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Disentangling the microfoundations of acquisition behavior and performance

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Abstract

***Research Summary*:** The acquisition literature has highlighted that both firm-level and manager-level factors shape acquisition outcomes, yet little is known about their relative contribution. We conduct a variance decomposition analysis to explore the contribution of CEO-level versus firm-level factors to acquisition behavior and performance. We also extend the methodology of variance decomposition in strategic management research by employing Poisson multilevel models, and deriving the percentage of variance attributable to each level in a four-level model. Although CEO and firm effects both explain a substantial share of the variance in acquisition behavior, the CEO-effect is notably larger. CEO-level factors also drive a large portion of the variance in acquisition performance. Overall, our study contributes to the literatures on acquisitions and variance decomposition, and has implications for dynamic capabilities.

***Managerial Summary*:** How much do firm-level factors and CEO-level factors matter for explaining acquisition behavior and acquisition performance? This question is not only relevant for researchers but also for practitioners who seek to better understand what drives acquisitions and their outcomes. To help answer this question, our study conducts a variance decomposition analysis of acquisition behavior and acquisition performance. We find that both CEO-level factors and firm-level factors explain a substantial portion of the variance in acquisition behavior, but that CEO-level factors matter relatively more. We

Philipp Meyer-Doyle and Sunkee Lee contributed equally to this study.

also find that CEO-level factors also explain a substantial portion of the variance in acquisition performance.

KEYWORDS
CEO, dynamic capabilities, mergers and acquisitions, microfoundations of firm capabilities and strategy, variance decomposition

1 | INTRODUCTION

The literature on mergers and acquisition (M&A) has highlighted the important role that acquisitions play in enabling firms to achieve their growth objectives (Capron & Mitchell, 2012; Hitt, Hoskisson, & Ireland, 1990), enter new product or geographic markets (Lee & Lieberman, 2010; Slangen & Hennart, 2007), fill capability gaps (Kaul & Wu, 2016), innovate (Ahuja & Katila, 2001; Puranam, Singh, & Zollo, 2006; Graebner, Eisenhardt, & Roundy, 2010), take advantage of economies of scale or scope (Rabier, 2017; Seth, 1990; Singh & Montgomery, 1987), or reconfigure, redeploy or modify their resources (e.g., Capron & Mitchell, 1998a, 1998b; Karim & Mitchell, 2000; Anand & Singh, 1997; Helfat et al., 2007). Not surprisingly, acquisitions have become a popular mode of corporate development and companies are engaging in acquisitions in record numbers (Financial Times, 2018). Given the important role that acquisitions can play, a firm's capacity to source and realize acquisition opportunities, as well as create and capture value from its acquisitions, can be seen as a critical factor shaping its overall performance and long-term survival. Indeed, prior research has viewed the firm's capacity to engage in mergers and acquisitions as an important dynamic capability (Helfat et al., 2007; Bingham, Heimeriks, Schijven, & Gates, 2015; Zollo & Winter, 2002; Bingham, Heimeriks, & Meyer-Doyle, 2017).

Prior studies have provided important insights into antecedents of acquisition behavior and performance (Haleblian, Devers, McNamara, Carpenter, & Davison, 2009; Barkema & Schijven, 2008; King, Dalton, Daily, & Covin, 2004). While papers traditionally have highlighted the role of firm-level factors such as organizational acquisition experience, knowledge codification, the degree of postmerger integration, and the nature of acquisition programs (Zollo & Singh, 2004; Haleblian & Finkelstein, 1999; Laamanen & Keil, 2008), research has also focused on manager-level drivers of acquisition behavior and postacquisition performance including expertise or prior experience, managerial response to performance incentives, or hubris (Chen, Huang, & Meyer-Doyle, 2017; Nadolska & Barkema, 2014; Sanders, 2001; Hayward & Hambrick, 1997). Despite a great deal of prior research on acquisitions, little is known about the relative contribution of firm-level and manager-level drivers in shaping acquisition outcomes. Yet, investigating this question can build understanding about the relative drivers of heterogeneity in acquisition behavior and postacquisition performance, which could inform future research and ultimately have practical implications.

This paper aims to address the lack of evidence in the literature on mergers and acquisitions regarding the relative contribution of firm-level versus manager-level factors to acquisition behavior and performance. Both firms and managers may differ substantially in their capacity and motivation to engage in acquisitions, and in their ability to create and capture value from these acquisitions. To investigate this heterogeneity, we conduct a variance decomposition analysis of firms' acquisition behavior—specifically, the number, size, type, and quality of acquisitions undertaken each year—as the outcome of heterogeneity among firms and their managers to source and realize acquisition opportunities. We also decompose the variance of long-term postacquisition performance as the outcome of heterogeneity among firms and their managers to create and capture value from the acquisitions they engage in.

In these analyses, we compare the contribution of CEO-level versus firm-level factors to the variance of acquisition behavior and firm performance. Consistent with the strategic leadership literature, we focus on the CEO as the key individual with final responsibility for major strategic decisions (Hambrick, 2007). The CEO can exert substantial impact on acquisitions (Chen et al., 2017; Gamache, McNamara, Mannor, & Johnson, 2015; Hayward & Hambrick, 1997; Wuebker, 2015), and may play a direct role in selecting the target company, executing the transaction, and overseeing postmerger integration. The CEO must also decide how much effort the organization should devote to each of these activities, which aspects of these activities to delegate to which individuals, and which organizational structures and policies to put in place to support each phase of the acquisition process.

Our paper makes several contributions. First, we contribute to the literature on mergers and acquisitions by shedding light on important microfoundations of acquisition behavior and performance. Specifically, we explicate the relative contributions that firm-level factors and CEO-level factors make to acquisition behavior and subsequent postacquisition performance. Although prior literature has found that both types of factors affect acquisition behavior and performance, we find that CEO-level factors have a greater effect on the variance of the firm's acquisition behavior and performance than firm-level factors. These results highlighting the importance of CEO-level factors in shaping acquisition outcomes are also relevant to practitioners who seek to better understand the factors that drive variability in acquisition behavior and performance.

Second, we contribute to the methodology of variance decomposition in strategic management research by employing Poisson nonlinear hierarchical modeling for the acquisition behavior models. To our knowledge, this estimation methodology has not yet been used in strategic management research for variance decomposition. Estimating the percentage of variance attributable to each level requires the derivation of complex formulas that do not appear to be publicly available for a four-level Poisson nonlinear hierarchical model. We derived these formulas and provide the full derivation in the online supplement to this paper for use by other researchers, which opens up avenues for further variance decomposition research in other areas of strategy research.

Finally, our analysis contributes to an understanding of variance in strategic behavior, which has received less attention than variance in performance. Engaging in an acquisition is an important strategic choice, and the capacity to engage in acquisitions is an important dynamic capability. Prior research has highlighted that the capacities for sensing and seizing opportunities, such as acquisitions, and for subsequent resource reconfiguration are important classes of dynamic capabilities (Teece, 2007; Helfat & Peteraf, 2015). Our results therefore may provide suggestive evidence regarding heterogeneity in sensing, seizing, and reconfiguring activities in acquisitions.

2 | ACQUISITION OUTCOMES AND VARIANCE DECOMPOSITION

A significant body of research in strategic management and related fields has focused on explaining the antecedents of acquisition outcomes (see the reviews by Haleblian et al., 2009; Barkema & Schijven, 2008; Graebner, Heimeriks, Huy, & Vaara, 2017). These outcomes are associated with distinct phases of the acquisition process.

The acquisition process begins with the selection of an acquisition opportunity to pursue. This involves discerning an appropriate time to acquire (McNamara, Haleblian, & Dykes, 2008; Carow, Heron, & Saxton, 2004), deciding whether acquisition is the most suitable mode of corporate development (Capron & Mitchell, 2009, 2012; Puranam & Vanneste, 2016), and choosing the best acquisition target (see also Chakrabarti & Mitchell, 2013; Mitchell & Shaver, 2003). Once a firm has identified an acquisition opportunity, the next phase involves undertaking and completing the acquisition transaction. This entails the full financial valuation of the target company and a determination and negotiation of an appropriate price to pay and other terms of the acquisition with the target company's management and shareholders, structuring the acquisition deal, obtaining regulatory and stakeholder approval, and fending off rival bids or other reasons for opposition by the target company (Bruner & Perella, 2004). Finally, when the acquisition transaction is completed, the postmerger integration process commences (Zollo & Singh, 2004; Graebner et al., 2017); in this phase, the acquirer may integrate the resources and capabilities of the target company with its own in an effort to generate cost and revenue-based synergies (Haspeslagh & Jemison, 1991). During postmerger integration, the acquirer may also reconfigure its resource base by removing, adding, modifying, combining, or repurposing resources and capabilities (Capron, Dussauge, & Mitchell, 1998; Anand & Singh, 1997). The integration phase involves extensive planning, communication, dedicated resources to manage the integration, and careful project management (Graebner, 2004; Graebner & Eisenhardt, 2004; Heimeriks, Schijven, & Gates, 2012).

Important outcomes that ensue from firms' acquisition behavior in the first two phases of the acquisition process include whether firms engage in acquisitions and how many acquisitions they undertake (e.g., Sanders, 2001; Haleblian, Kim, & Rajagopalan, 2006; Seo, Gamache, Devers, & Carpenter, 2015; Gamache et al., 2015), and the size, type, and quality of the acquisitions (e.g., Chen et al., 2017; Chakrabarti & Mitchell, 2016; Barkema & Schijven, 2008; Malhotra, Reus, Zhu, & Roelofsen, 2018). Postmerger integration affects the long-term acquisition performance that acquirers achieve (e.g., Haspeslagh & Jemison, 1991; Graebner et al., 2017; Zollo & Singh, 2004) in combination with prior selection and completion of acquisitions.

The literature on M&A has explicated various factors which shape these acquisition outcomes. Traditionally, studies have focused on *firm-level factors*. For instance, with respect to acquisition behavior, scholars have documented that some firms engage in many acquisitions while others engage in few or none (Laamanen & Keil, 2008). A firm's prior acquisition performance (Haleblian et al., 2006) or its age (Arikan & Stulz, 2016) have also been found to influence the propensity of a firm to engage in an acquisition or the average number of acquisitions per firm. Moreover, research has found that the location or reputation of a firm influences whether the firm engages in or completes certain *types* of acquisitions, emphasizing the distinction between related versus unrelated acquisitions (Chakrabarti & Mitchell, 2016; Haleblian, Pfarrer, & Kiley, 2017). Although related acquisitions are more likely than unrelated acquisitions to lead to operational synergies (King, Slotegraaf, & Kesner, 2008; Haleblian & Finkelstein, 1999; Kusewitt, 1985; Morck, Shleifer, & Vishny, 1990; Singh & Montgomery, 1987; Seth, 1990), the evidence regarding which type of acquisition performs better is mixed (King et al., 2004; Zollo & Singh, 2004). In addition, scholars have considered the size of a firm's acquisitions as an element of acquisition behavior (Haleblian et al., 2017).

Studies have also explicated important firm-level antecedents of acquisition performance. For instance, acquisition experience can impact acquisition performance (Barkema & Schijven, 2008; Cuypers, Cuypers, & Martin, 2017; Hayward, 2002), especially if the learned knowledge is codified at the firm-level (Zollo & Singh, 2004), and if the codification is facilitated by a dedicated acquisition function within the firm (Bingham et al., 2015). The firm's knowledge base and firm size can also affect its acquisition performance (Ahuja & Katila, 2001; Moeller, Schlingemann, & Stulz, 2004). In addition, scholars have highlighted how the firm's capabilities, use of best practices, and stakeholder orientation shape its acquisition performance (Bettinazzi & Zollo, 2017; Bingham et al., 2017; Kaul & Wu, 2016).

At the same time, a burgeoning stream of studies in the acquisition literature has documented how *manager-level factors*, especially at the level of the CEO, impact acquisition outcomes. For instance, research has highlighted how the CEO's prior work experience and human capital affects the number of acquisitions undertaken (Chen et al., 2017). In addition, scholars have highlighted how psychological attributes, such as the CEO's regulatory focus, overconfidence, or narcissism affect acquisition behavior (Gamache et al., 2015; Hayward & Hambrick, 1997; Zhu & Chen, 2015a). Incentives and self-serving motivations of CEOs can also affect the amount of acquisition activity (e.g., Sanders, 2001; Seo et al., 2015). Further, research has highlighted how CEO-level factors, including the CEO's type of human capital, affect the types of acquisitions they engage in, such as related acquisitions (Chen et al., 2017). Research has also shown that CEO-level factors such as extraversion affect the size of acquisitions (Malhotra et al., 2018). Finally, a number of studies have explicated important CEO-level antecedents of acquisition performance: for instance, scholars have emphasized the impact of psychological characteristics such as hubris, narcissism, or overconfidence on acquisition performance (e.g., Malmendier & Tate, 2008; Hayward & Hambrick, 1997). CEOs who engage in acquisitions for self-serving purposes, such as status-enhancement, have also been found to achieve lower acquisition success (Shi, Zhang, & Hoskisson, 2017).

In sum, research has firmly established that both firm-level factors and CEO-level factors are drivers of acquisition behavior and postacquisition performance. Yet, relatively little is known about the relative contribution of these factors to acquisition behavior and performance. Such knowledge would enable scholars to build a better understanding of factors shaping acquisition outcomes, which in turn can guide future research and have practical implications.

2.1 | Variance decomposition

To address the gap in the acquisition literature discussed above, we utilize variance decomposition because it provides a methodology with which to examine the relative contributions of CEO-level and firm-level factors to acquisition behavior and performance (e.g., Brush, Bromiley, & Hendrickx, 1999; Hambrick & Quigley, 2014; McGahan & Porter, 1997). A variance decomposition analysis partitions the variance observed in a variable into portions associated with different factors of interest. Beginning with Rumelt (1991), a substantial literature in strategic management has focused on decomposing the variance in firm performance, and has examined the relative contribution of a variety of factors such as industry, business unit, firm, and CEO (e.g., McGahan & Porter, 1997; Brush et al., 1999; Vanneste, 2017). Several studies have examined the contribution to firm performance of factors at the level of the CEO (i.e., time-invariant factors associated with the tenure of each CEO) vis-à-vis that of industry and firm-level factors, and concluded that CEO-level factors matter substantially for firm performance (termed the "CEO effect") (e.g., Quigley & Hambrick, 2015; Crossland & Hambrick, 2007; Mackey, 2008; Quigley & Graffin, 2017).

Although the variance decomposition literature has provided important insights, it has largely focused on explaining heterogeneity in overall firm performance. Relatively little is known about the factors that contribute to the variance of strategic behavior such as acquisitions and the variance of performance resulting from this behavior. In what follows, we shed light on these issues through the decomposition of the variance of acquisition behavior and performance.

3 | DATA AND VARIABLES

3.1 | Sample

Our data comes from multiple sources. First, we obtained data on corporate M&As from the SDC Platinum deals database, one of the most exhaustive M&A databases used in strategy research (e.g., Cuypers et al., 2017; Capron & Shen, 2007; Puranam et al., 2006). We restricted our sample to U.S. publicly listed firms due to enhanced data availability for these firms.[1] Our sample consists of acquisitions that occurred beginning in 1995, as in a number of other studies on acquisitions (e.g., Graffin, Haleblian, & Kiley, 2016; Ragozzino & Moschieri, 2014; Ellis, Reus, Lamont, & Ranft, 2011; Ransbotham & Mitra, 2010). The last year of acquisitions in the sample is 2015, the most recent year available when we collected the data.

Second, data on the CEOs of U.S. publicly-held firms comes from BoardEx, which contains detailed data on individual executives, including historical employment data and their titles. BoardEx has been used previously in strategy research (e.g., Zhu & Chen, 2015b; Zhu & Shen, 2016), and covers a larger number of executives within each firm than comparable databases. BoardEx collects the data from annual reports and company websites, supplemented by other publicly available data. For a firm to be included in our analysis in a given year, we needed to have data from BoardEx on the CEO in the year in question.

Finally, accounting data on the annual performance of acquiring firms as well as on company SIC codes comes from S&P's Compustat database, and data on the stock returns of the acquiring firms comes from Eventus, a program that performs event studies using stock price data from The Center for Research in Security Prices (CRSP).

We created two datasets. First, we merged the M&A data from SDC Platinum with the BoardEx data to construct a sample consisting of firm-year observations of the number and types of acquisitions during the period 1995–2015. In our analysis, we included both firms which engaged in acquisitions as well as firms which did not engage in acquisitions during our entire sample period. For a given firm-year, if the SDC deals database did not record any acquisitions in a year for that firm, given the comprehensive coverage of acquisition activity by public companies in SDC, we assumed that the firm had zero acquisitions in that year. We also conducted robustness checks where we excluded firms which did not engage in any acquisitions during our entire sample period and found substantively similar results. We then created a second dataset to analyze postacquisition financial performance, by merging annual accounting data from Compustat with the annual SDC Platinum and BoardEx data for each acquisition in the first dataset. We also used both datasets in conjunction with the Eventus program that performs event studies using CRSP data, as explained below.

3.2 | Dependent variables

3.2.1 | Acquisition behavior

We decompose the variance of the acquisition behavior of the firm as an outcome of efforts of firms and CEOs to source and realize acquisition opportunities. We use four alternate measures to account

[1]In our sample, we only included completed acquisitions in which the acquirer acquired 100% of the target's shares.

for different dimensions of acquisition behavior. The first measure accounts for the amount of acquisition activity, and three additional measures take acquisition size, type, and quality into account as well.

The outcomes of efforts by the firm and by individuals within the firm, such as the CEO, to source and realize acquisition opportunities will be reflected in the number of acquisitions that a firm engages in each year. Hence, our first measure of a firm's acquisition behavior is the *number of acquisitions* that a firm makes each year, consistent with prior research (e.g., Malhotra et al., 2018; Sanders, 2001; Seo et al., 2015).

Beyond the number of acquisitions, the size of the acquisitions may matter for our analysis. In particular, acquisitions that are small relative to the size of the acquirer may have less strategic importance to an acquirer. If firms and their CEOs therefore pay less attention to relatively small acquisitions, factors at both levels may have less influence on acquisition behavior for these acquisitions. As noted earlier, the antecedents to acquisition size have been studied in prior research (Haleblian et al., 2017; Chen, Crossland, & Huang, 2016; Seo et al., 2015; Malhotra et al., 2018), but we know little about the impact of CEO-level factors compared to firm-level factors. For this reason, we use a second measure of acquisition behavior, the *number of relatively large acquisitions* that a firm makes during a given year. To construct this measure, we first calculate the relative size of each acquisition in our sample by dividing the transaction value of each acquisition (in U.S. dollars) by the acquirer's total assets (in U.S. dollars); we then define relatively large acquisitions as those in the top 25th percentile of the relative acquisition size measure and count the number of relatively large acquisitions made by each firm in a given year.[2]

In addition to the number and size of acquisitions, firms also differ in the types of acquisitions that they make. As indicated earlier, prior research has emphasized the distinction between related and unrelated acquisitions. Therefore, as a third measure of acquisition behavior, we use the *number of related acquisitions* that a firm makes each year. To construct this measure, following prior literature we first determined whether each acquisition in our sample was a related acquisition by comparing the 2-digit SIC code of the acquirer and target company (Graffin et al., 2016; Zaheer, Hernandez, & Banerjee, 2010; Shaver & Mezias, 2009; Kusewitt, 1985; Walker, 2000).[3] Then we counted the number of related acquisitions that a firm made each year.

Finally, acquisitions may differ in terms of their quality—that is, acquisitions differ in the extent to which they are likely to improve the performance of the acquiring firm. Firms and their CEOs may have a variety of motivations for undertaking acquisitions, and these motivations may lead to differences in anticipated performance. For instance, all else equal, acquisitions motivated solely by CEO narcissism may be more likely to lower performance, and acquisitions motivated by a CEO's desire to improve scale economies may be more likely to raise performance. Our measure of acquisition behavior accounting for the quality of acquisitions is the *number of acquisitions which recorded a positive Cumulative Abnormal Return (CAR) upon announcement* for each firm in a given year. Prior research has highlighted that short-term CARs represent an "overall market sentiment"

[2]This variable has a correlation of 0.43 with the *number of acquisitions* variable. SDC Platinum has data on transaction value for 15,291 acquisitions out of our sample of 29,239 acquisitions. Acquisitions that did not have data on transaction value were coded as not relatively large acquisitions. This approach seems reasonable given that large acquisitions are prominently covered in the financial press and hence data on acquisition size is likely to be available, whereas small acquisitions are mostly not prominently covered by the financial press. We conducted a robustness check in which we defined *relatively large acquisitions* using only the sample of acquisitions for which we have data on transaction value, and the results were consistent with those reported here; the results of this robustness check are available on request from the authors.

[3]We matched on two-digit rather than four-digit SIC codes because four-digit SIC codes may specify the primary business of each company too narrowly to pick up relatedness in acquisitions.

(Zollo & Meier, 2008: p. 71); thus, a positive CAR suggests that the market positively evaluates the acquisition. In using this measure, we acknowledge that a CAR-based measure of acquisition quality is imperfect, because investors may not have enough information to fully assess the likely future performance of an acquisition (Zollo & Meier, 2008). We use event study methodology (see McWilliams & Siegel, 1997) and calculate CARs using Eventus. Following other studies (Lang, Stulz, & Walkling, 1989; Wang & Xie, 2008; Zaheer et al., 2010), we measure the acquirer's CAR for each acquisition in our sample using an 11-day event window around the acquisition announcement (from 5 days before the announcement day to 5 days after the announcement day), based on the market model.[4] We then count the number of acquisitions which each firm made in a given year that recorded a positive cumulative abnormal return.[5]

3.2.2 | Long-term acquisition performance

The outcome of the acquirer's efforts to create and capture value from acquisitions is reflected in its long-term postacquisition performance. Postacquisition performance is affected not only by resource reconfiguration and postmerger integration (e.g., Zollo & Singh, 2004) but also by the selection of a suitable acquisition target and the transaction structure and pricing. Prior literature has captured acquisition performance largely through two types of measures: accounting measures of financial performance for acquisitions, and financial market returns (using event studies of stock market returns or long-term stock returns). One or both types of measures have been used in approximately 70% of studies on acquisitions (Zollo & Meier, 2008; King et al., 2004). Consequently, we follow prior literature and use two different measures of long-term acquisition performance:

We use the *change in the acquirer's ROA from 1 year before the acquisition to 3 years after the acquisition, Δ ROA [$t-1$; $t+3$]*, as our first measure of long-term postacquisition performance, consistent with prior studies (e.g., Ellis et al., 2011; Zollo & Reuer, 2010; Zollo & Singh, 2004).[6] Prior research has shown that performance achieved in the integration process is linked to postacquisition accounting performance (Zollo & Meier, 2008). Choosing a 3-year window postacquisition announcement allows us to capture the full impact of reconfiguration activity, which typically lasts 1–3 years (Huang, Pierce, & Tsyplakov, 2015). Unlike prior studies using this measure, we do not industry-adjust our ROA measure, as this is problematic when conducting a variance decomposition that has industry as one of the predictor categories. In line with prior variance decomposition studies of firm performance, we winsorize the top and bottom one percentiles of the ROA measure (Crossland & Hambrick, 2011).[7]

[4]We have data on CARs for 27,226 acquisitions out of our sample of 29,239 acquisitions; in our decomposition analysis of the number of CAR-positive acquisitions, we drop the acquisitions for which we have missing data on the CARs; however, we ran a robustness check in which we include the acquisitions for which we have no data on CARs and coded these as having a neutral CAR (a value of zero, neither positive nor negative), and confirmed our results; results are available upon request from the authors. The mean CAR of the 27,226 acquisitions that we have CAR data on in our sample is 0.006 (*SD* 0.1). The mean is different from 0 based on a *t* test ($p < .01$). Approximately 52.3% of these acquisitions recorded a positive CAR while 47.7% of acquisitions in our sample recorded a negative CAR.

[5]The annual *number of acquisitions* is positively correlated the *number of related acquisitions* (correlation coefficient of 0.78) and with the *number of CAR-positive acquisitions* (correlation coefficient of 0.84).

[6]We compute ROA by dividing “Net Income” by “Total Assets,” with both accounting items obtained from Compustat. Because we obtained the Compustat data ending in 2016 and we require data 3 years postacquisition, the sample used for the change in ROA analysis excludes acquisitions in 2014 and 2015.

[7]We also conducted robustness checks where we drop the top and bottom one percentile of our ROA and BHAR measures (e.g., Quigley & Graffin, 2017) and the results remained consistent with those reported here; results are available from the authors.

As our second measure of long-term postacquisition performance, we use long-term stock market returns as measured by *Buy-and-Hold Abnormal Returns (BHARs)*. While prior literature in strategy using stock market returns has predominantly relied on Cumulative Abnormal Returns (CARs) with a short event window around the acquisition announcement as a measure of acquisition performance, this measure is not appropriate to capture *long-term* acquisition performance in our context. In this regard, Zollo and Meier (2008) demonstrate that CARs upon announcement poorly predict long-term postacquisition performance, and that long-term financial market returns are more suitable to capture such postacquisition performance. We measure long-term financial market returns using BHARs, which are commonly used long-term financial market returns in the finance literature (e.g., Barber & Lyon, 1997; Ikenberry, Lakonishok, & Vermaelen, 1995; Loughran & Vijh, 1997) and have also been adopted by strategy scholars (Rabier, 2017; Chatterjee, Harrison, & Bergh, 2003).

We obtained our *BHAR [t − 1 m; t + 36 m]* measure through Eventus. The measure is computed by comparing the acquirer's stock returns in the period from 1 month before the acquisition announcement to 36 months after the acquisition announcement to the returns of a reference portfolio of comparable firms in the same period.[8] A BHAR is an abnormal return, so it is measured as the difference between the acquirer's actual stock return and the expected return based on that of a reference portfolio. The reference portfolios are constructed based on size (market capitalization) and the book equity to market equity ratio (e.g., Barber & Lyon, 1997; Mitchell & Stafford, 2000), because these are well-established factors that have been shown to predict stock market returns (Fama & French, 1992). Each acquirer firm is matched to one of 25 Fama–French reference portfolios based on size (market capitalization) and the book equity to market equity ratio. In the computation of the *BHAR [t − 1 m; t + 36 m]* measure, the acquirer is (re-)assigned to a reference portfolio every 12 months and the reference portfolios are reconstituted every 12 months (see also Barber & Lyon, 1997). This procedure is used because the size (market capitalization) and book equity to market equity ratio of the acquirer and of the firms in the reference portfolios change over time, and as such their expected stock returns based on the Fama–French asset pricing model change over time.[9] We winsorize the top and bottom one percentiles of our *BHAR [t − 1 m; t + 36 m]* measure.

As measures of long-term acquisition performance, the change in ROA and BHARs have both advantages and disadvantages. The change in ROA has the advantage that it removes time-invariant (i.e., stable) portions of ROA that are unconnected to acquisitions. BHARs also have the advantage that they capture long-term abnormal market returns associated with acquisitions. However, both measures have the disadvantage that it is not possible to link them to single acquisitions. If a firm makes more than one acquisition in a given year, postacquisition accounting returns will reflect all acquisitions that the firm made during the year. In addition, a firm may make acquisitions in subsequent years that fall within the window during which postacquisition performance is measured. For these reasons, we need to interpret the decomposition analysis of the variance of long-term acquisition performance cautiously.

[8]We include the stock return for the month prior to the acquisition announcement (*t − 1 m*) in the computation of the BHAR measure in order to account for potential leakage of the acquisition news before the acquisition announcement.

[9]For example, if an acquirer experiences a drop in its share price 12 months after the acquisition announcement (possibly due to poor reconfiguration performance), its subsequent expected stock return is likely to be different since its size (market capitalization) and book equity to market equity ratio may be different. Hence, to capture the impact of subsequent reconfiguration performance on the acquirer's stock return, we need to compare the stock return of the acquirer against its expected stock return, which is proxied by the stock return of a comparable portfolio. Thus, acquirers need to be (re-)assigned to the most comparable portfolio every 12 months. Further, if the size (market capitalization) and book equity to market equity ratio of the firms in the Fama–French portfolios change over time, they may no longer belong in the most comparable portfolio and hence portfolios need to be reconstituted every 12 months.

3.3 | Explanatory factors

We decompose measures of the variance of acquisition behavior and the variance of long-term performance into factors connected with industry, firm, CEO, and year, as is common in many variance decomposition studies.

3.3.1 | Industry

Consistent with prior variance decomposition studies (Misangyi, Elms, Greckhamer, & Lepine, 2006; McGahan & Porter, 1997), the industry of each acquirer is denoted as the 4-digit SIC code assigned by Compustat based on the primary SIC code of the firm.[10]

3.3.2 | Firm

We assigned a unique code identifying each firm. Since there is no single standardized common identifier used across the databases in our sample for the same firm, we needed to identify the same firm across the databases; to do this we matched the firms across the main databases based on two common identifiers at the same time. Specifically, we first matched firms between SDC and Compustat if both the ticker and the CUSIP number matched in the respective year. Then we used the Compustat data from the resulting database to match firms in that database with BoardEx data if both the ticker and the CIK code matched in the respective year. Finally, we matched the resulting database with data from Eventus based on the CUSIP number of the firm and the acquisition announcement date.[11] Matching each firm across the databases through more than one identifier enabled us to more accurately assign a unique code to each firm.[12]

3.3.3 | CEO

The BoardEx data allows us to identify the CEO of the company through the title of each executive.[13] We then assign a unique identifier for each CEO based on the individual executive identifier number in the BoardEx database.

Table 1 presents an overview of our acquisition behavior sample and descriptive statistics for the dependent variables of the acquisition behavior sample. Our full sample used for our main analysis to decompose the variance of acquisition behavior contains data pertaining to 77,037 firm-year observations, covering 413 industries, 6,315 firms, and 11,556 CEOs. During the sample period, the firms engaged in 29,239 acquisitions.[14]

[10]Compustat assigns the primary SIC code based on the company's primary business activity (based on revenues).

[11]The only common identifier between the data from Eventus and the other databases in this paper is the CUSIP number; hence, we could only match the Eventus data based on the CUSIP and the acquisition announcement date.

[12]In the cases where only one of the two identifiers matched while the other one mismatched, we went through the discrepancies manually one by one, and used U.S. Securities and Exchange Commission (SEC) company filing data to decide for each case whether it was a match or not.

[13]A small number of firms have dual (or in some cases, multiple) CEOs at a given point in time. In order to attribute the CEO portion of the variance to a single individual, we include in the sample only firms with a single CEO at a given point in time.

[14]We also conducted robustness checks for our main decomposition analysis of acquisition behavior in which we drop any firm that does not have at least two CEOs in our database and that does not have at least 2 years of outcome data for each of the CEOs, and obtained very similar results.

TABLE 1 Descriptive statistics

Acquisition behavior sample overview	
Acquisitions	29,239
Industries (SIC [4-digit])	413
Firms	6,315
CEOs	11,556
Firm-year observations *(unit of analysis)*	77,037
Avg. # of observations per unit	
Industry	186.5
Firm	12.2
CEO	6.7
Acquisition behavior sample dependent variables statistics	
Number of acquisitions	
Mean	0.38
SD	1.16
Min/max	0/72
Number of relatively large acquisitions	
Mean	0.09
SD	0.34
Min/max	0/9
Number of related acquisitions	
Mean	0.21
SD	0.75
Min/max	0/36
Number of CAR-positive acquisitions	
Mean	0.18
SD	0.67
Min/max	0/58

4 | METHODOLOGY

Early variance decomposition studies in strategy relied on ANOVA (analysis of variance) and VCA (variance components analysis) to partition the variance of performance into constituent "effects" such as those associated with firms and industries (e.g., Rumelt, 1991; McGahan and Porter, 1997 and 2002; Brush et al., 1999). Because VCA has a number of limitations, including lack of reliability of the estimated effects (Brush et al., 1999), it is less frequently employed today in strategy research. ANOVA produces more stable results but has other drawbacks (Misangyi et al., 2006). In the most common application of ANOVA, each effect is entered into the model sequentially to estimate the variance attributable to the respective category. However, this ignores the nested nature of the data (e.g., CEOs are nested within firms, which are nested within industries). ANOVA also relies on the assumption that each category of effects is independent of the others, which is violated in the case of nested data (Misangyi et al., 2006). As a consequence, variance decomposition based on ANOVA can potentially lead to imprecise or biased estimates of the proportion of variance attributable to each category, and the order of entry of each effect (in sequential ANOVA) can substantially bias the results (Bowman & Helfat, 2001).

Misangyi et al. (2006) proposed that multi-level modeling has the advantage that it takes account of the nested nature of the effects analyzed in variance decomposition in strategy, and minimizes bias in the estimated effects. In this regard, multi-level modeling *simultaneously* partitions the total variance of a variable into the portions associated with hierarchically ordered (that is, nested) components, and makes it possible to estimate the contribution to total variance that is unique to each hierarchical level (Misangyi et al., 2006; Raudenbush, 1993; Raudenbush & Bryk, 2002; Hough, 2006; Klein & Kozlowski, 2000). In our data, acquisition behavior varies between industries, between firms, between CEOs, and across time. Importantly, the relationships between these levels of analysis are nested—firms operate within industries, and CEOs work within firms. Given this data structure, a multi-level model (MLM) is more appropriate for our purposes as such a model allows us to empirically examine the relative importance of different hierarchically-ordered categories of effects on acquisition behavior, by explicitly estimating the different error components and acknowledging the nested nature of the data. It is important to note that the CEO effect reflects all stable factors that are associated with the tenure of each CEO. Below we explain the estimation methods used for our analyses in more detail.

4.1 | Estimation methodology for acquisition behavior variance decomposition

Given the benefits of multi-level models, recent variance decomposition studies in the strategy literature have often adopted *linear* multi-level models to decompose the variance in continuous measures of firm performance (e.g., Quigley & Graffin, 2017; Crossland & Hambrick, 2011). However, because our acquisition behavior dependent variables are count variables, the adoption of a linear multi-level model is not appropriate; instead, we use a Poisson multi-level model, as is appropriate for count data. Because the acquisition behavior dependent variables have larger variances than their means, we tested whether the Poisson multi-level model is mis-specified due to overdispersion and found that Poisson is the appropriate specification.[15]

We use specialized statistical software for running multi-level models, MLwiN (see Charlton, Rasbash, Browne, Healy, & Cameron, 2019 for the latest user guide, documentation, and more details on this program), to estimate the Poisson multi-level models.[16] MLwiN has been used by

[15]To test for overdispersion, for each dependent acquisition behavior variable we estimated a negative binomial multi-level model, which includes an overdispersion term. We found that the coefficient of this overdispersion term for all of the acquisition behavior dependent variables was 0.000, confirming that there was no overdispersion and the estimated negative binomial model reduced to the Poisson model in all cases. Thus, the Poisson model was appropriate. In this regard, it is important to note that even when the raw data for a dependent variable appear overdispersed, such as for each of our acquisition behavior variables, Poisson multi-level models do not necessarily suffer from overdispersion. Leckie (2012) notes that: "In the multilevel Poisson model the inclusion of random effects results in the variance being greater than the mean. Thus, all multilevel Poisson models implicitly allow for an amount of overdispersion."

[16]MLwiN can be run from within Stata using the *runmlwin* command. MLwiN has advantages over Stata multi-level Poisson modeling routines (e.g., the *mepoisson* command) in that MLwiN enables greater flexibility in specifying the model and is much less computationally intensive (Leckie & Charlton, 2012). In addition, MLwiN has the advantage that it applies Markov Chain Monte Carlo (MCMC) algorithm as a default to produce estimates for Poisson multi-level models, whereas Stata applies the adaptive Gauss-Hermite Quadrature (GHQ) algorithm as the default. Although both methods are capable of producing estimates for Poisson models, prior studies have suggested that MCMC is more robust compared to GHQ, because the latter tends to sacrifice some robustness to improve estimation efficiency (Hadfield, 2010; Ormerod & Wand, 2012; Rabe-Hesketh, Skrondal, & Pickles, 2002; Zhang, 2013). The models that we run in MLwiN perform 500 "burn-in" iterations, followed by 5,000 estimation iterations that produce the output parameters.

scholars and statisticians in a variety of different fields to fit multi-level models (Guillaume, van Knippenberg, & Brodbeck, 2014; Leckie & Goldstein, 2015; Tranmer, Steel, & Browne, 2014; Schepers, Falk, de Ruyter, de Jong, & Hammerschmidt, 2012).

Because neither the total variance nor the residual unexplained variance is produced by the estimation model, additional steps must be taken to compute the percentage of variance attributable to each of the levels (all of the statistical packages of which we are aware that perform multi-level Poisson modeling have this problem). A recent paper in the life sciences has provided a method for computing the percentage of variance attributable to each level in Poisson models based on the outputs provided by the Poisson estimation (Austin, Stryhn, Leckie, & Merlo, 2018); however, the model in Austin et al. (2018) is a two-level Poisson model, while the models that we estimate have four levels of hierarchy. Thus, we needed to extend this method, and mathematically derive the equations to convert the output parameters from the estimated multi-level Poisson models into percentages of variance explained at each level. The full mathematical derivation of these equations can be found in the online supplement, as well as a brief explanation of how to compute the percentages of variance explained by each level of hierarchy in multi-level Poisson models with four levels of hierarchy.[17]

Based on the method described above, we estimate Poisson multi-level models for the decomposition of each of the acquisition behavior variables: the *number of acquisitions*, the *number of relatively large acquisitions*, the *number of related acquisitions*, and the *number of CAR-positive acquisitions* that a firm engages in each year. For each analysis, we estimate a four-level random effects model that partitions the total variance of each dependent variable between industries, firms, individual CEOs, and time periods (termed the "unconditional model"). In order to derive the size of the year effect, we follow recent multi-level studies and condition the specification in the unconditional model on year fixed effects (termed the "conditional model"). In this regard, estimating the unconditional model followed by the conditional model which has year-fixed effects allows us to separate the percentage of variance explained by the year level from the residual variance, and thus identify the percentage of variance attributable to the year level (see also Misangyi et al., 2006). All results reported below are for the conditional models that include year fixed effects.

Consistent with prior variance decomposition studies (Crossland & Hambrick, 2011; Hambrick & Quigley, 2014; Quigley & Graffin, 2017), we specify the order of nesting as follows: first industry, then firm, then CEO, then year. In other words, firms are nested within industries and CEOs are nested within firms. As a standard part of the estimation procedure, at each level of the hierarchy our multi-level modeling approach creates "groups," which are clusters that the observations are categorized into based on how they are nested within variables at higher levels in the hierarchy.[18]

4.2 | Estimation methodology for postacquisition performance variance decomposition

Since our measures for postacquisition performance, *Δ ROA [t − 1; t + 3]* and *BHAR [t − 1 m; t + 36 m]*, are continuous dependent variables, a hierarchical linear multi-level model (HLM) is

[17]The equations derived in the appendix are not specific to the MLwiN estimation and can in principle be applied to multilevel Poisson models estimated by other programs such as Stata.

[18]For example, the number of groups at the CEO level in our model is calculated as the number of distinct clusters of industry-firm-CEOs in the sample. Multi-level model estimation is more precise if there is more variation between the categories, that is, if firms have multiple CEOs during the sample period and/or CEOs move between firms in our context. In our acquisition behavior sample, approximately 69% of the observations pertain to firms which have had more than one CEO during the sample period, providing sufficient variance for the estimation.

TABLE 2 Variance decomposition of acquisition behavior

	(1) Number of acquisitions	(2) Number of relatively large acquisitions	(3) Number of related acquisitions	(4) Number of CAR-positive acquisitions
Year effect	0.5%	2.2%	0.8%	0.8%
Industry effect	5.0%	3.2%	4.3%	4.8%
Firm effect	31.6%	7.5%	28.4%	25.4%
CEO effect	46.8%	10.8%	40.9%	37.7%
Residual	16.1%	76.2%	25.7%	31.5%
R-squared/variance explained	83.9%	23.8%	74.3%	68.5%
Relative effect size: CEO/firm	1.48	1.44	1.44	1.48
Model p-value	0.000	0.000	0.000	0.000
Observations	77,037	77,037	77,037	77,037
Model	Poisson MLM	Poisson MLM	Poisson MLM	Poisson MLM

appropriate (Misangyi et al., 2006). Consistent with prior studies (Hambrick & Quigley, 2014; Quigley & Graffin, 2017), we adopt hierarchical linear models for the decomposition of our postacquisition performance dependent variables.[19] Specifically, we first estimate a four-level unconditional model, and then condition the specification in the unconditional model on year fixed effects. We specify the order of nesting as in our Poisson models: industry, firm, CEO, and year.

5 | RESULTS

5.1 | Acquisition behavior variance decomposition

The results of our analysis, which decomposes the variance in acquisition behavior using the conditional model, are displayed in Table 2; we report the percentage of total variance explained by each category of effects (the raw coefficient estimates as well as the results of the unconditional model can be provided on request).

Model 1 shows the decomposition of the variance of the *number of acquisitions* that a firm undertakes each year. The industry, firm, CEO, and year effects together account for 83.9% of the variance (model p-value = .000). The CEO effect accounts for the largest proportion of the variance at 46.8%, compared with 31.6% for the firm effect, 5.0% for the industry effect, and 0.5% for the year effect. The ratio of the CEO to the firm effect is 1.48. These results suggest that CEOs are powerful drivers of firm acquisition behavior as measured by the number of acquisitions, and account for a greater portion of the variance of firm acquisition behavior than firm-level factors. We also tested for a statistical difference between the CEO and firm effect. To do this, we first converted the percentages of variance explained by the CEO and firm effects to partial correlations (see Quigley & Hambrick, 2015) and performed Steiger's Z-test, which tests for differences in overlapping correlations within

[19]We use the *mixed* command in Stata (version 14) to estimate these models.

the same sample (Steiger, 1980; Meng, Rosenthal, & Rubin, 1992).[20] This test showed that these two effects differ (*p*-value <.01).[21]

Model 2 contains the decomposition analysis of the *number of relatively large acquisitions* that a firm makes each year. The model explains only 23.8% of the variance in this variable (model *p*-value = .000). The low portion of the variance explained by the model is most likely related to the lower variance of the dependent variable; specifically, we measure relatively large acquisitions as the top 25% of acquisitions, which reduces the variance in the number of relatively large acquisition variable compared to variance in the number of acquisitions variable.[22] The CEO effect explains 10.8% of the variance, while the firm effect explains 7.5%, the industry effect 3.2%, and the year effect 2.2% of the variance. The CEO effect is 1.44 times as big as the firm effect, and the CEO and firm effects differ as judged by Steiger's Z test (*p*-value <.01).[23]

Model 3 shows the decomposition analysis for the *number of related acquisitions* that a firm makes per year. The model explains 74.3% of the variance in this variable (model *p*-value = .000). The CEO effect explains 40.9% of the variance, the firm effect 28.4%, the industry effect 4.3%, and the year effect 0.8%. The results are consistent with those for the number of acquisitions as the dependent variable; the CEO effect is large, accounts for the largest share for the variance, and is 1.44 times as big as the firm effect. The CEO and firm effects again differ, as judged by Steiger's Z-test (*p*-value <.01).[24]

Model 4 contains the analysis of the decomposition of a firm's yearly *number of acquisitions that recorded a positive CAR* in the 11-day window around each acquisition announcement. The model explains 68.5% of the variance (model *p*-value = .000). The CEO effect accounts for the largest share of the variance with 37.7%, followed by the firm effect with 25.4%, the industry effect with 4.8%, and the year effect with 0.8%. The CEO effect is 1.48 times as large as the firm effect, and the results of Steiger's Z-test confirm the difference (*p*-value <.01).[25]

Overall, the decomposition analysis for the four acquisition behavior variables show that the CEO effect comprises the largest portion of the variance, followed by the firm effect. In the four analyses, the CEO effect is between 1.44 and 1.48 times as large as the firm effect. And with the exception of the relative acquisition size variable, which has a low total variance, the CEO effect explains a large

[20]To perform Steiger's Z-test, we require the correlation between the CEO effect and our dependent variable (acquisition behavior measured as the *number of acquisitions*), between the firm effect and the dependent variable, and between the CEO effect and the firm effect. Following Quigley and Hambrick (2015), we derive partial correlations based on the percentages of variance in the dependent variable explained by the CEO effect and the firm effect respectively, to estimate the first two parameters. The estimation model does not provide us with the correlation between the CEO and firm effect. Hence, we simulated Steiger's Z-test for every possible tenth decimal correlation between the CEO effect and the firm effect between −1.0 and 1.0, and for each simulation we found that the two effects differ (*p*-value <.01). We performed the same procedure for each application of Steiger's Z-test in this study, and found that the CEO and firm effects differ (*p*-value <.01) throughout our models.

[21]As an alternative test, based on the confidence intervals of the partial correlations, we also computed and compared confidence intervals for the CEO effect and the firm effect: the difference between the lower bound 99% confidence interval of the CEO effect (46.1%) and the upper bound 99% confidence interval of the firm effect (32.3%) remains very large, also suggesting that these effects differ.

[22]Because we have data on transaction value for only 52.3% of the acquisitions, it is difficult to meaningfully define the percentage of relatively large acquisitions as more than 25% of the acquisitions.

[23]The difference between the lower bound 99% confidence interval of the CEO effect (10.2%) and the upper bound 99% confidence interval of the firm effect (8.0%) remains very large, further suggesting that these effects differ.

[24]Further, the difference between the lower bound 99% confidence interval of the CEO effect (40.2%) and the upper bound 99% confidence interval of the firm effect (29.2%) remains very large, suggesting that these effects differ.

[25]Further, the difference between the lower bound 99% confidence interval of the CEO effect (37.0%) and the upper bound 99% confidence interval of the firm effect (26.1%) remains very large, suggesting that these effects differ.

TABLE 3 Variance decomposition of long-term acquisition performance

	(1) Δ ROA [*t* − *1*; *t* + *3*]	(2) BHAR (*t* − *1 m*; *t* + *36 m*)
Year effect	2.2%	1.0%
Industry effect	1.0%	2.3%
Firm effect	***8.7%***	***3.1%***
CEO effect	***40.7%***	***33.3%***
Residual	47.4%	60.3%
R-squared/variance explained	52.6%	39.7%
Relative effect size: CEO/firm	*4.68*	*10.74*
Model p-value	*0.000*	*0.000*
Observations	*25,918*	*27,510*
Model	*HLM*	*HLM*

Note: The number of observations in Table 3 is smaller than in Table 2 because the unit of analysis in Table 3 is the acquisition. The difference in the number of observations between the Δ ROA [*t* − *1*; *t* + *3*] analysis and the BHAR (*t* − *1 m*; *t* + *36 m*) analysis is due to different amounts of missing data for the two variables.
Abbreviations: BHAR, Buy-and-Hold Abnormal Returns; ROA, ROA, return on assets.

absolute share of the total variance, ranging from 37.7 to 46.8%. The firm effect is also substantial, accounting for 25.4 to 31.6% of the total variance for all but the relative acquisition size variable.

5.2 | Postacquisition performance variance decomposition

Table 3 presents the results of our HLM analysis decomposing the variance in long-term acquisition performance. In Model 1, which shows the decomposition of the variance of *Δ ROA [t − 1; t + 3]*, the four effects together explain 52.6% of the variance (model *p*-value = .000). The CEO effect accounts for the largest proportion of the variance with 40.7%, followed by the firm effect with 8.7%, the industry effect with 1.0%, and the year effect with 2.2%. In Model 2, which shows the decomposition of the variance of *BHAR [t − 1 m; t + 36 m]*, the four effects together explain 39.7% of the variance (model *p*-value = .000). Again, the CEO effect accounts for the largest proportion of variance explained with 33.3%, followed by the firm effect with 3.1%, the industry effect with 2.3%, and the year effect with 1.0%. The results of Steiger's Z-test confirm that the CEO effect is larger than the firm effect in both models (*p*-value <.01).[26]

The small firm effect in the postacquisition performance models may arise in part because our postacquisition performance variables capture *changes* in firm performance over time; in particular, the change in ROA may remove some of the effect of time-invariant firm-level factors. In addition, it is important to remember that these results pertain to the variance of postacquisition performance, not the level of performance. Even though firm-level factors may have a large impact on the level of postacquisition performance, if the variance in firm-level factors such as reconfiguration capacity is moderate across firms, we may not observe a large firm effect in our models. In this regard, it is also

[26]Further, in Model 1, the difference between the lower bound 99% confidence interval of the CEO effect (39.4%) and the upper bound 99% confidence interval of the firm effect (9.5%) remains very large, suggesting that these effects differ. In Model 2, the difference between the lower bound 99% confidence interval of the CEO effect (32.1%) and the upper bound 99% confidence interval of the firm effect (3.6%) is also very large, suggesting a difference in these effects.

TABLE 4 Prior studies—variance decomposition of firm performance (ROA)

	(1) Quigley and Graffin (2017)	(2) Hambrick and Quigley (2014)
Year effect	1.6%	2.1%
Industry effect	4.6%	3.2%
Firm effect	***21.1%***	***24.2%***
CEO effect	***21.8%***	***20.4%***
Residual	50.9%	50.2%
R-squared/variance explained	49.1%	49.8%
Relative effect size: CEO/firm	*1.0*	*0.8*
Model p-value	*0.000*	*Not reported*
Observations	*20,348*	*4,866*
Model	*HLM*	*HLM*

Abbreviations: HLM, hierarchical linear multi-level model; ROA, return on assets.

important to point out that our results do not contradict the important findings by prior literature that highlight how firms build reconfiguration capabilities in acquisitions (e.g., Zollo & Singh, 2004; Zollo & Reuer, 2010; Bingham et al., 2015).

It is interesting to compare the results of our decomposition of postacquisition performance with the results of two recent studies that conducted a decomposition of the variance of overall firm performance measured as ROA (Quigley & Graffin, 2017; Hambrick & Quigley, 2014), displayed in Table 4 (we only display the multilevel models used in their studies for comparability reasons). In these studies, the absolute value of the CEO effect is noticeably lower in these models than in ours (20–22% in the two prior studies versus 33–41% in ours). In addition, the size of the CEO effect relative to the firm effect is also substantially lower in these prior studies than in our models. This comparison with prior research suggests that our analyses are not simply capturing the decomposition of the variance of overall firm performance. It also reveals that the CEO effect may be even more important for the performance outcomes of specific strategic initiatives than previous studies of overall firm performance might suggest.

Overall, the finding of a large CEO effect, both in absolute size and relative to the firm effect, in the postacquisition performance decomposition analysis is consistent with our analysis of acquisition behavior. However, we must interpret the results of the postacquisition performance variance decompositions cautiously. As noted earlier, our measures of postacquisition performance cannot disentangle the effects of overlapping acquisitions which occur during the 3-year postacquisition period for a focal acquisition. We also cannot rule out effects on performance of other major strategic decisions such as divestments or new alliances during the postacquisition period. Further, we attribute the CEO effect in postacquisition performance to the CEO who was in place during the year of the acquisition announcement. While it is likely that the CEO is most involved in the formulation of postacquisition strategy and in the implementation during the critical initial postmerger integration period, changes in the CEO during the 3-year period after the acquisition announcement may introduce measurement error in our decomposition analysis of postacquisition performance.

6 | DISCUSSION AND CONCLUSION

The extant literature on acquisitions has highlighted the importance of both firm-level and individual-level factors in shaping acquisition behavior and acquisition performance, but we know little about the relative contribution of firm-level and manager-level drivers in shaping firm acquisition behavior and long-term acquisition performance. In this study, we have endeavored to address these gaps in the literature by conducting a variance decomposition analysis of acquisition behavior and postacquisition performance. In addition, by decomposing the variance of measures of strategic behavior, we add to the literature on variance decomposition in strategy, which thus far has largely focused on decomposing the variance of firm performance.

Our variance decomposition analysis of acquisition behavior documents that while both CEO-level factors and firm-level factors account for a substantial proportion of the variance in the number of acquisitions that firms engage in each year, CEO-level factors account for a significantly larger proportion of the variance. This finding also holds for the variance in acquisition behavior when accounting for the type of acquisitions as well as the quality of acquisitions when measured by investor sentiment. The significantly greater impact of CEO-level than firm-level factors also applies to the variance of acquisition behavior when accounting for relative acquisition size, although both factors comprise smaller portions of the overall variance. Taken together the results suggest that heterogeneity in sourcing and realizing acquisition opportunities is likely to derive to a greater extent from factors at the CEO than firm-level. Thus, factors such as the CEO's human capital or psychological attributes may play a role in determining the strategic acquisition behavior of firms. There may also be other time-invariant factors associated with the tenures of individual CEOs that are reflected in the CEO effect.

Further, we also find that factors at the CEO level are stronger drivers of heterogeneity in postacquisition performance than firm-level factors, although these results have to be interpreted cautiously given the empirical challenges involved in accurately measuring long-term acquisition performance. Nevertheless, it is worth noting that despite anecdotal observations that the involvement of CEOs in the operational implementation of postmerger integration is often limited (Shelton, 2003), we find a large CEO effect on the variance of postacquisition performance. This finding is consistent with the idea that CEOs may play an important role in formulating the postmerger integration strategy and approach, and may also be a consequence of the CEO's impact on the choice of the acquisition target and deal pricing, which inevitably affects the long-term performance of acquisitions.

Our study also contributes to the methodology of variance decomposition in strategic management research. Specifically, we employ multi-level Poisson nonlinear hierarchical modeling to examine the relative contributions to strategic behavior of factors at different levels of analysis. Such models have not yet been used in strategic management research for variance decomposition to the best of our knowledge, and estimating the percentage of variance attributable to each effect requires the derivation of complex formulas that do not appear to be publicly available for a four-level Poisson nonlinear hierarchical model. In the online supplement, we provide the full derivation of the formulas for estimating the percentage of variance attributable to each effect in a four-level Poisson model, thus opening up avenues for further variance decomposition research in other areas of strategy research. For instance, future variance decomposition research could analyze measures of different types of strategic behavior, such as the number of new product introductions, patents, alliances, supplier relationships, or ecosystem complementors. Variance decomposition research could also utilize count variables of performance, such as the number of years of survival subsequent to market entry or an IPO. These are just a few of the potential applications of a four-level Poisson model to better understand the variance of firm behavior and performance in strategic management.

Finally, our analysis may have implications for the literature on dynamic capabilities. As noted earlier, this literature has identified a firm's capacity to engage in acquisitions as a prominent dynamic capability (Bingham et al., 2015; Zollo & Winter, 2002; Bingham et al., 2017), and has identified three general classes of dynamic capabilities—sensing, seizing, and reconfiguring (Teece, 2007). The extant literature has also emphasized that dynamic capabilities stem from factors at both the firm and manager level (see e.g., Adner & Helfat, 2003; Helfat et al., 2007; Teece, 2007). Our study may help to inform future research seeking to understand the relative influence of manager-level versus firm-level factors on sensing, seizing, and reconfiguring. Using publicly available data, it is difficult to directly measure the sensing (identification) of acquisition opportunities and to separate sensing from seizing (acquisition completion), because we do not have data on acquisition opportunities that firms considered but did not pursue or complete. It is also difficult to separate the effects on performance of postacquisition reconfiguration from the effects of sensing and seizing, because postacquisition performance is likely to reflect all three elements. Although the measures in our study cannot fully capture dynamic capabilities, our finding that heterogeneity is more strongly influenced by factors at the CEO level than the firm level for both acquisition behavior and long-term performance suggests that CEO-level factors may be important to consider in future research on heterogeneity in sensing, seizing, and reconfiguring. However, these findings need to be interpreted cautiously and further research is needed in an empirical setting which allows for a cleaner identification of sensing, seizing, and reconfiguring.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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