Asset Purchases) | | |
|---|---|---|---|---|---|---|---|
| | | *Accruals* (1) | *iAccruals* (2) | *OCF* (3) | *Accruals* (4) | *iAccruals* (5) | *OCF* (6) |
| Intercept | | −0.025*** (−1.43) | 0.032*** (1.35) | 0.264* (6.90) | −0.039 (−0.79) | −0.160** (−2.14) | 0.384* (5.39) |
| *Big4* | − | −0.048* (−2.74) | −0.045* (−2.57) | −0.047 (−1.18) | 0.053 (0.91) | 0.067 (1.16) | −0.058 (−0.68) |
| *Leverage* | − | −0.124* (−2.47) | −0.076** (−1.68) | −0.031 (−0.28) | 0.019 (0.12) | −0.102 (−0.69) | 0.185 (0.78) |
| *Target Size* | − | 0.008*** (1.33) | 0.005 (0.84) | −0.026** (−1.85) | −0.023*** (−1.31) | −0.032** (−1.87) | −0.072* (−2.87) |
| *Sales Growth* | + | 0.012*** (1.33) | 0.0001 (0.10) | −0.123* (−6.31) | 0.004 (0.23) | 0.003 (0.22) | −0.133* (−6.10) |

(The table is continued on the next page.)

TABLE 8 (Continued)

| | | Private Firms (Stock Purchases) | | | Private Firms (Asset Purchases) | | |
|---|---|---|---|---|---|---|---|
| | Pred. Sign | *Accruals* (1) | *iAccruals* (2) | *OCF* (3) | *Accruals* (4) | *iAccruals* (5) | *OCF* (6) |
| Adj. $R^2$ | | 0.015 | 0.008 | 0.060 | −0.006 | 0.006 | 0.131 |
| No. of Obs. | | 664 | 664 | 664 | 271 | 271 | 271 |

**Notes:**

This table presents an analysis of the difference in total accruals between private firms with and without a Big 4 auditor. Panel A compares the mean of total accruals and industry-adjusted total accruals for private firms with a Big 4 auditor to that of firms without a Big 4 auditor. Panel B presents the results of regressing total accruals, industry-adjusted accruals, and operating cash flows on Big 4 auditor and selected explanatory variables. We estimate various specifications of:

$Accruals = \alpha_0 + \alpha_1\ Big4 + \alpha_2\ Leverage + \alpha_3\ Target\ Size + \alpha_4\ Sales\ Growth + \varepsilon$

$OCF = \alpha_0 + \alpha_1\ Big4 + \alpha_2\ Leverage + \alpha_3\ Target\ Size + \alpha_4\ Sales\ Growth + \varepsilon.$

* Significant at the 0.01 level (one-tailed).

** Significant at the 0.05 level (two-tailed in panel A and one-tailed in panel B).

*** Significant at the 0.10 level (one-tailed).

*Variable definitions.* All financial statement data are for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions. *Accruals* is total accruals scaled by lagged total assets. *OCF* is operating cash flows scaled by lagged total assets. *Big4* is an indicator variable that equals 1 if the auditor is a Big 4 audit firm, and 0 otherwise. *Leverage* is the ratio of total liabilities less current liabilities to total assets. *Target Size* is the log of total assets. *Sales Growth* is the percentage change in annual sales. The prefix *i* indicates that the variable is industry-adjusted by subtracting the respective COMPUSTAT industry-year median value from the raw value. If the dependent variable is industry-adjusted then so are the continuous independent variables.

columns of Table 8 indicate that the presence of a Big 4 auditor is not associated with accruals for private asset-purchase targets. Overall, the results in Table 8 suggest that Big 4 auditors enhance accruals quality for stock but not asset purchases, hence providing modest evidence that Big 4 auditors provide higher-quality audits.

## 5. Practitioner round-table discussion

To better place our results in perspective, we met for about three hours with a group of leading U.S. private-firm valuation practitioners at the New York City office of Duff and Phelps LLC specifically to discuss this study. These discussions were further supported by a three-hour meeting with the Valuation Study Group, an organization of private-company valuation and investment banking specialists.[25] Attendees also included existing and former auditors involved in conducting private-company transactions. In total we met with about two dozen participants. Most attendees had two to three decades of experience in this area. Some of the participants in particular were well-known authorities in this field, who have authored or contributed chapters to influential and best-selling books on valuation and appraisal. Some participants have written articles and serve on the editorial boards of publications such as *Business Valuation Review* and *Business Valuation Update* that serve the professional appraisal community. Others have developed and taught courses necessary to become accredited as a professional appraisal expert. The vast majority of attendees regularly provide expert witness testimony on valuation issues.

A working paper version of this study along with a set of presentation slides were provided to participants beforehand. These documents included the following questions about the role of target firms' Big 4 auditor:

As a professional who practices in this area, in your opinion:

1. Are the different valuation multiples (that we document in this study) for private companies with and without a Big 4 auditor plausible?
2. Can a private target company significantly enhance valuation multiples and hence proceeds by hiring a Big 4 auditor?
3. Do Big 4 auditors provide higher quality audits? Do public acquirers perceive that Big 4 auditors conduct a higher quality audit?
4. Do the answers to these questions change if the deal is structured as a stock or asset purchase?
5. We welcome alternative explanations for our findings.

The agenda was informal and structured much like a typical academic seminar presentation. We presented our work and answered participants' questions. We also directed questions to participants and probed their responses by asking follow-up questions. Two authors attended, one leading

25. We thank Roger Grabowski of Duff and Phelps LLC for arranging and participating in both meetings.

the discussion and the other taking detailed notes. Unless stated otherwise, our summary represents a general consensus among participants and not necessarily a unanimous view. We highlight the following points made by participants and stress that these are participants' opinions only.

***Big 4 auditors do provide higher-quality audits.***

This explanation is consistent with the literature and this study's accrual quality results. However, this is only a partial explanation for the Big 4 premium we empirically observe.

***The acquirer's due diligence process and results will vary and depend on whether the target's auditor is a Big 4 firm.***

The due diligence process generally goes more smoothly if the seller has a reputable auditor (as defined in footnote 11). If the due diligence costs for the potential acquirer are higher, then the purchase price will reflect these higher costs (i.e., the acquirer will lower the purchase price). Furthermore, the number and severity of negative adjustments to the purchase price arising from due diligence work are typically larger when the target is not audited by a reputable auditor. Purchase price impacts extend to the residual uncertainty about potential adjustments that were not detected, which is correlated with a reputable auditor. A lack of trust in the information provided by the seller lowers the purchase price.

***Firms without a Big 4 auditor are more likely to be different along five important dimensions.***

These include:

*Weak internal controls and underinvestment in accounting personnel.*

An understaffing in accounting personnel and generally weak internal controls is widespread among non–Big 4 private sellers. This was partly attributed to Big 4 client acceptance practices, because the Big 4 typically screen out firms with very weak internal controls unless the firm commits to improve this deficiency. The understaffing of non–Big 4 private sellers can have a substantial impact on the purchase price. As one participant pointed out, if the annual outlay to achieve staffing up in the accounting department post-acquisition amounted to $200,000, the purchase price implications for a non–Big 4 private seller could be as high as $1.4 million given a purchase price *EBITDA* multiple of seven.

*Contingent tax liabilities.*

One practitioner pointed out that there are typically fewer unrecorded tax liabilities for Big 4 private sellers, because Big 4 tax partners are less accommodating of owner-manager perks. An entrepreneur is less likely to engage a Big 4 firm to do the tax return or, for that matter, the audit, if the entrepreneur wants to enjoy such perks which, if detected by the Internal

Revenue Service, could result in substantial income tax penalties or reassessments. This is a subtle but important variation on the Big 4 screening role.

*Reduced marketability.*

An indirect effect of less trustworthy financial statements is that a large number of acquirers filter out these acquisition opportunities, which results in fewer interested buyers willing to bid for these targets. Less competition among buyers results in a lower purchase price. In other words, poor information quality (as proxied by a reputable auditor) can reduce marketability, the central idea cited in the finance literature to explain the PCD.

*Lower-quality advisors and management.*

Managers who hire a Big 4 auditor are more likely to hire other high-quality advisors and follow their advice. These managers are also more open-minded. All these factors lead to a better-managed company, which is worth more. This is especially true for entrepreneurs who anticipate selling and as part of succession planning engage a Big 4 auditor. As one participant put it, "[e]ntrepreneurs who are proactive enough to realize the benefits of hiring a Big 4 auditor are also likely to listen to the advice offered by the Big 4 firm in the two to three years leading up to sale." This advice can range from Big 4 management advisory services, to the suggestion to consult an industry specialist for advice, to suggestions for a business broker or investment banker who can help the seller achieve a top-selling price at the time of sale. All of this will result in a better-managed firm, and hence increased confidence in management, which plays a large role in determining the final purchase price.

*Sell without planning for it.*

While the private seller is generally in control of the timing of sale, this may not always be the case. Some transactions are buyer-initiated or arise due to an unforeseen need to sell the company. In such instances, the seller does not have two to three years to get the business ready for sale, including engaging a Big 4 auditor and enjoying the benefits of Big 4 advisory services discussed above. An unplanned sale will typically mean the owner did not have the time to improve accounting systems, staff up, and so on.

***Big 4 auditors do screen their clients.***

Though a private seller might want to enjoy the above-described benefits (e.g., lower information risk, better managed company), not every private company can hire a Big 4 auditor. Though our empirical models (in Table 6) attempt to control for effects due to auditor selection, private firms may have characteristics that affect deal pricing but are not measurable by researchers. For example, Big 4 client acceptance practices screen out firms with low management integrity, firms with high risk due to a poor business model, or weak internal controls. Such factors are very hard for researchers

to control for. Thus, it is possible that a portion of our Big 4 premium is explained by firm risk factors associated with Big 4 screening that are not captured by our selection model.[26]

***The implied higher proceeds from hiring a Big 4 auditor documented in our tests overstate the net benefits of doing so.***

Even if a private seller can succeed in hiring a Big 4 auditor and obtain higher proceeds as our empirical results suggest, our study does not capture the costs associated with the hiring of a Big 4 auditor. Such costs include the following: (i) higher Big 4 audit fees; (ii) the sizeable costs, as mentioned above, associated with staffing up in accounting personnel and getting internal controls to a level acceptable by the Big 4 auditor; (iii) costs of implementing any other advice provided by the Big 4 auditor; and (iv) higher costs associated with paying other advisors, such as the engagement of a high-quality broker or investment bank, that occur concurrently with the hiring of the Big 4 auditor.

Given this context, an interesting question is whether private sellers who *can but do not* hire a Big 4 auditor are sacrificing value in terms of *net* benefits. Participants felt that there are private company owners who fall into this category. These owners may be characterized as less sophisticated and in some cases overconfident in their ability to manage the process of selling their business. Our research may bring the potential existence of such net benefits to the attention of private-company managers who are considering how they can better ready their business for sale.

## 6. Conclusion

This study documents a substantial impact of Big 4 auditor choice on the sale proceeds of private firms in the United States. We offer this as at least a partial explanation for the PCD, one related to the information quality facing the buyer. This result adds to standard liquidity explanations offered for the PCD in the finance literature (e.g., Officer 2007). The effects we document are substantial. A representative private seller with median enterprise value ranging from $14 to $18 million (for stock purchases) and $10 to $12 million (for asset purchases) experiences a dollar value decrease in enterprise value due to not hiring a Big 4 auditor ranging from $2.0 to $3.2 million (for stock purchases) and $1.9 to $2.9 million (for asset purchases).

26. Another alternative explanation is as follows. If Big 4 auditors result in reported *EBITDA* that is relatively lower than reported *EBITDA* for comparable non–Big 4-audited companies (consistent with the less positive accruals for Big 4-audited companies we document in this study), and the purchase price is based on true earnings, then the price multiples based on reported *EBITDA* (that we measure) will in general be higher for Big 4-audited companies. In this scenario, there is no difference in price paid for Big 4-audited companies. However, unlike the other explanations, this explanation is less general and cannot explain our Big 4 premium results based on the enterprise value-to-sales model.

To calibrate these effects, we adopt a second approach which does not pool public and private firms and examines the impact of Big 4 on sale proceeds directly. These tests include controls for auditor self-selection characteristics. The dollar value decrease in enterprise value due to not hiring a Big 4 auditor with this approach ranges from $3.9 to $5.2 million (stock purchases) and $2.6 to $3.1 million (asset purchases).

Using either approach, the implied "deal value reduction" due to not hiring a Big 4 auditor is large given the extant Big 4 literature findings for public companies. Discussions with practitioners indicate they believe that Big 4 auditors do provide higher-quality audits and that the due diligence process is easier and less likely to result in downward price adjustments. Furthermore, they believe private companies with a Big 4 auditor are more likely to have strong internal controls, appropriate levels of accounting personnel, other high-quality advisors (such as an investment bank), and a well-planned-in-advance sale. These companies are also less likely to have potential contingent tax liabilities. Of interest, because many buyers will not consider purchasing a company with poor-quality accounting systems and financial statements, the number of potential buyers is correlated with the hiring of a Big 4 auditor. Even if a private company were to successfully engage a Big 4 auditor, our results document the benefits in terms of proceeds, but do not capture the costs of hiring a Big 4 auditor. Examples of these costs include the higher price of a Big 4 auditor, more sophisticated information systems, as well as more and better-qualified accounting personnel.

As additional analysis, we provide modest evidence that Big 4 auditor choice constrains income-increasing accruals, consistent with the notion that Big 4 audit firms provide higher-quality accruals. Last, given our large sample, multivariate approach that controls for other determinants of value, and alternative data sources, our analysis of the PCD complements and improves on the extant literature.

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