ORIGINAL ARTICLE

Incentive-compatible contracts in merger negotiations: The role of acquirer idiosyncratic stock return volatility

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Abstract

We show that the acquiring firm's idiosyncratic stock return volatility (sigma) is an important determinant of the selection and perceived valuation effects of earnouts in Mergers and Acquisitions (M&As). Earnout-based M&As are more often announced by high-sigma acquirers (nearly 40% of all earnout-based M&As), yet the documented higher risk-adjusted returns accrued to acquirers in earnout-based M&As, relative to M&As settled in cash, stock or mixed payments (the earnout effect), appear in deals announced by low-sigma acquirers (nearly 20% of all earnout-based M&As). High-sigma acquirers employing earnouts appear to break even, or even experience losses, relative to their counterparts employing single up-front payments. These results are confirmed based on a quasi-experimental design through which the earnout effect is measured in isolation. We argue that in M&As announced by high-sigma acquirers, the earnout effect is potentially elusive due to the presence of an acquirer-specific information revelation effect, resulting from the heightened extent of information asymmetry between (small) acquirers' managers and outside investors. On the contrary, the use of earnouts in M&As announced by low-sigma (large) acquirers, whereby the acquirer-specific information revelation effect is likely negligible, sends a strong signal for value creation that also prevents investors from inducing a size-related discount.

KEYWORDS
acquirer idiosyncratic stock return volatility (sigma), earnouts, information asymmetry, propensity score matching (PSM), risk-adjusted returns

JEL CLASSIFICATION
G12, G13, G14, G30, G34

1 | INTRODUCTION

The choice of payment method in Mergers and Acquisitions (M&As) is often guided by the aim of mitigating valuation risk, originating from asymmetric information (i.e. adverse selection) over the target firm (Eckbo, Giammarino, & Heinkel, 1990; Eckbo, Makaew, & Thorburn, 2018; Faccio & Masulis, 2005; Hansen, 1987). Such adverse selection is particularly prominent in M&As of unlisted (i.e. private and subsidiary) target firms and can be further aggravated in case the target fails to perform as originally envisaged, or to comply with the terms of the deal during the integration phase (i.e. moral hazard). As a multi-stage contingent payment mechanism, earnouts can effectively address the respective concerns arising from ex-ante adverse selection and ex-post moral hazard considerations and, thus, offer a solution to the implied valuation disagreement of the merging firms (Kohers & Ang, 2000).[1] Therefore, given the benefits originating from the reduction of merger valuation risk upon the use of earnouts, it is not surprising that this payment mechanism has increased considerably, reaching approximately 14% of all M&As in recent years, from nearly 3% in the mid-1980s.[2] In a seminal paper on the effect of earnout use on the acquiring firm's value, Kohers and Ang (2000) show that earnout-based deals yield significantly higher acquirer short- and long- run risk-adjusted returns, relative to deals settled in single up-front payments of cash or stock (hereafter referred to as the earnout effect).

Confronted with the stylized features and valuation implications of this contingent payment mechanism, the purpose of this paper is to further scrutinize the earnout effect, being mainly motivated by an established observation in prior studies (which is further detailed in the sample statistics section of this paper). That is, the majority of acquirers in earnout-based M&As are relatively small firms.[3] When compared to large firms, this asset class of acquirers is characterized by significantly higher idiosyncratic stock return volatility (i.e. sigma), an aspect that has been mainly attributed to the increased extent of asymmetric information between small firms' managers and outside investors (Campbell, Lettau, Malkiel, & Xu, 2001; Moeller, Schlingemann, & Stulz, 2004). Along these lines, prior studies have established a strong link between acquirers' sigma and the choice of payment method in M&As, as well as acquirers' short-run risk-adjusted returns (Moeller, Schlingemann, & Stulz, 2007). Overall, evidence suggests that, depending on sigma, acquirers' risk-adjusted returns during the announcement of M&As may also reflect the release of new non-M&A-related information over the acquiring firm (hereafter referred to as the acquirer-specific information revelation effect), as opposed to being solely reflective of the impact of the expected economic benefits of the deal itself (Moeller et al., 2004).

These empirical findings (i.e. the small size of acquirers in the majority of earnout-based deals and the high levels of sigma within this portfolio of M&As) raise important questions over the use of earnouts in M&As. In particular, they are suggestive of the potential presence of the acquirer-specific information revelation effect, which may limit the prevalence of the earnout effect, or even render it elusive. It is therefore in principle a possibility that the perceived earnout effect is distorted, due to the increased extent of information asymmetry between the managers of small acquiring firms that typically engage in earnout-based M&As and outside investors. We further elaborate on these relations through the following arguments.

First, we seek to establish a relation between acquirers' sigma and the choice of earnouts in M&As. In this respect, we consider that most targets in earnout-based M&As are privately held firms (Barbopoulos & Sudarsanam, 2012; Kohers & Ang, 2000). As the market for private firms is typically illiquid (Draper & Paudyal, 2006), most targets' managers are likely to prefer cash as the medium of exchange. However, cash is likely to be a 'sub-optimal' equilibrium payment method for acquirers, particularly if it pays for difficult-to-value targets, which are challenging to integrate into their core business (Fishman, 1989). Stock-financing, on the other hand, which is the closest contingent payment alternative to implementing earnouts, could offer a direct solution to acquirers.[4] Yet, stock may also not be the preferred financing method for acquirers as (a) under increased sigma, it may not serve the appropriate incentive mechanism postulated by Hansen (1987) and put forward by Chang (1998)[5] and, therefore, may be a 'sub-optimal' contracting method in accommodating the target's high valuation risk and (b) stock may dilute the (potentially small) acquiring firm's ownership structure.[6] Stock financing may also fail to represent the preferred payment method for

the target firm's managers as, among other reasons, (a) under increased sigma, it may raise misvaluation concerns over the acquiring firm's shares and, hence, result in the target firm's management rejecting[7] this medium of exchange (Chang, 1998), and (b) the shares of small acquirers are typically locked-up or cannot be sold or traded (to provide immediate liquidity to the target firm) for a sufficient period following the announcement of the deal.

The above suggest that the use of earnouts is likely to: (a) 'bridge the gap' in the inherent disaccord over the deal's intrinsic value, (b) provide cash immediately (by means of the first-stage payment) to the shareholders of the target firm and (c) signal the unwillingness of the merging firms to finance valuation-complex deals with stock. Both (a) and (b) are likely to accommodate potential valuation concerns and liquidity shortages regarding the target firm, irrespective of the acquiring firm's information environment. Conversely, (c) is highly sensitive to the extent of information asymmetry over the acquiring firm. Put simply, earnouts could potentially serve as an acceptable payment mechanism for both acquirers and targets that agree to proceed with the deal upon disaccords over their valuations and alternative transaction mediums of exchange. In this respect, as increased information asymmetry over the acquiring firm could also be linked to, or even trigger, such disagreements, it could motivate the use of earnouts.

Second, we establish a relation between acquirers' sigma and the wealth effects of earnouts in M&&As. Accordingly, we consider that acquirers in earnout-based deals are often small firms (Barbopoulos, Danbolt, & Alexakis, 2018a; Kohers & Ang, 2000). As small firms are characterized by increased levels of information asymmetry and, as also confirmed empirically, high levels of sigma (Campbell et al., 2001), their heightened sensitivity to non-systematic factors (i.e. high idiosyncratic risk) renders firm-specific information particularly valuable (Campbell et al., 2001). Such information is primarily possessed by acquirers' managers and is eventually reflected in security prices via information-releasing events, such as M&As (Dierkens, 1991).

As in the case of other major corporate events (e.g. seasonal offerings, bond issuance), M&A announcements attract media attention and place the acquiring firm under the spotlight of investors and analysts. In this specific setting, if the capital market's assessment of the deal is unbiased, the acquiring firm's risk-adjusted returns should reflect the impact of the expected economic benefits of the deal, in addition to the release (if any) of new non-M&A-related information over the acquiring firm (i.e. the acquirer-specific information revelation effect) (Moeller et al., 2004). Therefore, as acquirers' risk-adjusted returns may fully, or partly, reflect the deal's economic benefits, it could be that the perceived earnout effect is, in fact, distorted (or subsumed) by the acquirer-specific information revelation effect, the magnitude of which (and consequent elusiveness of the earnout effect) depends on the extent of asymmetric information over the acquiring firm. As the latter is expected to be heightened within the portfolio of earnout-based M&As, given the small size of acquirers that typically engage in earnout-based deals, it is worth examining the interaction between acquirers' sigma and acquirers' risk-adjusted returns during the announcement period.

Lastly, this paper is also motivated by newly emerged features of earnout-based M&As that point to the growing popularity of earnouts even in mega-deals.[8] Therefore, the suitability and wealth effects of earnouts in large deals involving large acquiring firms that generally exhibit low asymmetric information (and, hence, sigma), relative to small acquirers, and for which the elusiveness of the earnout effect is expected to be marginal, remains to be thoroughly investigated.

Our analysis is conducted using 35,121 M&A announcements between 1980 and 2016 (inclusive) made by US-domiciled acquirers. A standard event-study methodology is adopted to measure the effect of each announcement on the acquiring firm's risk-adjusted returns. To accommodate self-selection concerns, a quasi-experimental design is used based on which the earnout effect is measured in isolation via the PSM method. To overcome potential issues pertinent to the functional form of the propensity score estimator, the Rosenbaum bounds method (Rosenbaum, 2009) is employed.

Our main findings show that high-sigma (low-sigma) acquirers announce nearly 40% (20%) of all earnout-based deals. However, only those earnout-based deals announced by acquirers exhibiting low sigma are perceived to enjoy higher short-run risk-adjusted returns, relative to their non-earnout high-sigma counterparts. High-sigma acquirers in earnout-based deals appear to break even, or even experience significant losses, relative to their non-earnout high-sigma counterparts. The results from the PSM analysis confirm these findings by showing that it is earnout-based

M&As announced by low-sigma acquirers (as opposed to earnout-based M&As announced by high-sigma acquirers) that appear to significantly outperform their counterfactuals. Moreover, with respect to deals involving private targets, the results suggest that it is only earnout-based M&As announced by low-sigma acquirers that result in significantly greater risk-adjusted returns, relative to deals involving single up-front payments of cash, stock, or mixed.

Consistent with information asymmetry models (Moeller et al., 2007), we argue that our results suggest the prevalence (elusiveness) of the acquirer-specific information revelation effect (earnout effect), which, under high acquirer sigma, can be perceived as the main source of acquirers' aggregate announcement period wealth effects, irrespective of payment method. Conversely, as the acquirer-specific information release is expected to be marginal in earnout-based deals announced by low-sigma acquirers, the higher risk-adjusted returns are more likely to be due to the prevalence of the earnout effect. Hence, the deal's increased synergy potential, embedded in the earnout effect, is effectively captured in acquirers' risk-adjusted returns.

Confronted with the above, the paper also examines the extent to which size-effect considerations influence our findings (Moeller et al., 2004). The results of our analysis suggest that the earnout effect appears to prevail in deals announced by large (or low-sigma) acquirers. Thus, the use of earnouts, especially in deals announced by low-sigma acquirers, may be perceived as sending a strong signal for value creation that also prevents investors from inducing a size-related discount.

The paper makes credible contributions to the earnout literature. More specifically, it uncovers a strong link between acquirers' sigma and the use of earnouts, as well as a significant interaction between acquirers' sigma and acquirers' risk-adjusted returns around the announcement of earnout-based M&As. As sigma represents an established proxy for information asymmetry over a listed firm (Dierkens, 1991; Moeller et al., 2007), this paper draws the attention to the characteristics of publicly traded acquirers and illustrates the elusiveness of the earnout effect under high acquirer sigma.[9] We argue that this is due to the considerable presence of an acquirer-specific information revelation effect.

Albeit that identifying the content of the acquirer-specific information that is released in the market during the event of the M&A announcement is beyond the research scope of this paper, this is the first earnout paper that focuses explicitly on the acquiring firm's side of the deal by examining whether variables suggested by information asymmetry models are helpful in understanding the perceived valuation effects of earnouts in M&As, while accounting for selection bias and size effect considerations. It also needs to be mentioned that our findings should not be regarded as suggesting that there is no synergy potential in earnout-based deals announced by high-sigma acquirers, or that earnout contracts are not incentive-compatible in such M&A negotiations. Rather, we argue that the perceived positive earnout effect in such deals is likely to be elusive due to the presence of the acquirer-specific information revelation effect that is embedded in the portfolio of earnout-based M&As that are announced by high-sigma acquirers. More research is therefore needed in terms of identifying the information content of the acquirer-specific information revelation effect in shaping acquirers' risk-adjusted returns during the announcement of earnout-based deals.

The remainder of the paper is organized as follows. Section 2 formulates and presents the testable hypotheses. Section 3 outlines both the methods and main variables that employed to conduct the empirical analysis. Section 4 refers to the data and the sample statistics. Section 5 presents the main results. Section 6 concludes this paper with an overarching discussion of the results, along with suggestions for future research.

2 | DEFERRED PAYMENT MECHANISMS AND ACQUIRERS' RISK-ADJUSTED RETURNS

Information asymmetry between merging firms in M&As may (mis)lead an acquirer to buy a 'lemon' (Akerlof, 1970), but it can also (mis)lead a target to be purchased at a discount. As discussed by Officer, Poulsen, and Stegemoller (2009), this problem is further exacerbated in M&As in which the target firm is characterized by high degrees of opacity, which

is often the case for unlisted firms. Acquirers, as a result, are motivated to employ numerous valuation risk mitigation tools, which are regularly closely related to (a) the choice of payment method used to finance the deal (i.e. cash, stock, mixed), and (b) the delivery mechanism of the deal's consideration (i.e. single up-front, deferred). Prior studies (see, for example, Eckbo et al. (1990), Fishman (1989), and Hansen (1987)) have investigated the role of asymmetric information on the choice of payment method in M&As. By assuming two-sided information asymmetry, these studies show that the division of the deal's surplus between the merging parties becomes a function of the size of the bid and of the medium of exchange. Fishman (1989) shows that, in the presence of large disagreements over the value of the target, the use of single up-front payments of cash may be the outcome of a 'sub-optimal' contract design.

More recently, Kohers and Ang (2000) and Barbopoulos, Paudyal, and Sudarsanam (2018b) for the US, and Barbopoulos and Sudarsanam (2012) for the UK, studied the valuation risk mitigation properties of earnouts. These studies illustrate the suitability of this contingent payment mechanism in M&As involving relatively small acquirers of targets that are characterized by increased valuation complexity or opacity. Reuer, Shenkar, and Ragozzino (2004) further show that the likelihood of earnout choice in a deal's payment process increases with the uncertainty faced by the acquiring firm over the value of the target. In addition to their obscure nature that is often defined by their listing status (i.e. private or subsidiary), targets in earnout-based M&As often operate in intangible-rich sectors (e.g. the high-tech or the pharmaceuticals sectors). The expected synergies of these deals are difficult to estimate due to the target's business idiosyncrasy and intangible assets giving rise to information asymmetry, as well as due to the sensitivity of their estimation to the flair, creativity and skill of only a few key members of personnel. The above give rise to valuation risk and, ultimately, more scope for negotiation (and perhaps re-negotiation), as substantial disagreements may emerge.

Confronted with the intuitive suitability of earnouts in valuation-complex deals, prior studies show that acquirers enjoy, on average, significant gains during the announcement of earnout-based M&As, which are also superior to those generated from deals settled in single up-front payments of cash or stock. Barbopoulos and Sudarsanam (2012) further show that 'correctly' classified earnout choice, based on logit models predicting 'optimal' earnout choice, leads to even higher announcement period and long-run acquirer risk-adjusted returns.[10]

Nevertheless, a dimension within the earnout literature that has received limited or no attention to this date concerns the possibility that asymmetric information over the acquiring firm (i.e. the asymmetric information between acquirers' managers and outside investors) may distort the perceived earnout effect. As acquirers' managers and market participants are likely to possess dissimilar loads of information over the value of the firm (e.g. its growth prospects, investment plans, scheduled capital expenditures, key personnel, R&D pipeline, value of intangible assets), with the former group being exposed to significantly more information than the latter, information revelation events (such as M&As) are expected to shape acquirers' prices considerably. Arguably, the extent of information asymmetry over an acquiring firm is expected to be more severe when acquirers are small firms, for which the available information in the market is limited (Banz, 1981); hence, their perceived risk is much larger (Draper & Paudyal, 2008). Campbell et al. (2001) also illustrate the increased idiosyncratic risk characterizing small firms. Similarly, assuming that the acquiring firms' managers and outside investors are equally informed about non-firm-specific factors, any firm-specific information is what remains to be factored into acquirers' share prices. Such an outcome would be expected to occur either through the passage of time or through an information-releasing event (Dierkens, 1991). Until that equilibrium condition is reached, the market bears some firm-specific uncertainty.[11]

Along these lines, due to their considerable size that often guarantees significant media coverage, M&&A announcements result in the release of a substantial load of acquirer-specific information, which attracts the attention of investors and analysts. The latter may in turn factor in this information and adjust their assessments of the acquiring firm's true value. Therefore, acquirers' short-run risk-adjusted returns should reflect, in addition to the expected economic benefits of the deal, the release of non-M&A-related information regarding the acquiring firm. In this respect, Draper and Paudyal (2008) document that undervalued firms with greater information asymmetry enjoy greater risk-adjusted returns as a result of information revelation regarding their value, revelation of expected synergies, or both. Within this context, Moeller et al. (2007) test information asymmetry models inspired by Myers and Majluf (1984) and put forward by Travlos (1987). The authors illustrate the superiority of sigma as a proxy for information asymmetry

that significantly interacts with the method of payment and the listing status of the target firm in shaping acquirers' risk-adjusted returns during the announcement period.[12]

The above suggest that the market's reaction to the announcement of M&As (both earnout- and non-earnout-settled) should accommodate, in addition to the expected synergies of the deal, the impact of the release of non-M&A-related information over the acquiring firm. Such acquirer-specific information release should be greater under increased information asymmetry over the acquiring firm (arguably due to its small size, as elaborated in Campbell et al., 2001); which would, in turn, be indicated by high acquirer sigma.[13] Within the context of earnout-based M&As, considering the small size and high levels of sigma that characterize acquirers that typically engage in such deals, the above suggest the potential presence of an acquirer-specific information revelation effect, which could potentially distort the earnout effect. Such an outcome would cast doubts over the perceived superior comparative performance of earnouts over single up-front payments. In fact, acquirers' risk-adjusted returns during the announcement of earnout-based deals could be identical, or even inferior, to those from non-earnout-settled deals once controlling for the acquiring firm's sigma, thereby confirming the elusiveness of the earnout effect.[14]

By contrast, asymmetric information over low-sigma (large) acquirers is expected to be considerably less material. Therefore, the earnout effect in low-sigma acquirers' short-run risk-adjusted returns is expected to be unbiased (or materially less biased) due to the absence (or considerably reduced presence) of the acquirer-specific information revelation effect. The main hypothesis is therefore set as follows:

a) Low-sigma acquirers enjoy significantly greater short-run risk-adjusted returns in earnout-based deals, relative to deals settled in non-earnout payments.

b) High-sigma acquirers do not enjoy significantly greater short-run risk-adjusted returns in earnout-based deals, relative to deals settled in non-earnout payments.

3 | METHODS

The methods employed to estimate acquirers' risk-adjusted returns are presented first. Subsequently, the tests used to address self-selection bias concerns with regards to the endogeneity inherent in employing earnouts (or not) are presented. Finally, the multivariate tests and the variables employed in them are presented.

3.1 | Estimation of acquirers' risk-adjusted returns

The estimation of acquirers' risk-adjusted returns is conducted as follows:

$$AR_{i,t} = R_{i,t} - E\left(R_{i,t}\right). \tag{1}$$

Where: $AR_{i,t}$, is the abnormal return to acquirer i at day t, $R_{i,t}$ is the realized stock return of acquirer i at day t, and $E(R_{i,t})$ is the expected return of the acquiring firm i at day t, estimated based on the Fama and French (1996) three-factor model (3FF) as in Equation (2) below:

$$E\left(R_{i,t}\right) = \left(1 - \hat{\beta}_i\right)R_{f,t} + \hat{\beta}_i E\left(R_{m,t}\right) + \hat{\beta}_i^{smb}E\left(SMB_t\right) + \hat{\beta}_i^{hml}E\left(HML_t\right). \tag{2}$$

The parameters $\hat{\beta}_i$, $\hat{\beta}_i^{smb}$, and $\hat{\beta}_i^{hml}$ are estimated over days $t - 250$ to $t - 40$, where $t = 0$ is the announcement day of the M&A, as in Equation (3) below:

$$\left(R_i - R_f\right)_t = \alpha + \beta_i\left(R_m - R_f\right)_t + \beta_i^{smb}SMB_t + \beta_i^{hml}HML_t + \varepsilon_{i,t}. \tag{3}$$

The announcement period cumulative abnormal return (CAR) for acquirer i is estimated as the sum of the risk-adjusted returns in the five-day window ($t - 2$ to $t + 2$) surrounding the M&A's announcement day ($t = 0$), as outlined in Equation (4) below:

$$CAR_i = \sum_{t-2}^{t+2} AR_{i,t}. \tag{4}$$

For robustness, in line with numerous studies with similar sample characteristics (Barbopoulos et al., 2018a; Faccio, McConnell, & Stolin, 2006; Fuller, Netter, & Stegemoller, 2002), the announcement period risk-adjusted returns for an acquiring firm i are estimated using the market-adjusted model (MAM), the Carhart four-factor model (4-FM), the capital asset pricing model (CAPM), as well as the market model (MM). In unreported results (available from the authors upon request), the correlations between the acquirer CAR obtained from (a) the 3FF, (b) the 4-FM, (c) the CAPM, (d) the MM and (e) the MAM, are found to be in excess of 0.92. All results using the acquirer CAR obtained from (b), (c), (d) and (e) are qualitatively similar to those obtained from (a), and the conclusions hold regardless of which event study model is applied.

3.2 | Propensity Score Matching (PSM) and Rosenbaum bounds (Rb) methods

Observational studies differ from experimental ones in that randomization is not used to assign a treatment. Within the context of M&As, extant literature is concerned with understanding the motives and consequences of several mechanisms involved during the deal process, by examining the acquirer CAR as the response random variable. In this paper, earnouts are used in a small proportion of the sampled deals (= 7.51%). This raises concerns as to whether a form of sample-selection bias reduces the reliability of the derived results, or their causal interpretation, from both univariate and multiple regression tests. To accommodate such concerns, the PSM method is used, through which the earnout effect is measured in isolation.[15]

More specifically, implementing the PSM method allows for an unbiased causal inference by pairing treated (earnout-based) and control (non-earnout settled) sampled M&As based on observable pre-treatment characteristics and assessing differences between the two groups in a response random variable (i.e. CAR) (Dehejia & Wahba, 2002; Rosenbaum, 2009). In particular, PSM involves matching treated M&As to counterfactual/control ones that do not include the treatment (earnout), yet they share a similar propensity to include it.

The PSM is applied in three exercises. In Exercise 1 earnout-based deals (i.e. treated) are matched to non-earnout (i.e. control) ones within the full sample. Exercise 2 and Exercise 3 involve matching earnout to non-earnout deals within groups of deals announced by acquirers exhibiting only low sigma and only high sigma, respectively. As the propensity score estimators include sigma, performing these matching sequences enables us to match earnout-based M&As to counterfactual ones involving acquiring firms with the most similar expected release of acquirer-specific information during their announcement. Therefore, performing Exercises 2 and 3 allows us to measure the earnout effect, as well as how it varies between low- and high- sigma acquirers, separately.

We apply 1-to-1, 5-to-1 and 10-to-1 nearest neighbour matching with replacement within 1% of Absolute Probability Difference (APD). The sensitivity of our conclusions, derived from each matching sequence, to the potential effect of an unobserved covariate from each propensity score estimator, is also examined through the Rosenbaum bounds method (Rosenbaum, 2009), which measures how influential a confounding (unobserved) covariate needs to be in order to invalidate the effect of the treatment on the response random variable.

Finally, in response to the growing popularity of matching analyses in empirical finance, Ho, Imai, King, and Stuart (2007) argue that matching in itself is not an estimation method: once a matched sample (containing both the treated and counterfactual M&As) is established, an estimation procedure needs to be adopted to determine the factors influencing the treatment's outcome. They recommend that researchers benefit from 'their decades of experience with parametric models to adjust the matched sample' (p. 213). Particularly, matching on propensity scores is primarily used

to balance the main covariates by simple t-tests on the matched sample (Rosenbaum & Rubin, 1983; 1985).[16] Then, parametric methods can be applied on the matched sample.

3.3 | Determinants of earnout choice

The propensity scores used to perform the PSM exercises are estimated using three logit models (one for each exercise outlined in Section 3.2.). In particular, each logit model estimates the probability of a sampled deal being settled with an earnout conditional upon firm- and deal- specific characteristics, which will be regarded as 'predicting' the earnout choice. In the logit models, the dependent variable assumes the value of one if a deal is earnout-based, and zero otherwise.

Extant literature on the earnout effect illustrates that earnouts are regularly used in acquisitions of private or sub-sidiary target firms, operating in intangible-rich sectors or unrelated industries, and characterized by substantial val-uation risk, mainly sourced from adverse selection and moral hazard considerations (Kohers & Ang, 2000). Mantecon (2009) also demonstrates that the probability of earnout use is significantly lower when the deal involves a foreign target firm, while Datar, Frankel, and Wolfson (2001) illustrate that common law countries facilitate, to a great extent, contractual agreements, thus increasing the likelihood of earnout choice. In addition, the acquirer's growth opportuni-ties, as measured by its market-to-book (MTBV) ratio (Sudarsanam & Mahate, 2003), the relative size of the deal (Fuller et al., 2002), and the acquirer's debt-to-equity (total debt to common equity) and cash (cash and cash equivalents to its total assets) ratios (as in Barbopoulos et al., 2018a, 2018b) are found to be important determinants of earnout choice.

To account for these effects in the prediction of earnout choice in our logit models, the following variables are included: (a) dummy variables that account for the listing status of the target (private dummy = 1, and = 0 otherwise), the intangibility of the target firm's assets (Target in Intangible-rich sector = 1, and = 0 otherwise), the industrial diver-sification aspect of the deal (Diversifying deal = 1, and = 0 otherwise), the geographical diversification aspect of the deal (Foreign deal = 1, and = 0 otherwise), the legal system of the target firm's origin (Common Law = 1, and = 0 oth-erwise), and (b) continuous variables that account for the relative size of the deal, the acquirer's MTBV, debt-to-equity ratio, cash ratio and sigma.

3.4 | Acquirer idiosyncratic stock return volatility (sigma)

Moeller et al. (2007) illustrate the role of an acquiring firm's sigma in shaping its CAR during the announcement period of M&As. As in Moeller et al. (2007), sigma is estimated as the standard deviation of the residuals from the Fama and French (1996) three-factor model that is estimated from $t - 205$ days before the M&A announcement to $t - 6$, where $t = 0$ is the M&A announcement day. The market model, market-adjusted model, CAPM and the Carhart (1997) four-factor model are also used as robustness checks, whereas the results remain qualitatively and quantitatively similar to the ones in the main tests.

3.5 | Determinants of acquirers' risk-adjusted returns: A multivariate analysis

The impact of acquirers' sigma on acquirers' CAR from earnout- vs. non-earnout- settled deals is examined within a multivariate framework where the effects of several factors known to shape acquirers' CAR are simultaneously con-trolled. Equation (5) is therefore estimated in a nested regression form:

$$
\begin{aligned}
CAR_i = \ & \beta_1 + \beta_2 \times \text{Earnout dummy}_i + \beta_3 \times \text{Unlisted Target dummy}_i \\
& + \beta_4 \times \text{Target in Intangible} - \text{rich Sector dummy}_i \\
& + \beta_5 \times \text{Diversifying M\&A dummy}_i \\
& + \beta_6 \times \text{Foreign target dummy}_i + \beta_7 \times \text{Acquirer sigma}_i + \sum_{j=8}^{k} \beta_j X_{ij} + \tilde{d}_t + \tilde{c}_s + \varepsilon_i \ i = 1 \dots N \quad (5)
\end{aligned}
$$

where the intercept, β_1, accounts for the average acquirer CAR after accounting for the effects of all the explanatory variables entering the matrix X_{ij}. The dependent variable, CAR, is the five-day announcement period cumulative risk-adjusted return of acquirers as calculated in Equation (4). The impact of each of the explanatory variables entering the X_{ij} matrix is gathered in the vector β_j.

Earnout dummy: Prior studies indicate that earnout-based deals yield greater CAR to acquirers (Barbopoulos & Sudarsanam, 2012; Barbopoulos et al., 2018b; Kohers & Ang, 2000). To account for the potential implications of earnout choice on acquirers' CAR, a variable assigned the value of one when an earnout is employed in the deal, and zero otherwise, is included in Equation (5).

Unlisted target dummy: Extant literature has illustrated the influence of the target firm's listing status on acquirers' CAR (Chang, 1998; Fuller et al., 2002). To accommodate this effect in the analysis, a dummy variable taking the value of one for unlisted targets, and zero otherwise, is included in Equation (5).

Target in intangible-rich sector dummy: The valuation risk confronting the acquirer in an M&A deal increases with the extent of intangibility inherent in the target firm's assets (Kohers & Ang, 2000). To account for this effect in the analysis, a dummy variable taking the value of one if the target firm operates within the consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications sectors, and zero otherwise, is included in Equation (5).

Diversifying deal dummy: If both target and acquirer firms belong to the same sector, their integration may be easier and the synergy gains higher (Barbopoulos & Sudarsanam, 2012). However, firms acquiring targets that operate in an unrelated business may gain from diversification, thereby resulting in a reduction in the volatility of the combined firm's cash flows and cost of capital. Therefore, to control for the potential effect of corporate diversification in our multivariate tests, a dummy variable that is assigned the value of one for diversifying deals (i.e. target and acquirer do not share the same two-digit Standard Industrial Classification (SIC) code), and zero for focused deals, is included in Equation (5).

Foreign target dummy: Domestic and foreign deals have been illustrated to affect the acquirers' CAR differently (Barbopoulos et al., 2012; Moeller & Schlingemann, 2005). In general, domestic target acquisitions can be perceived as less risky compared to foreign target acquisitions. Therefore, to control for the effect of foreign target acquisitions in our multivariate tests, a dummy variable that is assigned the value of one when acquirer and target reside in different countries, and zero otherwise, is included in Equation (5).

Acquirer sigma (Sigma): Moeller et al. (2007) examine the link between the theoretical predictions of information asymmetry models in explaining acquirers' CAR. The authors illustrate the superiority of sigma as a proxy for information asymmetry over a publicly traded firm and its significance in shaping the distribution of acquirers' CAR. Therefore, to proxy for the extent of the acquiring firm's information asymmetry in the analysis, the acquirer's sigma is included in Equation (5).

Relative deal size: Extant literature (Asquith, Bruner, & Mullins, 1983; Fuller et al., 2002) depicts that acquirers' gains are positively related to the relative size of the deal (measured as the deal value over the market value of the acquirer 20 days prior to the announcement day). Therefore, to account for this effect in the analysis, the relative size of the deal is included in Equation (5).

Acquirer's age: Information asymmetry between acquirers' managers and investors influences acquirers' CAR. Zhang (2006) suggests that investors tend to have more information on firms with a longer trading history, which results in lower information asymmetry. Therefore, as an alternative (to sigma) proxy for information asymmetry over a publicly traded firm, the age of the acquirer (measured by the log of the number of days between the announcement day and the first record of the company in Datastream) is included in Equation (5).

Additional indicator and continuous variables: In Equation (5), two additional dummy variables are included indicating deals involving low- and high-sigma acquirers, respectively. Low sigma (High sigma) = one for the bottom (top) third of all deals in the sample based on their ranking by sigma, and zero otherwise. Lastly, key financial ratios of the acquiring firm, such as its market-to-book ratio (Acq. Market-to-Book Ratio), its ratio of 'total cash and cash

equivalents' to total assets (Acq. Cash Ratio) and its ratio of total debt-to-common equity (Acq. Debt/Equity Ratio), are included in Equation (5).

Year and target industry fixed effects: To account for potential unobserved time-variant characteristics related to a given year in which an M&A is announced, as well as unobserved characteristics specific to the target's primary sector of business operations, 'time fixed effects' ($\tilde{d}_t$) and 'target industry fixed effects' ($\tilde{c}_s$), respectively, are included in Equation (5).

4 | DATA AND SAMPLE STATISTICS

4.1 | Data

The sample includes M&As announced by US public firms between 01/01/1980 and 31/12/2016 and recorded by the Security Data Corporation (SDC). In order for a deal to remain in the sample, it must meet the following criteria: first, the acquirer is a US listed firm and has a market value of at least $1 m, measured 20 trading days prior to the announcement of the deal. To avoid the trivial effects of tiny deals, the transaction value is restricted to at least $1 m. Targets of public, private and subsidiary listing and from all domiciles (US or non-US) are included in the sample. To avoid the confounding effects of multiple deals, deals announced within the five days surrounding another deal by the same acquirer are excluded. The daily stock price and market value of the acquirer need to be available from Datastream. Spin-offs, recapitalizations, self-tenders, exchange offers and repurchases are excluded from the sample. Deals where either acquirer or target firm belong to the sector 'Government and Agencies' are excluded from the sample. Finally, considering the method of financing the M&A, the percentage of the payment made with an unknown payment method, according to SDC, must be less than 100% so that the sum of cash, stock and other payments equals 100%. The above criteria are satisfied by 35,121 deals, 2,638 of which (= 7.51%) are earnout-based ones (i.e. the earnout sample).

4.2 | Sample statistics

Table 1 presents the annual distribution of the sampled M&As for the full sample (Panel A), the earnout sample (Panel B) and the sample of private target M&As (Panel C), by several deal- and firm- specific features. Among other noticeable patterns, the statistics indicate that from 1999 to 2003 the majority of all M&As (Panel A), as well as the majority of earnout-based M&As (Panel B), were announced by acquirers exhibiting high sigma. Interestingly, Panel C shows that during the 1986–1998 period (with the exception of the year 1996) the majority of deals involving private targets were based in earnouts, as opposed to stock. Consistent with Table 1, Figure 1 illustrates that the relative earnout activity (i.e. earnout activity over all M&A activity) steadily increases over the period between 1996 and 2011. Figure 1 also highlights that since 1996, the relative earnout value (i.e. the ratio of the aggregate value of the deferred payments in earnout-based M&As over the aggregate value of all M&As) also increases. The gradually higher relative earnout value is possibly the outcome of the record growth of M&As involving hard-to-evaluate target firms operating in the hi-tech and other intangible-rich sectors over the same period, which suggests the higher valuation risk faced by acquirers (consistent with Cain, Denis, & Denis, 2011).

Table 1 also provides statistics on acquirer-, target-, and deal- specific features. Consistent with previous studies on the US market for corporate control (Moeller et al., 2004), Panel A demonstrates that the majority of M&As involve unlisted targets (private and subsidiary targets account for 48.83% and 26.90%, respectively). Considering the acquisition financing methods, cash payments dominate stock ones (35.27% vs. 22.81%). Moreover, 7.51% of the sampled deals are earnout-based and 92.49% are settled in a single up-front payment delivery mechanism. Panel B further shows that nearly 40% (1,058 out of 2,638) of all earnout-based deals are announced by high-sigma acquirers. Lastly, consistent with prior studies (Kohers & Ang, 2000), Panel C shows that almost 98% of earnout-based M&As involve private and subsidiary target firms, accounting for 73.81% and 24.03%, respectively.

TABLE 1 Annual distribution of M&A activities

Panel A: All M & As										
	All	Foreign	Diver-sifying	Low sigma	High Sigma	Private target	Public target	Cash	Stock	NEA
1980	36	0	24	18	2	19	10	6	2	36
1981	256	0	160	150	18	140	73	2	2	256
1982	359	0	215	211	22	190	90	0	0	359
1983	508	4	304	193	69	240	116	6	0	508
1984	599	4	299	311	55	237	184	21	11	599
1985	292	10	166	199	22	55	165	159	69	283
1986	296	11	131	159	23	94	146	123	97	288
1987	357	18	162	165	46	102	191	153	108	348
1988	345	24	173	60	113	76	198	161	83	335
1989	522	43	234	263	85	158	198	214	162	495
1990	414	31	184	165	96	141	134	160	115	392
1991	510	61	210	119	217	221	138	143	167	470
1992	744	78	296	207	259	366	163	192	260	699
1993	987	77	409	299	397	488	211	276	360	917
1994	1,259	111	507	396	437	636	315	378	417	1,201
1995	1,337	144	506	432	409	630	381	403	486	1,281
1996	1,570	158	653	439	596	825	369	427	581	1,509
1997	2,048	201	896	578	779	1,061	468	567	687	1,946
1998	2,139	284	916	482	802	1,119	549	632	696	2,008
1999	1,811	223	766	191	1,024	884	542	544	673	1,717
2000	1,812	247	772	82	1,243	969	478	483	735	1,701
2001	1,225	184	528	68	771	532	353	404	355	1,131
2002	1,118	160	485	211	561	505	249	450	206	1,010
2003	992	123	395	248	393	464	242	420	185	881
2004	1,246	199	483	476	402	668	247	558	177	1,116
2005	1,384	228	585	586	358	764	230	635	181	1,261
2006	1,385	226	614	589	296	745	265	703	151	1,243
2007	1,356	247	579	604	303	738	268	650	162	1,193
2008	967	192	401	255	317	504	193	460	117	828
2009	700	139	281	52	403	315	165	301	123	613
2010	819	180	341	329	209	399	168	415	103	718
2011	866	198	386	390	220	450	140	426	101	746
2012	882	194	391	444	154	415	155	483	73	777
2013	794	143	334	492	112	384	157	423	88	706
2014	1,029	189	421	601	175	545	188	511	130	919
2015	1,201	226	568	723	161	605	216	316	87	1,109
2016	956	161	471	520	158	464	169	182	61	884
Total	35,121	4,718	15,246	11,707	11,707	17,148	8,524	12,387	8,011	32,483
%	–	13.43	43.41	33.33	33.33	48.83	24.27	35.27	22.81	92.49

(Continues)

TABLE 1 (Continued)

Panel B: All Earnout–Based M & As						
	All	Foreign	Diversifying	Low sigma	High Sigma	Private target	Public target
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	9	0	4	5	3	5	2
1986	8	0	3	3	0	5	1
1987	9	1	3	2	1	7	0
1988	10	4	8	3	4	7	0
1989	27	2	16	8	9	14	2
1990	22	5	12	4	7	15	2
1991	40	12	22	3	20	29	1
1992	45	6	21	13	21	30	1
1993	70	7	38	7	38	46	1
1994	58	1	37	9	30	45	0
1995	56	6	24	7	25	40	1
1996	61	10	30	9	27	41	2
1997	102	14	52	10	56	82	1
1998	131	21	63	16	63	95	3
1999	94	8	57	3	66	67	3
2000	111	15	46	0	84	80	3
2001	94	17	52	3	68	68	2
2002	108	11	50	5	65	80	1
2003	111	13	46	16	57	80	2
2004	130	29	49	31	52	101	2
2005	123	22	48	35	34	92	3
2006	142	22	52	43	35	108	3
2007	163	20	70	55	36	124	2
2008	139	33	59	25	47	109	6
2009	87	15	37	3	52	66	3
2010	101	25	32	33	26	69	2
2011	120	27	44	35	35	94	0
2012	105	21	43	43	17	78	2
2013	88	17	30	46	15	61	2
2014	110	19	50	45	27	85	1
2015	92	23	37	40	18	70	2
2016	72	11	44	26	20	54	1
Total	2,638	437	1,179	586	1,058	1,947	57
%	–	16.57	44.69	22.21	40.11	73.81	2.16

TABLE 1 (Continued)

Panel C: Private Target M & As					
	Earnout	Earnout high sigma	%	Stock	Stock high sigma	%
1980	0	0	0	0	0	0
1981	0	0	0	1	0	0
1982	0	0	0	0	0	0
1983	0	0	0	0	0	0
1984	0	0	0	0	0	0
1985	5	3	60	20	3	15
1986	5	0	0	52	7	13
1987	7	1	14	52	5	10
1988	7	2	29	24	10	42
1989	14	5	36	67	8	12
1990	15	6	40	51	10	20
1991	29	17	59	82	44	54
1992	30	15	50	150	51	34
1993	46	29	63	213	91	43
1994	45	24	53	218	86	39
1995	40	18	45	245	98	40
1996	41	20	49	360	190	53
1997	82	45	55	377	199	53
1998	95	49	52	375	174	46
1999	67	49	73	378	286	76
2000	80	64	80	464	401	86
2001	68	50	74	168	141	84
2002	80	47	59	107	87	81
2003	80	44	55	81	59	73
2004	101	44	44	84	63	75
2005	92	27	29	97	74	76
2006	108	27	25	76	52	68
2007	124	29	23	82	55	67
2008	109	40	37	51	42	82
2009	66	37	56	46	34	74
2010	69	18	26	47	42	89
2011	94	26	28	57	46	81
2012	78	12	15	29	21	72
2013	61	12	20	43	28	65
2014	85	21	25	62	38	61
2015	70	13	19	36	16	44
2016	54	14	26	19	10	53

(Continues)

TABLE 1 (Continued)

Panel C: Private Target M & As						
Public target	Earnout	Earnout high sigma	%	Stock	Stock high sigma	%
Total	1,947	808	–	4,214	2,471	–
%	–	41.50	–	–	58.64	–

Note: Panel A refers to all M&As included in the analysis; Panel B refers to only earnout-based M&As Panel C refers to solely private target M&As settled in earnout or stock. 'All' refers to the entire M&A activity (within each panel); 'Foreign' (within each panel) refers to foreign target acquisitions in which the acquirer and target are based in different countries; 'Diversifying' (within each panel) refers to diversifying deals in which the acquirer and target operate in different industries, i.e. they do not share the same two-digit SIC code; 'Low sigma' (within each panel) corresponds to the bottom third of deals exhibiting the lowest acquirer sigma; 'High sigma' (within each panel) corresponds to the top third of deals exhibiting the highest acquirer sigma; 'Cash' refers to deals fully settled in cash; 'Stock' refers to deals fully settled in stock; 'Private target' (within each panel) refers to M&A deals in which the target is a private firm; 'Public target' (within each panel) refers to M&A deals in which the target firm is a publicly listed firm; 'NEA' (Panel A) refers to all deals that are not earnout-based (i.e. fully settled in cash, stock or mixed payments); 'Earnout' (Panel C) refers to deals that are earnout-based; 'Earnout high sigma' refers to earnout-based deals announced by high-sigma acquirers; 'Stock high sigma' refers to stock-settled deals announced by high-sigma acquirers. Further information on the definition of each variable can be found in Appendix A.
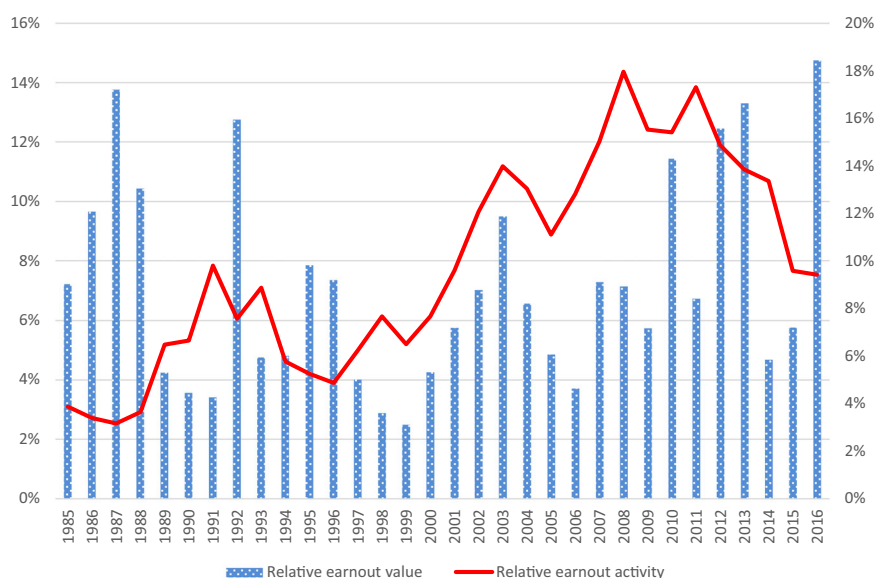

FIGURE 1 Relative earnout value and relative earnout activity [Color figure can be viewed at wileyonlinelibrary.com]

Note: The figure presents the *relative earnout value* (= ratio of earnout value to the value of all M&As) by year, as well as the *relative earnout activity* (= ratio of earnout activity to all M&A activities by year) by year. The right-hand scale (corresponding to blue columns) reports the relative earnout value from 1985 to 2016 (inclusive) while the left-hand scale (corresponding to the red-continuous line) reports the frequency of earnout activity from 1985 to 2016 (inclusive). The figure is restricted to the years including earnout-based M&As in our sample period. Data were obtained from the Thomson-Reuters SDC ONE Banker and DataStream databases.

In Table 2 (Panel A) earnout-based deals appear to involve relatively more targets operating in intangible-rich sectors (77.52% in earnout deals compared to 68.63% in non-earnout ones). Earnout-based deals also appear to be much smaller in transaction value than non-earnout settled deals ($133 m in earnout deals compared to $424 m in non-earnout deals) and to involve smaller acquirers ($4,175 m in earnout-deals compared to $5,728 m in non-earnout deals). However, the relative size of earnout-based deals is invariably greater than that of deals settled in cash, thereby

TABLE 2 Summary statistics

Panel A: All Deals					
	All	Earnout	NEA	Cash	Stock
All deals	35,121	2,638	32,483	12,387	8,011
Private target	17,148	1,947	15,201	4,786	4,214
Public target	8,524	57	8,467	2,888	2,973
Subsidiary target	9,449	634	8,815	4,713	824
Domestic	30,403	2,201	28,202	10,096	7,296
Foreign	4,718	437	4,281	2,291	715
Focused	19,875	1,459	18,416	6,806	4,955
Diversifying	15,246	1,179	14,067	5,581	3,056
Target in int. sector	24,339	2,045	22,294	8,146	6,524
Sigma	0.036	0.039	0.036	0.027	0.050
Deal value ($m)	402.6	133.3	424.4	254.5	508.6
Acq. MV ($m)	5,611.5	4,174.7	5,728.2	8,999.2	4,655.2
Relative deal size	0.392	0.290	0.400	0.213	0.590
Acq. MTBV	2.865	2.877	2.864	2.867	3.278
Acq. age (in years)	11.5	11.0	11.6	13.8	9.5
Acq. cash ratio	0.180	0.257	0.174	0.162	0.210
Acq. debt/equity ratio	0.833	0.478	0.863	0.898	0.765
Earnout value ($m)	37.62	37.62	–	–	–
Rel. earnout value	0.34	0.34	–	–	–
Panel B: Low-Sigma Acquirers					
	All	Earnout	NEA	Cash	Stock
All deals	11,707	586	11,121	5,278	1,899
Private target	4,488	400	4,088	1,765	681
Public target	3,824	18	3,806	1,515	1,093
Subsidiary target	3,395	168	3,227	1,998	125
Domestic	10,088	460	9,628	4,224	1,827
Foreign	1,619	126	1,493	1,054	72
Focused	6,361	314	6,047	2,622	1,372
Diversifying	5,346	272	5,074	2,656	527
Target in int. sector	7,531	447	7,084	3,214	1,525
Sigma	0.014	0.014	0.014	0.014	0.014
Deal value ($m)	784.5	313.5	809.3	435.0	1,202.1
Acq. MV ($m)	11,273.8	13,717.7	11,145.1	15,848.6	7,005.5
Relative deal size	0.270	0.253	0.271	0.156	0.365
Acq. MTBV	2.565	2.947	2.544	2.868	2.093
Acq. age (in years)	16.4	17.0	16.4	17.8	16.0
Acq. cash ratio	0.099	0.176	0.095	0.111	0.070
Acq. debt/equity ratio	1.137	0.585	1.168	1.062	1.438
Earnout value ($m)	88.45	88.45	–	–	–
Rel. earnout value	0.30	0.30	–	–	–

TABLE 2 (Continued)

Panel C: Medium-Sigma Acquirers

	All	Earnout	NEA	Cash	Stock
All deals	11,707	994	10,713	4,579	2,216
Private target	5,600	739	4,861	1,880	1,062
Public target	2,888	17	2,871	967	958
Subsidiary target	3,219	238	2,981	1,732	196
Domestic	10,209	835	9,374	3,748	2,069
Foreign	1,498	159	1,339	831	147
Focused	6,942	562	6,380	2,690	1,439
Diversifying	4,765	432	4,333	1,889	777
Target in int. sector	8,014	747	7,267	3,090	1,832
Sigma	0.025	0.026	0.025	0.025	0.026
Deal value ($m)	310.1	124.2	327.4	157.6	501.2
Acq. MV ($m)	4,487.6	2,335.9	4,687.2	5,134.8	8,405.9
Relative deal size	0.288	0.188	0.298	0.182	0.345
Acq. MTBV	2.836	2.838	2.836	2.874	3.278
Acq. age (in years)	11.1	10.8	11.1	12.4	9.8
Acq. cash ratio	0.166	0.242	0.159	0.175	0.148
Acq. debt/equity ratio	0.866	0.522	0.899	0.873	0.853
Earnout value ($m)	32.30	32.30	–	–	–
Rel. earnout value	0.31	0.31	–	–	–

Panel D: High-Sigma Acquirers

	All	Earnout	NEA	Cash	Stock
All deals	11,707	1,058	10,649	2,530	3,896
Private target	7,060	808	6,252	1,141	2,471
Public target	1,812	22	1,790	406	922
Subsidiary target	2,835	228	2,607	983	503
Domestic	10,106	906	9,200	2,124	3,400
Foreign	1,601	152	1,449	406	496
Focused	6,572	583	5,989	1,494	2,144
Diversifying	5,135	475	4,660	1,036	1,752
Target in int. sector	8,794	851	7,943	1,842	3,167
Sigma	0.070	0.066	0.071	0.058	0.081
Deal value ($m)	113.1	42.1	120.1	53.5	174.9
Acq. MV ($m)	1,073.1	616.7	1,118.4	1,704.5	1,376.1
Relative deal size	0.617	0.407	0.638	0.387	0.840
Acq. MTBV	3.229	2.875	3.265	2.852	3.927
Acq. age (in years)	7.0	7.7	6.9	8.1	6.1
Acq. cash ratio	0.292	0.326	0.288	0.254	0.333
Acq. debt/equity ratio	0.440	0.363	0.448	0.565	0.316

(Continues)

TABLE 2 (Continued)

Panel D: High-Sigma Acquirers					
	All	Earnout	NEA	Cash	Stock
Earnout value ($m)	14.47	14.47	–	–	–
Rel. earnout value	0.38	0.38	–	–	–

Note: Panel A refers to all M&As included in the analysis; Panel B refers to only M&As announced by low-sigma acquirers; Panel C refers to only M&As announced by medium-sigma acquirers; Panel D refers to only M&As announced by high-sigma acquirers. Each panel is organized as follows: it vertically presents the number of all deals, the number of deals that are earnout-based (Earnout), the number of deals that are not earnout-based (NEA), the number of deals fully settled in cash (Cash) and the number of deals fully settled in stock (Stock), which is further (horizontally) categorized by the target firm's listing status (i.e. private, public and subsidiary), the target firm's domicile (i.e. domestic and foreign) and the merging firms' industry relatedness (i.e. focused and diversifying), as well as by the extent of intangible richness of the target firm's assets (i.e. target in int. sector), followed by the mean of acquirer- and deal- specific characteristics (i.e. sigma, deal value, acquirer market value (Acq. MV), relative deal size, acquirer MTBV (Acq. MTBV), acquirer age (Acq. Age), acquirer cash ratio (Acq. Cash Ratio), and acquirer debt to equity ratio (Acq. Debt/Equity Ratio)). 'All' refers to all M && As within each Panel; 'Private target' corresponds to deals involving private targets; 'Public target' corresponds to deals involving public targets; 'Subsidiary target' corresponds to deals involving subsidiary targets; 'Domestic' refers to deals where the acquirer's and target's domiciles coincide; 'Foreign' refers to cross-border acquisitions in which the acquirer and target are based in different countries; 'Focused' refers to deals in which acquirer and target operate in the same industry, i.e. they share the same two-digit SIC code; 'Diversifying' refers to diversifying deals in which acquirer and target operate in different industries, i.e. they do not share the same two-digit SIC code; 'Target in int, sector' corresponds to deals involving targets operating in intangible-rich sectors (consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications); 'Sigma' corresponds to the acquiring firm's idiosyncratic stock return volatility (measured as in Moeller et al., 2007); 'Deal value' reflects the deal's transaction value (in $mil.); 'Acq. MV' corresponds to the acquiring firm's market capitalization (measured 20 days prior to the deal's announcement); 'Relative deal size' corresponds to the relative size of the deal (= deal value/acquirer's market value 20 days prior to the deal's announcement); 'Acq. MTBV' corresponds to the acquiring firm's market-to-book ratio (measured 20 days prior to the deal's announcement); 'Acq. age' corresponds to the number of years between the acquirer's first recorded day on Datastream and the deal's announcement day; 'Acq. cash ratio' corresponds to the acquirer's ratio of cash and cash equivalents to total assets at the end of the last quarter prior to the deal's announcement; 'Acq. debt/equity ratio' corresponds to the acquirer's ratio of total debt to common equity at the end of the last quarter prior to the deal's announcement; 'Earnout value' refers to the value (in $mil) of the deferred payment in an earnout–based M&As 'Rel. earnout value' corresponds to the relative earnout size of the deal (= earnout value/deal value). Further information on the definition of each variable can be found in Appendix A.

indicating the increased risk faced by acquirers (Panels A to D). The above findings are in line with prior earnout studies (Barbopoulos & Sudarsanam, 2012; Kohers & Ang, 2000; Mantecon, 2009) indicating the suitability of earnout in risky deals involving mainly domestic unlisted target firms, operating in intangible-rich sectors.

Panel A also verifies the (marginally) increased sigma characterizing acquirers in earnout-based deals, relative to acquirers in non-earnout settled M&As (0.039 in earnout deals, compared to 0.036 in non-earnout deals). In Panels B, C and D, the above statistics are repeated for deals involving low-, medium-, and high- sigma acquirers, respectively. A firm's sigma has been portrayed as an accurate measure of the extent of information asymmetry between its managers and outside investors (Dierkens, 1991). Nevertheless, when leverage increases, shareholders bear a greater share of the total risk of the firm, and the volatility of the stock return increases. Myers (1977) illustrates that firm leverage affects investment decisions due to debt overhang considerations. As can be observed in Panels A to C, acquiring firms in earnout-based deals exhibit the lowest debt-to-equity ratio and the highest cash ratio, compared to counterparts in non-earnout settled deals. In Panel D, in turn, the leverage and liquidity positions of acquirers in earnout-based deals come second, following that of acquirers in stock-financed deals. These features are perceived as evidence that equity investors' concerns over acquirers' leverage and liquidity positions are unlikely to be substantial within earnout-based deals.

Table 3 records the correlations between the variables in the analysis. In general, the correlation coefficients do not raise any concerns regarding multicollinearity that may impede the assessment of the effect of the independent variables in multiple regressions.

TABLE 3 Correlation matrix of main variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Sigma	(1)																								
Deal value	(2) −0.06																								
Acq, MV	(3) −0.11	0.25																							
Relative deal size	(4) 0.27	0.07	−0.07																						
Acq, MTBV	(5) 0.02	0.03	0.12	−0.11																					
Acq, cash ratio	(6) 0.26	−0.04	−0.01	0.03	0.14																				
Acq, debt/equity ratio	(7) −0.13	0.04	0.03	0.00	0.09	−0.20																			
Acq, age	(8) −0.26	0.12	0.23	−0.09	−0.03	−0.22	0.04																		
Earnout value	(9) −0.11	0.76	0.48	0.02	0.09	−0.03	0.09	0.15	–																
Earnout	(10) 0.02	−0.03	−0.02	−0.03	0.00	0.10	−0.05	−0.02	–	−0.21															
Cash	(11) −0.18	−0.04	0.10	−0.14	0.00	−0.06	0.03	0.17	–	−0.15	−0.40														
Stock	(12) 0.18	0.02	−0.02	0.11	0.04	0.07	−0.02	−0.11	–	−0.21	−0.53	−0.39													
Mixed	(13) 0.01	0.04	−0.07	0.06	−0.04	−0.05	0.02	−0.07	−0.04	0.14	−0.15	0.04	0.04												
Private target	(14) 0.16	−0.11	−0.08	−0.04	0.03	0.16	−0.09	−0.17	0.04	−0.15	−0.02	0.16	−0.05	−0.55											
Public target	(15) −0.14	0.16	0.10	0.06	−0.01	−0.11	0.09	0.15	0.02	−0.02	0.19	−0.20	0.00	−0.59	−0.34										
Subsidiary target	(16) −0.05	−0.03	−0.01	−0.01	−0.03	−0.07	0.02	0.05	0.03	0.03	0.11	−0.07	−0.06	−0.02	−0.04	0.07									
Foreign	(17) 0.01	−0.01	0.08	−0.02	0.03	0.06	−0.02	0.08	−0.07	0.01	0.02	−0.06	0.02	0.05	−0.07	0.02	0.01								
Diversifying	(18) 0.05	−0.03	0.04	0.04	−0.01	−0.04	0.01	0.02	0.04	0.05	−0.06	0.14	−0.10	0.09	0.04	−0.14	−0.06	−0.09							
Target in int. sector	(19) 0.04	−0.01	0.05	−0.05	0.06	0.22	−0.04	−0.11	−0.02	−0.01	0.02	−0.04	0.02	−0.02	−0.03	0.06	−0.02	0.03	0.16						
Target in med. & ent.	(20) 0.01	0.04	−0.01	0.04	0.00	−0.03	0.02	−0.05																	

(Continues)

TABLE 3 (Continued)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Target in retail	(21)	0.01	−0.01	−0.01	0.02	−0.01	−0.03	−0.01	−0.02	−0.03	−0.02	0.00	−0.01	0.02	0.00	0.00	0.00	−0.03	0.03	0.13	−0.05					
Target in financials	(22)	−0.13	−0.01	−0.02	−0.03	−0.09	−0.21	0.17	0.04	0.05	−0.07	−0.09	0.17	−0.03	−0.05	0.18	−0.12	−0.11	−0.11	0.28	−0.10	−0.08				
Target in high−tech	(23)	0.10	−0.03	0.06	−0.06	0.10	0.33	−0.13	−0.08	−0.07	0.05	0.01	0.06	−0.09	0.11	−0.06	−0.07	0.05	−0.06	0.34	−0.13	−0.10	−0.22			
Target in healthcare	(24)	0.00	0.03	0.04	−0.01	0.03	0.10	−0.05	0.02	0.17	0.08	0.00	−0.02	−0.02	0.00	0.00	−0.01	0.00	−0.08	0.23	−0.09	−0.07	−0.15	−0.18		
Target in cons. & serv.	(25)	0.03	−0.03	−0.03	−0.01	0.02	0.03	−0.03	−0.05	−0.07	0.04	−0.01	−0.02	0.00	0.07	−0.06	−0.02	0.01	0.12	0.21	−0.08	−0.06	−0.13	−0.16	−0.11	

Note: This table reports the Pearson correlation coefficients between the following variables: 'Sigma' corresponds to the acquiring firm's idiosyncratic stock return volatility (measured as in Moeller et al., 2007); 'Deal value' reflects the deal's transaction value (in \$mil.); 'Acq. MV' corresponds to the acquiring firm's market capitalization (measured 20 days prior to the deal's announcement); 'Relative deal size' corresponds to the relative size of the deal (= deal value/acquirer's market value 20 days prior to the deal's announcement); 'Acq. MTBV' corresponds to the acquiring firm's market−to−book ratio (measured 20 days prior to the deal's announcement); 'Acq. cash ratio' corresponds to the acquirer's ratio of cash and cash equivalents to total assets at the end of the last quarter prior to the deal's announcement; 'Acq. debt/equity ratio' corresponds to the acquirer's ratio of total debt to common equity at the end of the last quarter prior to the deal's announcement; 'Acq. Age' corresponds to the number of years between the acquirer's first recorded day on Datastream and the deal's announcement day; 'Earnout value' refers to the value (in \$m) of the deferred payment in an earnout-based M & A.; 'Earnout' corresponds to earnout-based M&As; 'Cash' refers to M&As fully settled in cash; 'Stock' refers to M&As fully settled in stock; 'Mixed' refers to M&As encompassing combinations of cash, stock and other payments; 'Private target' corresponds to deals involving private targets; 'Public target' corresponds to deals involving public targets; 'Subsidiary target' corresponds to deals involving subsidiary targets; 'Foreign' refers to cross-border acquisitions in which the acquirer and target are based in different countries; 'Diversifying' refers to diversifying deals in which acquirer and target operate in different industries, i.e. they do not share the same two-digit SIC code; 'Target in int. sector' corresponds to deals involving targets operating in intangible-rich sectors (consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications); 'Target in med. & ent.' refers to deals where the target operates within the media and entertainment two-digit SIC code; 'Target in retail' refers to deals where the target operates in the retail two-digit SIC code; 'Target in financials' refers to deals where the target operates in the financials two-digit SIC code; 'Target in high-tech' refers to deals where the target operates in the high-tech two-digit SIC code; 'Target in healthcare' refers to deals where the target operates in the healthcare two-digit SIC code; 'Target in cons. & serv.' refers to deals where the target operates in the consumer products and services two-digit SIC code. Further information on the definition of each variable can be found in Appendix A.

5 | THE RESULTS

This section commences with a discussion of the results obtained from out univariate and multivariate tests, followed by the results obtained from the robustness checks addressing: (a) self-selection concerns with regards to the endogeneity inherent in employing earnouts (or not), and (b) size effect considerations.

5.1 | Univariate tests of acquirers' risk-adjusted returns

The results of the univariate tests are presented in Table 4. They are organized according to the deal's method of payment and the target firm's listing status for the full sample (Panel A), and for samples corresponding to deals announced by acquirers exhibiting low sigma (Panel B), medium sigma (Panel C) and high sigma (Panel D). Differentials between acquirers' CAR from deals settled in earnouts vs. non-earnout are recorded within Panels A to D (rightmost columns), while Panel E records differentials between acquirers' CAR from deals announced by high- vs. low- sigma acquirers (i.e. Panel D vs. Panel B).

Consistent with prior studies (Barbopoulos & Sudarsanam, 2012; Kohers & Ang, 2000), acquirers in earnout-based deals enjoy a 0.45% higher CAR, compared to counterparts in non-earnout deals (Panel A). Panel A also reveals that acquirers' CAR in earnout-based deals outperform those from deals settled in cash (stock) by 0.69% (0.42%). Therefore, M&As in which the settlement of the deal's consideration carries contingent properties significantly outperform those lacking such properties (Hansen, 1987; Kohers & Ang, 2000). Along similar lines, earnout-based deals involving private targets outperform their cash-settled counterparts by 0.42%, perhaps due to the adequacy (inadequacy) of earnouts (cash) in deals exhibiting high valuation risk. Moreover, in line with information asymmetry models (Moeller et al., 2007), Panel D shows that stock-settled public target deals that are announced by high-sigma acquirers are associated with significant losses (−2.32%) and that high-sigma acquirers of (a) private or subsidiary targets, irrespective of the deal's payment delivery mechanism or payment method, and (b) public targets financed with cash, enjoy significant CAR.

The results further show that acquirers' higher CAR accrued from earnout- rather than non-earnout- settled deals (0.45%, Panel A) is shaped by deals announced by acquirers exhibiting low sigma (1.02%, Panel B), rather than high sigma (−0.33%, Panel D). This offers, to some extent, convincing evidence suggesting that earnouts do not appear to be perceived as superior in terms of wealth creation in the majority of the deals they are involved. Consistent with our main hypothesis, the results convey that the earnout effect in deals announced by high-sigma acquirers is potentially distorted (or elusive) due to the presence of the acquirer-specific information revelation effect.[17]

By contrast, under low sigma, acquirers in earnout-based M&As appear to significantly outperform their non-earnout counterparts.[18] As suggested by our theoretical predictions, this is likely due to the earnout effect not being elusive (or being materially less so) due to the absence (or considerably limited presence) of the acquirer-specific information revelation effect. The results therefore suggest that the extent of elusiveness of the earnout effect on acquirers' CAR (recorded in the rightmost columns on Panels A to D in Table 4) varies with acquirers' sigma.

Finally, Panel E records differentials between acquirers' CAR in M&As announced by high- and low- sigma acquirers. On average, high-sigma acquirers enjoy significantly higher CAR than low-sigma acquirers (consistent with Moeller et al., 2007). This finding may also be regarded as being in line with evidence suggesting that acquirers' gains during the announcement of M&As are affected by their size (Moeller et al., 2004), given the considerable disparities in the market values of high- and low- sigma acquirers (see also Table 2). Nevertheless, comparing the impact of earnouts across deals involving private targets and announced by low- and high- sigma acquirers reveals an insignificant difference of 0.42%, in contrast to what would be expected under the presence of a size effect. It could therefore be argued that, whereas under high acquirer sigma the earnout effect is likely elusive, under low acquirer sigma the earnout effect is likely considerable, ultimately rendering the performance of the two portfolios of deals (i.e. deals involving high-sigma acquirers and private targets, and deals involving low-sigma acquirers and private targets) indistinguishable.[19]

TABLE 4 Univariate analysis of acquirer risk-adjusted returns

		All	Earnout (1)	NEA (2)	Cash (3)	Stock (4)	Mixed (5)	(1) – (2)	(1) – (3)	(1) – (4)	(1) – (5)
Panel A: All deals											
All	Mean	1.26***	1.68***	1.23***	0.99***	1.26***	1.45***	0.45*	0.69***	0.42*	0.23
	N	35,121	2,638	32,483	12,387	8,011	12,085				
Private target	Mean	1.85***	1.32***	1.91***	0.90***	3.01***	1.95***	−0.59**	0.42**	−1.68***	−0.63**
	N	17,148	1,947	15,201	4,786	4,214	6,201				
Public target	Mean	−0.77***	2.44	−0.79***	0.48**	−1.82***	−1.03***	3.23*	1.95*	4.26**	3.47***
	N	8,524	57	8,467	2,888	2,973	2,606				
Subsidiary target	Mean	2.03***	2.71***	1.98***	1.38***	3.41***	2.48***	0.73*	1.33***	−0.70	0.23
	N	9,449	634	8,815	4,713	824	3,278				
Panel B: Deals Announced by Low-Sigma Acquirers											
All	Mean	0.23***	1.20***	0.18***	0.36***	−0.35**	0.20**	1.02***	0.84***	1.55***	1.00***
	N	11,707	586	11,121	5,278	1,899	3,944				
Private target	Mean	0.64***	1.32***	0.57***	0.30***	1.18***	0.60***	0.75***	1.02***	0.14	0.72**
	N	4,488	400	4,088	1,765	681	1,642				
Public target	Mean	−0.68***	0.37	−0.68***	0.09	−1.35***	−1.04***	1.05*	0.28	1.72***	1.41**
	N	3,824	18	3,806	1,515	1,093	1,198				
Subsidiary target	Mean	0.71***	1.00**	0.70***	0.61***	0.07	0.94***	0.30	0.39	0.93	0.06
	N	3,395	168	3,227	1,998	125	1,104				
Panel C: Deals Announced by Medium-Sigma Acquirers											
All	Mean	0.75***	1.10***	0.72***	0.93***	0.01	0.88***	0.37	0.17	1.09***	0.22
	N	11,707	994	10,713	4,579	2,216	3,918				
Private target	Mean	1.06***	0.87***	1.09***	0.68***	1.42***	1.30***	−0.22	0.19	−0.55	−0.43
	N	5,600	739	4,861	1,880	1,062	1,919				
Public target	Mean	−0.88***	−2.80	−0.86***	0.65***	−1.87***	−1.39***	−1.94	−3.45***	−0.93	−1.41
	N	2,888	17	2,871	967	958	946				
Subsidiary target	Mean	1.69***	2.08***	1.66***	1.36***	1.57***	2.16***	0.42	0.72*	0.51	−0.08
	N	3,219	238	2,981	1,732	196	1,053				

(Continues)

TABLE 4 (Continued)

Panel D: Deals Announced by High-Sigma Acquirers

		All	Earnout	NEA	Cash	Stock	Mixed				
All	Mean	2.80***	2.49***	2.83***	2.40***	2.75***	3.16***	−0.33	0.09	−0.26	−0.66
	N	11,707	1,058	10,649	2,530	3,896	4,223				
Private target	Mean	3.24***	1.74***	3.44***	2.18***	4.19***	3.27***	−1.70***	−0.44	−2.46***	−1.54***
	N	7,060	808	6,252	1,141	2,471	2,640				
Public target	Mean	−0.80**	8.18*	−0.91***	1.59***	−2.32***	−0.28	9.09***	6.59*	10.51**	8.46***
	N	1,812	22	1,790	406	922	462				
Subsidiary target	Mean	3.99***	4.63***	3.93***	3.00***	4.95***	4.29***	0.70	1.63*	−0.32	0.34
	N	2,835	228	2,607	983	503	1,121				

Panel E: Differentials between Panel D and Panel B

		All	Earnout	NEA	Cash	Stock	Mixed
All target	Mean	2.57***	1.29***	2.65***	2.05***	3.10***	2.96***
Private target	Mean	2.61***	0.42	2.87***	1.88***	3.01***	2.67***
Public target	Mean	−0.12	7.81*	−0.23	1.51***	−0.97*	0.77*
Subsidiary target	Mean	3.27***	3.63***	3.23***	2.39***	4.89***	3.36***

Note: The table presents mean announcement period five−day ($t − 2$, $t + 2$) cumulative risk-adjusted returns for all acquisitions (Panel A) divided by target listing status (All, Private target, Public target and Subsidiary target) and method of payment (All, earnout, non-earnout (NEA), Cash, Stock and Mixed). The analysis is further categorized by low (Panel B), medium (Panel C) and high (Panel D) acquirer sigma deals. Panel E illustrates differences in mean risk-adjusted returns between high and low acquirer sigma deals. 'All' corresponds to the full number of deals in each panel; 'Earnout' corresponds to earnout-based M&As; 'NEA' refers to non-earnout-settled M&As in cash, stock or mixed; 'Cash' refers to M&As fully settled in cash; 'Stock' refers to M&As fully settled in stock; 'Mixed' refers to M&As encompassing combinations of cash, stock and other payments; 'Private target' corresponds to deals involving private targets; 'Public target' corresponds to deals involving public targets; 'Subsidiary target' corresponds to deals involving subsidiary targets; 'Low sigma' corresponds to the bottom third of deals exhibiting the lowest levels of sigma; 'Medium sigma' corresponds to the middle third of deals in terms of their acquirer sigma ranking; 'High sigma' corresponds to the top third of deals exhibiting the highest levels of sigma. The statistical significance of differences in returns between groups of acquirers is tested using the t-test for equality of means. ***, ** and * indicate significance at 1%, 5% and 10% respectively of the mean for each covariate presented. N stands for the number of observations. Further information on the definition of each variable can be found in Appendix A.

By contrast, low-sigma acquirers of private targets using single up-front payments significantly underperform their high-sigma counterparts.

Put together, these results suggest the presence of a strong interaction between the earnout effect and the acquirer-specific information revelation effect in shaping acquirers' CAR. In particular, these findings are consistent with the predictions of our main hypothesis, which is in turn based on information asymmetry models that were put forward by Moeller et al. (2007). While self-selection issues may distort the strength and direction of the results, the earnout effect is isolated from the acquirer information revelation effect via the PSM method, which is performed later in the paper.

5.2 | Cross-sectional analysis of acquirers' risk-adjusted returns

Table 5 records the estimates of the multivariate tests, which account for the impact of several factors that are likely to affect acquirers' CAR. As reflected in the intercepts of all models in Table 5, once controlling for the effects of deal- and firm- specific factors, the average acquirer breaks even (depending on the model specification, the intercept terms are either positive or negative, yet statistically insignificant). This is partially consistent with previous evidence reported by Asquith et al. (1983), Eckbo and Thorburn (2000) and Moeller et al. (2004). Unlisted target M&As yield significant gains to acquirers' shareholders of about 3% (across all models) (Barbopoulos et al. (2018b); Faccio et al. (2006); Fuller et al. (2002)). The estimates further indicate that relatively large deals add value to acquirers (across all models), as do deals involving mature acquirers (Models 4, 6, 8, 10 and 12) (see Asquith et al., 1983; Fuller et al., 2002). Moreover, as in Sudarsanam and Mahate (2003), 'glamour' acquirers destroy value (across all models).[20] In addition, the results (Model 1) confirm the superiority of sigma, compared to the acquirer's age, as a proxy for information asymmetry over a publicly traded firm. Finally, consistent with Denis, Denis, and Yost (2002) and Moeller and Schlingemann (2005), engaging in foreign target M&As, as well as industry diversifying ones, adds value to acquirers.

The estimates of Models 1 and 2 show that acquirers in earnout-based deals appear to break even, as captured by the coefficient of the 'Earnout' dummy in each model. Consistent with Moeller et al. (2007), estimates reported in Model 2 convey that high- (low-) sigma acquirers are associated with positive (negative) CAR. Further results show that the earnout dummy, in conjunction with either low or high sigma, is associated with significant valuation effects for acquirers' shareholders.[21] Specifically, earnout-based M&As announced by low-sigma acquirers (Model 3) are associated with strictly positive gains, whereas Model 4 suggests the opposite outcome for earnout-based M&As announced by high-sigma acquirers (coefficients of 0.751 and –0.959, respectively). These results corroborate our findings from the univariate tests.

Further evidence shows that low-sigma acquirers of unlisted targets are perceived to enjoy significant gains (Model 5), whereas their high-sigma counterparts appear to experience significant losses (Model 6). In addition, low-sigma acquirers of intangible-rich targets seem to break even (Model 7), whereas their high-sigma counterparts are linked with significant losses (Model 8). Finally, low-sigma acquirers in diversifying deals also appear to break even (Model 9), whereas their high-sigma counterparts are perceived to experience significant losses (Model 10). These findings shed further light on the valuation implications of the interaction between the use of earnouts and acquirers' sigma in M&As that involve targets that are unlisted and based in different (than the acquirer), or difficult-to-value, sectors.

Overall, the results suggest that the perceived superior performance of earnout-based deals that has been uncovered by earlier studies (e.g. Barbopoulos & Sudarsanam, 2012; Kohers & Ang, 2000) appears to be driven by deals announced by acquirers exhibiting low sigma, wherein the acquirer-specific information revelation effect is expected to be negligible.[22] By contrast, under high sigma, consistent with our main hypothesis and the predictions of information asymmetry models (Moeller et al., 2007), it appears that it is the prevalence of the acquirer-specific information revelation effect that induces a positive wealth gain, irrespective of whether an earnout was used or not. Evidently, the extent to which acquirers' CAR reflect the ability of earnouts to reduce adverse selection and moral hazard concerns in M&As appears to vary with the acquiring firm's sigma.

TABLE 5 Determinants of acquirer risk−adjusted returns: Multivariate analysis

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Earnout	−0.008	−0.279	−0.678**	−0.091	−0.644**	−0.018	−0.592**	−0.143	−0.536**	−0.154	−0.481**	−0.481**
Unlisted	1.056***	2.380***	2.996***	2.919***	2.995***	2.921***	2.998***	2.922***	3.002***	2.917***	3.002***	2.929***
Target in int. sector	−0.497**	−0.585***	−0.201**	−0.251**	−0.200*	−0.252**	−0.207**	−0.231**	−0.197**	−0.248**	−0.196**	−0.249**
Diversifying	0.241**	0.073	0.223**	0.194*	0.223**	0.194*	0.223**	0.194*	0.215**	0.247**	0.222**	0.195*
Foreign	0.391**	−0.072	0.383**	0.350**	0.384**	0.350**	0.385**	0.352**	0.387**	0.344**	0.396**	0.331**
Sigma	26.975***											
Low sigma		−0.498***	−0.686***		−0.678***		−0.664***		−0.649***		−0.635***	
High sigma		1.779***		1.478***		1.497***		1.462***		1.465***		1.380***
Earnout × Low sigma			0.751**									
Earnout × High sigma				−0.959**								
Earnout × Low sigma × Unlisted					0.631*							
Earnout × High sigma × Unlisted						−1.186**						
Earnout × Low sigma × Target in int. sector							0.522					
Earnout × High sigma × Target in int. sector								−1.005**				
Earnout × Low sigma × Diversifying									0.373			
Earnout × High sigma × Diversifying										−1.838**		
Earnout × Low sigma × Foreign											−0.288	
Earnout × High sigma × Foreign												0.717
Relative deal size	0.564***	0.009**	0.745***	0.701***	0.744***	0.701***	0.745***	0.702***	0.744***	0.702***	0.745***	0.701***
Acq. age	0.031	0.001	0.065	0.121**	0.065	0.122**	0.065	0.121**	0.066	0.119**	0.065	0.118**
Acq. MTBV	−0.074**	−0.103***	−0.062**	−0.065***	−0.062**	−0.065***	−0.062**	−0.065***	−0.062**	−0.065***	−0.062**	−0.065***
Acq. cash ratio	−0.757**	−1.226***	−0.371	−0.834**	−0.372	−0.839**	−0.370	−0.826**	−0.372	−0.857**	−0.373	−0.823**

(Continues)

TABLE 5 (Continued)

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Acq. debt/equity ratio	−0.040	−0.013	−0.043	−0.030	−0.043	−0.030	−0.043	−0.031	−0.043	−0.031	−0.044	−0.032
Intercept	0.731	−0.761	0.342	−0.657	0.340	−0.665	0.338	−0.663	0.319	−0.650	0.313	−0.624
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared (in %)	3.28	2.88	4.01	4.30	4.01	4.31	4.01	4.30	4.01	4.32	4.01	4.28
F-stat	76.94***	62.42***	88.13***	94.62***	88.07***	94.83***	88.01***	94.63***	87.96***	95.08***	87.94***	94.28***
Min VIF	1.02	1.00	1.03	1.02	1.03	1.02	1.03	1.02	1.04	1.05	1.03	1.03
Max VIF	1.26	1.42	1.38	1.69	1.36	1.66	1.28	1.50	1.26	1.30	1.26	1.29
Mean VIF	1.12	1.14	1.17	1.23	1.17	1.23	1.16	1.20	1.14	1.16	1.13	1.13
N	29,523	29,523	29,523	29,523	29,523	29,523	29,523	29,523	29,523	29,523	29,523	29,523

Note: The table presents results from the multivariate analysis examining the wealth effects of earnout-based deals. The dependent variable consists of the announcement period market-adjusted five-day ($t − 2$, $t + 2$) risk-adjusted returns of acquirers, which are regressed against a set of explanatory variables. Regression outputs are estimated using ordinary least squares with the coefficients adjusted for possible heteroscedasticity using White (1980) heteroscedasticity-consistent standard errors and covariance. The intercept measures the risk-adjusted returns to acquirers after accounting for the effects of the explanatory variables included in the specification or model. 'Earnout' corresponds to earnout-based deals; 'Unlisted' corresponds to deals involving unlisted (private or subsidiary) targets; 'Target in int. sector' corresponds to deals involving targets operating in intangible-rich sectors (consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications); 'Diversifying' corresponds to diversifying deals (the acquiring and target firms do not share the same two-digit SIC number); 'Foreign' corresponds to cross-border deals; 'Sigma' corresponds to the acquiring firm's idiosyncratic stock return volatility (measured as in Moeller et al., 2007); 'Low sigma' corresponds to the bottom third of deals exhibiting the lowest levels of sigma; 'High sigma' corresponds to the top third of deals exhibiting the highest levels of sigma; 'Relative deal size' corresponds to the relative size of the deal (= deal value/acquirer's market value 20 days prior to the deal's announcement); 'Acq. age' corresponds to the number of days between the acquirer's first recorded day on Datastream and the deal's announcement day; 'Acq. MTBV' corresponds to the acquiring firm's market-to-book ratio (measured 20 days prior to the deal's announcement; 'Acq. cash ratio' corresponds to the acquirer's ratio of cash and cash equivalents to total assets at the end of the last quarter prior to the deal's announcement; 'Acq. debt/equity ratio' corresponds to the acquirer's ratio of total debt to common equity at the end of the last quarter prior to the deal's announcement. N stands for the number of observations. ***, **, and * indicate significance at 1%, 5% and 10% respectively. VIF is the Variance Inflation Factor, which quantifies the severity of multicollinearity. Variance inflation is the reciprocal of tolerance. Further information on the definition of each variable can be found in Appendix A.

5.3 | Addressing selection bias

The impact of earnouts on acquirers' CAR may be due to the pre-treatment characteristics of the treated group (earnout-based M&As), rather than to the impact of the treatment (the use of earnouts) per se. In experimental studies, where the two samples (the treated and control) are randomly assigned, the assessment of their comparative performance is free from such bias. However, in observational studies, such as ours, the assignment is non-random, which may affect the estimation of the treatment effect. To accommodate this concern in the analysis, the PSM method is used, thereby allowing for the earnout effect to be measured in isolation.

More specifically, PSM allows for an unbiased causal inference by pairing treated M&As (earnout-based) with control M&As (non-earnout-settled), based on a propensity score that is estimated at the deal-level via a logit model that includes observable pre-treatment features (see Section 3.3.). The propensity scores are estimated for the full sample, as well as within groups of M&As announced by low- and high- sigma acquirers, separately. Following the matching exercise (see Dehejia and Wahba (2002) and Rosenbaum (2009) for an application of the method) the acquirers' CAR in the treated and control samples are compared.[23] To ensure accuracy in the matching process, the distributions of the covariates between the earnout (treated) and non-earnout (control) groups are tested for similarity. The output of the PSM analysis is recorded in Table 6 (Univariate tests) and Table 7 (Multivariate tests).

As can be seen in Table 6, the evaluation of the treatment effect (i.e. the earnout effect) is initially conducted within all deals (Model 1, defined as Exercise 1), as well as within deals announced by acquirers exhibiting low (Model 2, defined as Exercise 2) and high (Model 3, defined as Exercise 3) sigma, separately. Including sigma in its continuous form as a covariate term across all models, and particularly in Model 1, enables us to select counterfactual or control M&As (non-earnout-settled deals) that are highly likely to exhibit similar levels of acquirer-specific information dissemination at the time of their announcement as their treated earnout-based M&As. Consequently, examining differences in the outcome variable (i.e. acquirers' CAR) between treated and control deals allows us to control for the acquirer-specific information revelation effect and, thus, capture the earnout effect, as well as observe how it varies across deals announced by acquirers exhibiting low or high sigma, separately.

5.3.1 | Addressing selection bias – Univariate tests of acquirers' risk-adjusted returns

Consistent with Kohers and Ang (2000) and Barbopoulos and Sudarsanam (2012), Models 1 to 3 illustrate that earnouts are more likely to occur in relatively larger deals involving private targets that operate in intangible-rich sectors. Acquirers in such deals are expected to face high merger valuation risk, as a result of adverse selection and moral hazard concerns. Accordingly, as such considerations may manifest in the form of integration challenges and/or give rise to substantial disagreements between the merging firms over the deal's payoff during the negotiation period, the use of earnouts is likely to be triggered.

In Panel B the balance of covariates is presented. Across all models, the statistical properties of the covariates employed are similar (Panel B), thereby confirming successful matching sequences.

The treatment effect is presented in Panel C. Model 1 confirms that, once controlling for sigma, acquirers employing earnouts appear to break even, relative to their control counterfactuals (statistically insignificant difference of 0.38%). Therefore, it seems that, upon addressing selection-bias concerns, the impact of implementing earnouts on acquirers' CAR that emerged from the univariate analysis (0.45% as reported in Table 4, Panel A) becomes negligible.

Models 2 and 3 offer direct evidence on the superiority of earnouts in deals announced by acquirers exhibiting low sigma. The earnout effect is found positive and highly significant, as treated deals significantly outperform their untreated counterparts by 0.85% (Model 2). While this finding corroborates earlier findings in both the univariate and multivariate tests, it offers strong support to our main hypothesis. Model 3 conveys that, under high acquirer sigma, earnout-based deals appear to be indistinguishable from their non-earnout counterparts in terms of the announcement period CAR. Therefore, upon addressing self-selection concerns, the insignificant earnout effect within deals announced by acquirers exhibiting high sigma persists.

TABLE 6 Addressing selection bias

Model/exercise:	(1) All M&As	(2) M&As by low-Sigma acquirers	(3) M&As by high-sigma acquirers
Panel A: Logistic Regression			
Private target	1.151***	1.297***	1.948***
Target in int. sector	0.187***	0.172***	0.220***
Diversifying	−0.003	−0.087	0.033
Foreign	0.241***	0.390***	0.119
Sigma	−0.680	82.797***	−1.192*
Relative deal size	0.097***	0.079***	0.515**
Acq. age	0.018	0.040	0.050
Acq. MTBV	−0.045*	0.200***	−0.075**
Acq. cash ratio	0.964***		
Acq. debt/equity ratio	0.001		
Target in high-tech	0.213**		
Target in cons. & serv.	0.455***		
Target in telecoms	0.049		
Target under Common law	0.182		
Intercept	−4.751***	−6.375***	−4.646***
Year fixed effects (YFE)	Yes	Yes	Yes
Pseudo R-Squared (in %)	7.98	9.07	4.86
LR chi square test	1,235.95	384.16	246.35
Mean VIF	1.19	1.11	1.07
N	28,371	10,256	7,964

(Continues)

TABLE 6 (Continued)

Panel B: Covariate Balance

	Earnout treated	Non-Earnout control	Treated vs. control	Earnout treated	Non-Earnout control	Treated vs. control	Earnout treated	Non-Earnout control	Treated vs. control
Private target	1,519***	1,464***		353	338		549	518	
Target in int. sector	617	570		170	160		437	410	
Diversifying	905	887		233	233		301	306	
Foreign	349	300		106	119		116	106	
Sigma	0.036***	0.034***	0.002	0.014***	0.014***	−0.000	0.063***	0.062***	0.001
Relative deal size	−2.530***	−2.604***	0.075	−3.037***	−3.158***	0.120	−2.069***	−2.021***	−0.047
Acq. age	7.872***	7.914***	−0.042	8.391***	8.440***	−0.050	7.498***	7.447***	0.051
Acq. MTBV	0.865***	0.838***	0.027	0.881***	0.890***	−0.009	0.900***	0.867***	0.033
Acq. cash ratio	0.252***	0.241***	0.012						
Acq. debt/equity ratio	0.530***	0.701***	−0.171						
Target in high-tech	602	553							
Target in cons. & serv.	260	264							
Target in telecoms	75	83							
Target under Common law	1,951	1,881							
Panel C: Differentials Treated vs. Control (Counterfactual) M&A Deals									
Mean CAR Treated (in %)	1.31***			1.18***			1.80***		
N	2,094			523			726		
Mean CAR Control (in %)	0.93***			0.32***			2.70***		
N	2,094			523			726		
Mean (in %) Difference (Treated VS Control)	**0.38**			**0.85*****			**−0.90**		

(Continues)

TABLE 6 (Continued)

Panel D: Rosenbaum bounds			
Rb: p-value of estimated difference at Γ = 1	0.015	0.006	0.047
Rb: critical value of Γ at cut-off p = 0.05	1.03	1.09	1.01
Rb: critical value of Γ at cut-off p = 0.10	**1.05**	**1.14**	**1.04**

Note: Panel A presents the output of the logistic regression models that were used to estimate the probability of occurrence of an earnout relative to alternative single up-front payment delivery methods. Panel B presents the balance of covariates between treated and control deals in the matching sequences. The PSM technique employs 1-to-1 nearest neighbour matching allowing for replacement. Differences in average covariates are tested using the *t*-test. Panel C presents mean five-day announcement period cumulative abnormal returns (CAR) for treated and matched deals. The statistical significance of differences in mean returns between the two groups is tested using the *t*-test for equality of means. Panel D presents the outcome of the Rosenbaum bounds (Rb) test. ***, **, and * indicate significance at 1%, 5% and 10% respectively of the mean for each covariate presented. 'Private target' corresponds to deals involving private targets; 'Target in int. sector' corresponds to deals involving targets operating in intangible-rich sectors (consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications); 'Diversifying' corresponds to diversifying deals (the acquiring and target firms do not share the same two-digit SIC number); 'Foreign' corresponds to international deals; 'Sigma' corresponds to the acquiring firm's idiosyncratic stock return volatility (measured as in Moeller et al., 2007); 'Relative deal size' corresponds to the relative size of the deal (= deal value/acquirer's market value 20 days prior to the deal's announcement); 'Acq. Age' corresponds to the number of days between the acquirer's first recorded day on Datastream and the deal's announcement day; 'Acq. MTBV' corresponds to the acquiring firm's market-to-book ratio (measured 20 days prior to the deal's announcement); 'Acq. cash ratio' corresponds to the acquirer's cash ratio at the end of the last quarter prior to the deal's announcement; 'Acq. debt/equity ratio' corresponds to the acquirer's ratio of total debt to common equity at the end of the last quarter prior to the deal's announcement; 'Target in high-tech' corresponds to deals involving targets operating in the high-tech sector; 'Target in cons. & serv.' corresponds to deals involving targets operating in the consumer products and services sector; 'Target in telecoms' corresponds to deals involving targets operating in the telecommunications sector; 'Target under Common law' corresponds to deals in which the target operates in a country under a Common law legal framework; 'Low sigma' corresponds to the bottom third of deals exhibiting the lowest levels of sigma; 'High sigma' corresponds to the top third of deals exhibiting the highest levels of sigma; *N* stands for the number of observations. CAR corresponds to the five-day (*t* − 2, *t* + 2) announcement period acquirer cumulative risk-adjusted returns; VIF is the Variance Inflation Factor, which quantifies the severity of multicollinearity. Variance inflation is the reciprocal of tolerance. Further information on the definition of each variable can be found in Appendix A.

TABLE 7 Determinants of acquirer risk-adjusted returns: Multivariate analysis

Model:	(1)	(2)	(3)	(4)	(5)	(6)
Matching Ratio:	1-to−1	5-to−1	10-to−1	1-to−1	5-to−1	10-to−1
Unlisted	0.015**	0.013***	0.013***	0.029*	0.052***	0.055***
Target in int. sector	−0.010**	−0.004*	−0.003*	−0.012	−0.014***	−0.012***
Diversifying	−0.001	−0.001	−0.002	−0.009	0.001	0.005
Foreign	−0.007*	−0.001	0.001	0.011	0.002	0.005
Relative deal size	0.004***	0.004***	0.004***	0.020***	0.015***	0.014**
Acq. age	0.002	0.002*	0.001*	0.001	0.001	0.001
Acq. MTBV	0.001	0.001	0.001	−0.001	−0.001	−0.001**
Acq. cash ratio	0.023*	0.016*	0.018**	−0.018	−0.020**	−0.009
Acq. debt/equity ratio	−0.001	−0.001	0.001	−0.001	−0.001	−0.001
Control dummy: Low sigma	−0.006*	−0.005*	−0.004*			
Control dummy: High sigma				0.011	0.013**	0.013***
Intercept	0.004	−0.004	−0.001	0.058*	0.003	−0.009
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared (in %)	4.74	3.04	2.69	6.13	5.18	5.06
F-stat	4.22***	6.99***	9.31***	7.62***	15.6***	22.02***
Min VIF	1.04	1.06	1.06	1.01	1.01	1.01
Max VIF	1.20	1.20	1.21	1.20	1.19	1.19
Mean VIF	1.12	1.12	1.12	1.08	1.07	1.07
N	1,032	2,687	4,056	1,414	3,441	4,973

Note: The table presents results from our multivariate analysis examining the wealth effects of earnout-based deals on the matched sample (created as discussed in Sections 3.2. and 5.3.). The dependent variable consists of the announcement period market-adjusted five-day ($t − 2, t + 2$) risk-adjusted returns of acquirers which are regressed against a set of explanatory variables. Regression outputs are estimated using ordinary least squares with the coefficients adjusted for possible heteroscedasticity using White (1980) heteroscedasticity-consistent standard errors and covariance. The intercept measures the risk-adjusted returns to acquirers after accounting for the effects of the explanatory variables included in each specification. 'Unlisted' corresponds to deals involving unlisted (private or subsidiary) targets; 'Target in int. sector' corresponds to deals involving targets operating in intangible-rich sectors (consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications); 'Diversifying' corresponds to diversifying deals (the acquiring and target firms do not share the same two-digit SIC number); 'Foreign' corresponds to international deals; 'Relative deal size' corresponds to the relative size of the deal (= deal value/acquirer's market value 20 days prior to the deal's announcement); 'Acq. Age' corresponds to the number of days between the acquirer's first recorded day on Datastream and the deal's announcement day; 'Acq. MTBV' corresponds to the acquiring firm's market-to-book ratio (measured 20 days prior to the deal's announcement); 'Acq. cash ratio' corresponds to the acquirer' s ratio of cash and cash equivalents to total assets at the end of the last quarter prior to the deal's announcement; 'Acq. debt/equity ratio' corresponds to the acquirer's ratio of total debt to common equity at the end of the last quarter prior to the deal's announcement; 'Control dummy: Low sigma' corresponds to deals that were control counterfactuals in PSM Exercise 2 (see Sections 3.2. and 5.3. for information on the formulation of the matching sequence); 'Control dummy: High sigma' corresponds to deals that were control counterfactuals in PSM Exercise 3 (see Sections 3.2. and 5.3. for information on the formulation of the matching sequence); N stands for the number of observations. ***, ** and * indicate significance at 1%, 5% and 10% respectively. VIF is the Variance Inflation Factor, which quantifies the severity of multicollinearity. Variance inflation is the reciprocal of tolerance. Further information on the definition of each variable can be found in Appendix A.

Finally, across all models, the estimates suggest that the impact of the treatment on acquirers' CAR would be rendered negligible, or even flip sign, if an unobserved covariate caused the odds of treatment assignment to change by at least 5% (Model 1), 14% (Model 2) and 4% (Model 3), respectively.[24]

5.3.2 │ Addressing selection bias – Cross-sectional tests of acquirers' risk-adjusted returns

Table 7 records the results that emerge once addressing self-selection concerns by means of multiple regression tests on the matched sample obtained from the PSM method. The sample is restricted to deals announced by low-sigma acquirers (Models 1 to 3) and high-sigma acquirers (Models 4 to 6), whereas the respective estimations include, as additional covariates, dummy variables that identify the matched counterfactual deals (according to Models 2 and 3, respectively, of Table 6). More specifically, two dummy variables are added (Control Dummy: Low sigma and Control Dummy: High sigma), which are assigned the value of one if a deal constitutes a control counterfactual from the matching exercise within each sigma group, and zero otherwise, respectively. A control deal constitutes a sample unit that does not receive the treatment (earnout) but, nevertheless, exhibits the same probability, as estimated through the PSM method, of receiving the treatment as a treated sampled unit.

Models 1 to 3 reveal that low-sigma acquirers not implementing earnouts, despite exhibiting the same probability to do so as low-sigma acquirers that implement earnouts, experience marginally significant losses (Control Dummy: Low sigma = −0.006, −0.005 and −0.004, for Models 1 to 3, respectively). On the other hand, Models 4 to 6 reveal that high-sigma acquirers not implementing earnouts, despite exhibiting the same probability as high-sigma acquirers that implement earnouts, enjoy significant gains (Control Dummy: High sigma = 0.011, 0.013 and 0.013, for Models 4 to 6, respectively).

Overall, this analysis allows us to elicit more robust estimates regarding the valuation effects of earnouts within matched deals announced by acquirers exhibiting similar levels of sigma. Evidently, once the acquirer-specific information revelation effect is held constant between earnout- and non-earnout- settled deals, it is acquirers exhibiting low, rather than high, sigma that are perceived to enjoy higher risk-adjusted returns, relative to their non-earnout counterparts.

5.4 │ Size effect considerations

Prior studies suggest that firms exhibiting high sigma and, hence, greater information asymmetry between their managers and outside investors, are more likely to be small firms and vice versa (Banz, 1981; Campbell et al., 2001; Draper & Paudyal, 2008; Moeller et al., 2004). Moeller et al. (2004) further identify the presence of a size effect in acquirers' CAR, resulting in small acquirers enjoying significantly greater CAR during the announcement of M&As than large acquirers. In turn, our results presented so far indicate that, under increased information asymmetry (or high sigma) over the (likely small) acquiring firm, the earnout effect appears to be distorted (or elusive) due to an acquirer-specific information revelation effect, resulting from the heightened extent of information asymmetry between acquirers' managers and outside investors. Thus, we are prompted to examine the possibility that the acquirer-specific information revelation effect could, in fact, be linked to the well-established size effect. Therefore, our analysis is now turned to study the exposure of the portfolio of both earnout- and non-earnout- based M&As, announced by either low- or high-sigma acquirers, to size effect considerations.

The presence of a size effect would be suggested if an opposite sign between the average acquirer CAR and the weighted-by-market-value average acquirer CAR (= WCAR) is observed. Such an outcome would indicate that, as acquirers' market values increase, the risk-adjusted returns reaped by their shareholders decrease. Consistent with Moeller et al. (2004), Table 8 reports that for all acquirers, the average acquirer CAR is 1.26%, while the WCAR is -0.63%, thereby suggesting the presence of a size effect. Panel A demonstrates that earnout-based deals, as a whole, are also exposed to a size effect, as indicated by the opposite signs between the respective average acquirer CAR and WCAR (1.68% and −0.16%, respectively).

TABLE 8 Acquirer size, acquirer sigma, and acquirer risk-adjusted returns

	N	Acquirer MV	CAR	WCAR
Panel A: All M&As				
All	35,121	5,611	1.26	−0.63
Earnout	2,638	4,175	1.68	−0.16
Non-earnout	32,483	5,728	1.23	−0.66
Panel B: M&As Announced by Low-Sigma Acquirers				
All	11,707	11,274	0.23	−0.42
Earnout	586	13,718	1.20	0.14
Non-earnout	11,121	11,145	0.18	−0.46
Panel C: M&As Announced by Medium-Sigma Acquirers				
All	11,707	4,488	0.75	−0.57
Earnout	994	2,336	1.10	0.04
Non-earnout	10,713	4,687	0.72	−0.6
Panel D: M&As Announced by High-Sigma Acquirers				
All	11,707	1,073	2.80	−3.13
Earnout	1,058	617	2.49	−4.52
Non-earnout	10,649	1,118	2.83	−3.05

Note: The table presents M &A activity for all deals (All) (Panel A), earnout-based deals (earnout), as well as non-earnout-settled deals (Non-earnout), according to the acquiring firm's idiosyncratic stock return volatility (high, medium and low acquirer sigma in Panels B, C and D, respectively). *N* stands for the number of observations; sigma corresponds to the acquiring firm's idiosyncratic stock return volatility (measured as in Moeller et al., 2007); Low sigma corresponds to the bottom third of deals exhibiting the lowest levels of sigma; Medium sigma corresponds to the medium third of deals exhibiting medium levels of sigma; High sigma corresponds to the top third of deals exhibiting the highest levels of sigma; MV corresponds to each group's average market capitalization of acquiring firms measured 20 days before the announcement of the deal; CAR corresponds to each group's average CAR for the window from $t − 2$ to $t + 2$, where $t = 0$ is the announcement day of the M &A; WCAR reports the weighted by MV average CAR of each group of deals as in Moeller et al. (2004). Further information on the definition of each variable can be found in Appendix A.

Nevertheless, within earnout-based M&As involving low- and medium- sigma acquirers (Panels B and C), we find that the CAR is of the same sign as the WCAR. This suggests that the exposure of earnout-based M&As announced by non-high-sigma acquirers to a size-related discount and, hence, size effect considerations is limited or even absent, despite their considerably larger size ($13,718 m and $2,336 m under low and medium sigma, respectively, compared to $617 m under high sigma). Hence, the results indicate that the selection of earnouts by large acquirers with low information asymmetry sends a strong signal for value creation that also prevents the occurrence of a size-related discount. On the contrary, we find that the CAR and WCAR differ in sign for deals announced by acquirers exhibiting high sigma (Panel D) (2.49% and −4.52%, respectively). This suggests the substantial exposure of earnout-based deals, announced by acquirers exhibiting high sigma, to a size effect.

6 | CONCLUSIONS AND FURTHER DISCUSSION

We trace the interaction between the acquiring firm's information environment (measured by its idiosyncratic stock return volatility or sigma), the choice of earnouts as the payment delivery mechanism in M&As, and the statistical properties of acquirers' risk-adjusted returns in the announcement period. The analysis is motivated by several interesting features of earnout-based M&As, such as the generally small size of acquirers and their heightened levels of sigma.

Confronted with prior evidence suggesting that information asymmetry over the acquiring firm influences acquirers' risk-adjusted returns (Moeller et al., 2007), concerns are raised as to whether the earnout effect could in fact be distorted (or elusive) due to the release of acquirer-specific information during the announcement of the deal. Accordingly, we set out to test the interaction between the earnout effect and the acquirer-specific information revelation effect in shaping acquirers' CAR using a standard event-study methodology, as well as a quasi-experimental design through which the earnout effect is examined in isolation.

Our results suggest that the well-documented superior announcement period gains accrued to acquirers in earnout- vs. non-earnout- settled M&As are mainly detected in deals involving low-sigma acquirers. By contrast, high-sigma acquirers are perceived to break even, or experience losses, when using earnouts, relative to non-earnout payments. Our PSM results further confirm these findings, as it is exclusively under low acquirer sigma that earnout-based M&&As are perceived to significantly outperform their counterfactual deals. Lastly, as low-sigma acquirers are likely to be much larger firms than high-sigma acquirers, we examine the likely presence of size effect considerations within the portfolios of deals announced by acquirers exhibiting low, medium and high sigma. In contrast to deals settled in single up-front payments, the results do not suggest the presence of a size effect within the portfolio of low-sigma acquirers using earnouts.

We argue that the most realistic explanation associated with our results is the presence (absence) of an acquirer-specific information revelation effect in deals announced by acquirers exhibiting high sigma (low sigma), ultimately rendering the comparative performance of earnout- and non-earnout- based deals elusive (apparent). It is important to be mentioned that our findings should not be regarded as suggesting that there is no synergy potential in earnout-based deals involving high-sigma acquirers, or that earnout contracts are not incentive-compatible in such M&A negotiations. However, our results do suggest that, under high acquirer sigma, the earnout effect is likely to be elusive. It would thus be highly unwarranted to infer an earnout-based deal's likelihood of success from acquirers' risk-adjusted returns without controlling for acquirers' sigma.

ACKNOWLEDGMENTS

ENDNOTES

[1] In an earnout-based deal, the target receives only a part of the deal consideration during the announcement of the deal, while the receipt of the deferred (remaining) payment(s) is conditional upon the satisfaction of pre-specified performance-related goals (i.e. the earnout terms) within a pre-determined period(s) (i.e. the earnout period).

[2] Earnout-based M&As mainly involve unlisted target firms operating in intangible-rich sectors, such as the high-tech, pharmaceuticals, and other patent-loaded and services-based sectors (Cain et al., 2011; Kohers & Ang, 2000).

[3] Acquirers in earnout-based M&As are less than half the size of acquirers engaged in M&As settled in conventional single up-front payments of cash or stock (Barbopoulos et al., 2018a). Along similar lines, Banz (1981) points to the limited information available to investors over small publicly listed firms.

[4] Depending on the earnout composition (e.g. whether both initial and contingent payments are in stock), earnout-based M&As can be very similar, or dissimilar, to stock-financing (see Barbopoulos et al., 2018b).

[5] Hansen (1987) has theoretically illustrated that, given that a target firm knows its own (true) value better than a potential acquirer, the acquirer will prefer to offer stock, as opposed to cash, due to the implied contingent-pricing properties of stock. Therefore, under stock-financing, the target will be incentivized to share valuable information with the acquirer during the valuation and negotiation phase of the deal and, hence, eliminate valuation errors. Such valuation errors can lead to significant valuation corrections ex-post and, thus, significant target losses too.

[6] See Amihud, Lev, and Travlos (1990) for a discussion on issues related to the choice of payment method in M&As and the firm's ownership structure.

[7] The pecking order theory postulated by Myers and Majluf (1984) suggests that managers would be inclined to use equity when they believe it is overvalued. Taking advantage of this overvaluation would allow the acquirer to buy a target at a discount. However, in the case of private target M&As, the target's managers are likely to reject such a payment alternative (Chang, 1998).

[8] For instance, the 2015 acquisition of Visa Europe Ltd. by Visa Inc amounted to roughly $17 billion in deal value, nearly $4 billion of which constituted the deferred payment.

[9] Moeller et al., (2007) illustrate the superiority of sigma as a proxy for information asymmetry, relative to alternative information asymmetry proxies (such as the standard deviation of the earnings announcement abnormal returns), or relative to diversity of opinion proxies (such as, the dispersion of analyst forecasts and breadth of ownership).

[10] Limited evidence is also provided considering the announcement period wealth effects of earnouts in cross-border M&As. Mantecon (2009) examines alternative methods of valuation uncertainty avoidance and indicates that the use of earnouts benefits predominantly domestic acquirers, leading to positive announcement period risk-adjusted returns. However, Barbopoulos et al. (2018a) show that the use of earnouts benefits acquirers with no, or limited, international business experience.

[11] Information asymmetry corresponds to only a subset of the total uncertainty about the firm, as the managers of the firm and the market are likely to be equally well-informed about market-wide variables influencing its value (Dierkens, 1991).

[12] Pastor and Veronesi (2006) illustrate the positive relation between a firm's sigma and uncertainty about average profitability, as well as the idiosyncratic volatility of profitability. Irvine and Pontiff (2009) attribute the recent rise in sigma to increased economy-wide competition resulting in firms enjoying lower market power. Jiang et al. (2008) illustrate that high-sigma firms tend to have poor information disclosure, leading to more heterogeneous beliefs among investors.

[13] High asymmetric information between high-sigma acquirers' managers and outside investors is also likely to imply relative mispricing or perhaps undervaluation (Draper & Paudyal, 2008; Moeller et al., 2007), whereas the selection of earnouts by high-sigma acquirers may also serve the unwillingness of acquirers' managers to mitigate the inherent valuation risk with relatively undervalued shares.

[14] It needs to be mentioned, nevertheless, that such an outcome would not suggest that there is no synergy potential in earnout-based deals involving high-sigma (or small) acquirers. Rather, such an outcome would suggest that it would be a fallacy to infer an earnout-based deal's synergy potential from acquirers' short-run risk-adjusted returns without controlling for the influence of the release of acquirer-specific information.

[15] Although PSM has become a popular method in estimating causal effects in policy impact research, it has only recently been used in the finance literature (Casu, Clare, Sarkisyan, & Thomas, 2013; Saunders & Steffen, 2011). Behr and Heid (2011) provide a thorough analysis of the PSM methodology along with its application in evaluating the success of German bank mergers in the period 1995-2000. An analytic representation of the PSM method can also be found in Rosenbaum (2009), Chapters 3 and 7 to 13.

[16] As PSM is based on matching relative to each deal's propensity score to exhibit the treatment, and not on each deal's separate covariate's effect on the probability of its occurrence, the covariates' balance is tested between treated and control deals once matching is completed. Rosenbaum and Rubin (1983) illustrate that a two-sample *t*-test among the distribution of covariates between the treated and control groups offers a sufficient diagnostic to determine covariate balance.

[17] As high-sigma acquirers are subject to high information asymmetry, the dissemination of non-M&A-related acquirer-specific information through the announcement of the deal ultimately leads to a substantial re-appraisal of their value, which need not be exclusively reflective of the economic benefits of the deal (Draper & Paudyal, 2008; Moeller et al., 2004).

[18] Panel B also shows that low-sigma acquirers in earnout-based deals significantly outperform their cash and stock counterparts by 0.84% and 1.55%, respectively, which is mainly due to deals involving unlisted targets.

[19] Section 5.3. addresses this issue by relying on a quasi-experimental design through which the earnout effect is measured in isolation.

[20] Sudarsanam and Mahate (2003) illustrate that glamour acquirers, i.e. high market-to-book ratio firms or $MTBV > 1$, destroy value.

[21] Deals are sorted by the acquirer's sigma to allow for the creation of two dummy variables (high sigma and low sigma). The high sigma (low sigma) dummy variable is assigned the value of one for the top (bottom) third of deals, exhibiting the highest (lowest) values of acquirer sigma, and zero otherwise.

[22] This paper argues that the earnout effect could potentially be stronger in deals announced by high-sigma (small) acquirers, yet it is concealed by the acquirer-specific information revelation effect.

[23] Deals from the non-earnout group are selected based on the alternative Matching Ratios (MR) of 1-to-1, 5-to-1 and 10-to-1 within 1% Absolute Probability Difference (APD).

[24] The Rb critical value of Γ at p = 0.10 is usually compared to the proportion of treatment frequencies within each model, which in turn constitutes the *a priori* probability of an observation belonging to the treated group. In this respect, the lower Rb values, relative to the corresponding treatment frequencies, in Model 1 (2,094/28,371 = 7.38%) and in Model 3 (726/7,964 = 9.12%) can be perceived as suggesting the tendency of the treatment effect to revamp. On the contrary, the high Rb value (= 14%) in Model 2 exceeds the corresponding treatment frequencies (523/10,526 = 4.97%), suggesting the relatively limited exposure of the estimation and, hence, of the matching outcome to hidden or unobserved variable bias.

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APPENDIX A: VARIABLE DEFINITIONS

Variable	Definition	Source
All	Refers to the entire sample analysed in this paper.	SDC
Earnout	Dummy = 1 when payment includes earnout in addition to cash, stock or mixed, and = 0 otherwise (= Non-Earnout) (NEA).	SDC
NEA	Dummy = 1 when payment does not include earnout, and = 0 otherwise (= Earnout).	SDC
Cash	Dummy = 1 when payment is 100% cash.	SDC
Stock	Dummy = 1 when payment is 100% stock.	SDC
Mixed	Dummy = 1 when payment is a combination of cash, stock and other payments (excluding earnouts)	SDC
Foreign	Dummy = 1 with a US acquirer and non-US target, and = 0 when both acquirer and target are US institutions (= Domestic).	SDC
Domestic	Dummy = 1 when both acquirer and target are US institutions, and = 0 otherwise (= Foreign).	
Target under Common law	Dummy = 1 when the acquisition is cross-border and the target's nation follows the English Common law legal system, and = 0 otherwise.	SDC
Focused	Dummy = 1 when acquirer and target share the same two-digit SIC code, and = 0 otherwise.	
Diversifying	Dummy = 1 when acquirer and target do not share the same two-digit SIC code, and = 0 otherwise.	SDC
Deal value	Bid's transaction value, in millions of dollars.	SDC
Earnout value	The deal's value, in millions of dollars, of the deferred payment in an earnout-based M&A	SDC
Rel. earnout value	The bid's relative earnout size (= earnout value/deal value)	SDC
Private target	Dummy = 1 if target is a private firm, and = 0 otherwise.	SDC
Subsidiary target	Dummy = 1 if target is a subsidiary firm, and = 0 otherwise.	SDC
Unlisted target	Dummy = 1 if target is not a listed firm, and = 0 otherwise.	SDC
Public target	Dummy = 1 if target is a listed firm, and = 0 otherwise.	SDC
Target in int. sector	Dummy = 1 when target belongs to a high intangible assets industry (consumer products and services, financials, healthcare, high-tech, media and entertainment, and telecommunications) and = 0 otherwise.	SDC
Target in high-tech	Dummy = 1 if target belongs to the high technology industry, and = 0 otherwise.	SDC

Variable	Definition	Source
Target in cons. & serv.	Dummy = 1 if target belongs to the Consumer Products and Services industry, and = 0 otherwise.	SDC
Target in med. & ent.	Dummy = 1 if target belongs to the Media and Entertainment industry, and = 0 otherwise.	SDC
Target in telecoms	Dummy = 1 if target belongs to the Telecommunications industry, and = 0 otherwise.	SDC
Target in financials	Dummy = 1 if target belongs to the Financials industry, and = 0 otherwise.	SDC
Target in retail	Dummy = 1 if target belongs to the Retail industry, and = 0 otherwise.	SDC
Relative deal size	Ratio of Deal Value to Acq. MV (Deal Value/ Acq. MV).	SDC & Datastream
Acq. age	Number of years between day the acquirer is first recorded on Datastream and bid's announcement day.	Datastream
Acq. debt/equity ratio	Acquirer's total debt to common equity measured at the end of the last quarter prior to the deal's announcement.	Datastream
Acq. cash ratio	Acquirer's total cash and cash equivalents to its total assets measured at the end of the last quarter prior to the deal's announcement	Datastream
Sigma	Acquirer's idiosyncratic stock return volatility (Measured as in Moeller et al., 2007)	Datastream
High sigma	Dummy = 1 if a sample deal belongs to the top third of deals based on their distribution of sigma.	Datastream
Low sigma	Dummy = 1 if a sample deal belongs to the bottom third of deals based on their distribution of sigma.	Datastream
Acq. MV	Acquirer's market value of equity at four weeks prior to the bid's announcement, in millions of dollars.	Datastream
Acq. MTBV	Acquirer's market-to-book value estimated four weeks prior to the deal announcement.	Datastream
Control Dummy: Low sigma	Dummy = 1 for deals that were control counterfactuals in PSM Exercise 2 (see Sections 3.2. and 5.3. for information on the formulation of the matching sequence), and = 0 otherwise.	Authors' calculations
Control Dummy: High sigma	Dummy = 1 for deals that were control counterfactuals in PSM Exercise 3 (see Sections 3.2. and 5.3. for information on the formulation of the matching sequence), and = 0 otherwise.	Authors' calculations

Note: The table defines the variables used in the empirical analysis and indicates the data source used. SDC denotes Thomson-Reuters SDC M & A database. With a dummy variable, a sample observation without the value of one has the value of zero. Age, MTBV, RS and Debt are log transformed in subsequent regressions.