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A Behavioral Understanding of Investment Horizon and Firm Performance

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Observers have argued that firms overly emphasize short-term results at the expense of long-run value. Using a behavioral perspective, we analyze three hypotheses related to this general argument. First, we examine the association of investment time horizons with firm performance, contributing new theory that argues for a quadratic rather than linear association. Second, because the tendency toward immediate results could reflect stock market pressures, we consider how the interaction of investor patience and firm horizon relates to firm performance. Third, we examine the argument's implication that most firms have investment horizons at a level where marginal increases in horizon associate positively with firm performance. Measuring horizon as the expected useful lives of capital expenditures, we find empirical support for the hypothesized quadratic relation in a large-scale, multiyear sample of U.S. publicly held manufacturing firms and confirm that a majority of firms have horizons in the region where our models predict increases in horizon positively influence performance. We also find that the most positive returns occur when long horizon investments are aligned with investor patience.

Keywords: investment horizon; firm performance; intertemporal choice; long-term strategy; short-termism
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Introduction

For decades, observers have argued that widespread short-termism reduces firm competitiveness (Drucker 1993, Hayes and Abernathy 1980, Laverty 1996) and firms, on average, could improve performance by building portfolios of longer horizon investments (e.g., Brown 2007, Graham et al. 2005, Thakor 1990). However, the literature supporting a relation between horizon and performance often relies on common-sense allusions, small-sample anecdotes, or proxy variables that measure time indirectly. Key constructs have been defined in broad, complex, and often imprecise ways that apply to multiple strategic decisions. For example, scholars have linked short-termism to underinvestment in capital expenditures (Porter 1992), supplier relations (Srinivasan and Brush 2006), new technologies (Henderson 1993), training programs (Lepak and Snell 1999), and research and development (Hoskisson et al. 1993). Combining these disparate activities into a single measure of firm-level short-termism is problematic. Moreover, an investment's horizon is only one of several factors germane to each decision, along with the expected return, the magnitude of expenditures required, the variability of expected outcomes, the direct relevance to a firm's strategic objectives, and the availability of viable alternatives (Sanders and Hambrick 2007). Any of these factors, including horizon, could be the primary motivator for an observed investment choice. Because these mechanisms are difficult to untangle, management scholars often exercise caution about drawing inferences about horizon based solely on data about the level of investment (e.g., capital or R&D spending).

In this paper, we conduct a large-sample empirical analysis of the association of investment horizon with performance. At the firm level, we define *investment horizon* as the ex ante average expected useful life of a firm's investments. This is measured using depreciation data that reflect upfront expectations about the productive life of capital investments. Investment horizon is a key element of firm strategy because firms profit by acquiring assets that yield future benefits exceeding upfront costs (Kogut and Zander 1992, Quirin and Wiginton 1981). Firm investment horizon represents an aspect of a firm's behavioral routines that helps define its dominant logic (Prahalad and Bettis 1986). Our empirical work includes a panel regression analysis of firm investment horizon and performance data from publicly traded U.S. manufacturing firms between 1991 and 2011, using a measure directly derived from expectations about the useful lives of capital expenditures (Souder and Bromiley 2012).

This paper contributes toward refining three related implications of the existing literature. First, the aforementioned claim that short investment horizons lead to suboptimal performance has been ascribed to the undervaluation of longer horizon investments by managers, investors, or both (e.g., Jacobson and Aaker 1993, Stein 1989, Zhang and Gimeno 2016). We incorporate these arguments but also note a smaller body of literature on the drawbacks of long horizons that limit flexibility (see, e.g., Bebchuk and Stole 1993). Combining these insights, we describe boundary conditions around the performance benefits of longer investment horizons, and theorize that the association of firm investment horizon with performance follows a quadratic shape that levels off for horizons much longer than average. Our theory reorients the discussion of investment horizon from a simple normative shortcoming to one where managers must understand and manage competing priorities.

Second, we take an initial step toward distinguishing between the roles of managers and investors in formulating a firm's investment horizon. In contrast to some theories that ascribe neutrality about time horizons to investors, we take note of prior literature that finds investors can vary in their horizons and exert pressure on firms to follow suit (Benner 2007; Zhang and Gimeno 2010, 2016). Building on this premise, we argue that the best performance outcomes will occur in firms that match long investment horizons with relatively patient investors, as proxied by the trading frequency of a firm's stock. We recognize that such archival records provide a coarse and preliminary examination of the issue, and welcome future research that further disentangles the complex interaction between the temporal preferences of managers and investors.

Third, much prior literature claims U.S. firms, especially those with publicly traded equity, generally suffer from detrimental short-termism (Brown 2007, Hayes and Abernathy 1980, Marginson and McAulay 2008, Narayanan 1985, Samuelson and Preisser 2006). This issue becomes interesting mainly if evidence supports the first claim that short-termism associates with lower firm performance. It warrants distinct consideration because the premise runs counter to the normal expectation among strategy scholars for firms to converge toward practices that generate better performance, not worse.

Overall, our approach follows the social science tradition of developing general theoretical arguments, and then gaining empirical traction by narrowing scope. The resulting focus enables empirical analysis but limits generalizability. Although our arguments may apply to other types of investment decisions, this paper's empirical results focus exclusively on trade-offs between capital expenditures with longer and shorter horizons in publicly traded U.S. manufacturing firms. Future research should address the performance implications of horizon in other types of long-term investments or other settings. In addition, it is beyond the scope of this paper to analyze whether any particular firm should enact a longer or shorter horizon.

Theory and Hypotheses

A growing body of management research has developed around topics salient to investment horizon, including the alignment of long-term incentives (Devers et al. 2008), long-term orientations of family firms (Chrisman and Patel 2012), pressure to meet earnings targets (Zhang and Gimeno 2010, 2016), connections between long-term orientation and corporate social responsibility (Wang and Bansal 2012), and changes in firm investment horizon over time (Souder and Bromiley 2012, Souder and Shaver 2010). Often such studies demonstrate that variables claimed to associate with managerial time preferences influence firm behavior in ways that appear detrimental to firm performance. For example, according to Zhang and Gimeno (2016), firms with CEOs that hold unvested stock options and patient investors appear less likely to increase prices or reduce service frequency in response to earnings below analyst forecasts, actions claimed to associate with a less aggressive competitive stance. Much existing research aims to explain short-termism by identifying factors that result in what appear to be short-sighted behaviors, without directly demonstrating such behaviors damage firm performance.

While short-termism can be seen in a wide variety of firm behaviors, many scholars emphasize how short-termism appears in a firm's *investments*, conceptualized broadly as any expenditure intended to have returns over a period longer than one accounting fiscal year including research and development (Mansfield 1968), product quality enhancements (Crosby 1979), training programs (Lepak and Snell 1999), brand-building advertisements (Tesler 1968), and most conventionally, capital expenditures (Quirin and Wiginton 1981).

At the firm level, we define *investment horizon* as the ex ante average expected useful life of a firm's investments. Our theoretical arguments apply to all investment types, but our empirical analysis emphasizes capital investments in property, plant, and equipment (PPE) because we can measure horizon in this domain. Relative to other investment types, capital expenditures offer three advantages in studying the performance implications of firm investment horizon. First, decisions on capital investment require comparisons about expected cash flows at different times in the future, because firms typically spend capital upfront and then receive cash flows generated by that spending over several years. Standard budgeting tools explicitly require firms to confront such trade-offs. Second, many papers discuss capital expenditures as an area in which short-termism would be evident and problematic (Graham et al. 2005, Porter 1992, Poterba and Summers 1995, Stein 1989, Thakor 1990). Third, accounting depreciation practices require managers to predict the expected useful life of capital expenditures, and Souder and Bromiley (2012) describe how to estimate this concept from published financial statements.

Investment Policy and Firm Investment Horizon

To analyze performance at the firm level, we address the investment horizon implied by a firm's entire portfolio of investments rather than any particular investment project. From this point forward, all references to "horizon" can be interpreted as shorthand for "firm investment horizon," which constitutes one aspect of a firm's dominant logic (Prahalad and Bettis 1986) and likely reflects the temporal orientation of management (Das 1987). In this paper, we theorize about an attribute of investments made by firms (horizon) and not the mindset of managers that may motivate them (temporal orientation). We proceed to consider arguments that imply firms vary in their analyses of horizon, tend to err in the direction of shorter horizons, and achieve lower levels of performance when they do.

Firm variation in choice of time horizon. Horizon plays a central role in firms' investment decisions because investment decisions depend on the trade-offs between expected cash flows at different times in the future based on predictions that have significant potential for error or bias (see, for instance, Bower 1986). As *short-termism* implies, the existing literature generally presumes an undesirable bias in favor of investments with quick returns, which in turn implies a positive relation between firm investment horizon and subsequent performance (Graham et al. 2005, Hayes and Abernathy 1980, Laverty 1996, Porter 1992). Such claims rely on the tacit premise that firms differ in their choice of horizon, consistent with behavioral studies that find considerable room for discretion regarding both a firm's overall level of PPE investment and the specific investments made (Bower 1970, Bromiley 1986a). In their textbook treatment of capital budgeting, Brealey and Myers (1996) acknowledge that net present value (NPV) analysis does not provide a full prescription for implementation and firms might estimate cash flows and discount rates differently. Surveys confirm wide variation in how firms determine discount rates (AFP 2011, Bruner et al. 1998).

While only one of several reasons that horizons can vary, NPV does offer a specific procedure for discounting future cash flows, which results in a relation between discount rates and firm horizons. Because compounding in NPV incorporates a nonlinear function of the discount rate, higher discount rates cause firms using NPV analysis to favor projects with quick returns, while lower discount rates favor longer-horizon payoffs (Poterba and Summers 1995). However, empirical surveys find that the average firm uses a discount rate roughly double the weighted average cost of capital implied by the textbook approach (Jagannathan et al. 2016, Poterba and Summers 1995). While simple differences in minor assumptions could explain modest differences in cost of capital estimates, these persistent large differences likely reflect substantive differences between textbook prescriptions and practice.

Overemphasis on short horizon investments. The connection between horizon and discount rates helps explain the intuition for a relation between horizon and firm performance. Consider an example of two firms with identical pools of investment projects where firm A uses the textbook discount rate and firm B uses a discount rate twice as high. Firm B's approach might be considered a prudent buffer against uncertain future cash flows, but Poterba and Summers (1995) explain how this approach censors some promising longer horizon investments out of the firm's portfolio, and Jacobs (1991) offers a supporting anecdote about a firm that withdrew from the industrial robots industry entirely because the required technology investments could not be justified at a high cost of capital. Conversely, firm A can outperform B because A's use of the textbook lower discount rate means A will accept all the projects B does, plus additional projects with expected returns above the textbook rate but below B's unnecessarily higher discount rate. Given the nonlinearity in discount functions, those projects will tend to have longer investment horizons. They will also have positive NPV when evaluated with the textbook discount rate and therefore firm A's performance should exceed firm B's.

Time also figures centrally in other methods used to select firm investments. Graham and Harvey (2001) found that over half the firms in their sample evaluated investments based on payback period (i.e., the time until the positive later cash flows balance the negative upfront cash flows) and over half used average accounting return over a fixed horizon (total net income over a fixed number of years divided by total investment and number of years) usually with a required minimum return termed a hurdle rate. Finance textbooks have critiqued these alternate measures specifically for their implications for horizon (e.g., Brealey and Myers 1996); payback period ignores cash flows after the payback period is reached, and average accounting return ignores returns after the specified horizon. These critiques parallel the NPV by implying firms using such procedures will have shorter average horizons than they would with the NPV and the correct discount rate, and consequently achieve lower performance because they forgo opportunities to invest in profitable long horizon projects.

We will discuss a variety of theories that claim firms generally favor short-term results in the development of Hypothesis 3, and the use of excessive discount rates could be interpreted as one manifestation of a general overemphasis of the short term. For now, we only address the performance implications of this behavior. To summarize, the evidence presented above suggests that firms generally use discount rates that exceed the textbook rates. Because of compounding, the use of higher discount rates explains an overemphasis on shorter horizon investment alternatives. Compared to firms using textbook discount rates, firms that use high discount rates—and overly deflate the value of long-run cash flows—will achieve lower performance because these firms will reject many projects with positive NPV in the textbook analysis. By contrast, firms that use discount rates closer to textbook levels will pursue these long horizon positive NPV projects and thus generate comparatively higher levels of firm performance. Thus, variation in discount rates can generate a positive association of horizon and firm performance.

While we have explained our logic in terms of investment criteria, various other theories make similar predictions that firms will over value immediate returns relative to delayed returns. For example, Cyert and March's (1963) behavioral theory of the firm says firms try to solve immediate problems rather than appropriately consider the future. Many agency theory analyses assume managerial incentives and career concerns encourage managers to excessively favor short-term results. Others argue the investing community's emphasis on short-term results and returns that exceed analyst forecasts encourage an emphasis on short-term results (Laverty 1996). Almost any theory that says managers inappropriately favor immediate returns is consistent with a positive association of horizon and firm performance.

Our argument about horizon needs one additional clarification. Because technologies and rates of technological change vary substantially across industries, a firm's investment horizon must be compared to the firm's industry. What constitutes a long horizon in a short horizon industry (e.g., precision instruments) would constitute a short horizon in a long horizon industry (e.g., petroleum refining or primary metals). Consequently, our hypotheses will refer to horizon relative in industry.

Hypothesis 1(A). *Firm investment horizon relative to industry peers will be positively associated with firm performance.*

Hypothesis 1(A) argues that excessively discounting future cash flows results in a positive association between horizon and firm performance. This does not inherently imply that long horizon investments are more profitable than short horizon investments. Rather, it says only that avoiding projects with long horizons for reasons that ignore their value-creating potential leads to lower performance than would occur with appropriate investment horizons.

At the other end of the spectrum, the performance benefits associated with longer horizon investments should not continue without limit. The use of excessively low discount rates—resulting in overinvestment in long horizon projects—should also have negative performance outcomes, implying that performance can also decline if firms pursue long horizon investments for dubious reasons (Bebchuk and Stole 1993, Miller 2002).

Prior research suggests that long horizon investments have implications that do not fit neatly into an NPV analysis. For example, short horizon equipment generally has lower up-front costs than more durable equipment, and thus the firm with a shorter investment horizon ties up less capital in relatively illiquid assets, a flexibility benefit that is hard to estimate accurately and does not neatly figure into a project's NPV. Empirical studies suggest liquidity and related factors influence the level of capital expenditures (Bromiley 1986b, Eisner 1978), and Kim and Bettis (2014) find cash holdings positively influence subsequent firm performance. Furthermore, a series of shorter-lived investments may let the firm upgrade equipment more frequently than a longer-lived investment.[1] This flexibility to replace shorter horizon equipment can produce positive performance outcomes for equipment likely to become obsolete before it wears out, thus truncating the income stream expected at the time of investment (Whelan 2002).

Computer investments illustrate this point. At one extreme, purchasing a computer with a very short life is inefficient since changing computers incurs costs in contracting (Williamson 1985) and transitioning to new computers. Furthermore, a computer near the end of its expected usable life may impose additional costs on the user because of increased rate of product failure or capability limitations. However, at the other extreme, the firm probably should not pay extra for a computer engineered to have a very long life. The more durable computer generally costs more, which reduces the firm's financial flexibility. As the computer's useable life increases, the likelihood increases that unanticipated technological change or other exogenous factors will render it obsolete or unusable. Just as buying a computer expected to last three months is generally ill-advised, buying one hoping it will last 30 years is also generally ill-advised.

Considering both of these arguments, we expect the extremes (very short or very long expected lives) associate with lower performance than some point in the middle, and thus we predict that the shape of an inverted-U will fit the relation between horizon and performance better than the positive linear relation developed in Hypothesis 1(A).

Hypothesis 1(B). *Firm investment horizon relative to industry peers will have a quadratic, inverted-U relation with performance.*

Influence of Capital Patience

To more fully understand horizon's effect on performance, we now consider how investor temporal preferences interact with firm investment horizon. Prior research suggests that a firm's investment horizon may be influenced by its investors (Stein 1988), who collectively signal their level of satisfaction with the firm through stock price movement, public statements, and votes for members of boards of directors. As Thanassoulis and Somekh (2015, p. 1) explain, "To the extent that managers are responsive to the interests of their shareholders, the presence of these short-term investors on the register may impact corporate decisions on investments."

Investor horizon has appeared in several forms in prior literature. For example, scholars have used the term "patient capital" to describe the willingness of family investors to wait for long-term performance outcomes and not overreact to quarterly performance reports (Sirmon and Hitt 2003), partly out of the motivation of family investors to pass on a business to their successors (Chrisman et al. 2012). The capital patience concept also appears in more general literature (Jacobs 1991, Laverty 1996, Porter 1992) as well as finance research that sometimes measures capital patience as the frequency with which a public company's stock is traded (Black and Gilson 1999). Alternatively, scholars have differentiated among types of institutional investors, for example, attributing greater capital patience to pension funds than hedge funds or index funds rather than rapidly trading funds (Bushee 1998, Zahra 1996, Zhang and Gimeno 2016).

Evidence suggests that investors interact with firm managers on the subject of investment horizon. A variety of stock market actors—including shareholders, underwriters, and equity analysts—often pressure managers of publicly traded companies toward short horizons (Baysinger et al. 1991, Benner 2007, Bushee 1998, Munari et al. 2010, Zhang and Gimeno 2010). News accounts have described as "activist investors" certain large shareholders who publicly express demands for management to change investment policies. In response, a large percentage of chief financial officers report delaying positive NPV projects to ensure that firm earnings meet analyst targets (Graham et al. 2006), an observation explained by catering theory's claim that managers emphasize shorter-term investments to appease equity investors who overly favor immediate returns over delayed gains (Baker and Wurgler 2011, Polk and Sapienza 2009).[2] Similarly, Eccles et al. (2014) use linguistic analysis of investor calls to capture long-term thinking in firms and argue that such firms are more likely to attract long-term investors.

Our firm-level analysis of investment horizon only observes the outcome of this process. As a result, we cannot distinguish between a scenario in which a firm's management is inherently short-termist and an alternate scenario in which impatient capital pressures management to make shorter horizon investments than they might prefer. However, we expect that firm performance will be strongest when the firm's investment horizon most closely aligns with investors demonstrating capital patience by holding ownership in the firm's stock for long periods of time. Such a scenario indicates implicit agreement between management and investors regarding the value of long horizon investments. By comparison, a firm that combines impatient capital with a relatively short investment horizon is likely overlooking some positive NPV investments. The remaining combinations introduce the potential for conflict between managers and investors, and the various pressures toward short-termism presumably lead to a firm investment horizon associated with lower performance outcomes. Expressed as a hypothesis, this reasoning suggests that the combination of patient capital and longer investment horizon will have a positive association with firm performance:

Hypothesis 2. *Firm performance will be relatively higher when capital patience interacts with long firm investment horizon.*

Distribution of Firms' Horizons

Earlier, we summarized research that found firms often use discount rates roughly double what the scholars think appropriate (Poterba and Summers 1995), consistent with the claim that many U.S. firms have adopted insufficiently long horizons (Porter 1992), especially publicly traded firms. Rather than occasional instances of certain firms misapplying the NPV rule, these scholars imply that across the overall population of firms, a high percentage have horizons below the peak implied in Hypothesis 1(B). We now consider the arguments why this performance-reducing behavior might be commonly observed.

Two insights from a behavioral perspective on investment policy address why some firms routinely overdiscount—and thus underinvest in—long-term projects. First, firms lack sufficient information to compare their discount rates to textbook levels. Since a firm only obtains detailed information on its own internal practices and never sees what would have happened if it had used different practices, it lacks the variation necessary to realize the performance implications of its routines (March and Simon 1958). Comparison to other firms is likewise problematic since firms seldom publish their investment decision rules, discount rates, or project returns. In addition, the returns on many investments depend on interactions with other parts of the system and those parts of the system also change over time (Amit and Schoemaker 1993). For example, the returns on a plant expansion investment depend on the ability of marketing and sales to generate sales that utilize the additional plant; the ability of operations management to use the new equipment to its full potential; and external factors such as recessions, changes in input prices or customer preferences, or unanticipated technological disruption. Even trained scholars would find it hard to identify best practices given these difficulties, and practicing managers seldom have the training of scholars in estimating causal relations, raising the likelihood of superstitious learning (March and Olsen 1975). These arguments coincide with substantial empirical literatures that demonstrate using publicly known practices positively influences firm performance (see Bromiley and Rau 2014 for references to relevant empirical work).

A second relevant insight derives from literatures demonstrating people excessively favor immediate returns over delayed returns, even after adjusting for the time value of money. Cyert and March (1963, p. 167) describe managers "emphasizing short-run reaction to short-run feedback rather than anticipation of long-run uncertain events. They solve pressing problems rather than develop long-run strategies," a behavior associated with satisficing. Research at the individual level reveals a human tendency to prefer immediate small gains to larger deferred gains (Kahneman et al. 1982). Thaler (1981) finds evidence of implicit discount rates by individuals well above 25% and medians for several experimental conditions reflecting discount rates over 100%. Studies in hyperbolic discounting find individuals making choices consistent with exceedingly high discount rates, holding an excess preference for returns sooner rather than later (e.g., Dasgupta and Maskin 2005, Laibson 1997, Loewenstein and Prelec 1992). Among consumers, studies of durable goods purchases find implicit average discount rates that range from 25% to 300% (Gately 1980, Hausman 1979). Other factors further reinforce this general tendency. Management incentives typically favor short-term performance, as seen in agency theory arguments for stronger long-term incentives to balance the pressures for short-termism from salary and bonuses (e.g., Jensen and Murphy 1990). Career concerns also push managers systematically toward the short term (Narayanan 1985). Because evaluation of managers rests largely on the outcomes of past decisions, managers need positive short-term results to achieve promotions, and career mobility. A project that has great results five years down the road is of little career value to a manager who plans to move, retire, or be promoted in two years.

All of these arguments imply that a disproportionate number of firms will adopt excessively short horizons, i.e., below the horizon associated with highest performance. In addressing the prevalence of horizons across a population of firms, our arguments go beyond existing research, which explains variation in firm horizons based on factors that cause particular firms to have longer or shorter horizons (Bebchuk and Stole 1993, Laverty 1996, Marginson and McAulay 2008, Souder and Bromiley 2012, Souder and Shaver 2010, Zhang and Gimeno 2010). We therefore formalize a hypothesis consistent with the claim that firms in general favor short investment horizons.

Hypothesis 3. *On average, publicly traded firms have investment horizons shorter than is associated with the highest levels of predicted performance, such that the value of a marginal increase in investment horizon would be positive.*

Methods

Data

We employ a large-sample empirical analysis using accounting data reported in firms' annual reports and 10-K statements. For consistency in accounting practices related to capital expenditures, we focus on publicly traded manufacturing firms (SIC codes from 2000–3999) listed in Compustat with primary headquarters in the United States. All the data used come from the Compustat data base. Our data start in 1991 and continue through 2011. Two reasons support 1991 as the starting point: first, this provides ample time for firms to adapt their practices following the 1986 changes to accounting standards, and second, this is the first year for which all of the variables in our analysis appear in standard databases. Because depreciation data play a key role in our variable construction, we only analyze firms using straight-line depreciation, which includes nearly 80% of publicly traded manufacturing firms. To reduce outliers and extreme values associated with very small firms, we restrict our sample to firms with assets and sales greater than $100 million. In total, we analyze over 21,000 firm-year observations from 2,300 U.S.-based manufacturing firms. Tables 1 and 2 present descriptive statistics and zero-order correlations. Variables are winsorized at the 1% level to mitigate the effects of extreme values in the sample.

Dependent Variable

The study's dependent variable is *firm performance*, defined as return on assets (ROA). We are aware that Wiseman (2009) explains how ratios can produce misleading regression results if not used carefully, so we have performed robustness checks to confirm that similar results are obtained when using raw values of net income and operating cash flow. Given that the raw values and ratios yield the same substantive conclusions, we chose to present the ratio-based analysis because it allows for

Table 1 Descriptive Statistics

Variable name	*N*	Median	Mean	Std. dev.	Min	Max	VIF	Skewness
Dependent variable								
Return on assets (%)	21,643	4.89	3.00	9.64	−38.48	13.22	—	−2.15
Explanatory variables								
Firm investment horizon (*Years*)	21,643	11.99	12.76	6.51	1.72	40.00	—	1.28
Relative horizon (*Years from industry avg.*)	21,643	0.59	1.39	5.89	−17.95	32.28	2.52	1.47
Relative horizon squared	21,643	9.91	36.67	99.79	0.00	1,041.69	2.87	6.61
Capital patience (*relative to industry*)	21,643	−0.19	−0.71	1.59	−7.57	2.31	1.56	−1.96
Relative horizon ∗ capital patience	21,643	0.14	0.27	11.81	−232.34	78.21	2.59	−5.92
Rel. horizon squared ∗ capital patience	21,643	−0.28	−28.39	245.66	−7,479.33	1,076.54	3.15	−16.25
Control variables								
CAPX intensity (*% of assets*)	21,643	4.06	5.15	4.11	0.06	26.02	1.87	2.06
R&D intensity (*% of assets*)	21,643	1.53	3.97	6.02	0.00	69.42	1.50	3.07
Revenue growth (*% change from year t* − 1)	21,643	8.01	13.65	33.77	−62.22	293.69	1.18	3.64
Debt ratio (*% of total capital*)	21,643	17.87	23.22	21.92	0.00	87.84	1.50	1.03
Exercisable option ratio	8,593	75.42	66.37	32.00	0.00	100.00	—	−0.75
					Mean VIF		2.08	

Notes. All variables winsorized at the 1% level except *return on assets*, which is winsorized at the 10% level.
VIF = Variance inflation factor for main analysis (Model 3).

Table 2 Zero Order Correlations

	1	2	3	4	5	6	7	8	9	10	11
1. *Return on assets*	1.00										
2. *Relative horizon*	0.07	1.00									
3. *Relative horizon squared*	−0.06	0.66	1.00								
4. *Capital patience*	0.08	0.14	−0.02	1.00							
5. *Relative horizon ∗ Capital patience*	−0.03	−0.43	−0.38	0.01	1.00						
6. *Relative horizon sq. ∗ Capital patience*	0.06	−0.26	−0.51	0.30	0.70	1.00					
7. *CAPX intensity*	0.05	0.12	0.02	−0.03	−0.07	−0.01	1.00				
8. *R&D intensity*	−0.09	−0.15	−0.03	−0.30	0.08	−0.07	0.00	1.00			
9. *Revenue growth*	0.17	−0.04	0.05	−0.07	0.00	−0.05	0.01	0.15	1.00		
10. *Debt ratio*	−0.35	0.05	0.05	0.18	−0.03	0.04	−0.03	−0.34	−0.13	1.00	
11. *Exercisable option ratio*	0.06	0.01	0.00	0.01	0.01	0.00	0.00	−0.01	0.00	−0.06	1.00

Notes. All variables winsorized at the 1% level; squared and interaction variables not shown. Correlations with an absolute value of 0.03 or greater are statistically significant at the 95% confidence level.

more intuitive interpretation of economic value and practical implications. In addition, because extreme values of ROA often occur under extraordinary circumstances, we winsorize ROA at a higher level than other variables (10% instead of 1%). After winsorization, ROA ranges from −38% to 13% with a mean value of 3.0% and a median of 4.9%.

Explanatory Variables

Our study focuses on two explanatory variables: *firm investment horizon* and *capital patience*. For reasons explained below, we analyze both variables relative to industry norms, but first we explain the steps involved in calculating firm-specific values of each variable. We compute the value for *firm investment horizon* from Compustat data extending a procedure described by Souder and Bromiley (2012). Under accounting standards, reported assets and depreciation include only the assets actively in service in year t. The number of years of assets contributing to a firm's horizon in year t is not constant, but instead varies across companies based on the longevity of their investments. Whereas Souder and Bromiley (2012) theorized about a firm's horizon as reflected in capital expenditures in a particular year, our theory addresses the horizon of a firm's entire asset base. Consequently, our measure follows the logic of prior literature but captures the "stock" instead of the "flow."

An estimate of *firm investment horizon* can be calculated from accounting data based on the anticipated durability of a firm's property, plant, and equipment (PPE) using accounting rules that govern depreciation. Each firm tracks its asset base by adding new investments and subtracting investments that are retired or sold. Managers and auditors must determine the expected useful life of each capital asset at the time of purchase, and firms using straight-line depreciation amortize the expense by dividing the cost equally over the asset's expected life (Keating and Zimmerman 1999). By reversing this logic, we can estimate the average expected useful life of a firm's assets by dividing a firm's gross PPE (i.e., the aggregate purchase price of its assets, which equals the firm's reported net PPE plus accumulated depreciation) by its reported depreciation expense in a given year. This yields the weighted-average estimated life (in years) for a firm's fixed assets, providing a measure of the average horizon of a firm's entire PPE portfolio.

Accounting standards require that expected useful lives lie between 1 and 40, and we therefore limit observations to this range. Thus, our measure of firm investment horizon is a dollar-weighted estimate of the average expected life of a firm's capital equipment, approximated as the firm's gross PPE divided by reported depreciation. We show the sample mean horizon of 12.8 years on Table 1, along with the median value of 12.0 years.

However, the interpretation of horizon varies by industry; a 15-year time frame would represent a long horizon in precision instruments but a relatively short horizon in petroleum refining (see Table 3 for industry average horizons and ROA). Consequently, we use *relative horizon* instead of horizon itself in our analyses. We calculate relative horizon as the difference between the firm's horizon in year t and the median horizon for its industry excluding the focal firm—based on two-digit standard industrial classification (SIC) codes—in the same year. Conceptually, this has value because firms in any given industry face many of the same environmental factors and use generally similar technologies as their industry competitors (Cool and Schendel 1987, Hunt 1972, Porter 1980). Therefore, relative horizon is used in all our regression analyses. For this variable, the mean is 1.4 years and the median is 0.6 years.[3]

To examine the association of firm horizon and performance, we want to measure horizon at a time before firm performance. However, the appropriate time difference between measures of horizon and performance is unclear. The majority of a firm's PPE that determines the horizon in year t comes from investments in years prior to t. Consequently, even if individual investments associate with performance with a multiyear lag, horizon in t (which includes investments in many previous years) might positively associate with performance in $t+1$. Furthermore, if we use horizon in t to explain a much later performance (say $t+5$) then the horizon measure will not include investments made in years $t+1$ to $t+4$. We tried to address this problem by using performance in $t+1$ for our primary results, and then replicating the analysis using average ROA over two-, three-, four-, and five-year intervals. As discussed below, all five specifications produce substantively similar results.

The second explanatory variable is *capital patience*, which cannot be measured directly but has been equated with observable data on trading frequency (Bushee 2004). Firms with frequent trading in their stock often face pressures to favor short horizon investments that produce immediate results (Graham et al. 2009). Conversely, firms with less frequently traded shares typically have investors with greater tolerance for long-term investments. We measure a firm's trading intensity by dividing the volume of shares traded in year t for each firm by its total number of shares outstanding, and then subtracting each firm's trading intensity from the median value for its industry, which both accounts for industry effects in trading intensity and reverse-codes the variable to yield the patient capital interpretation (i.e., the opposite of trading frequency). Finally, we lag capital patience by one year to mitigate concerns about reverse-causality and create temporal separation between this variable and the firm's ROA. The variable ranges from -7.6 to 2.3, with values below 0 indicating low patience (high trading activity) relative to industry average that year, and values above 0 indicating higher patience (lower trading frequency) relative to industry that year. Both the mean and median values are fractionally below 0.

We follow the customary practice of constructing the interaction between relative horizon and capital patience by multiplying the values for each term. The resulting interaction term has a low variance inflation factor (VIF) of 2.59. All variables in the study, including the interaction terms, have VIFs below 2.87 and the average VIF is 2.08.

Control Variables

Our analysis controls for several factors that may influence firm performance, including both *CAPX intensity* (capital expenditures divided by total assets) and *R&D intensity* (R&D expenditures divided by total assets). All else equal, we expect a positive association between both variables and performance. CAPX intensity ranges from 0.06% to 26% with a mean of 5% and a median of 4%. R&D intensity ranges from 0 to 69% with a mean of 4% and a median of 1.5%. Both of these ranges seem plausible for manufacturing firms. If firms did not report values for CAPX or R&D, we coded these values as zeroes.

We also control for *revenue growth*, measured as the change in revenue from year $t-1$ to year t divided by revenue in $t-1$. This variable ranges from -62% to $+294\%$ (almost a quadrupling of firm revenue). Mean revenue growth in the sample is 14%, higher than the median level of 8%, and we expect revenue changes to associate positively with ROA. Similarly, *debt ratio* reflects the ability of the firm to fund potential needs in the capital markets. We calculate the measure by dividing a firm's total debt by its entire valuation, based on the current market values of its equity and debt. This variable ranges from 0 to 88%, with a mean debt ratio of 22% and a median of 18%. More leveraged firms with higher debt ratios are expected to have lower firm performance.

Table 3 Average Horizon and Performance by Industry

SIC code industry	Number of observations	Average horizon (years)	Return on assets: Average (%)	Return on assets: Winsorized (%)
20 Food and kindred products	1,673	15.66	5.0	4.6
21 Tobacco products manufacturers	126	16.17	14.5	12.7
22 Textile mill products	437	13.73	0.4	0.1
23 Apparel and other finished products	574	10.29	4.0	4.0
24 Lumber and wood products	255	17.79	1.5	1.5
25 Furniture and fixtures	366	14.33	4.7	4.2
26 Paper and allied products	514	17.36	2.3	2.4
27 Printing and publishing	843	11.68	3.8	3.3
28 Chemicals and allied products	3,091	14.13	5.3	4.4
29 Petroleum refining	207	21.52	4.6	4.3
30 Rubber and plastics products	566	13.61	1.7	1.8
31 Leather and leather products	171	10.20	8.3	6.3
32 Stone, clay, glass, and concrete products	344	17.66	3.9	3.2
33 Primary metal industries	1,100	18.80	3.1	2.0
34 Fabricated metal products	787	14.37	3.2	3.0
35 Industrial and commercial machinery	2,979	10.60	2.1	2.1
36 Electronic equipment and components	3,756	10.40	0.9	1.5
37 Transportation equipment	1,284	13.56	2.9	2.8
38 Precision instruments	2,143	9.04	4.5	4.3
39 Miscellaneous manufacturing industries	427	10.46	3.6	3.1
TOTAL	21,643	12.76	3.3	3.0

Finally, in one model used to test robustness, we control for *exercisable option ratio*, because prior research has found that managers behave differently when holding exercisable versus unexercisable stock options (Devers et al. 2008), in particular regarding horizon (Souder and Shaver 2010). Based on this research, we expect a negative association with performance from this variable, which is calculated as the embedded value of options exercisable by the firm's CEO in year t divided by the total value of all options held by the CEO in the same year. As shown in Table 1, 66% of the value of the average CEO's options was in options the CEO could exercise immediately, and the median figure in a firm-year was 75%. Compensation data are available from Compustat for about 40% of the sample, so our primary analysis excludes this variable to retain a larger sample size. Results for the hypothesized variables change little when exercisable option ratio appears in the regression.

Results

Hypothesis Testing

We present several models that control for potential autocorrelation. All models have *ROA* as the dependent variable. Our primary analysis, which appears on Table 4, uses time-series regression with first-order autoregressive error terms to account for the repeated measurement of ROA from the same firms. Model 1 includes only the control variables, Model 2 adds the main effects of *relative horizon* and *capital patience*, and Model 3 presents all hypothesized variables, including the *squared value of horizon* and the *interaction between relative horizon and capital patience*. Goodness of fit, as measured by the Wald chi-squared statistic and R-squared levels, improves as the horizon variables are added. We consider Model 3 to be our full model and perform additional robustness checks of this model below.

Our analysis features a fixed effects specification, which offers an unbiased estimator that may be less efficient than an equivalent random effects model. Based on a Hausman test, which rejected the null hypothesis that random effects and fixed effects produce the same parameter estimates ($\chi^2 = 612.00$, d.f. $= 9$, $p < 0.001$), we present the results produced by fixed effects. Substantively, we obtained similar results on the variables of interest from the random effects specification.

We begin by analyzing results on the linear influence of horizon on performance (Model 2). This model shows a positive and statistically significant parameter estimate ($b = 0.08$, $z = 4.44$, $p < 0.001$), indicating support for Hypothesis 1(A) that shorter horizons are associated with lower performance and longer horizons are associated with higher firm performance. Substantively, this result implies that a one-year lengthening of a firm's horizon corresponds to a 0.8% increase in predicted ROA.

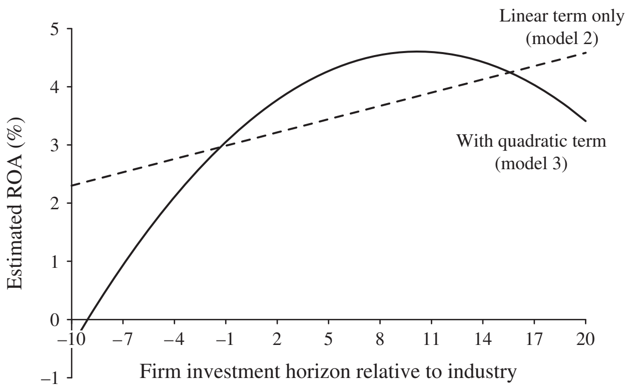
Hypothesis 1(B) argues for a nonlinear relation between horizon and performance, and we find supporting evidence of this as well. In Model 3, relative horizon has a positive linear parameter estimate ($b = 0.25$, $z = 8.87$, $p < 0.001$) and a negative quadratic parameter

Table 4 Results from Time-Series Regression with Autoregressive Error Structure and Fixed Effects

	Model 1 Controls only				Model 2 Including main effects				Model 3 Full primary model				Model 4 Full model incl. options data			
DV = *Return on assets*	Coeff.	SE	z	$P > z$	Coeff.	SE	z	$P > z$	Coeff.	SE	z	$P > z$	Coeff.	SE	z	$P > z$
Relative horizon					0.076	0.017	4.44	0.000**	0.253	0.029	8.87	0.000**	0.227	0.049	4.67	0.000**
Relative horizon squared									−0.012	0.001	−8.35	0.000**	−0.008	0.003	−2.76	0.006**
Capital patience					0.245	0.067	3.66	0.000**	0.180	0.069	2.61	0.009**	0.175	0.086	2.03	0.042*
Horizon × capital patience									−0.045	0.011	−4.01	0.000**	−0.039	0.016	−2.48	0.013*
Horizon squared × capital patience									0.002	0.001	3.48	0.000**	0.003	0.001	4.32	0.000**
CAPX intensity	0.024	0.021	1.17	0.242	0.025	0.021	1.22	0.224	0.021	0.021	1.04	0.299	−0.043	0.031	−1.40	0.161
R&D intensity	0.227	0.024	9.31	0.000**	0.224	0.024	9.20	0.000**	0.217	0.024	8.91	0.000**	0.272	0.028	9.67	0.000**
Revenue growth	0.061	0.002	28.86	0.000**	0.060	0.002	28.35	0.000**	0.060	0.002	28.48	0.000**	0.064	0.003	21.60	0.000**
Debt ratio	−0.226	0.005	−41.35	0.000**	−0.225	0.005	−41.14	0.000**	−0.221	0.005	−40.48	0.000**	−0.204	0.009	−23.01	0.000**
Exercisable options ratio													−0.002	0.003	−0.56	0.574
Constant term	6.553	0.150	43.59	0.000**	6.624	0.156	42.38	0.000**	6.787	0.157	43.31	0.000**	7.420	0.232	31.96	0.000**
F	(4, 16,640)		718.91	0.000**	(6, 16,638)		485.33	0.000**	(9, 16,635)		341.06	0.000**	(10, 6,585)		132.69	0.000**
Number of observations				18,986				18,986				18,986				7,555
Number of firms				2,342				2,342				2,342				960
		Within	Between	Overall		Within	Between	Overall		Within	Between	Overall		Within	Between	Overall
R-squared		0.15	0.09	0.11		0.15	0.11	0.12		0.16	0.14	0.15		0.17	0.06	0.10
Rho (autocorrelation coefficient)				0.27				0.27				0.27				0.37

Notes. SE = standard error. Autoregressive error structure (AR1) based on Durbin-Watson technique.
$^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.10$.

Figure 1 Estimated ROA Across the Range of Horizon Holding all Other Variables Constant at Their Mean Values



Note. Based on Table 4.

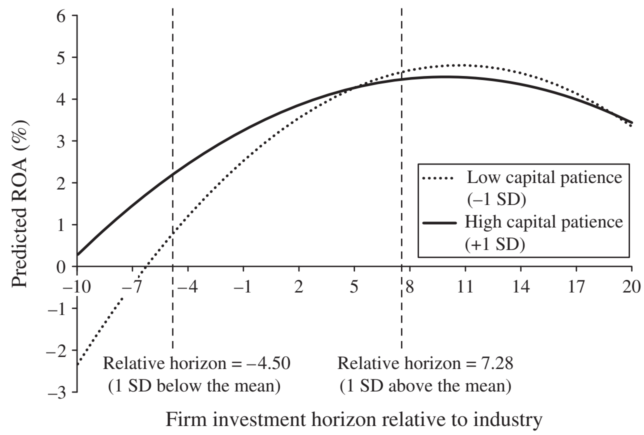
estimate ($b = -0.01$, $z = -8.35$, $p < 0.001$). Both the linear and quadratic models are statistically significant, and as reported in Table 4, the percentage of variance explained increases from 12% to 15% with the quadratic model. These results support Hypothesis 1(B) and suggest that horizon can be modeled more accurately with an inverted U-shaped model than a purely linear one.

Figure 1 shows the predicted performance versus horizon from both of these models. The quadratic model features a much steeper slope between horizon and performance than the linear model at low horizons, but the relation tapers off for firms with horizons above the mean, and turns negative at extremely long horizons—i.e., horizons more than 10 years longer than industry averages. The results predict that a firm with a horizon five years below the industry average would have expected ROA of about 1.8%, whereas a firm with a horizon equal to the industry average would have expected ROA of 3.3%. The change in expected performance for a change in horizon is largest for very low horizons. At the peak of 10 years longer than industry average, Model 3 predicts ROA of 4.6%—a substantial increase in profitability but also a slower rate of increase than for horizons below mean levels. However, lengthening horizon beyond this point appears counterproductive, with predicted ROA decreasing. The model predicts that firms with horizons 20 years longer than the industry average can only expect an ROA of 3.4%.

The results discussed so far have ignored the hypothesized interaction with the patience of capital providers. Consequently, the results can be thought of as an average value across the observed distribution of patience. We now turn to the patience of capital providers.

In Hypothesis 2, we argued that firm performance will be relatively higher when capital patience interacts with long investment horizon. Model 3 provides evidence partially supporting this hypothesized interaction ($b = 0.02$, $z = 2.04$, $p < 0.05$). Combining the linear interaction term—capital patience—with a curvilinear relation

Figure 2 Estimated ROA Across the Range of Horizon at Different Levels of Capital Patience, Holding all Other Variables Constant at Their Mean Values



Notes. Based on Table 4, Model 3. SD = standard deviation.

between investment horizon and performance produces a three-way interaction that is easiest to understand by looking at Figure 2. We identify two insights. First, Figure 2 shows how the relation between horizon and performance becomes less curvilinear (i.e., the curve is flatter) at a higher level of capital patience. For all horizons of at least two years longer than the industry average, predictions at the high (+1 standard deviation) and low (−1 standard deviation) levels of capital patience are within 0.31% of each other—a relatively small difference for a variable with a mean of 3.0% and a standard deviation of 9.6%.

Second, however, the predicted effect of capital patience is notably larger at shorter horizons. For example, a firm with capital patience and horizon both one standard deviation below the mean would be expected to have ROA of 1.35% lower than a firm with the same horizon but capital patience one standard deviation above the mean. At the extreme horizon of our sample (10 years shorter than the industry average), a firm with capital patience one standard deviation above the mean would be expected to perform 2.63% better than a firm with the same horizon but capital patience one standard deviation below the mean. We therefore see evidence that the combination of short investment horizons and impatient investors produces the most negative performance levels (as predicted by Hypothesis 2), but that capital patience has little effect on the relation between horizon and performance when firm horizons are longer than average (which does not support Hypothesis 2).

Hypothesis 3 argues that most firm horizons lie in the region where firms have horizons shorter than the level implied by peak ROA. Descriptive statistics show that 96% of firms have horizons shorter than 10 years above average—the level associated with highest firm performance. A t-test confirms that average observed horizon is significantly less than the horizon associated with highest firm performance ($t = 2{,}200$, $p < 0.001$). These findings support Hypothesis 3.

The quadratic relation leads to three conclusions that differ substantively from a linear modeling of horizon. First, whereas the linear model assumes monotonically increasing benefits to horizon, Model 3 demonstrates that the benefits of horizons do not continue without limit. The marginal influence of horizon on predicted performance becomes relatively small once a firm's horizon is more than four years longer than average—predicted ROA based on Model 3 lies in a tight range of 4.3% to 4.6% for all horizons from 5 to 15 years longer than the industry average. Second, although our model supports the conceptual idea that a firm's horizon can be too long, this was rarely observed in practice. A negative marginal return to increased horizon is predicted for fewer than 4% of sampled firms. Third, for firms with below-average horizons, the quadratic model implies a much steeper cost than the linear model. Firms with the shortest horizons gain the most from marginal increases in horizon.

Parameter estimates for the control variables generally match expectations. As assumed, R&D intensity has a positive effect on ROA. The effect of CAPX intensity, however, is not statistically significant. Revenue growth and debt ratio have statistically significant and consistent effects in the expected directions—positive for revenue growth and negative for debt ratio.

Robustness Checks

Effect of stock options. Some firms claim to grant stock options as an incentive to promote long-term investment among managers. Consequently, we checked whether our results are robust to the inclusion of option data. We focus on *exercisable options ratio*, because prior research has found investment differences when managers hold exercisable versus unexercisable stock options (Devers et al. 2008) and have tied the issue directly to horizon (Souder and Shaver 2010). These studies imply a negative effect of exercisable options ratio on ROA, and in Model 4 exercisable options ratio has a negative but statistically insignificant parameter estimate. Because Execucomp provides compensation data for only about 40% of the total sample, however, the sample is drastically reduced for Model 4 in Table 4. Given that substantive results for other variables are similar between Models 3 and 4, we have emphasized Model 3 and its larger sample size as our primary model.

Multiyear performance periods. The reported results in Model 3 come from modeling the effect of firm horizon on ROA in year t based on all assets in use at the time. Previously, we explained why this is a valid comparison. At the same time, the essence of our study concerns the long-run value of longer-horizon PPE, and we therefore checked whether our results were robust to longer observations of operating performance. We replicated the model using average ROA over two-, three-, four-, and five-year periods. The drawback of this approach is that in each additional year, the firm acquires additional PPE that could influence performance but would not be in our measure of firm horizon.

Table 5 reports the results for these robustness checks. In each performance window, firm horizon has the hypothesized quadratic association with average ROA. All are statistically significant. Consistent with the diminishing overlap between the horizon data and the performance period, the magnitude of the effect declines with the length of time over which the dependent variable is calculated. Each additional year reduces the number of observations (as we use more lead periods to construct the estimable observations), but the sample size remains over 16,000 even in the five-year period. The relation between horizon and performance remains similar in sign across the different performance windows. However, the interaction between horizon and capital patience disappears over longer time periods, and gets replaced by a (not hypothesized) negative main effect for the capital patience variable.

Discussion

Given the centrality of intertemporal trade-offs to firm strategies, this manuscript attempts to enhance both the theoretical basis and empirical understanding of the impact of firm investment horizon on financial performance. Our empirical results support the argument that longer investment horizons associate with higher firm performance for a substantial majority of firms, but this relation has diminishing marginal returns and may even turn negative at very long horizons. The evidence that a handful of firms may have excessively long horizons should caution scholars against blanket prescriptions. In the folk wisdom, "good things come to those who wait," it is not the waiting per se that has value. What matters is there is something "good" that makes the wait worthwhile. Excessively lengthening a firm's horizon may prove unwise for the few firms that have already adopted long horizons. In addition, we find empirical support for the longstanding conventional wisdom that a majority of U.S. firms regularly choose investments with shorter horizons than associated with highest performance. Given that the vast majority of observations appear in the positive slope section of the curve, we believe the safest inference is that the nonlinear results indicate a declining benefit to increased horizon but it is premature to conclude that performance actually declines for firms with extremely long horizons.

The nonlinear relation also reflects on a more general issue. Scholars have often argued firms have excessively short horizons, but only occasionally recognized the possibility of excessively long horizons. Many social science studies examine the linear influence of some

Table 5 Results from Time-Series Regression with Autoregressive Error Structure and Fixed Effects (Model 3) Over Different Time Frames

	2 years (t to $t+1$)				3 years (t to $t+2$)				4 years (t to $t+3$)				5 years (t to $t+4$)			
DV = *Average return on assets*	Coeff.	SE	z	$P > z$	Coeff.	SE	z	$P > z$	Coeff.	SE	z	$P > z$	Coeff.	SE	z	$P > z$
Relative horizon	0.205	0.020	10.41	0.000**	0.110	0.015	7.48	0.000**	0.073	0.011	6.47	0.000**	0.044	0.010	4.67	0.000**
Relative horizon squared	−0.008	0.001	−8.20	0.000**	−0.004	0.001	−5.37	0.000**	−0.003	0.001	−5.52	0.000**	−0.002	0.000	−4.10	0.000**
Capital patience	−0.038	0.047	−0.81	0.418	−0.252	0.035	−7.20	0.000**	−0.134	0.027	−4.98	0.000**	−0.093	0.022	−4.19	0.000**
Horizon × capital patience	−0.012	0.007	−1.67	0.096†	−0.008	0.005	−1.55	0.122	−0.007	0.004	−1.66	0.096†	−0.005	0.004	−1.56	0.119
Hor. sq. × capital patience	0.000	0.000	1.08	0.279	0.000	0.000	1.34	0.180	0.000	0.000	0.57	0.572	0.000	0.000	0.77	0.441
CAPX intensity	0.061	0.014	4.47	0.000**	0.142	0.010	14.42	0.000**	0.099	0.008	13.11	0.000**	0.056	0.006	8.93	0.000**
R&D intensity	−0.335	0.015	−22.28	0.000**	−0.093	0.011	−8.67	0.000**	−0.043	0.008	−5.42	0.000**	−0.037	0.007	−5.41	0.000**
Revenue growth	0.017	0.001	13.99	0.000**	0.006	0.001	7.15	0.000**	0.005	0.001	7.90	0.000**	0.004	0.001	7.98	0.000**
Debt ratio	−0.165	0.004	−41.67	0.000**	−0.094	0.003	−31.32	0.000**	−0.058	0.002	−24.64	0.000**	−0.042	0.002	−21.63	0.000**
Constant term	7.662	0.065	117.29	0.000**	4.529	0.038	117.98	0.000**	3.588	0.025	141.15	0.000**	3.578	0.020	181.08	0.000**
F	(9, 16,635)		299.12	0.000**	(9, 16,240)		155.95	0.000**	(9, 15,555)		102.32	0.000**	(9, 14,637)		75.40	0.000**
Number of observations				18,986				18,539				17,784				16,730
Number of firms				2,342				2,290				2,220				2,084
		Within	Between	Overall		Within	Between	Overall		Within	Between	Overall		Within	Between	Overall
R-squared		0.14	0.33	0.27		0.08	0.23	0.22		0.06	0.21	0.20		0.04	0.21	0.19
Rho (autocorrelation coefficient)				0.58				0.70				0.81				0.82

Notes. SE = standard error. Autoregressive error structure (AR1) based on Durbin-Watson technique.
$^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.10$.

variable on something else, implicitly assuming that continued increases in a variable limitlessly benefit the firm. This only makes sense if other factors bound the range of that variable. Almost any beneficial behavior should have declining marginal benefits at high levels, or else increasing that single variable would increase firm performance ad infinitum. Our study of firm investment horizon thus exemplifies the "too-much-of-a-good-thing effect," which argues that management research theorizes about many relations for which an inverted-U might be more compelling than a linear model (Pierce and Aguinis 2013).

Our analysis finds that the cost of short investment horizons is magnified when capital patience is also low. In this scenario, the impatience of investors may conceivably be responsible for exerting pressure on managers toward shorter horizon investments (Zhang and Gimeno 2016). We proceed cautiously with our interpretation because our empirical work cannot establish causality between the potential short-termism of managers and investors. Given that caveat, we see clear evidence that the combination of short-termism from both parties is associated with very low performance outcomes—plausibly because the perceived earnings pressure makes managers reluctant to consider "good" longer horizon investments and simultaneously enables an inefficient number of relatively poor investments with shorter horizons. At the other end of the performance spectrum, among firms with relatively long horizons, the effect of capital patience appears minor. Further research into the interplay between managers and investors on the issue of horizon would be valuable.

Our paper fits with the practice-based view (Bromiley and Rau 2014) in that it finds a readily imitable activity positively influences firm performance. In this, it joins historical research and recent findings that many readily copied factors like executive compensation practices, diversification, etc., explain some of the variation in firm performance. For example, a recent study finds that a firm's cash assets have a nonlinear influence on subsequent firm performance (Kim and Bettis 2014). Such results fall under the behavioral theory of the firm (Cyert and March 1963), which claims that firms adapt by solving a series of short-term problems rather than developing long-range strategies. Largely, firms try to raise performance above aspirations as quickly as possible—implying a tendency to develop and approve projects with short horizons. By emphasizing projects that solve immediate problems, firms settle for a less profitable set of opportunities than could be pursued. Our results support the prevalence of this tendency toward short-termism and the performance consequences of doing so. Furthermore, the overarching behavioral explanation—of managers satisficing in the face of conflicting priorities—contributes richness that is missing from some literature on capital budgeting that treats the variance in discount rates as an error (Ferson and Locke 1998) or bias that could be overcome by applying the NPV rule more diligently.

Limitations, Extensions, and Practical Implications

This study is limited by its emphasis on publicly held, U.S.-based manufacturing companies. We imposed these restrictions to obtain comparable data, but future research might relax them. Capital expenditures have a consistent meaning in manufacturing firms, but all industries face horizon dilemmas. For example, observers partially attribute the banking crisis of 2008 short-termism in financial services (Cohen 2009). It would be valuable to develop a corresponding measure appropriate for financial services firms to confirm our results in that setting. Likewise, future research should consider whether these relations differ between high and low technology manufacturing industries or across geographic boundaries or industry segments.

Another limitation of our paper comes from analyzing the horizon of CAPX and not other types of investments. CAPX is an important investment category, but the prior literature conceptualizes investment more broadly than the purchase of property, plant, and equipment. We focused on CAPX because we had a defensible measure of horizon in CAPX, but similar measures are hard to find in other time-related expenditures. However, this leaves us unable to address the association of firm horizons in other investment types with performance. Subject to finding horizon measures applicable outside CAPX, future research could usefully analyze the association of firm horizons in other investment types with performance and the extent to which the investment horizon based on CAPX represents a good proxy for the dominant logic of a firm's overall investment horizon. With multiple measures of horizon, scholars could also consider whether firms evidence a consistent policy toward the future.

We characterize horizon based on the average horizon of a firm's PPE. However, a firm that focused most of its investments in a given horizon may have a very different strategy than a firm with extremely varied horizons but the same mean horizon. Future research might want to examine the entire distribution of horizons across a firm's PPE rather than the single number we use. Further, we acknowledge that some debate exists about whether firms use NPV analysis for regular capital investments that are required to replenish equipment and maintain broad competitiveness rather than just as a "project-based" analysis tool. Our theorizing about the impact of NPV on horizon assumes managers perceive choices in PPE investments that evidence differing levels of durability.

We also emphasized publicly held companies for data availability. Previous research suggests that time horizon issues in privately held firms may differ substantially from public ones (Wang and Bansal 2012), and that the governance of family firms especially permits a longer orientation than in nonpublic firms (Chua et al. 2009, Lumpkin and Brigham 2011). Additional research should attempt to understand differences in investment horizon between private and public firms. Similar to the point made above, comparisons across types of firms (e.g., public versus privately held) might analyze the distribution of horizons among various investments within a firm, rather than just the average level that can be algebraically deduced from accounting data. Such granular investment data are not publicly available but might be obtained from internal corporate sources.

The results of our analysis of the interactive effects of manager and investor horizon are interesting but preliminary. Our study uses a simple indictor for investors' temporal preferences. Future studies could work to improve construct clarity and develop better measures of investor horizon. Our measure of capital patience, trading volume, does not fully separate investor risk preferences from horizon preferences. It also does not capture some aspects of the construct as well as other existing measures such as those capturing the kinds of institutional investors invested in the firm or degree of family ownership. Additional research might also examine the antecedents of investor horizon. Scholars might examine whether long horizon investors use different mechanisms to influence managers than short-term investors do. Finally, greater investigation of the interaction between investor and manager horizons could yield more specific prescriptions for managerial action through understanding the boundaries under which each group's horizon is expected to have the greatest impact on performance outcomes. While our study establishes a relationship between both manager and investor horizons and firm performance, we do not examine the relative influence of the two. As such, our theorizing focuses on establishing a performance relationship between time horizons and firm performance. Future research can clearly distinguish the effects of manager and investor horizons from one another.

Our results also provide useful implications for practicing managers and corporate directors, who readily acknowledge the vexing trade-off between short- and long-term goals (Lorsch and MacIver 1989, Welch 2005)—a problem Abell (1993, p. 3) calls the "dual nature of management." In addition to support for most firms lengthening their horizons, our approach provides a way for managers to calculate their own firm's position among peers in an industry and judge the degree to which changing their dominant logic about investment horizon could provide performance benefits. While cognizant of the difference between large sample findings and specific case prescriptions, we suggest these results offer preliminary guidance to firms concerned about selecting an appropriate investment horizon.

Conclusion

Organizational scholars often claim that temporal aspects of firm research are hidden or have effects that are poorly understood (Rumelt et al. 1991, Zaheer et al. 1999). This paper explores one of these temporal issues in depth. We find empirical justification for the commonly held belief that firms with longer investment horizon can achieve success greater than more myopic peers, and that most, but not all, firms would benefit from longer investment horizons. Both of these results help bring hard evidence to bear on the ongoing debate about the presumed benefits of farsighted investing.

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Endnotes

[1]Portions of this argument follow the logic of real options reasoning, although most strategy research on real options focuses on growth opportunities rather than the purchase of capital equipment.

[2]Note that this makes sense if managers and/or investors do not believe the stock market to be fundamentally efficient so that myopic actions can influence stock price without positively influencing the net present value of future earnings. A fully efficient stock market would eliminate the possibility of benefiting investors with specific time preferences in that the only factor that would matter would be the net present value of future earnings discounted at the true cost of capital.

[3]The mean does not equal zero because relative horizon is calculated based on the industry median rather than the industry mean.

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