MAKING THE NUMBERS? "SHORT TERMISM" & THE PUZZLE OF ONLY OCCASIONAL DISASTER

Nelson P. Repenning
Rebecca M. Henderson

Making the Numbers? "Short Termism” & the Puzzle of Only Occasional Disaster
Nelson P. Repenning and Rebecca M. Henderson
NBER Working Paper No. 16367
September 2010
JEL No. L25

ABSTRACT

Much recent work in strategy and popular discussion suggests that an excessive focus on “managing the numbers”–delivering quarterly earnings at the expense of longer term investments–makes it difficult for firms to make the investments necessary to build competitive advantage. “Short termism” has been blamed for everything from the decline of the US automobile industry to the low penetration of techniques such as TQM and continuous improvement. Yet a vigorous tradition in the accounting literature establishes that firms routinely sacrifice long-term investment to manage earnings and are rewarded for doing so. This paper presents a model that can reconcile these apparently contradictory perspectives. We show that if the source of long-term advantage is modeled as a stock of capability that accumulates gradually over time, a firm’s proclivity to manage short-term earnings at the expense of long-term investment can have very different consequences depending on whether the firm’s capability is close to a critical “tipping threshold”. When the firm operates above this threshold, managing earnings smoothes revenue with few long-term consequences. Below it, managing earnings can tip the firm into a vicious cycle of accelerating decline. Our results have important implications for understanding managerial incentives and the internal processes that lead to sustained advantage.

Nelson P. Repenning
MIT
nelsonr@mit.edu

Rebecca M. Henderson
Heinz Professor of Environmental Management
Harvard Business School
Morgan 445
Soldiers Field
Boston, MA 02163
and NBER
rhenderson@hbs.edu

Everyone who has worked with American managements can testify that the need to satisfy the pension fund manager's quest for higher earnings next quarter, together with the panicky fear of the raider, constantly pushes top managements toward decisions they know to be costly, if not suicidal, mistakes. The damage is greatest where we can least afford it: in the fast-growing middle-sized high-tech or high-engineering firm that needs to put every available penny into tomorrow. (Drucker, 1986: 31) Quoted in Laverty, 1996)

1. Introduction.

There is little doubt that the desire for smooth and reliable earnings has a significant effect on managerial behavior. Even the most casual visit to a publicly-traded company during a period of lower-than-expected revenue reveals the lengths to which managers will go to "meet their numbers": doing anything from banning travel and eliminating training to canceling investments projects and delaying maintenance. Indeed, research within the finance and accounting literatures finds that managers do sacrifice (at least some) long-term investments in response to pressure from the capital markets. Graham et al.'s, (2005) large-scale qualitative study of CFOs and CEOs finds that 78% of the managers surveyed admit to sacrificing long-term value to achieve smoother earnings. Brav et al. (2005) find that capital market pressures lead managers to "avoid cutting dividends at all costs" even if this means bypassing NPV positive investments. Similarly Dechowe & Sloan (1991), Bartov (1993), Bushee (1988) and Penman & Zhang (2002), all report evidence consistent with the idea that managers sell assets, cut R&D or reduce earnings to meet earnings targets.   More recently Brenner (2007, 2010) has suggested that firms going through significant technological transitions face particularly intense pressure from analysts, causing them to reduce capital investment and investment in R&D. But does such a focus on short-term results actually detract from overall firm performance? Despite the ubiquity of this practice, both popular opinion and the available data remain decidedly mixed and the strategy literature takes a distinctly different perspective from that which is largely dominant in the finance and accounting literatures.

Research in strategy has long stressed the importance of sustained investment over long periods of time as a key source of competitive advantage. Scholars working within this tradition have suggested that the unique resources and distinctive organizational competences that underlie enduring supranormal

returns cannot be developed instantaneously but must be "grown" gradually over time (Dierickx and Cool, 1989). For example, Wal-Mart's superior IT capabilities were built through sustained investment over many years; by the time K-Mart attempted to respond by building equivalent skills the investment required was more than their balance sheet could sustain. Similarly the organizational competencies developed by firms such as Nordstrom, Southwest, Toyota, McKinsey and Merck appear to rest on the slow accumulation of mutual trust and local or "sticky" knowledge that takes years to develop (Gibbons and Henderson, 2010; Helfat et al. 2007).

This understanding has led to the suggestion that the short term orientation of American capital markets and American managers is a significant problem. Commenting on the recent meltdown of the US financial system, William Donaldson, a former head of the securities and exchange commission, said "The excessive focus by too many corporations on achieving short-term results… certainly is one of the root causes for some of the problems we face today (Rummel, 2008)." Donaldson is not alone in his views: both academics and pundits are fond of highlighting the "tyranny of quarterly earnings" as the principal reason for the perceived decline of the western economy (Hayes & Abernathy, 1980; Jacobs, 1991; Laverty, 1996; Dertouzos et al., 1989; Porter 1992).

Consistent with this view, there are plenty of examples of once successful concerns whose efforts to achieve short-term performance targets appear to have had a negative impact on their willingness to make important longer term investments. The current woes of the US auto industry are often attributed to their unwillingness to address the eventual need for smaller fuel-efficient vehicles in favor of continuing to sell profitable trucks and sport utility vehicles (e.g., Freidman, 2008). Similarly, Pfeffer and Sutton (2000:142-147) document how a focus on short-term results severely weakened Hewlett-Packard's much vaunted employee focused culture. At a more micro level, a sequence of papers exploring the dynamics of process-focused improvement suggest that many firms are reluctant to invest in practices that raise profitability in the long term if they come at the expense of short term performance (Easton and Jarrell, 1998; Repenning and Sterman, 2002; Repenning 2001). Work in the innovation tradition suggests

that one of the reasons firms experience difficulty in responding to discontinuous technological change is that they are reluctant to make investments in next generation technologies at the expense of investment in the status quo (Christensen, 1997). Similarly, work in organizational economics suggests that a focus on short-term measureable performance can induce managers to neglect those tasks for which clear performance measures are not available (Holmstrom and Milgram 1991), and that rewarding short-term performance when managerial ability is unclear can lead managers to "borrow" earnings from the future at an unfavorable rate (Stein 1989).

In contrast to this collection of case evidence and theory, large sample studies in the accounting literature suggest that "managing earnings" and "meeting analyst expectations" are systematically associated with superior performance. Barth et al. (1999), for example, find that firms that report continuous growth in annual earnings earn a premium in the market. Bartov et al. (2002) find that firms that meet or beat analyst expectations often report superior operating profits, while Skiner and Sloan, (2002) find that firms that fail to meet benchmarks suffer large negative price reactions. A significant body of theory explains these results by suggesting that they reflect agency or information problems. For example, Bowen et al. (1995) and Burgstahler and Dicheu (1997) suggest that those who "manage earnings" enhance their reputation with key stakeholders and thus obtain better terms of trade. Farrell and Whichbee (2003) suggest that "making the numbers" reflects career concerns on the part of senior managers who would otherwise lose their jobs. Bolten, Scheinkman and Xiong (2006) present a theoretical model in which optimal compensation contracts emphasize short-term stock performance at the expense of long run fundamental value to induce managers to pursue actions that increase the speculative component of the stock price.

The idea that sacrificing some long-term investment for the sake of short-term earnings management might not be entirely disastrous is further supported by the observation that, to paraphrase Mark Twain, reports of the demise of the western economy have often been greatly exaggerated. A former SEC chief, Harold Williams, said, in an address given in November 1980 (Williams 1980), "I

believe that the most fundamental problem facing us is that we have lost our sense of the future—we tend increasingly to focus on the short-run and to ignore the longer-range consequences of business and political decisions." Williams' remarks failed to predict what would eventually become the longest peacetime expansion in US economic history, and there is little reason to believe that managers became less shortsighted during the period.

How are we to make sense of this apparent paradox? When does a short term, target driven focus increase performance and when does it lead to the erosion of critical long-term capabilities and a failure to invest in new markets and new technologies? In this paper we attempt to answer this question through the development of a simple model that captures the dynamics associated with managing earnings. Our formulation begins with a premise central to the strategy literature: long-term investment leads to the development of a stock of "capability" which continually erodes through natural entropy and thus requires continued investment and maintenance. We think of capability as including many competitively significant assets – particularly organizational capabilities, but also such intangibles as reputation and brand value. Critically, the stock of "capability" at any single time and its effect on performance can neither be easily measured nor predicted by the firm. Investments in capability are thus likely to be driven more by rules of thumb and managerial intuition than by precise calculation. We then define firm performance as a function of the effort devoted to short-term performance and the current level of capability, thus presenting the firm with the task of trading off investments in long-term capability against short-term revenue generation. We use the model to study the dynamics that emerge when firms try to "manage earnings" by changing the emphasis placed on short-run revenue performance in response to exogenous shocks to revenue.

Analyzing our model yields several insights. First, we show that conceptualizing capability as a stock or level variable implies that the firm faces a temporal trade-off in making resource allocation decisions. If managerial time is scarce, increasing the attention dedicated to capabilities necessarily results in a temporary decline in overall performance – a pattern of "worse before better". Conversely,

reducing the time dedicated to cultivating capabilities leads to a temporary increase in performance – a pattern of "better before worse." Second, combining these physical dynamics with the efforts of managers to smooth earnings yields a system characterized by two stable equilibria separated by a tipping threshold. Critically, this structure implies that attempts to manage earnings can produce very different outcomes depending on their intensity. As long as the resource adjustments targeted at smoothing performance keep the system above its tipping threshold, they will have a only a second-order effect on long-run average performance while significantly reducing its variation around the mean. Above the tipping threshold managing earnings thus offers several positive benefits including improved internal financial discipline and higher external investor confidence. Since it seems plausible that this is the dominant state most of the time in most industries, our analysis suggests that it is not surprising that the accounting literature finds that most firms smooth earnings and are rewarded by the market for doing so. However, if, in an effort to maintain earnings stability, capability is allowed to fall below this critical threshold, then efforts to smooth earnings become a path to failure. The firm enters a vicious spiral created by an increased emphasis on revenue generation and declining organizational capability which, left unchecked, eventually leads to failure.

Third, we use the model to identify the conditions under which firms are most prone to "tipping" into this pathological set of dynamics. We show that the risk of tipping into a vicious spiral of declining capability increases with both the manager's willingness to shift investment in response to short term revenue shortfalls increases and the general proclivity of managers to emphasize short term results. Those managers who "overweight" short-term returns even when times are good are significantly more likely to tip towards disaster.

Finally, we explore the effects of increasing demand variability on these dynamics. We show that when demand is relatively smooth "hares" (firms that respond to shifts in demand by rapidly shifting investment to keep day to day revenues stable) can minimize revenue variability and thus presumably maximize their equity performance with no significant long-term penalty. However as demand variability

increases they become significantly more likely to tip into disaster than "tortoises" - firms that respond much less dramatically to shortfalls in immediate revenue.

These results have several implications for our understanding of the sources of competitive advantage. Most critically, they suggest that whether earnings management is a source of improved performance or deeply pathological is a matter of degree, and that the dynamics of the system are such that it is relatively easy for managers to learn the wrong lessons about the optimal mix of the two activities. Unless one holds to heroic assumptions about managers' understanding of the system in which they are embedded, it appears that managers cannot necessarily be counted on to make this trade-off in the long-term best interests of the firm. Our results thus suggest that organizational practices that protect investments in capability from the inevitable desire to cut them during down periods are likely to be a key source of persistent above average firm performance. Most notably, compensation systems that rely on relational contracts and subjective performance measures to reward the long term development of capability may prove to be a key contributor to sustained above-average performance.

We organize our arguments as follows. In the next section we present our model, first analyzing the implications of our conceptualization of capability and performance. Following that, we add a decision rule to the model in which managers treat earnings management as a simple control problem and then analyze its dynamics. Finally, we discuss the implications of our results for future research.

2.0 The Model

2.1 Capability and Performance

We begin the specification of our model with the notion of *capability*. We follow Dierickx and Cool (1989) in hypothesizing that because capabilities cannot be directly acquired, they are usefully conceptualized as being the outcome of a process of accumulation and, consequently, behave as stock or level variables. Managers in this formulation cannot influence the level of capability directly, but instead can only control its rate of change. Thus, for example, managers cannot immediately transform a poorly maintained production line and a poorly trained workforce into a high performance operation. Instead,

they must invest in maintenance, process improvement and training, and, with time, operational performance will improve. Conversely, if managers suddenly begin to neglect maintenance and training, operational performance does not immediately decline; time is required before poorly maintained equipment begins to break and turnover and forgetting yield a poorly skilled workforce.

We model capability, C, as a stock or level variable whose rate of change is determined by two factors, investment and erosion:

$$\frac{dC}{dt} = e_C \cdot \rho - \frac{C}{\tau} \tag{1}$$

Investment, the first term, is the product of the effort the firm dedicates to developing and maintaining capability, e_c, and the productivity of those efforts, ρ. Erosion is captured by the second term: absent investment, capability erodes with an average delay of $1/\tau$. [2]

We specify the firm's revenue, R, as a Cobb-Douglas function of the firm's capability, C, the effort currently being dedicated to generating revenue, e_R, and an exogenous shock, s.

$$R = C^\alpha e_R^\beta (1 + s) \tag{2}$$

Finally, we model the resources available to the firm as bounded by H, the number of available hours.

$$e_R + e_C = H \tag{3}$$

In the long run firms could in principle choose to increase H. To focus attention on the fundamental structure of the model, however, we assume H is fixed. With this specification it is straightforward to calculate the optimal allocation of effort between the two activities in equilibrium:

$$e_C^* = H \cdot \left(\frac{\alpha}{\alpha + \beta}\right)$$

---

[2] . Note our formulation is simpler than the one proposed by Dierickx and Cool (1989) who suggest that managers may also influence the rate with which capability erodes. For simplicity, we assume that erosion happens autonomously and that managers influence capability solely through the investment term.

$$e_R^* = H \cdot \left(\frac{\beta}{\alpha + \beta} \right)$$

2.2 Earnings Management

We model the tendency to "manage earnings" using a simple representation of the manager's decision rule in which she continually adjusts the effort dedicated to revenue generation, e_R, in an effort to achieve her target revenue, R^T:

$$e_R = e_R^* \left(\frac{R^T}{R} \right)^\gamma \tag{4}$$

The effort dedicated to revenue generation, e_R, is equal to the optimal balance, e_R^*, multiplied by the target revenue divided by current revenue raised to the γ power, $(R^T/R)^\gamma$. For most of the analyses we set R^T equal to R^*, the revenue that can be achieved when effort is allocated optimally. The parameter γ represents the strength of the manager's tendency to shift investment in response to unanticipated revenue shortfalls. If γ is zero, then managers continue to pursue the steady state optimum and do not react to unanticipated changes in R caused by exogenous shocks. However as γ increases managers make increasingly aggressively efforts to compensate for revenue deviations.

Note that our formulation presumes a particular flavor of rationality on the part of our hypothesized manager. We assume that our manager is rational in equilibrium but reacts to disequilibrium situations by following a simple adjustment rule rather than solving a sophisticated dynamic program. Put differently, in our model the manager in question knows both the optimal revenue that can be achieved in steady state and the effort balance required to achieve that output. She is not, however, able to calculate the optimal trajectory to return to that steady state when the revenue is perturbed by exogenous deviations. Instead, when faced with a disequilibrium situation, the manager follows the simple adjustment rule described in (6). A growing body of literature support this approach, suggesting that when facing disequilibrium dynamics, human behavior is often best described by the reliance on such simple heuristics (e.g., Sterman 1989, Brehmer 1986).

2.3 Model Overview

These assumptions yield a system comprised of three key feedback loops (see figure 1). First, there is the balancing *Capability Erosion* loop; absent ongoing investment, capability erodes towards zero, with an average delay of τ. Second, the decision rule described above results in the balancing *Make the Numbers* loop. As revenue, R, falls below its target, R^T, managers concerned with short term results (i.e. those with non zero values of γ) increase the effort dedicated to revenue generation, which, in the short run, increases revenue and closes the gap. Finally, the allocation of effort to long-term investment creates the reinforcing *Invest in the Future* loop. Notice that this loop can act as either a virtuous or vicious cycle, amplifying whichever behavior is currently in progress. For example, if revenue exceeds the target, then the firm can grow its stock of capability and make achieving the revenue objective even easier.

When operating in this virtuous direction the *Invest in the Future* loop creates a growing level of capability and competitive advantage. However if revenue falls below its target, firms engaged in earnings management may divert resources away from capability development in an effort to close the gap. While this will increase revenue in the short run, it also reduces investment in capability. As the level of capability falls, it becomes more difficult for the firm to achieve its revenue target, thus increasing the pressure to shift resources towards revenue generation and away from capability development. In the extreme, capability can decline so much that the firm collapses – reproducing the dynamics identified by those who bewail the short-term focus of the capital markets. In the next section, we use the model to explore the conditions under which this is more or less likely to happen.
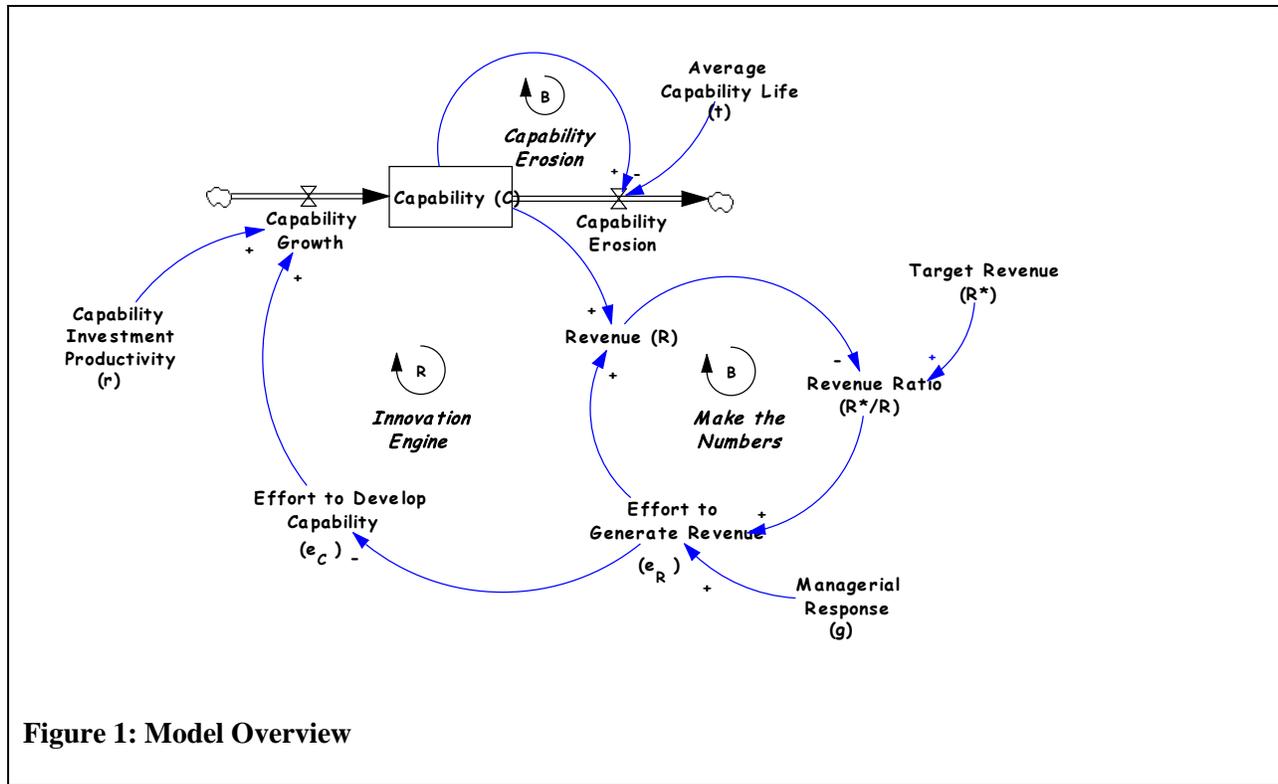
Figure 1: Model Overview

3. Model Analysis

3.1 Worse-Before-Better and Better-Before-Worse

We begin the analysis by reproducing two of the dynamics highlighted in the qualitative literature (e.g., Repenning and Sterman, 2001): "Better before worse" and "Worse before better". Figure 2 shows a set of model runs in which effort is initially split optimally between revenue generation and capability investment and then, in month twelve, rebalanced to focus "excessively" on generating short term revenue. We show three possible paths, each corresponding to an increased allocation towards short-term activity at month twelve. In each case, immediately following the shift, revenue grows above the steady state optimum because capability does not immediately degrade. However, in the longer term, the reduced investment in capability results in its erosion and revenue begins to fall. Adjusting effort towards revenue generation thus creates a "better-before-worse" behavior pattern; by reducing investment in capability the firm can temporarily raise its revenue, but such gains come at the expense of future

10

performance as capability begins to erode. This is the classic "milk the business" trajectory highlighted by those who worry about an excessive focus on short-term performance.

Conversely, figure 3 shows the revenue trajectories when the simulation starts with an overemphasis on revenue generation and, then, at month twelve effort is rebalanced to match the optimal mix. In these cases revenue initially declines with the reduction in the effort dedicated to generating revenue . Later, as the additional effort dedicated to capability investment begins to pay off, revenue improves, eventually surpassing the initial level (since the effort balance is now optimal in steady state). This is the classic "worse-before-better" trade-off found in the innovation and process improvement literatures (e.g., Repenning and Sterman 2001): increased investment in assets and activities that build capability eventually pay off, but only do so after depressing short term results.
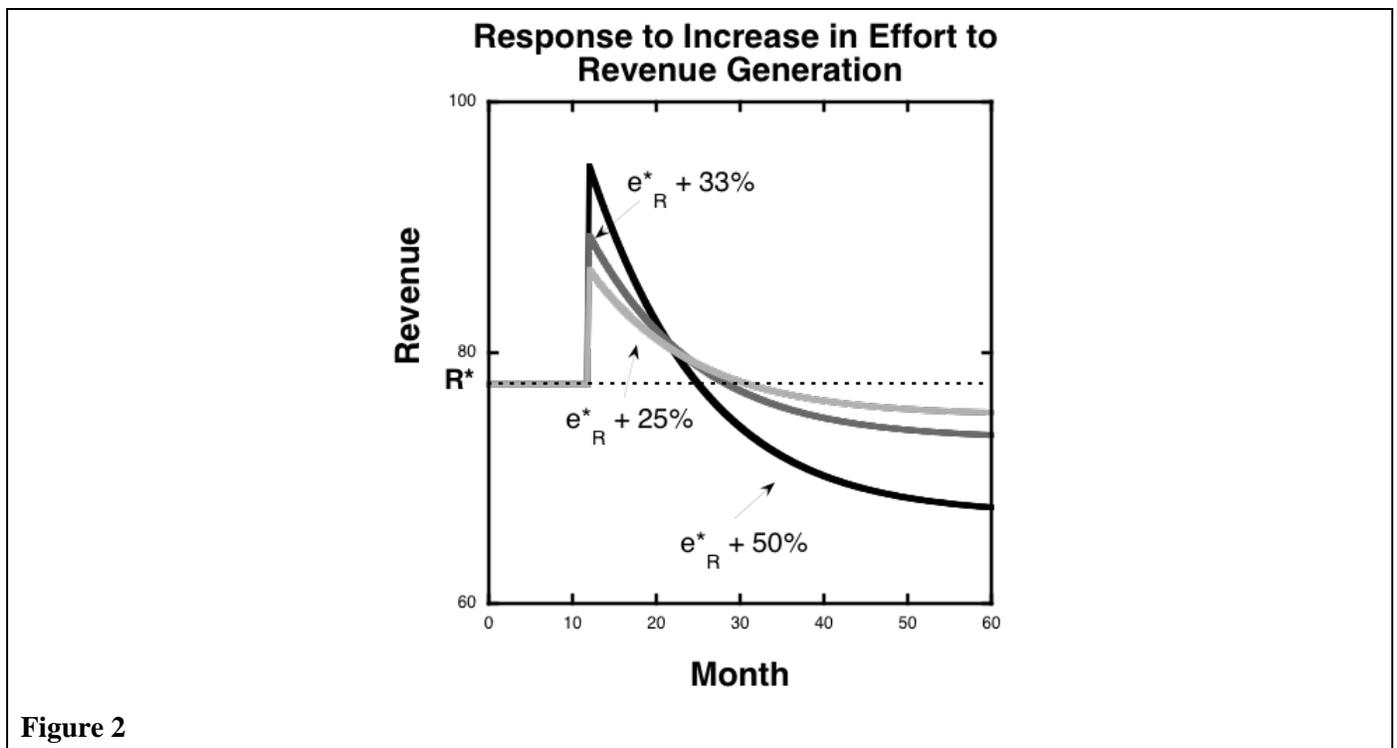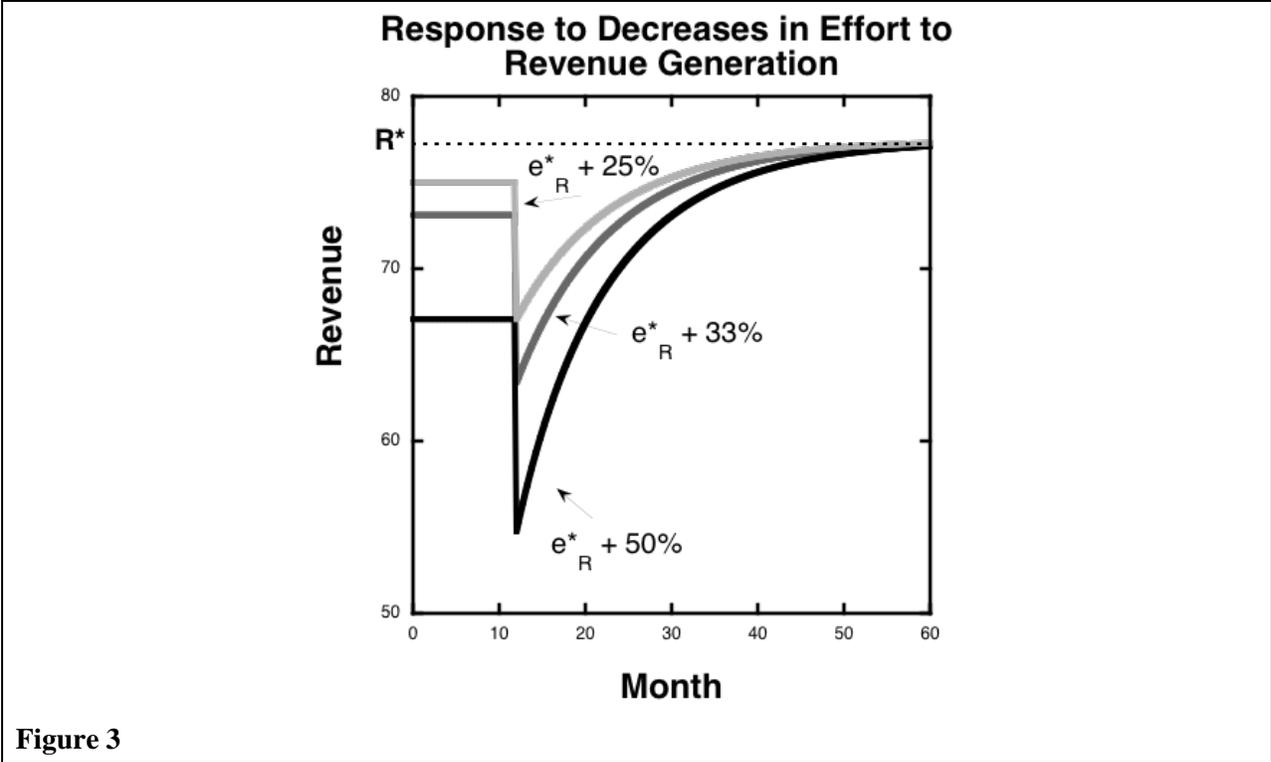

Figure 2

Figure 3

As these results highlight, if investment in capability is usefully conceptualized as building assets that are subject to the processes of accumulation and erosion, then managers face an important temporal trade-off. That the productive capabilities of these assets do not degrade immediately when investments in them are reduced affords managers some ability to adjust when revenue is actually earned. A manager facing a weak fourth quarter might, for example, choose to cut back on investment in capability in favor of revenue generation to meet earnings targets, planning to rebuild the consequent loss in capability later. Conversely, those who wish to push their organization to a higher level of performance by developing new capabilities must endure a period of low performance before their investments yield significant gains.

Note that these dynamics raise the agency concerns highlighted by Stein (1989) and others. A principal (or a shareholder) observing a performance decline has difficulty determining whether this decline is due to an increased investment in capability—which will pay off in the future—or to lack of ability on the part of the agent (or the management team). Conversely, principals observing a performance gain cannot determine whether it is a signal of above average ability or simply the result of

12

the agent focusing on short run gains at the expense of long run performance. Stein (1989) in particular

finds that in such cases managers will often "borrow" from the future at an unfavorable rate—akin to

focusing on revenue at the expense of capability-- in an effort to demonstrate that they are neither

shirking nor incompetent. Given their presumption of equilibrium, however, models in this tradition

cannot analyze the disequilibrium dynamics that may result from an overemphasis on immediate revenue

generation, particularly in the face of external shocks. In what follows we therefore explore how

managers' efforts to maintain steady earnings can have quite different effects depending on the state of

the firm. While models in the tradition of Stein (1989) predict a uniform degradation in performance as a

result of the pressure to maintain short term results, our analysis shows that the influence of earnings

management on performance can be non-linear due to the existence of a critical threshold beyond which

efforts to smooth earning shift from functional to pathological.

3.2 Earnings Management and Tipping

The system we study is, in principle, at least second order. Capability is a state variable and the

"Make the Numbers" loop also requires at least one state variable. However, if the *Make the Numbers*

loop adjusts quickly relative to the dynamics of capability, then the system can be reduced to 1st order--

thereby simplifying the analysis-- by assuming that the effort allocation adjusts instantaneously to the

revenue ratio. This assumption yields the following equation for the effort dedicated to generating

revenue:

$$e_R = Min[e_R^* \cdot \left(\frac{C^*}{C}\right)^{\frac{\alpha \cdot \gamma}{1+\beta \cdot \gamma}}, H]$$

(5)

Having made this simplification, equation (5) can be substituted into equation (1), which then yields a

single differential equation describing the evolution of the capability state variable:

$$\frac{dC}{dt} = \rho \cdot \left[H - Min\left[e_R^* \cdot \left(\frac{C^*}{C}\right)^{\frac{\alpha \cdot \gamma}{1+\beta \cdot \lambda}}, H \right] \right] - \frac{C}{\tau}$$

(6)

While this system can be analyzed in several ways, for simple non-linear systems, graphical methods often prove the most intuitive (Strogatz 2001). Figure 4 shows a sample rate-level plot:
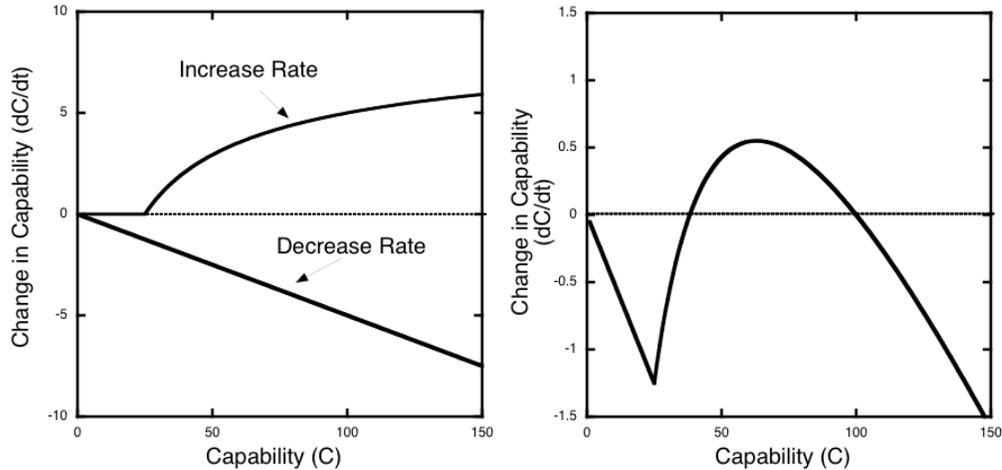

Figure 4: Rate-Level Plot for Simplified System

A rate-level plot captures the evolution of a one-dimensional dynamic system by showing the net rate of change in the state variable as a function of that variable. We begin in figure 4a by showing the two components of (6).[3] The first term of (6) is plotted in the upper portion of the figure: a concave curve with a flat section near the origin. The flat section at the origin results from the Min function in (6): When capability is sufficiently low, the firm must expend all of its time to meet its revenue target, thereby leaving no resources for investment in capabilities. As the stock of capability rises (moving right on the horizontal axis), the firm can meets its revenue targets with relatively less effort dedicated to revenue generation, thus leaving more resources for investing in capability—as capability rises, so does its rate of change. The rate of change slows, however, due to the diminishing marginal return of additional investments implied by the Cobb-Douglas performance function; regardless of the level of capability, some effort dedicated to revenue generation is necessary for the firm to achieve its revenue target.

---

[3] . In the "base case" of our model we assume that: $H=200$, $\tau=12$ months, $R^T=R^*$, and $\gamma=4$. The sensitivity of the system to these parameter assumptions is discussed in the next sub-section.

The negatively sloped line starting at the origin captures the dynamics of capability erosion. As the stock of capability grows, so too does the loss rate (the slope is equal to the reciprocal of the average capability life, τ). Adding these two curves together in figure 4b yields the net rate-level plot for the dynamic system described by (6). The net curve begins with a downwardly sloping section, where the effects of erosion dominate because capability (and therefore performance) is so low that the firm has little revenue and can make no investments in capability building. Note that this downwardly sloping section will exist as long as there is a level of capability below which the firm cannot achieve its performance targets even when effort is fully dedicated to revenue generation. Moving to the right on the horizontal axis, the rate-level curve eventually becomes positive as capability grows to the point where the firm can make some investments in it while still hitting its revenue target. Finally, as the returns to investing in capability begin to decline, the effects of erosion again dominate, causing the slope to once again turn negative. From a feedback perspective, the erosion loop dominates (is the stronger of the two) in the sections in which the phase plot is downwardly sloping; the reinforcing loop dominates in the region for which the phase plot is upwardly sloped.

The rate-level plot formalism makes the system's dynamics easy to characterize. Each intersection between the rate-level curve and the horizontal axis represents an equilibrium; the system we study has three such points. The local dynamics around each equilibrium are captured by the slope of the curve that intersection. When the slope is negative, the equilibrium is locally stable—small perturbations will be counteracted by the system's dynamics—while when the slope is positive the equilibrium is unstable—once perturbed, the system will not return to that point. Figure 5 shows the rate-level plot again, indicating the three equilibria and the dynamics around them.
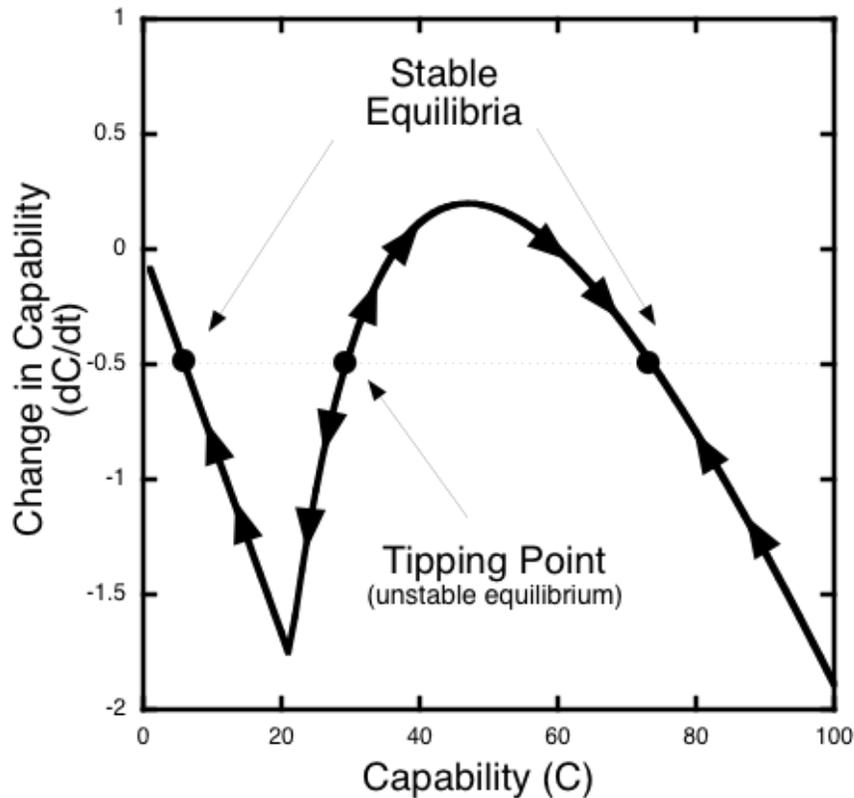
Figure 5: Rate-Level Plot Showing the Three Equilibria

Beginning at the right, the first equilibrium represents a state in which the firm (by construction) allocates

its effort optimally between revenue generation and capability investment, and therefore achieves its

optimal capability, C^*, and revenue, R^* (recall that $R^T = R^*$ in the base case). Note that this equilibrium is

stable due to the curve's negative slope at the intersection. This local stability implies that small

perturbations will be offset by the system's dynamics (also indicated by the arrows pointing towards the

equilibrium point). In other words, while in the neighborhood of this point, the decision rule described in

(4) will work to offset any randomness in revenue generation and will return the system to its optimal

operating point.

Moving to the far left of the rate-level curve, there is a second stable equilibrium at the origin.

At this point, investment has ceased and capability has fallen to zero. This equilibrium is also locally

stable; once in its neighborhood, absent an additional intervention, the firm will be on a trajectory towards

failure. Here, the decision rule embodied in (4) (assuming γ is greater than zero), rather than being

functional, drives the firm to ruin; the efforts of managers to maintain revenue trap the firm in a vicious

cycle of declining capability and available resources. A third, unstable, equilibrium lies between the two

stable ones. Due to its instability, even the smallest perturbation will move the system towards one of the

two stable points, thus making it unlikely that the system would ever settle at this level of capability.

However, this point plays an important role in determining the system's dynamics. As indicated by the

arrows on the rate-level curve, it represents the point at which the utility of our hypothesized decision

rules changes. When operating at levels of capability above the unstable equilibrium, managers' efforts

to smooth earnings do not entail a long-term sacrifice in performance and capability will always tend

towards the optimal level. However, once capability falls below the unstable equilibrium, the *same*

decision rule now drives the firm towards failure.

The main insight that thus emerges from our analysis is that whether efforts to smooth earnings

detract from performance is a matter of degree. As long as capability remains above the critical threshold

captured by the unstable equilibrium, efforts to adjust earning have only a second-order impact on

performance. Once that threshold is crossed, however, the desire to smooth earnings become pathological

as the efforts to maintain revenue come at the expense of the firm's long term viability. Of course, our

analysis presumes that managers who cross this threshold continue to use the decision rule outlined in (4)

and do not change their tendency to smooth earnings (represented by γ). This assumption undoubtedly

simplifies real behavior as it seems likely that many managers would eventually realize that capability

had fallen to a dangerously low level. If, however, managers only make this realization with a significant

delay, then a firm that crossed its capability threshold could operate in a vicious cycle of increasing

emphasis on earning and declining investment in capability for some time before its leaders recognized

that their efforts to manage earnings were threatening the firm's long term viability. Indeed, there are

several reasons to believe that managers will not immediately recognize when their efforts to manage

earnings have moved from functional to pathological. Most generally, learning is difficult in non-linear

dynamic systems because local search and simple extrapolation are poor guides to anticipating outcomes

(Sterman 1994). Systems with tipping dynamics are particularly challenging on this score because the system's response to inputs when operating above the threshold differ that which once the threshold is crossed (see also Rudolph and Repenning 2002). Moreover managers who do realize that they have crossed the tipping threshold face the "worse-before-better" dynamics associated with an increased emphasis on capability that we described at the beginning of our analysis. Managers who are rewarded principally on short-term results may not be able to "afford" the price of rebalancing effort towards capability generation.

Figure 6 shows two model runs that illustrate this insight. In both the firm begins with the optimal level of capability and in both its revenue target, R^T, is temporarily increased over the optimum, R*, in the first case by 25%, and in the second by 30%.
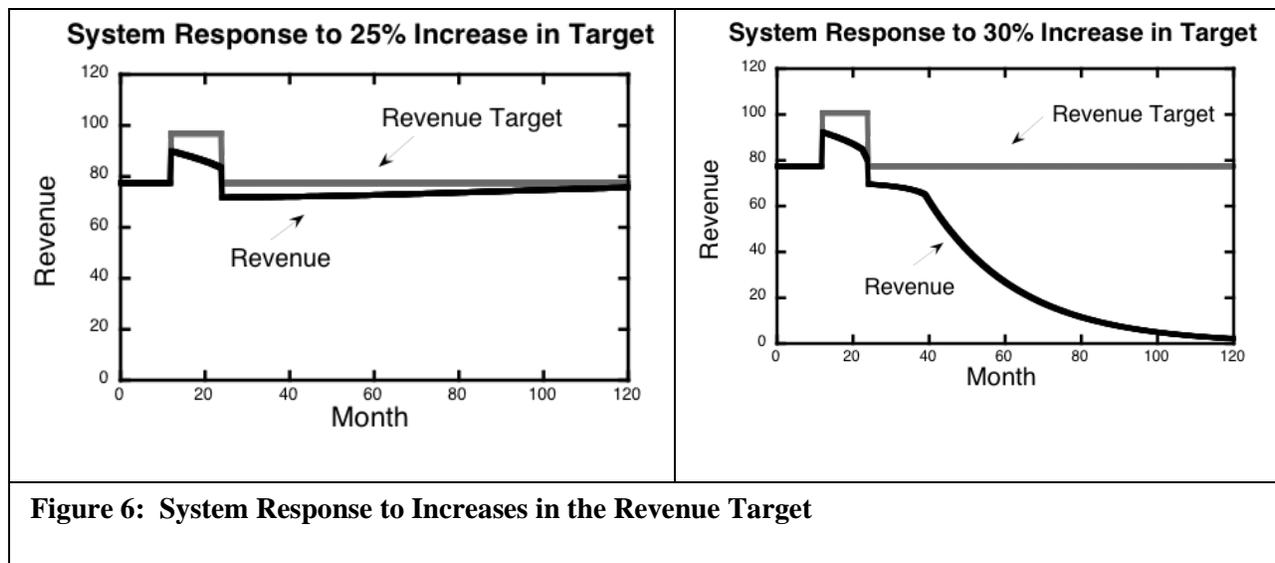

Figure 6: System Response to Increases in the Revenue Target

In the case of a 25% increase (figure 6A), revenue grows to match the goal (although it never fully meets it) then declines back to the initial steady state once the revenue expectation returns to its normal level. When target revenue increases by 30% (figure 6B), revenue again grows to meet the target, but after the shock has passed it does not return to its original level. The differing outcomes result from the existence of the unstable equilibrium (or tipping threshold). A 30% increase in the target revenue pushes the system over this threshold, thus causing a permanent decline in capability; the 25% increase, in contrast, does not, and thus has no permanent effect. Figures 7a and 7b show the underlying dynamics. In

both cases, following the shock, the firm allocates more attention to revenue generation (figure 7a), and, consequently, capability begins to decline (figure 7b). Once the revenue target returns to its initial level, effort is reallocated and a greater emphasis is again placed on capability development. In the case of the 25% shock the decline in capability is small enough that once the shock passes the firm can simultaneously hit its revenue target and begin to increase its investment in capability development; the unstable equilibrium has not been crossed. In the case of the 30% shock, however, the decline in capability is such that the firm can no longer meet its normal revenue target *and* invest in capability at a rate sufficient to return it to its optimal level. In an effort to meet its revenue target, the firm continues to under-invest and the stock of capability declines further, thereby trapping the firm in a vicious cycle of declining performance and increased emphasis on revenue generation.
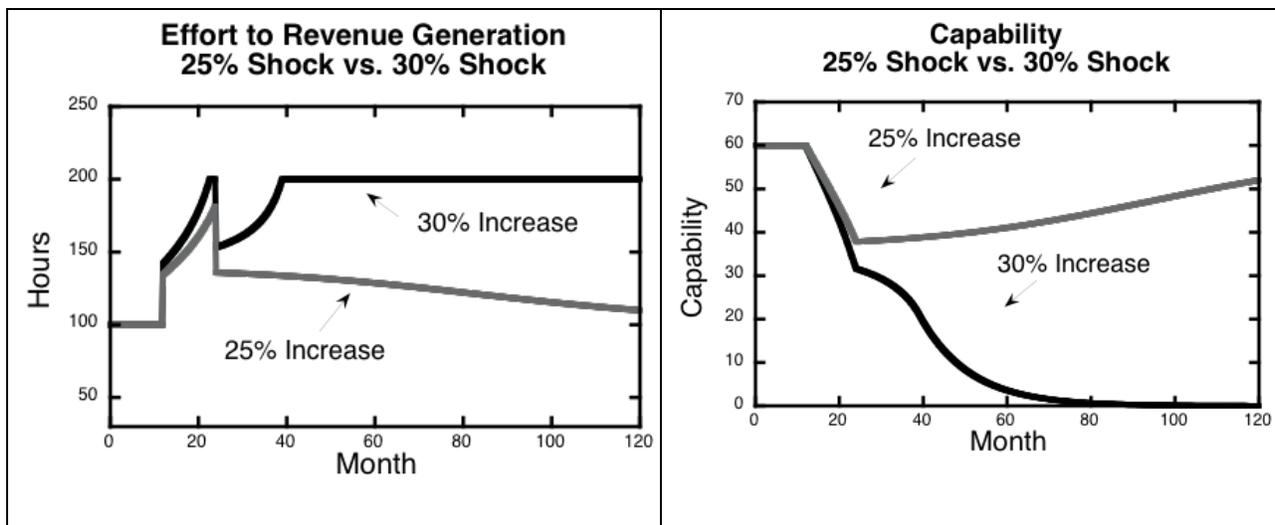

Figure 7: Comparison of System Responses to 25% and 30% target increase

Our analysis thus yields a candidate resolution to the puzzle of why managers' efforts to "make their numbers" can seem alternatively functional and pathological. Recognizing that capability behaves as a stock or level variable combined with the efforts of managers to offset changes in revenue generation creates a system with a tipping threshold. When operating above that threshold, efforts to manage earnings are a functional response to the capital market's desire for smooth earnings and lead to both reduced agency concerns and a higher valuation. Once that threshold is crossed, however, earnings

management becomes a path to low performance. Whether or not the firm survives this type of decline will depend on its strength relative to its competitors, its institutional context (e.g., whether a government is willing to support it through a rebuilding period) and, how long it takes managers to recognize that a change of approach is in order.

3.3 Comparative Dynamics

The existence of a tipping threshold suggests that in the pursuit of stable earnings managers run the risk of descending from a higher performance configuration into a vicious cycle of declining performance and eroding capability. A key implication of our characterization of the system's dynamics is that the distance between the desired, stable, equilibrium and the tipping point determines how much "room" a manager has to smooth earnings. If the distance is large, then capability can decline significantly before the threshold is crossed. If the distance is small, however, then efforts to offset even a small revenue shock can push the system into the downward spiral of capability erosion. In the analysis that follows, we explore the degree to which the distance between the two equilibria – or the likelihood that the firm will tip into "firefighting" – changes as a function of two key behavioral parameters: the firm's responsiveness to revenue shortfalls, γ, and the degree to which the firm routinely under or overinvests in long term capability building.[4]

Changing levels of responsiveness. The first parameter that plays a significant role in determining the system's sensitivity to tipping is γ, the strength of managers' responses to revenue shortfalls. In the analyses so far, γ has been set to four, representing a moderate degree of intensity in managing earnings. In figure 8, we show how the rate-level plot changes as managers respond to shocks more or less aggressively.

---

[4] The model has been analyzed extensively and several of its parameters play a minor role in determining the system's sensitivity to pathological tipping dynamics. Increasing the rate of capability erosion does make the system more prone to tipping, although not significantly.
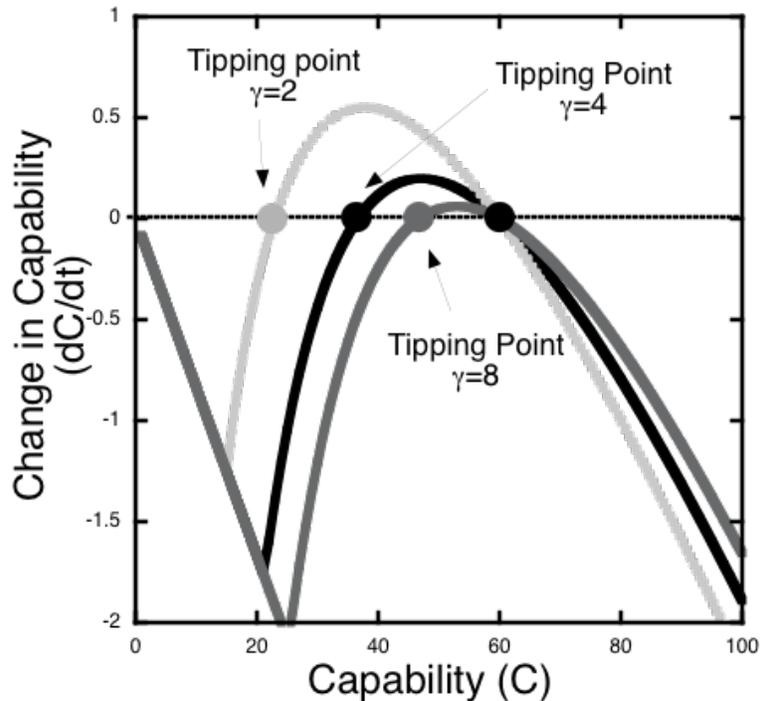
Figure 8: Rate-Level Plot Under Alternative Assumptions About γ.

As the plot suggests, the system is sensitive to changes in the strength of managers' response to revenue shortfalls. The locations of the stable equilibria do not change since γ only affects the out-of-equilibrium behavior. However, the location of the tipping threshold changes significantly. As managers respond more aggressively to short falls in revenue (i.e. as γ grows), the distance between the tipping threshold and the desired operating point declines, implying that a smaller shock is required to push the system over the edge. Thus, the analysis suggests that managers who aggressively adjust short-run resource allocation to maintain revenue in the face of demand shocks run an increased risk of pushing their firms over the tipping threshold.

"Errors" in Effort Level. The second parameter that proves influential in determining the system's dynamics is the initial allocation of effort between revenue generation and long-term investment. So far we have assumed that the firm begins with the optimal allocation of effort to revenue generation and capability investment. The available evidence suggests, however, that such optimality is far from guaranteed. Studies of effort allocation in both manufacturing and new product development indicate that

firms often over emphasize short-term revenue generation and undervalue capability development (Repenning and Sterman 2002, Repenning 2001, Easton and Jarrell 1998, Pfeffer and Sutton 2000). These studies identify several reasons for such persistent errors ranging from individual-level perceptual biases—revenue generation is far more salient and tangible than long term investments like capability development—to organizational level challenges—rewarding longer term investments in less tangible assets like "capability" is often more difficult than recognizing contributions to immediate revenue generation. Systematic under-investment in capability appears to often be the norm.

Figure 9 shows how the rate level plot changes when the firm over-invests in revenue generation at the expense of capability.

Figure 9: Rate-Level Plot with Systematic Errors in Effort Allocation
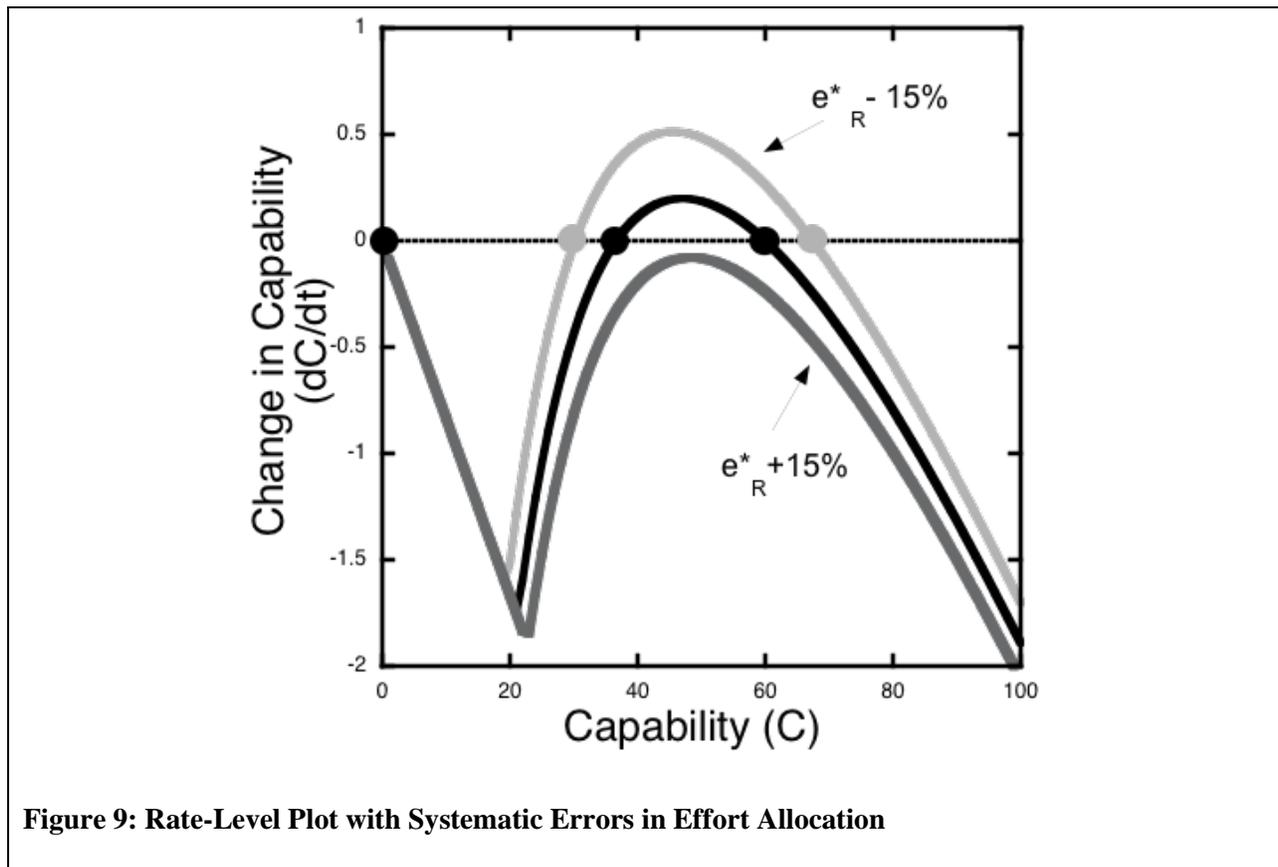
As the figure shows, when firms systematically over-invest in capability development (in this case by 15%) the phase plot moves up and the distance between the desired equilibrium and the tipping threshold

increases. In this case, the system becomes more robust to temporary shocks but this robustness comes at the expense of revenue generation since, relative to the optimum, the firm is overinvesting in capability generation. Conversely, when the firm over-invests in revenue generation, the phase plot moves down and the distance between the desired equilibrium and the tipping threshold shrinks. In fact, as we show in the figure, if the overinvestment is large enough, both the desired equilibrium and the tipping point disappear and the system displays a single trajectory, a downward spiral to failure. Thus, as firms place greater emphasis on immediate revenue generation, the distance between the stable equilibrium and the tipping threshold decreases and smaller shocks are required to push the firm into the downward spiral of declining capability. In the next section we extend this result to explore the interaction between demand variability and a firm's tendency to "over respond" to short-term revenue fluctuations.

4.0 Extensions: The Tortoise and the Hare

In this section we explore the degree to which increasing variability in demand aggravates the dynamics we have identified above. We have already shown that "hares" -- firms that are highly responsive to unexpected fluctuations in revenues (i.e., they have a higher γ)--have a smaller stable range in which to operate without the risk of crossing the tipping threshold than do "tortoises" – firms that respond less dramatically. Here we show that both tortoises and hares are prone to tipping but that in relatively stable environments, hares can generate more predictable – and thus perhaps "better" performance. However, as the variability of demand increases the risks of being a hare increase significantly.

To incorporate the effect of demand uncertainty we represent noise in demand by modeling "s" – exogenous shocks to revenue – as a "pink" noise process, ε, in which standard white noise is exponentially smoothed to create first-order autocorrelation.[5]

$$R = C^\alpha e_R^\beta \cdot (1 + \varepsilon)$$

(2')

[5]. See Sterman 2000 for an extended discussion concerning the utility of pink noise as a test input for continuous time simulation models.

We present large sample results in a moment, but in the interest of developing intuition for the main finding, consider two firms responding to the same pattern of demand. The first firm, the *Hare,* responds aggressively to any revenue shortfall caused by a low demand realization ($\gamma=4$), while the second firm, the *Tortoise*, adjusts it resource allocation more modestly ($\gamma=1$).

Two Sample Paths. Figure 11a shows one potential sample path for demand. When the two firms face this demand stream, the Hare is able to maintain a steadier revenue stream (Figure 11b). It does so by moving resources back and forth between capability development and revenue generation more rapidly than does the tortoise (figure 11c). The steadier earnings come at the expense of sustained investment in capability, and the Hare's capability level swings more than does that of the Tortoise (figure 11d). However, as shown in figures 11e and 11f, since its capability always remains above the tipping threshold, the Hare displays superior performance. Its cumulative revenue over the simulation is virtually identical to that of the Tortoise, but its revenue stream is substantially smoother. To the degree that the capital markets value predictable revenues (and hence, perhaps, earnings), they would clearly value the Hare's firm over the Tortoise's and the Hare's management team would be viewed as superior.
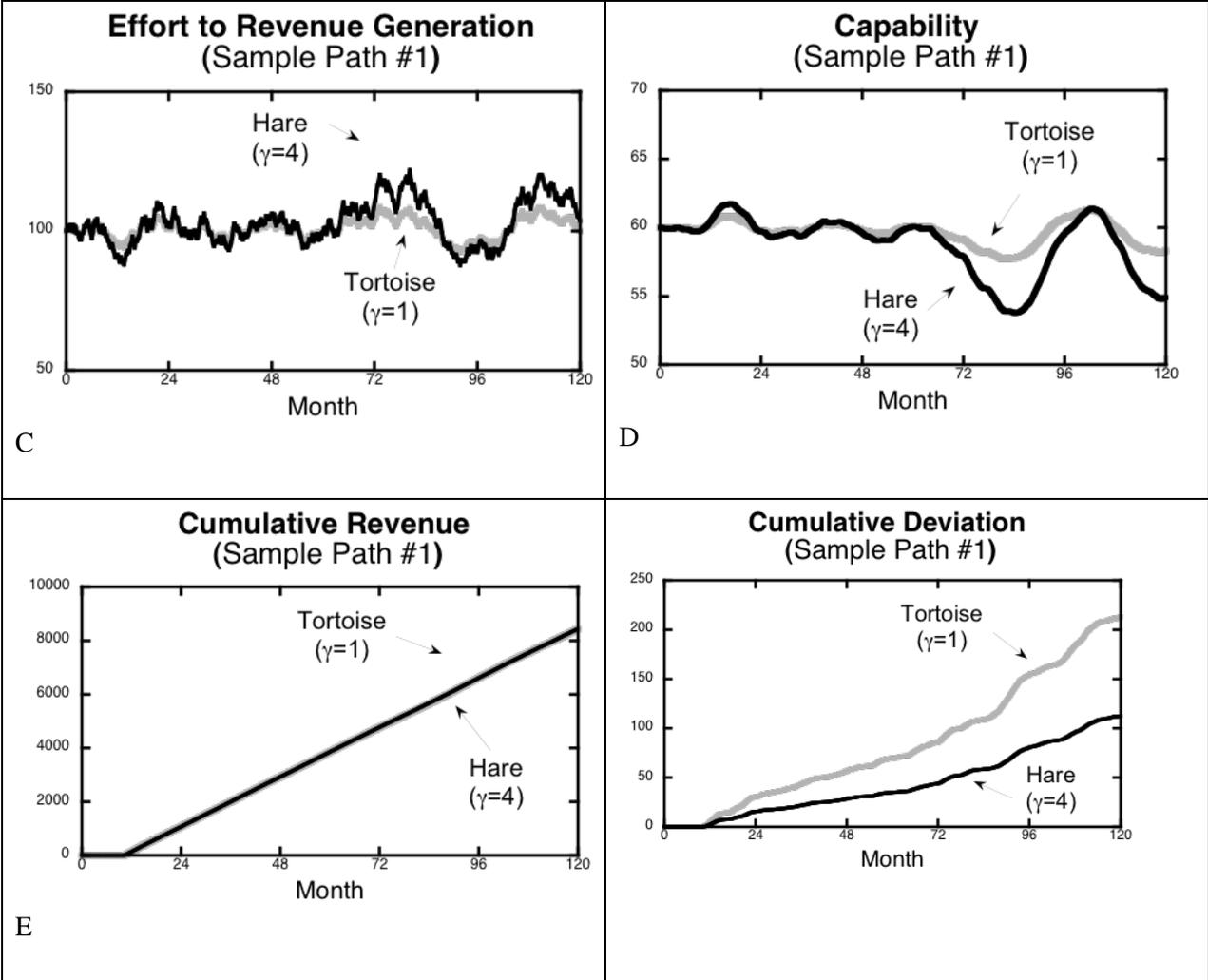

A

B

24
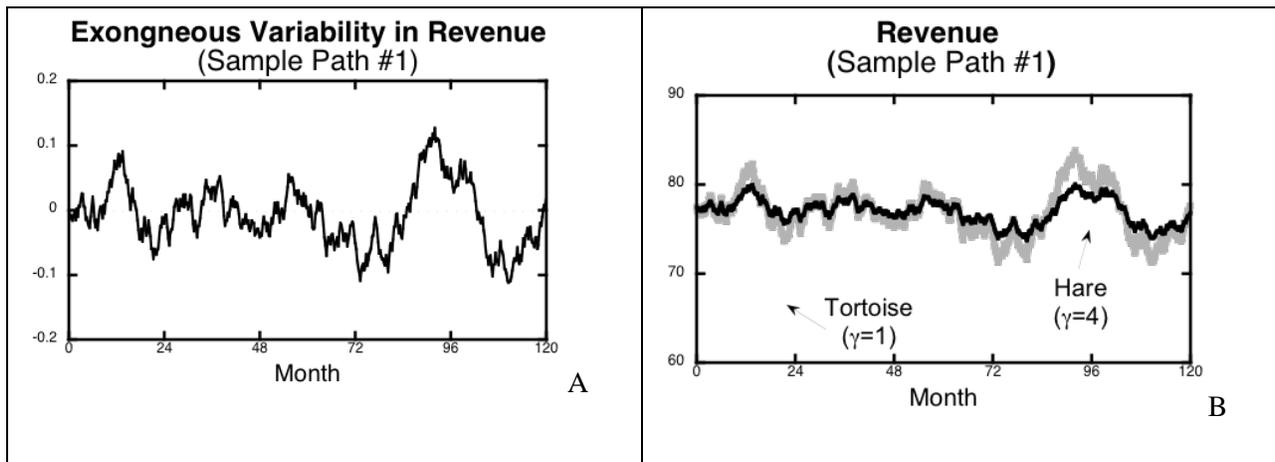
Figure 11: Tortoise vs. Hare for One Demand Realization

Before lionizing the Hare, however, consider a second realization of demand that has identical statistical
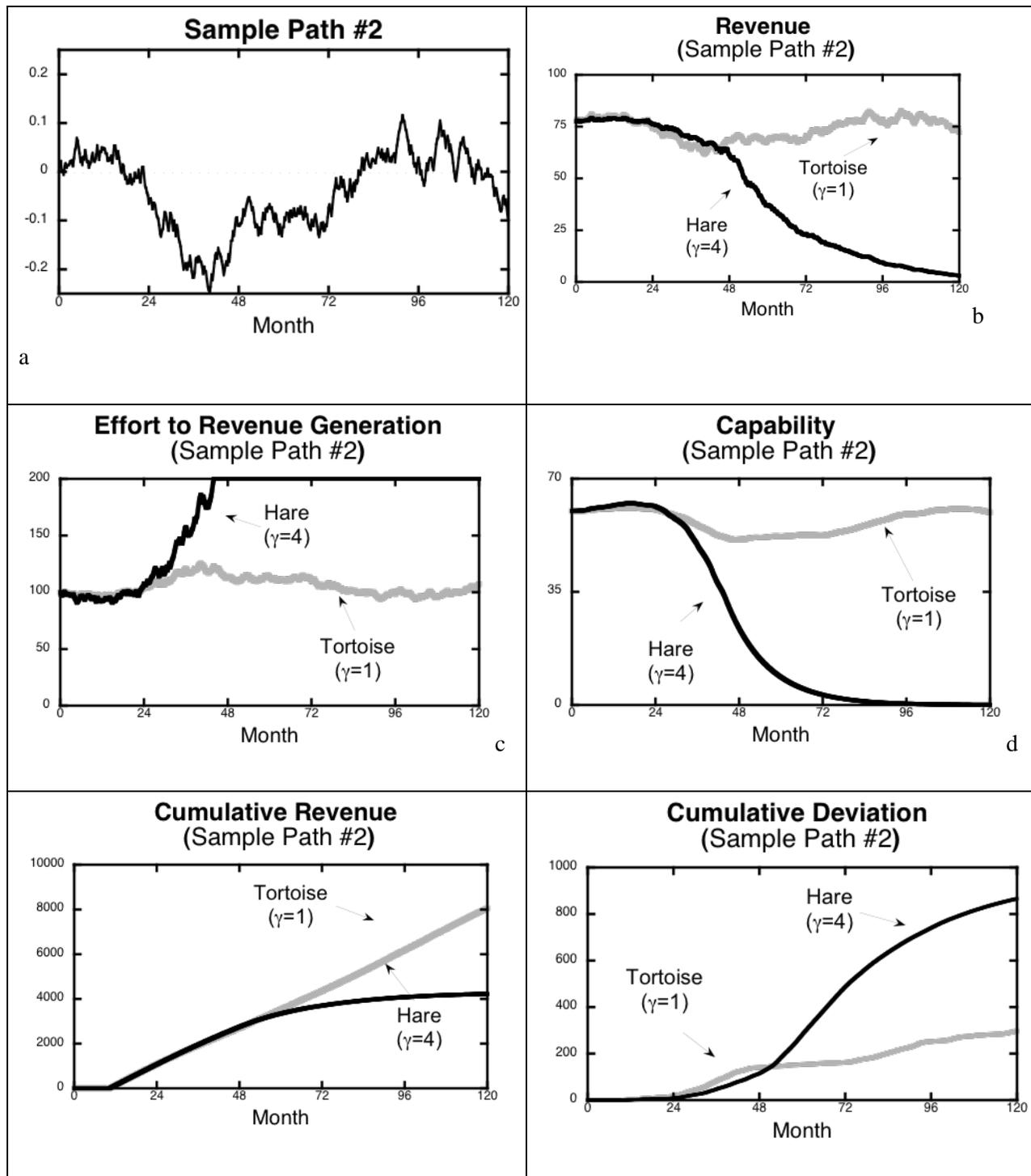
properties the first one.

Figure 12: Tortoise vs. the Hare under a Different Demand Realization

The second sample path is characterized by an extended period of low demand between months twenty-four and sixty (Figure 12a). During this period, the Hare works hard to maintain its revenue (Figure 12b) by increasingly allocating attention towards additional revenue generation (Figure 12c). The

strategy initially appears to be successful; during the downturn the Hare has higher revenue than the

Tortoise for more than a year. However, the Hare's efforts to survive the period of low demand result in

declining capability, which, in turn, requires more effort dedicated to revenue generation. Eventually, the

Hare falls below the tipping threshold and the firm's performance declines. Meanwhile, the Tortoise,

although experiencing higher variability in its revenue, survives throughout the simulation period.

Large Sample Results. Figures 13 through 15 show the results of a full Monte Carlo analysis. The

model was run under both the Tortoise and Hare strategy 1000 times for each of 10 different demand

processes—coefficients of variation ranging from 0 to 100%. In these simulations we (arbitrarily) define

a firm as having "tipped" when capability falls to less than one third of its initial value.

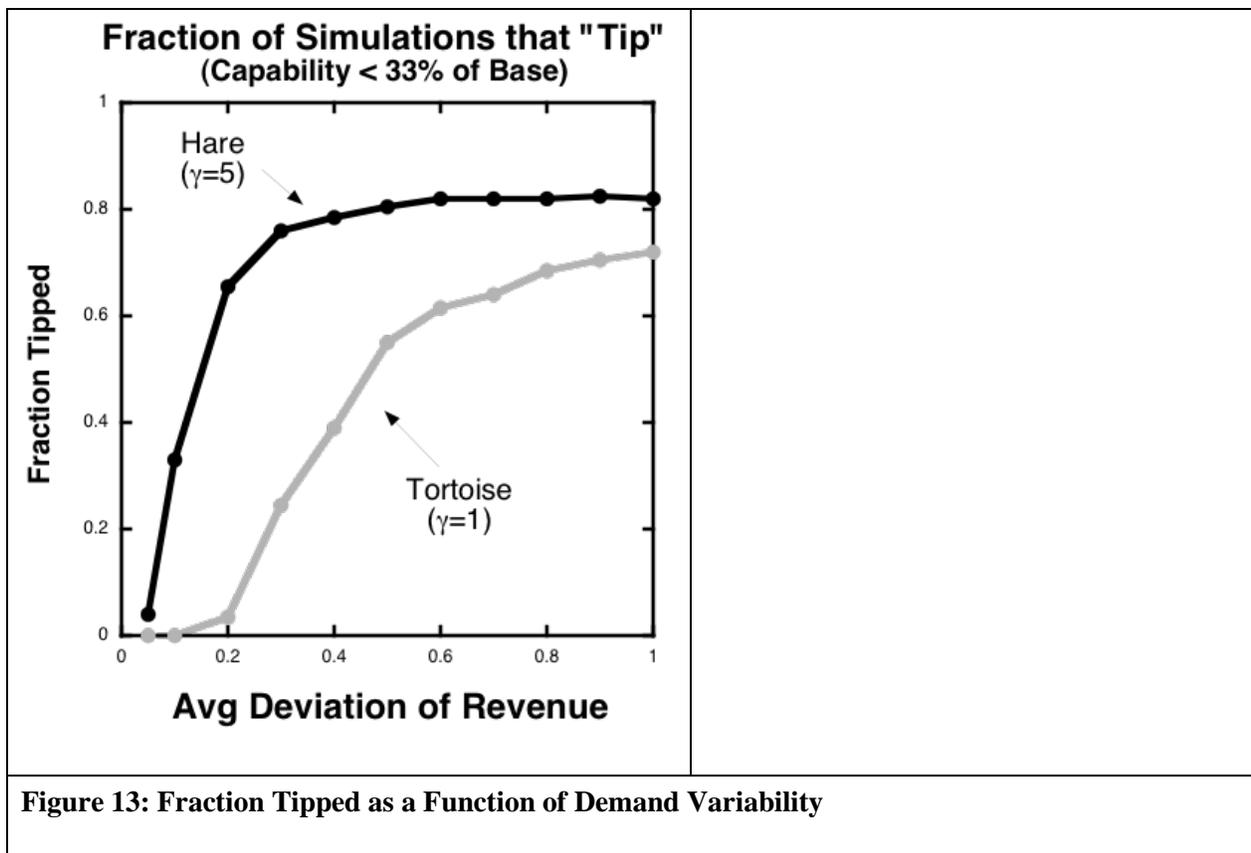**Figure 13: Fraction Tipped as a Function of Demand Variability**

Figure 13 shows how the fraction of demand paths that result in the firm's "tipping" changes as

variability increases. For modest demand variation the Tortoise is significantly less prone to tipping than

its more aggressive rival. As demand variation increases, however, even the Tortoise becomes prone to

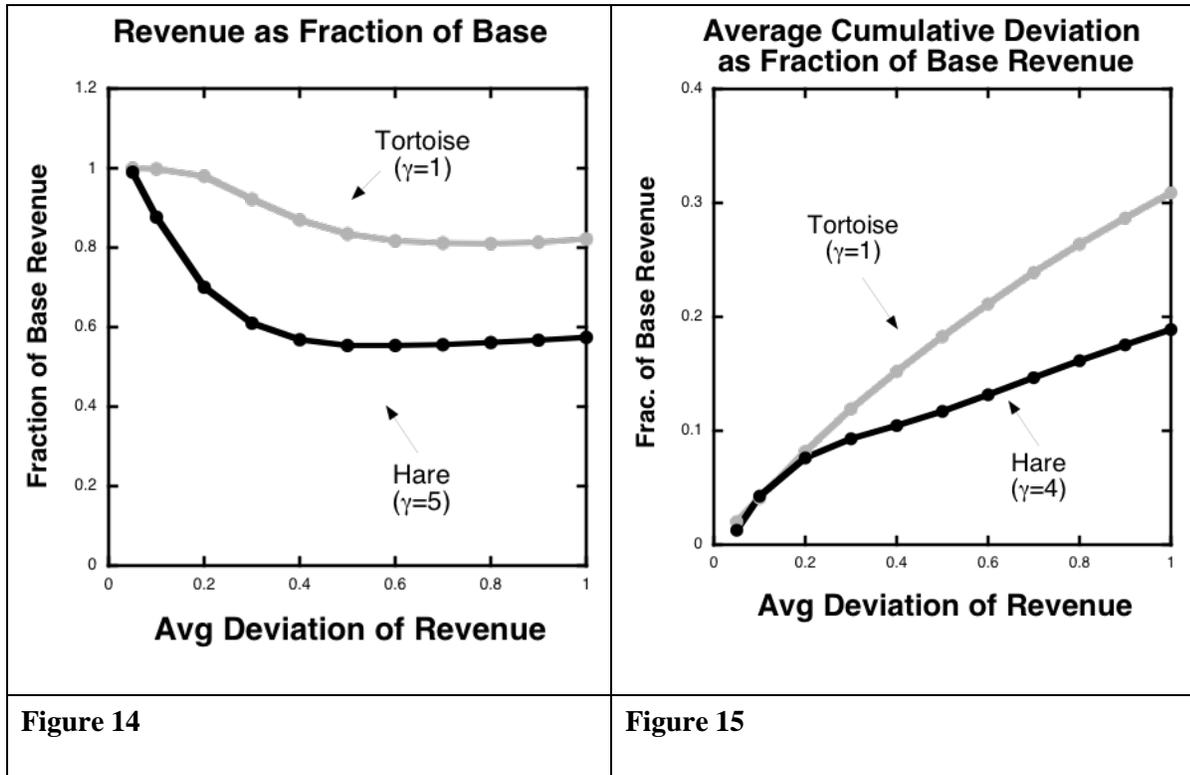tipping as the demand swings become large enough to push it over its tipping threshold.

Figure 14

Figure 15

Figure 14 suggests that the Tortoise strategy is likely to deliver superior profitability. Both

strategies suffer a decline in cumulative revenue as variability increases, but on average the Tortoise is

likely to do better because it tips less often. However, the increased stability comes with a cost: the

Tortoise display more variability in its revenue stream (figure 15). To the degree that capital markets

punish firms (or managers) that display greater variability in revenue or earnings it may be infeasible to

pursue a tortoise strategy.

5.0 Discussion

Analyzing our model thus suggests that whether managing earnings helps or hurts turns on the intensity

with which managers engage in it. If, as we hypothesize, capability behaves as a stock variable, then the

firm can smooth some of the demand variation it faces without risking a significant decline in

performance.   Managing earnings in this situation offers several potential benefits including improved

internal financial discipline and higher external investor confidence. If, however, the firm becomes too

aggressive in its efforts to smooth earnings, it risks tipping into a vicious cycle of declining capability and a growing emphasis on short-term revenue generation. Whether crossing such a tipping threshold will result in firm failure or just an extended period of poor performance depends on both the institutional context and the speed with which the firm realizes the need to adjust its strategy. Our model thus reconciles the apparently puzzling tension in the literature between those who have shown that a focus on "managing earnings" is associated with better performance in the capital markets and those who have suggested it may be dangerously short sighted. In the space that remains we first address what is, perhaps, the central question raised by our analysis, namely "would managers ever be so naive as to get stuck in the trap we identify?", and then sketch an agenda for future research.

Finding the Tipping Point. Would managers ever be sufficiently shortsighted as to allow a short-term focus to pull their firm into the vicious cycle of capability decline highlighted in our model? Unfortunately much recent research on human decision making in dynamics environments suggests that it is all too plausible for several reasons. First, while the benefits of focusing on earnings are realized relatively quickly—cutting the travel budget or canceling a development program can improve earnings within the given month or quarter—the costs—poorly operating equipment or an incompetent workforce—are only realized with a significant delay. Both experimental and field-based studies demonstrate that human decision makers do not perform well when their actions produce multiple outcomes that occur on different time scales. People tend to overweight those outcomes that happen quickly and to underweight those that occur with a delay (e.g., Sterman 1989, Behmer 1986, Repenning and Sterman 2002). Managers finding themselves in a vicious cycle of declining capability and increasing earnings shortfalls are unlikely to make the connection between the challenges they face and their past actions and instead are likely to redouble their efforts to meet their short term targets (e.g., Staw 1976, 1981; Azoulay, Repenning and Zuckerman *forthcoming*).

Second, because the system behaves very differently on the two sides of the tipping threshold, the dynamics associated with tipping greatly exacerbate the challenges associated with learning to balance the

short and long run.   As long as capability remains above the tipping threshold, efforts to manage earnings will have immediate benefits and few costs; once the threshold is crossed, however the costs are significant. The challenge of learning in this system is considerable. A new manager facing her first downturn in demand might be fairly modest in her initial attempts to manage earnings, perhaps restricting travel or temporarily cutting training budgets to offset low revenue. These efforts are likely to be "successful" – she will meet her targets despite the downturn--thus providing powerful feedback confirming the wisdom of her efforts. During the next down period, she is likely to be even more strict (building on her previous success), perhaps cutting the maintenance or R&D budgets, hoping to demonstrate further her commitment to maintaining profitability. And again, these efforts are likely to be recognized and rewarded, providing additional positive reinforcement. This cycle of experimentation with increasingly aggressive measures and positive reinforcement will continue until capability is pushed below the critical threshold, whereupon performance will begin to decline despite her continued efforts. However, having experienced several rounds of success with a strategy that cuts the resources devoted to investing in capability, our hypothetical manager will require compelling evidence as to the error in her ways before revisiting her strategy. Capability, in the meantime, may have fallen to a dangerously low level.

The third factor making life difficult for managers is that it is usually difficult to measure or reward efforts to build "capability." Decision makers tend to focus on cues that are both salient and tangible (Einhorn and Hogarth 1985, 1986). While quarterly earnings satisfy both of these criteria, most capabilities do not.   Managers are thus unlikely to be aware that the firm's "stock" of capability is fluctuating dangerously. Several studies suggest, for example, that major industrial accidents are often preceded by extended periods of inadequate investment in both training and mechanical integrity (e.g., Baker et al. 2007, CAIB Report 2003). Capability in these settings had been allowed to fall precipitously, but because accidents don't happen every day, recognizing the costs of such a decline was difficult until the lack of capability finally translated into a very visible accident.

Our analysis thus opens several avenues for further research. It suggests, for example, that firms in settings in which capability is more easily measured, or in which the risks of tipping are more widely understood, are less likely to manage earnings and less likely to be punished by the capital markets for not doing do. The commonplace observation that rapidly growing firms, whose earnings potential will only be realized in the future, are not penalized for missing short-term targets is consistent with this hypothesis.

Most intriguingly, we believe, it reinforces the idea that firms able to use "relational" contracts based on "subjective" measures to measure and reward their managers may be able to outperform their competition. A long literature that includes Holmstrom and Milgram's (1991) seminal analysis of incentives in "multi-task" environments suggests that, in the absence of relational contracts, high-powered incentives can produce significant distortions when one activity is more easily measured than another. Since short-term revenue generation is so much easier to measure objectively than investments in capability, this dynamic is likely to reinforce the tendency of managers to focus on current performance.

If, however, managers and employees can develop an effective relational contract (e.g. Bull 1987; Baker, Gibbons and Murphy, 2002), they can complement the objective measures of performance inherent in "making the numbers" with subjective measures that might capture the employee's contribution to capability development and maintenance. Such a mechanism would, to a degree, allow managers to "have their cake and eat it too" in that they could still reap some of the benefits of high powered incentives—extra effort, financial discipline, steadier earnings and better access to capital— without the risk of tipping their firm into the vicious cycle of declining capability and increased pressure to meet earnings. We thus suspect that a key source of above average performance might be the differential ability of firms to create relational contracts that include subjective evaluations of capability in them. Gibbons and Henderson (2010) present some preliminary research exploring this idea, but it remains tantalizingly underdeveloped. An illustrative example of this kind of incentive scheme in action

is provided by Jack Welch's recent description of his practice during his time as GE's CEO (Welch and Welch, 2005).

While GE had a notoriously performance-focused culture, GE's compensation scheme under Welch's tenure increasingly incorporated a subjective evaluation of how each manager performed on the company's "values." Critically, GE's definition of values extended far beyond that suggested by common usage. While "values" typically include things like trust and integrity, Welch expanded the definition to include those behaviors that were core to maintaining the long-term performance of the business. As he wrote, "… (at GE) values are just behaviors—specific, nitty gritty, and so descriptive that they leave little to the imagination (Welch and Welch 2005)." These "values" included several measures of capability that would ultimately translate to long-term success including customer focus, product and service quality, and the development of intellectual capital. Thus, during his tenure GE employees were evaluated both on their ability to "hit their numbers" *and* on their ability to maintain and develop critical capabilities. Further, Welch reports learning the hard way to be wary of employees that made their numbers but did not display GE's values. Invariably, he reports, those employees were achieving their results by sacrificing key capabilities. "Those people," he said, "…kill companies (Welch, 2008)." While GE's remarkable performance during Welch's extended tenure undoubtedly had several sources, the ability to mix a strong performance focus with an emphasis on capability development may have been an important factor, creating an organization capable of delivering steady performance without succumbing to the vicious cycle of capability decline.

Conclusion

Steady and reliable earnings bring many advantages to the firms that deliver them. Share prices rise, capital costs decline, and bonuses become both bigger and more likely. Such firms grow faster and attract more talented people to manage that growth. Despite these benefits, both scholars and practitioners have long been critical of the short-term focus that often characterizes western managers. Our model suggests a solution to this seeming paradox: due to the fundamentally non-linear nature of a system built on a stock

of capability, above a given threshold earnings management is relatively harmless, but below it, it can be disastrous. We hope that future research will explore both the degree to which this model is supported empirically and the notion that managing the appropriate balance between short and long term investment in such a way as to avoid tipping through the use of relational contracts built on subjective measures may be a critical source of competitive advantage.

References

Azoulay, P. N. Repenning, E. Zuckerman (*forthcoming*). Nasty, Brutish, and Short: Embeddedness Failure in the Pharmaceutical Industry. To appear in *Administrative Science Quarterly*.

Baker, J., F. Bowman, G. Erwing, S. Gorton, D. Hendershot, N. Leveson, S. Priest, I. Rosenthal, P. Tebo, D. Wiegman, L. Wilson (2007). The Report of the BP U.S. Refineries Independent Safety Review Panel.

Baker, George, Robert Gibbons, and Kevin J. Murphy (2002). Relational Contracts and the Theory of the Firm. *Quarterly Journal of Economics* 117: 39-83.

Barth, M., Elliot, J., Finn, M., (1999). Market rewards associated with patterns of increasing earnings. Journal of Accounting Research 37, 387–413

Bartov, E. (1993). The timing of asset sales and earnings manipulation. The Accounting Review 68 (4), 840–855.

Bartov, E., Givoly, D., Hayn, C. (2002). The rewards to meeting or beating earnings expectations. Journal of Accounting and Economics 33 (2), 173–204.

Benner, M. (2010). Securities Analysts and Incumbent Response to Radical Technological Change: Evidence from Digital Photography and Internet Telephony. Organization Science January 2010, 42-62.

Benner, M. (2007). The incumbent discount: stock market categories and response to radical technological change. Academy of Management Review, 32, 3: 703–720.

Bolton, P., J. Scheinkman and W. Xiong (2006). Executive Compensation and Short-Termist Behaviour in Speculative Market. Review of Economic Studies 73: 577–610.

Bowen, R., Ducharme, L., Shores, D. (1995). Stakeholders implicit claims and accounting method choice. Journal of Accounting and Economics 20: 255–295.

Bull, C. (1987). The Existence of Self-Enforcing Implicit Contracts. Quarterly Journal of Economics 102: 147-59.

Burgstahler, D., Dichev, I. (1997). Earnings management to avoid earnings decreases and losses. Journal of Accounting and Economics 24: 99–126.

Brav, A., Graham, J.R., Harvey, C.R., Michaely, R. (2005). Payout policy in the 21st century. Journal of Financial Economics 77, 3: 483-527.

Brehmer, B. (1992). Dynamic decision making: Human control of complex systems. Acta Psychologica, 81: 211-241.

Bushee, B. (1998). The influence of institutional investors on myopic R&D investment behavior. The Accounting Review 73, 3: 305–333.

Christensen, C. (1997). The Innovator's Dilemma. Harvard Business School Press, Boston MA.

Dawson, C. (2005). A China Price for Toyota. *Business Week,* 21 Feburary. Available at
http://www.businessweek.com/magazine/content/05_08/b3921062.htm

Dechow, P., Sloan, R. (1991). Executive incentives and the horizon problem: an empirical
investigation. Journal of Accounting and Economics 14: 51–89.

Dertouzos, M. L., Lester, R. K. & Solow, R. M. (1989). Made in America: Regaining the productive
edge. Cambridge, MA: MIT Press.

Dierickx, I. and K. Cool (1989). Asset Stock Accumulation and Sustainability of Competitive
Advantage. Management Science 35, 12: 1504-1513.

Easton, G., and S. Jarrell (1998). The effects of total quality management on corporate performance: An
empirical investigation. Journal of Business 71: 253-307.

Einhorn, H. J., and R. M. Hogarth (1985). Ambiguity and uncertainty in probabilistic inference.
Psychological Review, 92: 433-461.

Einhorn, H. J., and R. M. Hogarth (1986). Judging probable cause. Psychological Bulletin 99: 3-19.

Farrell, K., Whidbee, D. (2003). Impact of firm performance expectations on CEO turnover and
replacement decisions. Journal of Accounting & Economics 36, 1–3: 165–196.

Friedman, T. (2008). How to Fix a Flat, New York Times, 12 November 2008, pA31.

Gibbons, R. and R. Henderson (2010). Relational Contracts and the Origins of Organizational
Capabilities. Forthcoming in R. Gibbons and J. Roberts (eds.), The Handbook of Organizational
Economics. Princeton, NJ: Princeton University Press.

Graham, J., C. Harvey and S. Rajgopal (2005). The economic implications of corporate financial
reporting. Journal of Accounting and Economics, 40: 3-73

Helfat, C., S. Finkelstein & W. Mitchell (Eds) (2007). Dynamic capabilities: understanding strategic
change in organizations. Wiley Blackwell.

Hayes, R. H., & Abernathy, W. J. (1980). Managing our way to economic decline. Harvard Business
Review 58, 4: 67-77.

Holmstrom, Bengt and Paul Milgrom (1991). Multi-Task Principal-Agent Problems: Incentive
Contracts, Asset Ownership and Job Design. Journal of Law, Economics and Organization 7, Special
Issue.

Jacobs, M. T. (1991). Short-term America: The causes and cures of our business myopia. Boston:
Harvard Business School Press.

Laverty, K. (1996). Economic "Short-Termism": The Debate, the Unresolved Issues, and the
Implications for Management Practice and Research. The Academy of Management Review 21, 3:
825-860.

Penman, S., Zhang, X. (2002). Accounting conservatism, the quality of earnings, and stock returns. Accounting Review 77: 237–264.

Pfeffer, J., and R. I. Sutton (2000). The Knowing-Doing Gap. Boston: Harvard Business School Press.

Porter, M. (1992). Capital disadvantage: America's failing capital investment system. Harvard Business Review, 70, 5: 65-82.

Repenning, N. and J. Sterman (2002). Capability Traps and Self-Confirming Attribution Errors in the Dynamics of Process Improvement, Administrative Science Quarterly 47: 265 - 295.

Repenning, N. and J. Sterman (2001). Nobody Ever Gets Credit for Fixing Defects that Didn't Happen: Creating and Sustaining Process Improvement, California Management Review 43, 4: 64-88.

Rummel, N. (2008). Short-term earnings focus led to Wall Street woes, former SEC chief Donaldson says, Financial Week. Available at http://www.financialweek.com/apps/pbcs.dll/article?AID=/20080917/REG/809179981/1038/EXCLUSIVES

Skinner, D., Sloan, R. (2002). Earnings surprises, growth expectations, and stock returns or don't let an earnings torpedo sink your portfolio. Review of Accounting Studies 7, 2–3: 289–312.

Staw, B. M. (1976). Knee-deep in the Big Muddy: A study of escalating commitment to a chosen course of action. Organizational Behavior and Human Performance, 16: 27-44.

Staw, B. M. (1981). The escalation of commitment to a course of action. Academy of Management Review, 6: 577-587.

Stein, Jeremy (1989). Efficient capital markets, inefficient firms: a model of myopic corporate behavior. Quarterly Journal of Economics, 104, 4: 655-669.

Sterman, J. D. (1989). Modeling managerial behavior: Misperceptions of feedback in a dynamic decision making experiment. Management Science 35: 321-339.

Strogatz, S. (2001). Nonlinear Dynamics And Chaos: With Applications To Physics, Biology, Chemistry, and Engineering. Westview Press.

Welch, J. and S. Welch (2005). Winning. Harper Business.

Welch, J. (2008). Unpublished Personal Interview.

Williams, H. (1980). "The Economy and the Future—The Tyranny of the Short-Run", An address given to the Commonwealth Club of San Francisco, 21 November. Available at http://www.sec.gov/news/speech/1980/112180williams.pdf