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Performance metrics in strategy research: A new metric and method for assessing dynamic value

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[Correction added on 09 October 2023, after first online publication: Author name Jared D. Harris has been corrected in this version.]

Abstract

Research Summary: We discuss two research design considerations that jointly influence the choice of financial performance metrics in strategy research: (a) expected temporal payoff of the strategic choice and (b) source of variation invoked in the research design (i.e., within-firm vs. between-firm comparisons). We map existing performance metrics commonly used in the research literature to these considerations, and highlight the lack of performance metrics well suited for the combination of strategies with not-well-defined temporal payoffs and within-firm research designs. To remedy this, we introduce a value partitioning methodology that provides a performance metric we call dynamic value. We apply this methodology and demonstrate how it generates additional insights about how cash holdings affect firm performance.

Managerial Summary: This article introduces the value partitioning methodology for interpreting two distinct elements of stock market valuations: (a) the firm's implied future value from continuing operations in a "steady state" and (b) the market's estimate of dynamic future value associated with the firm's strategic choices or competitive positioning. We describe situations where the latter element is useful for measuring strategy performance. We apply this methodology and demonstrate how it generates additional insights about how cash holdings affect firm performance.

KEYWORDS

corporate investments, financial event studies, firm valuation, long-term returns, sustainable performance

1 | INTRODUCTION

The strategic management literature employs a wide range of metrics to assess how strategy choices affect financial performance and firm value. We focus on two research design considerations that jointly inform how to match performance metrics with the operational implications of the underlying research questions. The first consideration relates to the temporal impact of when a strategic choice expectedly affects firm performance: Is it in a well-defined time period or not? The second consideration relates to the intended comparison or counterfactual in the research design: Does the study intend to compare the performance of firms that adopt a strategy to those that do not (i.e., exploit between-firm variation) or compare changes in a firm's performance after it adopts a strategy (i.e., exploit within-firm variation)? Addressing these questions provides novel implications about how to measure performance in strategic management scholarship.

Although a large body of research focuses on the relative advantages and constraints of accounting-based versus market-based performance metrics (e.g., Custodio, 2014; Fisher & McGowan, 1983; Lang & Stulz, 1994; Wibbens & Siggelkow, 2020), this measurement discussion is generally not well integrated into an overall discussion of research design—especially for studies of investments that influence performance in the future more than the present. By addressing the aforementioned research design considerations directly, we identify the types of questions and research designs aligned with commonly used performance metrics. We also identify the lack of performance metrics that are well suited to assess how strategic choices with not-well-defined payoff periods affect performance within firms.

To remedy this, we introduce a metric of *dynamic value*. The methodology to calculate this metric starts with a firm's equity market capitalization and debt (sometimes called "enterprise value"; e.g., Wibbens & Siggelkow, 2020) and subtracts from it a hypothetical future valuation assuming its current performance continues in steady state. We discuss the motivation for and derivation of dynamic value, as well as the types of strategic actions that this metric is well suited to assess. We then demonstrate its use empirically by extending Kim and Bettis' (2014) research into the value of cash holdings, which focuses on the type of within-firm practice that can have benefits over many different future time periods that are not clearly defined. It therefore represents the type of strategic decision that does not lend itself to an event study but maps well to the use of dynamic value as the dependent variable. We conclude by presenting suggestions for choosing performance metrics based on the nature of the payoff of the strategic choice and the source of variance exploited in the research design.

2 | OVERVIEW OF FINANCIAL PERFORMANCE METRICS

Because a focal line of inquiry in strategic management examines how firms' choices affect performance (e.g., Andrews, 1971; Porter, 1980; Rumelt et al., 1991), a large proportion of empirical studies employ financial performance metrics as dependent variables (Barney, 2020;

Shaver, 2020). Data sources include (a) accounting statements, which produce metrics such as revenue, profits, and return on assets (ROA; e.g., Lovallo et al., 2020); (b) stock market activity, which determines market capitalization and cumulative abnormal returns (CAR; e.g., Feldman et al., 2019); and (c) combinations of both (e.g., Tobin's q divides market value by replacement cost of assets—the latter proxied by accounting data; e.g., DesJardine & Durand, 2020).

Prior literature describes the relative advantages of each type of metric in detail. For instance, accounting metrics draw from audited statements and meet reporting requirements. Standards guide the use of accruals (e.g., when to recognize revenue and depreciation) to capture financial performance within a defined time period, such as a quarter or year (Weygandt et al., 2019). On the other hand, market-based metrics use trading activity by financial investors to indicate a firm's prospects into the future (Lubatkin & Shrieves, 1986). Such metrics rely on theoretical arguments that market prices represent the net present value of future discounted cash flows (Fama, 1970, 1998; Modigliani & Miller, 1958). Both types of metrics are limited by the assumptions needed for them to be useful. For example, one must assume that managers do not manipulate accounting metrics (e.g., Harris & Bromiley, 2007) and that investors' expectations are accurate estimates of future cash flows (De Bondt & Thaler, 1985; Fama, 1970, 1998).

Although prior literature offers extensive discussion about the extent to which these metrics capture underlying economic performance (e.g., Carton & Hofer, 2006; Choi & Wang, 2009; Demsetz & Villalonga, 2001; Liang & Wen, 2006), we highlight two less-discussed conceptual questions about measuring financial performance that have important implications for research design in strategic management—specifically in the selection of performance metrics that are well suited to address the underlying research questions. First, does the temporal impact of a strategic decision expectedly affect performance within a well-defined time period, or within uncertain/variable time periods? Second, does the research design focus on contrasting the performance of heterogeneous firms or estimating how strategic decisions change a firm's performance—such as how such an effect might vary across firms (e.g., difference-in-difference analyses)?[1] The usefulness of specific metrics depends on the answers to these two questions.

With respect to the first question about time periods, accounting data capture what has already happened within a defined time period, and may reflect the impact of strategic actions if they impact firm performance within those defined time periods (Fisher & McGowan, 1983). Market-based metrics can also be used to calculate certain types of firm outcomes over defined time periods (Huang et al., 2017; Steinbach et al., 2017), even though these metrics incorporate investor expectations about future performance that has not yet been observed. The inclusion of such forward-looking expectations also enables scholars to use market-based metrics to gauge performance even if the financial impact of strategic actions unfolds over periods that are variable or not well defined (Wibbens & Siggelkow, 2020). For example, investments in R&D, advertising, or employee training are undertaken with the goal of improved future performance, but there is little clarity or consistency about the amount of time until those improvements can be detected in accounting statements or how long their effects will persist. However, as we will elaborate later, there are inherent challenges in matching such strategic decisions to the relevant time period for assessing outcomes.

With respect to the second question about research design, strategy scholars often design research to contrast performance across many heterogeneous firms (e.g., Certo et al., 2017). This approach motivates the common use of scaled performance metrics. If all firms are identically

[1]An equivalent way to phrase this question is whether the research design relies (a) solely on between-firm variation or (b) within-firm variation (i.e., whether or not it examines between-firm variation of the within-effect).

sized, scaled and unscaled comparisons are equivalent. Therefore, scaling is important only when trying to account for heterogeneity in firm size. For example, earning $1 in profit with $10 of assets is not equivalent to earning $1 in profit with $100 of assets.[2] Nevertheless, scaled variables can produce several distortions—especially when the denominators are small (Certo et al., 2018; Wiseman, 2009). Moreover, regression coefficients of scaled variables capture marginal effects on the scaled variable, not the underlying performance metric. As a result, negative marginal effects of scaled variables can indicate that firms are moving from highly profitable to less profitable investments—but not necessarily that firms are undertaking unprofitable investments (Brealey et al., 2006, 2012; Shapira and Shaver, 2014). Studies that instead focus on within-firm variation (i.e., assessing how changes in a strategic variable relate to changes in firm performance), can often accurately measure the impact of strategic choices without using scaled performance metrics.[3] This observation holds for research questions designed to assess if within-effects vary across types of firms or over time. For example, do changes in employee training have a different effect on changes in profits for knowledge-intensive firms, compared with nonknowledge-intensive firms? Or do changes in employee training have a different effect on changes in profits across different decades?

Table 1 maps commonly used performance metrics along these two dimensions. The horizontal dimension reflects the temporal period for assessing the impact on performance, while the vertical dimension reflects whether a metric is scaled. Formulas for each metric are included as Table A1.

2.1 | Unscaled time period-defined metrics

Familiar accounting metrics such as *revenue* and *profit* are quintessential examples of unscaled metrics that capture what a firm has accomplished in a previous defined time period. *Economic value added* makes further adjustments intended to contextualize firm performance. Professional consultancies offer firms a large number of customizable adjustments in their proprietary work, with the most common and important adjustment capturing a charge for a firm's cost of capital.

Wibbens and Siggelkow (2020) develop an unscaled metric of *long-term investor value appropriation* (*LIVA*) that offers a way to assess value creation over longer time periods than typical accounting metrics. The LIVA technique helps to reflect the multidimensionality of firm performance in relation to strategic choices (Barney, 2020; Kaplan, 2020) by offsetting some of the shortcomings with existing metrics. It settles up changes in market capitalization over past time periods and is bolded in Table 1 because its derivation combines accounting and market-based data. Similarly, *value capture and appropriation* belongs in this quadrant of Table 1 in bold because it uses a combination of accounting and market-based data to measure a firm's incremental change in value from one period to another (Lieberman et al., 2017, 2018).

[2]Instead of scaling, an unscaled variable could be used as a dependent variable in a regression that controls for size. As shown in Table 2, unscaled dependent variables are uncommon in strategy research. One reason could be that controls for size (e.g., assets) correlate with many independent variables of interest (e.g., R&D spending), which can lead to unstable coefficient estimates because they both capture the latent effect of size (e.g., Kalnins, 2018).

[3]Because within research designs examine changes on changes, this will often mitigate the correlation between potential control variables. For example, assets and R&D spending are often highly correlated. However, changes in assets and changes in R&D spending are generally less highly correlated and less likely to capture the latent effect of size as in between research designs.

TABLE 1 Classification of performance metrics.

	Temporal period of investment's impact on performance	
	Precisely defined (based on observed performance)	**Flexible (based on expectations of future performance)**
Unscaled metric	Profit Revenue Economic value added (EVA) **Long-term investor appreciation (LIVA)** **Value created and appropriated (VCA)**	*Market capitalization* **Dynamic value**
Scaled metric	Return on assets (ROA) Return on equity (RrOE) Return on sales (ROS) Return on investment (ROI) Research quotient (RQ) Revenue growth rate Output growth rate *Total shareholder return* (*TSR*) **Implied discount rate (IDR)**	**Tobin's q** **Market/Book** *Cumulative abnormal returns* (*CAR*) *Buy-and-hold abnormal returns* (*BHrAR*) **Price–earnings ratio (PE)** Growth option

Note: Standard text reflects accounting-based metrics. Italicized text reflects market-based metrics. Bold text reflects both market based and accounting based.

2.2 | Scaled time period-defined metrics

To facilitate comparisons across firms, many scaled metrics have been developed with profit as the numerator. ROA scales profits by a firm's assets, return on equity scales profits by equity, return on sales scales profits by sales (or revenue), and return on investment scales profits by a firm's entire capital base. Each of these scaled metrics uses a different basis for normalizing profits based on a firm's size. While this facilitates comparisons across firms, the choice of scaling denominator can have a strong influence on results. For example, ROA will typically be lower in capital-intensive industries (e.g., mining) than low-capital industries (e.g., software development).

Growth rates are another way of scaling metrics, by using the past performance of the same metric in the denominator. When studies compare growth rates across firms, they combine the between and within effects into a single metric. Revenue growth is commonly used, especially for entrepreneurial firms that have not yet become profitable. All of these scaled metrics require precisely defined time periods in order to calculate them.

We note an example of a metric designed specifically to accommodate between-firm designs. The underlying logic of *research quotient* (Knott, 2008, Knott & Vieregger, 2020) captures the returns, in terms of output growth, of a firm's R&D spending. If this were the final metric, research quotient would fit in the upper left quadrant of Table 1, as it uses a within-firm research design based on observed data from precise time periods. However, research quotient takes the second step of scaling its metric across firms using a normalization procedure similar to the computation of intelligence quotient. As a result, the final version of research quotient belongs in the lower left quadrant as a metric that is most useful for between-firm research designs.

Another metric designed for between-firm comparisons is the *implied discount rate* (Sampson & Shi, 2023), which uses estimates of a firm's cost of capital to compute the relationship between a firm's current stock price and its expected future returns (including dividends and stock appreciation). The use of a scaled metric to make between-firm comparisons calls for inclusion in the lower left quadrant of Table 1. Research quotient and the implied discount rate are less direct performance metrics than traditional metrics such as ROA, but similar to Tobin's q, their intended interpretation is that higher values will be observed for firms perceived to have higher future growth potential.

2.3 | Scaled forward-looking metrics

Tobin's q combines accounting and stock-based metrics into a scaled metric that facilitates comparisons across firms, by dividing a firm's (forward-looking) market capitalization of equity and debt by its asset base (a backward-looking accounting metric). This construction facilitates cross-sectional performance comparisons by minimizing the effects of size and emphasizing future expectations relative to the present. Whereas practitioners often accomplish these goals with *price-to-earnings* (*PE*) ratio, research scholars favor Tobin's q because its use of assets in the denominator (instead of earnings) reduces (but does not eliminate) the potential for misleadingly atypical values. *Market-to-book* ratio is a simplified version of Tobin's q that gets used frequently by both scholars and practitioners (Wernerfelt & Montgomery, 1988).

Event studies are designed to capture the change in market capitalization over a short period of time—typically a few days—surrounding the announcement of a major corporate decision or strategic initiative (e.g., acquisitions, alliances, or major product announcements). They typically compute CAR by comparing before-announcement and after-announcement market capitalizations, adjusted for the market performance of a relevant peer group over the same time period. CAR is scaled by the before-announcement market capitalization and computes how investors initially perceive the value of an announced strategy by calculating a firm's relative change in market capitalization (Lubatkin & Shrieves, 1986; McWilliams et al., 1999; Park, 2004). Returns from continuing operations that were expected prior to the announcement are differenced out with this approach.

As an alternative to CAR, scholars also use *buy and hold abnormal returns* (*BHAR*) to capture longer-term performance (Chatterjee et al., 2003; Meyer-Doyle et al., 2019; Rabier, 2017), such as evaluating an acquisition 3 years after it occurred. BHAR follows the logic of CAR in measuring the difference between a firm's stock returns and the expected returns of a reference portfolio, but instead of relying on investors' immediate perceptions about the future value of an event, BHAR allows time to pass and some results to be observed by investors (Meyer-Doyle et al., 2019). It uses percentage increases in stock returns to provide scaled comparisons across firms. Scholars have observed that BHAR can lead to measurement inconsistencies and biases if the reference portfolio lacks validity (Lyon et al., 1999).

Total shareholder return (*TSR*) computes the percentage change in market capitalization, including hypothetically reinvested dividends, over a certain time period. It therefore measures the change within a specified time period regarding future expectations for the firm. As such, it attenuates the future orientation of market capitalization (i.e., a firm that investors consider to have high future potential can still have a negative TSR if those expectations decline over time). TSR is also sensitive to the choice of time periods, and may yield anomalous results if time periods are arbitrary. Such a drawback makes sense given the derivation of the metric based on the perspective of investors, who have nonarbitrary timepoints at which they buy and sell a firm's stock. Consequently, the design of TSR facilitates cross-sectional comparisons to other investment opportunities over the same time period.

Finally, the real options literature has developed a metric of *growth option value* that isolates different contributing effects to a firm's overall market capitalization. This corresponds closely to our interest in interpreting investor expectations as revealed in market capitalization to assess ongoing strategic initiatives, but because this metric is designed as a scale, it contributes to comparisons across firms more directly than within firms over time.

2.4 | Implications

Table 1 helps to identify when performance metrics are well-suited, contingent on the question asked and the research design to answer the question. Metrics in the left column are aligned with investigating the impact of strategic decisions that have well-defined temporal payoffs. In contrast, metrics in the right column are well-suited to strategic decisions that have impact at unspecified or variable time periods (e.g., looking into the future). The metrics on the bottom row are useful for comparing potentially heterogeneous firms, and, therefore, studies that rely on between-firm variation to identify coefficient estimates. However, when studies rely on within-firm variation (as in studies that employ firm fixed effects and examine how changes within firms affect performance), unscaled metrics may be preferred. A focus on within-firm effects mitigates the need for scaling because data are compared over time from a single firm rather than heterogeneous firms (cf., Certo et al., 2017). In this scenario, unscaled metrics avoid introducing the aforementioned distortions (Certo et al., 2018; Wiseman, 2009).

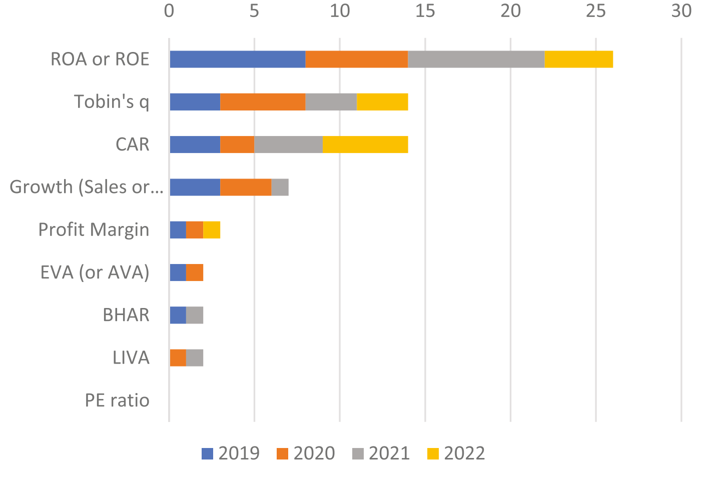
We draw two insights from this table. First, the table reinforces why certain performance metrics are frequently employed to address certain questions. For example, studies that examine how diversified companies perform versus nondiversified companies rely on between-firm variation. Therefore, scaled variables are useful to address this question. Determining whether a scholar cares about current or future performance helps guide their choice of ROA versus Tobin's q as the metric of choice. Unsurprisingly, these metrics are heavily used in strategy research (e.g., DesJardine & Durand, 2020; Surroca et al., 2020; Villalonga, 2004). Another example is the use of CAR in studies of acquisition performance (e.g., Blagoeva et al., 2020; Feldman et al., 2019). Many of these studies use between-firm variation to identify their empirical estimates. For example, do firms making related acquisitions perform better than those making unrelated acquisitions? Because it is difficult to define precisely when acquisitions impact performance, it can be beneficial to use a forward-looking metric. In addition, because the conclusions regarding this question rely on comparing different firms' strategies, scaling is advantageous. Such motivations reinforce the usefulness of CAR to study this question.

Second, Table 1 highlights a sparsity of metrics in the upper-right quadrant—only market capitalization resides there. However, as given in Table 2, strategy research rarely uses this metric, whereas papers published in the *Strategic Management Journal* from 2019 to 2022 repeatedly used ROA, Tobin's q, and growth metrics. We infer that additional metrics in the upper-right quadrant would make it easier to address research designs that focus on within-firm variation of strategies with notpayoff periods.

TABLE 2 Count of dependent variables in *SMJ*, 2019–2022.

Dependent variables	2019	2020	2021	2022	Total
ROA or ROE	8	6	8	4	26
Tobin's q	3	5	3	3	14
CAR	3	2	4	5	14
Growth (Sales or output)	3	3	1	0	7
Profit margin	1	1	0	1	3
EVA (or AVA)	1	1	0	0	2
BHAR	1	0	1	0	2
LIVA	0	1	1	0	2
PE ratio	0	0	0	0	0
Number of empirical articles	72	75	75	83	305
Total articles	90	92	91	99	372

Abbreviations: CAR, cumulative abnormal returns; EVA, Economic value added; LIVA, Long-term investor appreciation; PE, price-to-earnings ratio; ROA, return on assets; ROE, return on equity.



What types of strategic investments can be evaluated by metrics in the upper-right quadrant? Such metrics are well-suited to leverage within-firm research designs that might analyze investments with expected performance effects at an unspecified future point—that is, investments that firms typically undertake in the normal course of business and not only part of a distinct, high-profile event. Examples of investments that would meet these criteria include R&D (Bromiley et al., 2017), capital expenditures (Souder & Bromiley, 2012), employee training (Campbell et al., 2012), or marketing—especially for brand building (Vomberg et al., 2015). Initiatives that promote sustainability or corporate social responsibility might also meet these criteria as investments that take time to payoff and occur with sufficient variation over time for valid within-firm research designs (Durand et al., 2019; Flammer, 2015).

We also draw attention to a limitation on market capitalization—the only performance metric in the top right quadrant of Table 1. In addition to capturing how firm investments might change future performance, market capitalization changes in response to quarterly or annual reports of past performance (Skinner & Sloan, 2002; Womack, 1996; Zhang & Gimeno, 2016). To capture the impact of future-oriented strategic investments, we isolate the former effect from the latter through a partitioning methodology and derive a new metric called *dynamic value*.

2.5 | Partitioning approach measuring a firm's dynamic market value

We propose that market values can be partitioned into two distinct and identifiable metrics. The first, called *steady-state value*, represents a thought experiment that can be quantified through the methodology described below. It allows us to construct the second metric—dynamic value—in a way that better isolates the future impact of strategic investments by firms. We are ultimately interested in dynamic value, but an understanding of this metric requires a full explanation of steady-state value. Our methodology builds on the logic underlying event studies, with the additional advantage that it can be generalized beyond discrete events to accommodate research questions about routine investments.

We could follow the event study approach to derive a nonscaled metric of market reaction to strategic investments. However, its usefulness would be limited to assessing strategies that have discrete timing and are significant enough to generate an "event announcement," and not for strategic initiatives that are part of a firm's routines rather than event-driven. Moreover, rare discrete investments often suggest between-firm comparisons and are not ideal sources of variation in within-firm research designs. Partitioning overcomes some of the aforementioned drawbacks of event studies by emphasizing ongoing investment routines within firms.

Our methodology isolates expectations about how a firm and its environment will change, based on an accounting technique that describes the relationship between a firm's market value and book value. Ohlson's (1995) abnormal revenue model uses the perpetuity concept to derive the terminal value of a firm's investments under the assumption that they continue indefinitely. We derive the value attributed from the continuation of the firm's operating performance, calculating a perpetuity value by dividing current cash flows by a rate of return.

Consistent with Fama (1970), we conceptualize a firm's *expected* future performance as the portion of its market value that deviates from the implied value of performance that has already been achieved. To partition the value attributed to expected long-term performance, we start with the firm's "enterprise value," defined by Bhojraj and Lee (2002) as the total market value of equity market capitalization plus debt.[4] This metric provides a fair, complete, and unbiased estimate of the firm's total value.

In Equation (1) below, we partition the market capitalization of equity and debt into three components. First, we recognize that a firm's cash and marketable securities have a known value reported on a firm's balance sheet. Such value is entirely liquid and exists independently of the firm's operations or future potential. Other current assets (such as accounts receivable) and current liabilities (such as accounts payable) reflect known obligations generated in the past, and we therefore define *net current assets* (Carson, 1949; DeFond & Park, 2001) as one component of a firm's value. In practice, net current assets can be calculated directly from amounts that appear on a firm's balance sheet. This component is included solely for bookkeeping purposes and has no relevance for partitioning, so we rearrange terms to place net current assets on the left side of the equation. We denote an error term because future expectations

[4]Because the book value and market value of debt are ordinarily similar, Bhojraj and Lee (2002) are among many scholars who treat them as equivalent.

cannot be measured precisely. The two terms on the right side of the equation are explained in detail below:

$$V_{it} - \mathrm{NCA}_{it} = \mathrm{SSV}_{it} + \mathrm{DYV}_{it} + e \tag{1}$$

where, V_{it}, value (equity market capitalization plus debt) of a firm at a given time; NCA, net current assets (i.e., current assets minus current liabilities); SSV, steady-state value (i.e., continuation of current cash flows in perpetuity); DYV, dynamic value (i.e., future change in cashflow as compared with steady state); e, stochastic error; i, individual firm; t, time.

We calculate steady-state value based on an asset valuation practice commonly used to model terminal values for stocks, government bonds, and real estate (Daley, 1984; Gjesdal, 2004; Krouse, 1972), using the perpetuity formula for a stream of cash flows equal to those already achieved by the firm, discounted to present value (Brealey et al., 2012).[5] The steady-state value is not a prediction that a firm's conditions will remain constant, but rather a benchmark assessment of firm value if they did. Steady-state value is intended as a "money-machine" thought experiment that ignores *how* a firm generates its cash flow or *whether* cash flows can be sustained, and simply computes the perpetuity for an amount of money equal to a firm's cash flow. Because the thought experiment is indifferent about the source of the money, we ignore firm-specific information to define the required return (i.e., the required return is constant across firms).[6] Equation (2) provides the perpetuity formula.

$$\mathrm{SSV}_{it} = \frac{1}{\mathrm{R\%}} * \mathrm{CF}_{\mathrm{it}} \tag{2}$$

where, CF, cash flow; R%, required rate of return.

By construction, neither net current assets nor steady-state value incorporate any departure from current operations. All expectations about unknown future changes in the firm's cash flows, *relative to current levels*, are isolated in the dynamic value term. To the extent a firm's market value exceeds or falls short of the benchmark established by the sum of net current assets and steady-state value, the remaining difference can be interpreted as a market-based estimate of the as-yet-unseen future value of a firm. In this partitioning of firm value, all investor expectations of future changes—for example, firm-specific growth expectations, competitive dynamics, perceived riskiness of the firm, managerial foresight and adaptability, and so forth—are carried in the dynamic value term and not in the benchmark steady-state value.

Dynamic value can therefore be interpreted as the expected future return on firm investments that are not currently reflected in profit levels—that is, a firm's implied future value attributable to departures from current profit levels, presumably based on the suitability of the firm's investments relative to changes in the competitive environment. This is essentially

[5]As we describe the general methodology, we do not specify how to operationalize each construct. We will specify an internally consistent set of operationalizations below in an empirical demonstration of the insights available from using the partitioning methodology. The partitioning of cash flows can also be found in O'Brien (2003). Our approach differs because we define SSV as a constant into perpetuity instead of increasing at a constant growth rate.

[6]Steady-state value is similar but not identical to the practitioner notion of "intrinsic value." The key distinction is that intrinsic value tries to capture firm-specific risk in the required rate of return (e.g., by multiplying a firm's beta times an equity risk premium), whereas steady-state value is constructed to eliminate all firm-specific information except the amount of cash flow. We note that the choice of discount rate affects the nominal calculation of steady-state value—a point we discuss later.

the metric by which scholars typically wish to evaluate major strategic decisions ex ante. We can obtain a firm's dynamic value by subtracting net assets and steady-state value from its overall market value. We then rearrange terms to solve for dynamic value in Equation (3) and isolate this value from the steady-state benchmark:

$$\mathrm{DYV}_{it} + e = \mathrm{V}_{it} - \mathrm{NCA}_{it} - \mathrm{SSV}_{it} \tag{3}$$

Calculating dynamic value as the residual makes sense because it is the unobserved term. All the terms on the right side of Equation (3) can be estimated from stock prices and accounting statements. This arrangement of terms makes it clear that the residual value comprises dynamic value plus all the noise captured by an error term. Such an error term will include the frictions mentioned above—such as the biases of investors or the herd behavior seen in bubbles, manias, and panics—in addition to the measurement error associated with expectations about uncertain future outcomes, which vary widely. To the extent such expectations persist or are specific to individual firms, the within-variation research design suited to this metric mitigates these effects. Other terms may not be devoid of measurement error, particularly if managers willfully distort accounting reports, but they have conventionally been taken at face value. Dynamic value provides a stronger signal of expectations about as-yet-unseen future value than the firm's market capitalization (even when contextualized by a denominator as in Tobin's q or price–equity ratio) because it subtracts out a value derived from the already seen. In other words, dynamic value isolates the available “wisdom of crowds” to capture a stronger signal about a firm's future prospects even though this term also carries all of the noise.

There is no inherent reason to expect a direct correlation between a firm's steady state and dynamic value. Firms can choose whether or not to perform routine maintenance and how much to invest in various growth initiatives. These choices will influence the two terms in ways that vary by category. By definition, R&D expenses reduce current cash flows (and thus have a negative correlation with steady-state value) but are expected to create growth and thus correlate positively with dynamic value. Capital expenditures are also expected to have a positive correlation with dynamic value, but because of depreciation rules, might have little effect on steady-state value. Successful training sessions or advertising campaigns could conceivably increase both types of value by successfully motivating customers to buy more products today and sustain their loyalty to the product in the future.

Moreover, although a firm's future profits are unknown, investor expectations about those profits are not random. These expectations reflect a variety of factors, many of which involve speculative judgments, such as anticipated increases or decreases in competition, potential advances in technology, or beliefs about the quality of a firm's managers (McGahan, 1999; Sanders & Boivie, 2004). However, the level of current profits also influences market valuations without requiring speculation (Amit & Wernerfelt, 1990; Cho & Pucik, 2005), as seen when firms experience major changes in valuation when actual profits depart significantly from prior expectations (Skinner & Sloan, 2002; Womack, 1996; Zhang & Gimeno, 2016).

Fittingly for a metric that partitions expectations about future value, differences in discount rates reflect the time value of money. As a result, the choice of discount rate affects the nominal calculation of steady-state value. We recognize that discount rates are often defined to incorporate the perceived risk of the underlying asset generating the cash flows being discounted (e.g., Brealey et al., 2006). For the within-firm research designs aligned with analyzing dynamic value, nominal steady-state values are compared for a firm over time, but not across firms. As long as a firm's riskiness does not change, the comparison over time is straightforward. If firm riskiness changes, then dynamic value will also change—and in a way consistent with what we wish to measure. For example, if a firm action increases the certainty of achieving its previously expected cash flows, this reduces risk and hence increases firm value. Assuming the same underlying future cash flow and a standard discount rate, steady-state value would not change. However, with an increase in firm value and no change in steady state value, dynamic value increases. As a result, the forward-looking dynamic value captures changes in firm-specific risk.

2.6 | Using dynamic value to extend a prior study[7]

Now that the derivation of dynamic value has been explained, it is useful to illustrate how it enhances empirical modeling in strategy. To do so, we replicate and extend the work of Kim and Bettis (2014), who study the effect of a firm's cash holdings on performance. Cash management is the type of within-firm routine practice that can reflect strategic decisions but typically does not lend itself to an event study. Presumably, the benefits of holding cash could be realized over different future time periods (i.e., the temporal payoff is not well defined). Therefore, a research design with dynamic value as the dependent variable maps well to this question.

Kim and Bettis (2014) show a positive relationship between cash holdings and firm performance, measured as Tobin's *q*.[8,9] Although our analysis replicates their original results when we follow their approach, dynamic value brings further precision to their findings because dynamic value estimates the future benefit of holding cash more directly than metrics that lump steady state and dynamic values together.

Following the methodology described by Kim and Bettis (2014), we reproduce nearly identical descriptive statistics (see the Appendix S1). Table 3 presents the results from Kim and Bettis (2014) and our regression results using their specification on the nearly identical sample. We wish to highlight the similarity of the coefficient estimates and standard errors. This ensures that when we change the performance metric to dynamic value and focus on within-firm analysis, any differences in interpretation do not result from differences in the sample. Because the empirical approach chosen by Kim and Bettis uses both within-firm and across-firm variation to identify coefficient estimates, their use of a scaled performance metric (Tobin's q) matches an expectation for more variation across firms than within firms over time, and matches their aim to compare effects across large and small firms.[10] However, it is also possible that a firm's strategy to hold more cash reflects a within-firm objective to accumulate slack resources that provide some adaptability toward

[7]In the interest of brevity, we omit much detail of Kim and Bettis (2014) and focus on illustrating how dynamic value adds insight to traditionally employed metrics. As described in Table A1, we took care to replicate the original results before introducing the dynamic value metric.

[8]Kim and Bettis (2014) also examine if the effect of cash on Tobin's q is quadratic and varies by firm size. Replicating the linear relationship serves our goal to apply dynamic value and compare it to existing research. It also avoids the empirical complication that within estimators that estimate specifications with quadratic effects and interactions cease to be true within estimators (Shaver, 2019).

[9]The substantive question explored by Kim and Bettis (2014) references a debate about whether the firm's value can change more positively from deploying more cash in operating investments or storing more cash as a slack resource to buffer against future downturns. (e.g., Bourgeois, 1981; Deb et al., 2017; Devers et al., 2007; Iyer & Miller, 2008; Jensen, 1986; Levinthal & Wu, 2010; Nohria & Gulati, 1996; Roll, 1986; Singh, 1986).

[10]The empirical approach utilizes between and within variation because the data setup includes observations of many firms across many years and the Prais–Winsten technique is not a within-estimator. Rather, Prais–Winsten takes into account that the error structure in the data is AR(1). Therefore, the coefficient estimates are determined by both variation across firms and within firms over time (Prais & Winsten, 1954).

improving a firm's future performance (Cyert & March, 1963; Deb et al., 2017). Dynamic value offers a way to assess this within-firm effect more directly, whereas Kim and Bettis emphasize comparison of outcomes across firms, contingent on each firm's cash holdings. Similar to employee training or R&D, holding cash is the type of routine decision that could influence investor perceptions about a firm's future potential, but is not associated with a discrete event that would enable use of an event study. This argument suggests that dynamic value has relevance as a performance metric for assessing the value of cash holdings.

In Column 1 of Table 4, we introduce an analysis of cash holdings and performance using dynamic value. As described in the motivation for our approach, unscaled metrics are especially useful for within-firm analyses. For this reason, we alter the empirical approach used by Kim and Bettis (see the Appendix S1). To estimate within-firm effects, we employ a linear estimator with firm and year fixed effects.[11] We first discuss these results and then walk through a series of incremental changes in measurement and model specification from Kim and Bettis' analysis to help establish what leads to the differences in estimates (Bettis et al., 2016).

Turning to the results in Column 1, we find a negative coefficient estimate for cash holdings with a relatively large *p*-value ($p = .48$). Kim and Bettis report a positive coefficient estimate of cash with small *p*-value. As a result, we do not replicate their result with dynamic value as the dependent variable. To aid discussion of dynamic value, we draw attention to two other variables in the original analysis that are strategic choices to increase firm value: R&D and advertising spending. Once again, we find different results. Whereas Kim and Bettis find a positive coefficient estimate for the effect of R&D on Tobin's q with low *p*-value ($p = .02$), we find a positive coefficient estimate for the effect of R&D on dynamic value with greater *p*-value ($p = .52$). Also, Kim and Bettis find a negative coefficient of advertising on Tobin's q with large *p*-value ($p = .98$), whereas we find a positive coefficient for the effect of advertising on dynamic value with relatively small *p*-value ($p = .03$).

Because the dependent variable and source of variation to identify coefficient estimates both differ between our replication and the original analysis, we systematically step through these differences to understand what leads to the change in results. The original paper uses both across- and within-firm variation to identify coefficient estimates, whereas our replication uses only within-firm variation. In Column 2, we present results that keep Tobin's q as the dependent variable and use the same (scaled) independent variables as in the original study, but estimate the specification with firm and year fixed effects. This keeps the original analysis and only changes the source of variation to identify the coefficient estimates.[12] In comparing these results to the original, we find that cash continues to have a positive coefficient estimate with low *p*-value; however, the magnitude of the effect is about 15% smaller. These results show that as companies hold more cash, their Tobin's q increases. Also, note that the coefficient estimates of R&D and advertising are both negative with large *p*-values. It appears that the R&D result in the original paper reflects that within an industry, high R&D spending firms have higher Tobin's q (i.e., cross-sectional variation within an industry identified the effect). However, our specification does not find that a firm's Tobin's q increases when it increases its R&D spending.

In Column 3, we move away from the scaled metric of Tobin's q and use market capitalization of equity and debt as the dependent variable. We continue to focus on within-firm variation and estimate a similar model to that in Column 2. Comparing these results to Column 2 helps assess the extent to which scaling changes the interpretation of results. The effects of

[11]Our specification differs from the original in that we remove the independent variable that measures cash flow because dynamic value is measured by subtracting a linear transformation of cash flow from enterprise value.
[12]The original analysis included industry fixed effects that are absorbed by the firm fixed effects in this analysis.

TABLE 3 Comparison of Kim and Bettis (2014) results with our replicated sample (*using Prais–Winsten regression with Robust standard errors*).

	Results from Kim and Bettis			Results from current sample		
Dependent variable: Tobin's q	**Coeff.**	**SE**	***p*-Value**	**Coeff.**	**SE**	***p*-Value**
R&D (scaled by net sales)	0.65	0.28	0.020	0.67	0.27	0.013
Advertising (scaled by net sales)	−0.01	0.38	0.980	−0.02	0.41	0.961
CAPEX (scaled by total assets)	1.65	0.13	0.000	1.65	0.12	0.000
Growth (ln(sales t/sales $t-1$))	0.36	0.03	0.000	0.35	0.03	0.000
Cashflow (scaled by total assets)	0.31	0.24	0.200	0.30	0.24	0.200
Leverage (scaled by total assets)	0.44	0.18	0.010	0.45	0.17	0.010
Absorbed (NWK) (scaled by total assets)	0.11	0.12	0.360	0.12	0.11	0.281
Absorbed (SG&A) (scaled by net sales)	0.00	0.00	0.090	0.00	0.00	0.102
Size (Natural log of total employees)	0.01	0.01	0.060	0.01	0.01	0.048
Cash (scaled by total assets)	2.11	0.13	0.000	2.08	0.13	0.000
Constant	0.83	0.22	0.000	1.03	0.23	0.000
Industry fixed effects	Yes			Yes		
Year fixed effects	Yes			Yes		
Observations	63,103			63,089		
R^2	0.16			0.17		

Note: *p*-Values are based on two-tailed tests.

cash holdings and R&D remain consistent across columns; however, the coefficient estimate for advertising in Column 3 flips to positive with a smaller *p*-value ($p = .07$). Overall, the unscaled metric of market capitalization did not substantially affect the interpretation of the results.

Column 4 uses the same specification as Column 3 but employs dynamic value as the dependent variable. (It differs from Column 1 by excluding cashflow in the specification.) We do not observe material differences between the results in Columns 1 and 4. Therefore, we focus on how moving from market capitalization to dynamic value alters the results (Column 3 compared with Column 4). Recall that dynamic value removes the perpetuity value of current cash flow from the firm's valuation. This approach has notable effects on the estimates. First, the coefficient estimate of cash becomes negative with a large *p*-value ($p = .64$). Our interpretation is that investors place value on cash being held by a firm, but place little value on cash as an unspecified means to increase future earnings not associated with current performance.[13] Second, we note that when dynamic value is the dependent variable rather than market capitalization, the coefficient estimate for R&D changes from negative to positive, though with large *p*-value ($p = .52$), while the coefficient estimate for advertising increases in magnitude with smaller *p*-value (.02). This is consistent with our expectation that dynamic value is better suited to measure the future impact of strategic investments that reinforce current performance.

[13]The stronger relationship between cash and market capitalization (as compared to cash and dynamic value) could be explained if companies tend to replenish their cash holdings when they have greater cash flows. The within estimator could capture this "reverse–causality" relationship.

TABLE 4 Within firm analysis comparing dynamic value, Tobin's q, and market capitalization of equity and debt.

Dependent variable	Model 1 Dynamic value Unscaled			Model 2 Tobin's q Scaled			Model 3 Market capitalization Unscaled			Model 4 Dynamic value Unscaled		
Independent variables	Coeff.	SE[a]	*p*-value	Coeff.	SE[a]	*p*-value	Coeff.	SE[a]	*p*-value	Coeff.	SE[a]	*p*-value
R&D	1.40	2.19	.524	−0.14	0.46	.760	−0.86	1.64	.600	1.42	2.22	.523
Advertising	9.22	4.27	.031	−0.88	0.66	.185	6.59	3.60	.067	9.70	4.25	.023
CAPEX	−3.11	0.77	.000	2.26	0.17	.000	2.31	0.86	.007	−2.43	0.77	.002
Growth (sales t − sales $t-1$)	−0.24	0.13	.067	0.45	0.04	.000	−0.05	0.10	.595	−0.17	0.13	.196
Cashflow				0.53	0.28	.061	4.62	0.66	.000	−1.39	0.55	.012
Leverage	0.19	0.21	.377	0.39	0.20	.049	−0.44	0.22	.047	0.22	0.22	.329
Absorbed (NWK)	−1.65	0.35	.000	0.28	0.14	.040	−1.57	0.51	.002	−1.69	0.37	.000
Absorbed (SG&A)	0.22	0.80	.786	0.00	0.00	.002	2.51	0.59	.000	0.47	0.83	.570
Size (total employees)	11.67	21.59	.589	−0.19	0.02	.000	−24.68	21.46	.250	10.29	21.95	.639
Cash	−0.64	0.91	.481	1.75	0.14	.000	1.88	0.61	.002	−0.42	0.87	.635
Constant	−549.72	177.50	.002	0.81	0.08	.000	−512.95	171.43	.003	−603.31	181.53	.001
Industry fixed effects	No			No			No			No		
Firm fixed effects	Yes			Yes			Yes			Yes		
Year fixed effects	Yes			Yes			Yes			Yes		
Observations	63,089			63,089			63,089			63,089		
R-squared	0.14			0.08			0.75			0.15		

[a]Robust SE.

Market capitalization does not isolate this effect because it confounds this relationship with the relationship that increased R&D or advertising spending, by definition, depletes cash.

In summary, it appears that the differences in our analysis compared with Kim and Bettis reflect the following substantive conclusions. The loss of the effect of cash holdings suggests that it correlates with investor valuation of current cash flow, which is not captured by dynamic value. The loss of the effect of R&D reflects that the estimate in the original analysis captured cross-sectional variation in companies within industries. Finally, the appearance of the effect of advertising reflects that dynamic value is able to focus on future performance expectations and mitigates the relationship that advertising expenditures will lower current performance.

3 | DISCUSSION

3.1 | Importance of a more focused dependent variable

We return to an observation about two control variables in Kim and Bettis (2014): R&D and advertising spending. Our analysis in Table 3 confirms a positive association between R&D and Tobin's q (p-value of .02 in the original study and .01 in the replication), but finds no discernible association in Table 4 when we switch to the unscaled metrics of dynamic value (p-value of .41) or market capitalization of equity and debt (p-value of .68). This may appear surprising because the nature of R&D implies value in the future rather than the present. However, R&D also represents speculative investments that may or may not prove fruitful. Whereas the observed relation between R&D and Tobin's q captures a between-firm effect that investors perceive greater future potential from firms with higher R&D intensity, the lack of a discernible within-firm effect on dynamic value or market capitalization suggests that incremental increases in R&D do not inherently raise prospective investor valuations. Nevertheless, we note that the effect size (1.75) is positive, which leads us to conclude that some firms likely see relationships between R&D and dynamics value—but not all firms.

For advertising expenses, we find evidence of a positive association with dynamic value ($p = .03$, Column 1 of Table 4), even though the original study did not report a discernible effect ($p = .98$, Column 1 of Table 3). In this case, investors do not perceive value across firms with regard to the overall level of advertising spending—implicitly treating firms as having developed their advertising strategy endogenously. But from a within-firm perspective, higher valuations are seen in response to incremental increases in advertising, perhaps because investors perceive the firm's need for additional advertising to reflect increased future demand. It is also worth noting that the effect is more pronounced for dynamic value than for market capitalization ($p = .13$, Column 2 of Table 4), because the partitioning approach helps to isolate the future impact of such strategically important effects from the overall valuation level associated with the firm's history. As such, we contend dynamic value more closely captures the theoretically intended dependent variable from Kim and Bettis (2014) than does market capitalization or Tobin's q.

Moreover, because value partitioning does not rely on discrete events, the value partitioning approach generalizes the reasoning behind event studies to have applicability to the broad categories of strategic initiatives that unfold over time or exist in the absence of an "event"-inducing shock that appreciably influences the firm's overall equity valuation. In the absence of an identifiable event, scholars must turn to other performance metrics, and we propose that dynamic value offers beneficial attributes relative to existing metrics.

3.2 | Advantages of dynamic value over valuation ratios

Common valuation metrics such as PE ratio and Tobin's *q* use division to contextualize a firm's future in relation to its current productivity or size (Henderson et al., 2012; e.g., Lenox et al., 2010). The value partitioning methodology instead uses subtraction to *isolate and quantify* expectations about how the firm's competitive positioning and strategic investments will lead the firm to improve or decline by separating out a steady state benchmark. Subtraction avoids the measurement anomalies that can arise with ratios, particularly when the denominator has values near or below zero (Bartlett & Partnoy, 2018; Wiseman, 2009). It also mitigates critiques that Tobin's q conflates past and future performance (Dybvig & Warachka, 2015), and undervalues the potential value of R&D by recording it as expenses, not as assets (Lang & Stulz, 1994).

The value partitioning methodology also facilitates interpreting the magnitude of effects compared with other ratio-based metrics, such as Tobin's q and ROA. Because dynamic value is unscaled, it provides marginal effects from coefficients that have direct interpretations—they capture the dollar value of changes in the independent variables. Taking these benefits in consideration, we argue that dynamic value can accentuate the economic impact of the empirical findings in strategic management research for both scholars and practitioners.

3.3 | Challenges and limitations

Although we emphasize the rigor of partitioning steady state and dynamic values, the methodology relies on two assumptions that can cause confusion if applied inconsistently: the definition of established earnings and the discount rate. To define established annual earnings, reasonable arguments can be made for summing the results from the four most recent quarters or averaging earnings reports over a longer time frame. Each approach has strengths and weaknesses. Without question, the same approach must be applied consistently within an analysis, but none of these approaches is universally preferable to the others.

Similarly, there are multiple arguments for selecting the discount rate. We believe it is logical to let the discount rate vary over time along with prevailing rates, but there is little underlying guidance about whether to base the applicable risk-free rate on US treasury bonds, LIBOR, or some other benchmark. The relevant equity risk premium is also open for debate; however, employing dynamic value in within-firm research designs mitigates this concern. Let us reiterate that even though the specific approach to implement our proposed methodology could differ across analyses based on reasonable differences in assumptions, the importance of logical consistency within any particular analysis is unequivocal. We believe that, as with all methods and measurement approaches, it is incumbent to explain and justify implementation choices based on the specific purpose of the study and the empirical context.

Another limitation is that, like other market-based metrics absent short event windows, it is difficult to isolate a particular action that leads to the change in stock price (e.g., Meyer-Doyle et al., 2019). Therefore, using dynamic value will not solve the issue of causal identification by itself. Rather, its use must be paired with other approaches to help discern what drives the result.

Finally, our work could be extended further by employing the approach recommended by Beck and Katz (2011) to study how *quickly* a dependent variable changes following a change in the corresponding independent variable. Such an approach aligns with the motivation for and naming of dynamic value, and can be implemented so that differences in response speed across firms are modeled. For example, whereas our rationale for using dynamic value deliberately embraces the flexibility and imprecision associated with future outcomes, we also see the potential for future researchers to seek answers to questions about the length of the lag between observed operating outcomes and changes in stock price. This type of study could be performed effectively using dynamic value as the dependent variable and the approach described by Beck and Katz (2011) for modeling dynamics.

3.4 | Directions for future research

The logic underlying Table 1 can be translated into a flowchart to aid in determining dependent variables aligned with a study's research design (see Figure 1). The first question to ask is whether the strategic choice being studied will affect performance in a known and well-defined time frame. If yes, the better-suited dependent variables appear in the left column of Table 1; if no, the better-suited dependent variables appear in the right column of Table 1. Within each column, a second question directs scholars to the specific quadrant with relevance: is part of the design an evaluation of how performance within a firm changes after the strategic choice? A "yes" answer to the second question suggests the value of unscaled metrics shown in the top row of Table 1, whereas a "no" answer implies a cross-sectional study of between-firm effects for which scaled metrics are suitable.

We call attention to the important nuance that scholars may be interested in studying how within-firm effects vary across different firms (e.g., difference-in-difference analyses). Due to the interest in comparing firms in this type of analysis, it may be tempting to use scaled variables. However, the conceptual underpinning of this analysis is to analyze contingencies in a within-firm relationship. Therefore, we see merit in estimating the within-firm effect as precisely as possible and unscaled metrics are most conducive to this purpose.

For a strategic choice meant to improve performance over a time frame that cannot be defined well, metrics that may be useful appear in the top right quadrant of Table 1. At present, the only metric in this quadrant is market capitalization, and presumably because of the limitations discussed earlier, it is infrequently used in strategic management research (see Table 2). By using the partitioning method to develop dynamic value, this article offers an alternative metric with fewer disadvantages when research designs call for the top right quadrant.

We also observe that the partitioning method can be used at greater levels of precision; for example, researchers could use quarterly data instead of annual data. Regardless, the value partitioning methodology illustrates how a reliable estimate of expectations regarding the as-yet-unseen effects of a firm's investments can be obtained from reinterpreting the financial and accounting data already available. Recent literature has also offered new ways of capturing future-oriented constructs at a more nuanced level, such as Hawn et al.'s (2018) analysis of investor reactions to CSR and sustainability practices, or Souder and Bromiley's (2012) metric of investment horizon. It would be interesting to study how these initiatives—capturing the degree to which specific firms have a future orientation—correlate with the future expectations of stock market investors, as revealed by the value partitioning methodology.

4 | CONCLUSION

We advance a metric of dynamic value that is well suited to investigate the financial impact of strategic investments that affect changes in a firm's performance over undefined future

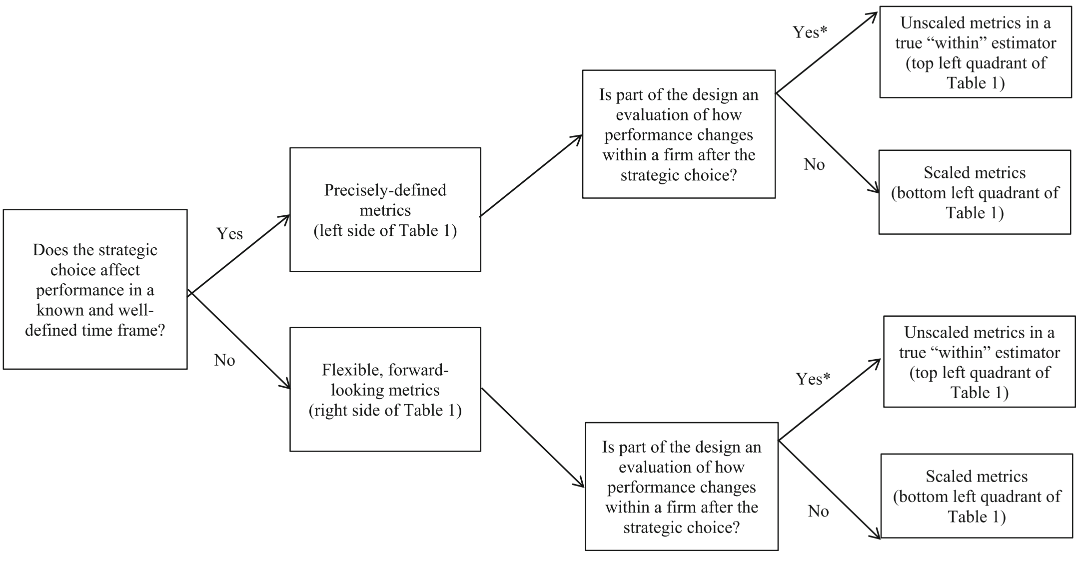


FIGURE 1 Decision tree for choice of performance metrics.*A "yes" answer includes comparing the within-effect across firms or across time.

periods. As we demonstrate in Table 1, there are few metrics in the literature suited for these tasks; and the metric that exists, market capitalization, has drawbacks and is sparsely used in empirical studies. Therefore, dynamic value has the potential to assess more accurately the financial impact of certain strategic investments like R&D and can open-up new areas of inquiry. Refining measurement approaches is an important tool for scholars in our quest to build a cumulative body of knowledge and advance empirical identification (Shaver, 2020).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the CRSP/Compustat merged database available through subscription from Wharton Data Research Services (WRDS). Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the authors with the permission of WRDS.

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SUPPORTING INFORMATION

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

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APPENDIX A

TABLE A1 Formulas for performance metrics analyzed

Accounting-based

1. Revenue (also known as Sales) – as reported on a firm's financial statements
2. Profit (also known as Net Income) = Revenue *minus* Expenses
3. Return on sales (ROS) = Profit *divided by* Net Sales
4. Return on assets (ROA) = Profit *divided by* Total Assets
5. Return on equity (ROE) = Profit *divided by* Shareholders' common equity
6. Return on investment (ROI) = Profit before interest expense *divided by* (Shareholders' common equity *plus* debt)
7. Economic value added (EVA) = Net operating profit after taxes *minus* cost of capital for both equity and debt (Chen & Dodd, 1997)
8. Research quotient (RQ) refers to the firm-specific output elasticity of R&D expenditures (Cummings & Knott, 2018), as reflected by the exponent γ_i in firm i's Cobb-Douglas production function
9. Output growth rate = ((Output at the end of period – Output at the beginning of period) / Output at the beginning of period)) *times* 100%
10. Growth option = (The firm's market value *minus* the book value of the firm's total assets) *divided* by the firm's market value (Smit *et al.*, 2017)

Stock market-based

11. Market capitalization = Stock price *times* shares outstanding
12. Enterprise value = Market capitalization of equity and debt
13. Total shareholder return = (Current stock price *plus* reinvested dividends) *divided by* prior stock price
14. Cumulative abnormal returns (CAR) = The expected returns of the firm's stock over a specific period following an event *minus* the expected market return, often calculated using CAPM. (Lubatkin & Shrieves, 1986; McWilliams et al., 1999; Park, 2004).
15. Buy-and-hold abnormal returns (BHAR) = The expected returns of the firm's stock over a specific period *minus* the expected return of a reference portfolio, a benchmark index, or matching firms (Burchard *et al.*, 2021; Meyer-Doyle *et al.*, 2019)

Accounting and stock-based

16. Long term investor appreciation (LIVA) = Change in Enterprise Value *adjusted for* time value of money (Wibbens & Siggelkow, 2020: 871)
17. Value created and appropriated (VCA) = Change in firm output *minus* change in labor *minus* change in capital *minus* change in raw materials (Lieberman, Garcia-Castro, and Balasubramanian, 2017: 1195)
18. Implied discount rate (IDR) = The rate used to discount the expected value of the firm's future cashflows that results from the firm's current stock price *minus* CAPM's expected market return. (Sampson & Shi, 2023)
19. Tobin's q = (market value of *equity plus* market value of long-term *debt*) *divided by* total assets (Tobin & Brainard, 1977)
20. Market-to-book ratio = Market capitalization of equity *divided by* book value of equity
21. Price-earnings ratio = Stock price *divided by* earnings per share (EPS)

Note: Unless otherwise stated, metrics are for specified time period, usually one fiscal year.