Performance as a Random Variable

INTRODUCTION

Individual performance varies over time. A worker who excels one week may struggle the next. Likewise, a newly promoted high-achiever is likely to see their performance regress towards the mean (Benson et al., 2019; Lazear, 2004). For grocery clerks (Sackett et al., 1988), school superintendents (J. C. March & March, 1977) , basketball players (Awtrey et al., 2021), executives (C. Liu & Tsay, 2021; Malmendier & Tate, 2009), and superstar scientists (L. Liu et al., 2018) alike, the difference between one person's "good" and "bad" periods can be larger than the average difference across individuals (Dalal et al., 2020). Inasmuch as bad days for the person can translate to bad days for the organization, worker volatility presents a material human capital management challenge on par with worker mobility, bargaining, and motivation (Coff, 1997).

It follows that the management of volatility across a portfolio of human capital should be a source of value for organizations and an important capability for managers (Sirmon et al., 2007; Teece et al., 1997). Yet strategic human capital management (HCM) research has almost entirely ignored worker volatility in favor of studying interventions which raise a worker's expected performance (Awtrey et al., 2021). Despite the possibility that hiring, training, compensation, and supervision regimes can impact the stability of worker performance, most studies report only changes to the mean (Bandiera et al., 2007; Bartel, 1995; Ichniowski et al., 1995; Lazear, 2000). Even work that is explicitly concerned with performance volatility or intertemporal gaming (Benson et al., 2019; Larkin, 2014; Lazear, 2004; C. Liu & Tsay, 2021, e.g.) stops short of examining the strategic implications. Whether we attribute this omission to measurement challenges, indefinite planning horizons, or a firm faith in the law of large numbers, the implicit assumption is that increases to worker productivity flow directly to improved organizational outcomes, regardless of how those increases are distributed temporally.

In practice, this is a difficult assumption to sustain. The machinery between individual performance and organizational value is complex and idiosyncratic. Interactions between workers, resources, routines, and objectives/norms can warp and magnify seemingly benign shocks and produce outsized organizational consequences (Perrow, 1984). Further, performance varies at the task level and some tasks are infrequent enough that incidents of underachievement are not smoothed out before they impact the broader organization. As a result, human capital management which ignores the stochastic nature of performance is potentially flawed. Research on the Peter Principle has already demonstrated the damaging interaction between promotions, prior performance, and worker volatility (Benson et al., 2019; Lazear, 2004). Other, similarly benign claims like "managers should hire the best candidate" or "firms should choose the compensation plan that maximizes performance" require a set of scope conditions with respect to worker volatility which are entirely unstated.

This paper borrows from portfolio theory (Markowitz, 1952) to outline some of these scope conditions. Using a two-period model, I examine how organizational features (wealth, scale, workforce composition, and interconnectivity.) shape organizational sensitivity to and preferences for worker volatility. I model a hiring manager's choice between a reliable candidate and a volatile one and calculate a "reliability premium" representing the added compensation that would make a hiring manager indifferent between the two. This compensating differential prices the marginal risk associated with a new hire. When it is zero, the hiring manager can select the worker with the best mean without regard for volatility. Conversely, organizations for which the reliability premium is high should eschew high-mean, high-volatility talent and instead prefer workers who are unspectacular but predictable. The reliability premium can also be interpreted as the worth of information about a candidate's volatility or a measure of the sustained human capital advantage available to an organization which approaches hiring with a portfolio mindset.

The model suggests that organizations with sufficient resources, quality, or survivability can largely ignore individual-scale negative shocks while still capitalizing on positive events. Small, poor, or fragile entities, on the other hand, cannot self-insure against worker volatility and so must pay higher wages or sacrifice expected performance or competitive fitness. This "Volatility Tax" is U-shaped with respect to organizational precarity (consistent with Denrell 2005; Denrell and Liu 2012; J. G. March 1991) and functions as a liability of smallness (Stinchcombe, 1965) and a driver of assortative matching.

I then show that entities with tightly-coupled or highly-interdependent production are more vulnerable to individual variance because one person's bad day can cascade disastrously. Depending on how they interact with an organization's internal structure, features like scale, team composition, and theory/product quality can modify the attractiveness of a marginal volatile employee and alter the way that their performance adds value. For example, in a large organization with competitive or tournament style production, highly volatile workers supply the organization's output while low-volatility workers function only as insurance against the bad days of their volatile peers. When organizational outputs instead depend on contributions from many workers, reliability is more salient.

This paper makes three contributions. It first establishes within-person volatility as a boundary condition for HR/HCM claims. Mean-only interventions (Shearer, 2004) can raise performance, lower costs, and produce competitive advantage, but only in large, mature, resource-rich settings and organizations. In small, constrained, or fragile teams or entities, volatility should be a central feature of practice and research because the spread of performance can be punishingly expensive. Second, the paper introduces the reliability premium as a measure of the importance of volatility. This compensating differential describes cross-organization and cross-industry variation in human capital management regimes and has a variety of strategic interpretations. Finally, I lay the groundwork for Human Capital Portfolio Management (HCPM) as a research program to address a range of open questions at the intersection of strategy, human capital management, and organizational design. Together, these contributions recast the staffing and management of teams and organizations as an ongoing process of balancing performance volatility and expected returns.

My theory builds on the slim literature at the intersection of human capital management and portfolio management. I am not the first to suggest that organizations should manage their workforce as investors do their holdings, but prior work tends to look at tradeoffs between familiar features: specialization, fit, flexibility, and talent-pool selection (e.g. J. W. Boudreau and Ramstad, 2005; Lepak and Snell, 1999; Wright and Snell, 1998; Wright et al., 2001). The choice between reliability and volatility has not been explored and is, perhaps, the most direct translation of the portfolio management concept. It also is an inherently microfounded approach (Felin & Foss, 2005; Puranam, 2018) that can be connected to the literatures on resources (Barney, 1991; Campbell et al., 2012; Coff, 1997; Sirmon et al., 2007) and strategy setting (Denrell, 2005; Denrell & Liu, 2012; J. G. March, 1991) .

WORKER VOLATILITY

I use the terms performance, productivity, and output interchangeably to denote a worker's contribution in a given period. Unless otherwise specified, this is an intermediate output that the worker supplies to the organization's production technology.

I define volatility as stochastic noise which produces intertemporal variation in a worker's task-specific performance, holding constant role, environment, and ability level. This is not to say that cross-individual variation is the only driver of performance volatility. Role, task, and environmental features interact with individuals in unique and unpredictable ways. However, variation in individual performance distributions is necessary and sufficient to produce volatility and it provides a simpler theoretical construct to examine. Volatility includes both the impact of individuals' good days and bad days and cases where two or more workers who are considered equal and interchangeable can produce materially different outputs in a given period. Volatility is a within-person phenomenon that reflects the influence of individual-specific traits like personality, cognitive processing, problem-solving heuristics, or preferences. Unlike learning curves or age-related maturation trajectories (Bavafa & Jónasson, 2021), volatility is non-directional and typically mean-reverting, suggesting that performance fluctuates above and below a stable personal baseline.

Consider a stylized hiring dilemma in which a firm or team chooses between two candidates for a role. After extensive reference checks, aptitude tests, and structured interviews, the hiring manager feels confident that Candidate A would be an exceptional worker and an excellent fit with the team. Candidate B is acceptable, but comparatively pedestrian. Both would demand the same wages for the same role. The choice is obvious, right? Candidate A is more valuable. The manager would be foolish not to hire them and an organization that can regularly identify these exceptional workers can build an extraordinarily successful business.

But what if Candidate A's performance is stochastic, drawing from a distribution of possible outcomes. If the role is a creative one, we might frame this as Candidate A mixing great ideas with bad ideas or punctuating a series of very bad designs with moments of brilliance. In a throughput-oriented role like sales, we might think of them as exceeding their quota in some periods while delivering almost nothing in others. Meanwhile, Candidate B's performance is unvarying. Their ideas are always passable, if unremarkable, and they deliver the same thing, day in and day out.

With this modification, the choice is no longer obvious. In some periods, Candidate A will underperform Candidate B. Depending on the shape of their performance distribution, they may be a net-negative for the organization for extended periods of time. Candidate A may also produce a volume of work, in a single period, that the organization is unable to absorb. If there are other upstream or downstream functions that depend on this role, they may be unwillingly pulled into Candidate A's ebbs and flows, even if they themselves are otherwise reliable in their output.

Preferring Candidate A now requires the hiring manager to hold two additional beliefs:

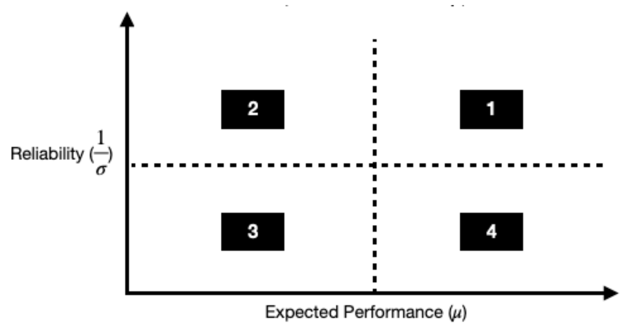
1. The organization can weather periods in which Candidate A produces less than Candidate B (or none at all).
2. Candidate A's output will arrive at a cadence which the organization can convert into value and which does not generate expensive or unsurvivable volatility elsewhere in the organization.

If either of these assumptions do not hold, the organization should pass on the exceptional talent and instead hire someone that, by its own estimation, is less talented and productive.

The same logic holds for other human capital policies and interventions. A compensation plan that produces greater expected returns but also temporally distorts performance (Asch, 1990; Larkin, 2014; Shearer, 2004) can be detrimental to the organization. Training or quality control may reduce expected performance for some workers while tightening the spread. Likewise, management oversight which reduces uncertainty at the cost of lowered productivity might be worthwhile for some organizations but not others (Bloom et al., 2013; Ichniowski et al., 1995). Much of our empirical and theoretical HCM literature makes an implicit assumption that the interventions which impact a worker's mean productivity do not affect the spread of performance enough to matter.

MODEL OVERVIEW

The model that follows builds on this example. I focus on hiring because I've defined volatility as a characteristic of the individual, but the implications of the model apply similarly to benefits, compensation, management, organizational structure, role definition, and other aspects of HCM. My research questions – which organizations are vulnerable to worker volatility and what are the strategy implications thereof – can be reframed as "Who should hire Candidate B?" and, more interestingly, "How can an organization structure itself such that it doesn't have to pass on the exceptional Candidate A?"



I model a hiring manager who chooses between these two candidates with the intent to maximize two-period profits. This model is simple by design: two workers, one organization, and two periods.

Two Workers

I leverage two useful features of worker performance volatility. First, there is broad and stable variation among workers in within-person performance volatility (Beus & Whitman, 2012; Dalal et al., 2014; Fleeson & Jayawickreme, 2015; L. Liu et al., 2018; Minbashian et al., 2009; Ployhart & Hakel, 1998; Yin et al., 2019). Second, worker volatility is only loosely correlated with worker ability (Awtrey et al., 2021; Benson et al., 2019; Dalal et al., 2009; Lazear, 2004; C. Liu & Tsay, 2021; J. C. March & March, 1977; Sackett et al., 1988). Performance is a random variable and workers differ on both its mean and its standard deviation.

I organize workers into four categories (summarized in Figure 1) for simplicity. Workers can be low-mean or high-mean and low-volatility or high-volatility. Intuitively, high-mean is preferable to low-mean and predictability is more valuable than volatility. Wages should respond accordingly: high-mean, low-volatility workers (Quadrant 1) are paid more than low-mean, high-volatility workers (Quadrant 3). The remaining two types (Quadrants 2 and 4) are of indeterminate value without more information about the organization and environment.

As wages respond to both reliability and expected performance, the hiring manager needs to determine their "exchange rate" between expected performance and volatility to make an optimal hiring decision. In this case, the model has another useful feature: the tradeoff is fractal. If we "zoom in" on Quadrant 1, there should still be gradients of quality and reliability. So even wealthy organizations with the resources to hire "the best" can still benefit from distinguishing between reliable and performant candidates. In practice, the extent to which wages respond to some combination of expected performance and reliability depends on how well hiring managers understand the importance of volatility and are able to measure it (Awtrey et al., 2021; Benson et al., 2019; Lazear, 2004). Given that we have an extensive literature on signaling, hiring and skill/performance and comparatively little on volatility, we might suspect that organizations are somewhat naive with regard to the value of Quadrant 2. If true, this suggests opportunities for arbitrage in hiring reliable but unspectacular workers (Awtrey et al., 2021). On the other hand, over the course of a career, volatile workers will have more setbacks than reliable workers, which hiring managers can observe. Even without holding the mean-variance tradeoff in mind, they may still penalize candidates with obvious failures on their resume (Denrell & Liu, 2012).

In this model, I hold wages constant and examine two candidate types with the same wages. This is functionally equivalent to treating all productivity as the worker's output, net of wages paid. This framing borrows from finance portfolio theory (Markowitz, 1952) and work on exploration/exploitation (J. G. March, 1991), allowing us to "value" worker volatility in the same units as performance.

Each Reliable-type worker produces deterministic and positive productivity for the organization each period: $x_r > 0$. A Volatile-type worker's performance is stochastic with mean and standard deviation: $x_v \sim (x_r, \sigma)$. I leave the exact shape of the distribution unspecified because the below findings are sensitive to the shape of the volatile worker's performance distribution. Log-normal or exponentially distributed performance will produce considerably more conservative behavior than gaussian worker performance because the left tails are heavier. Rather than specify a distribution (and to avoid wading into an ongoing debate), I use only the marginal probability of failure and require only that the worker's performance be drawn from a class of distributions in which $Pr(X \leq \tau)$ is strictly increasing in σ for any τ .

I allow that x_r and σ are knowable by the hiring manager. Though this is a substantial assumption, it does not materially impacting the results: uncertainty with regard to worker attributes will predictably bias the hiring manager towards lower-risk alternatives and/or prior beliefs.

The Organization

A representative organization has a workforce consisting of these two worker types (N^r, N^v with some x_r and σ) and a production process $Q(N^r, N^v)$ which converts individual worker output into the organization's output. The organization also has some resource endowment (W_t) and is subject to a stochastic resource shock each period: $\omega_t \sim (0, \sigma_\omega)$ Resources include the organization's capital, assets, capabilities, reputation, and credit-worthiness (Barney, 1991). The shock is mean-zero, uncorrelated with worker volatility, and designed to capture the ordinary frictions of business (Yoo et al., 2016). Profits carry forward: $W_{t+1} = W_t - \omega_t + Q(N^r, N^v)$. Prices are normalized to one, wages are included in productivity, and all other costs are normalized to zero.

I interpret baseline features of the model as indications of the quality of the organization or environment. All entities have the same risk tolerance and decision-making quality, but highly productive employees (high x_r) and lower baseline failure chance (σ_ω) suggest a more effective organization, a more favorable environment, or a better business theory. Likewise, greater wealth (W_t) can be interpreted as an indicator of the quality of the organization or its aptitude with regard to raising capital or attracting talent.

Production Functions

The impact of one person's volatility on the organization depends on how their productivity translates into organization output. If an employee is a single point of failure for an entire factory, the impact of any error or left-tail draw is magnified. An employee working independently is more limited in the damage that they can do, but the organization still cannot derive outsized benefits from over-performance. I model three production functions, each chosen to illustrate one extreme of independence and inter-connectivity.

Additive production, in which all employees work independently and are perfect substitutes:

$$Q(N^r, N^v) = N^r x_r + \Sigma_{n=1}^{N^v} x_{v,n}$$

This is a reasonable representation of many small companies as well as some teams. Consider, as examples, a sales organization in which productivity is the sum of the individual agents' sales or a piecework manufacturing facility where output is the sum of the individual workers' productivity. Organizations or teams with additive production are equally sensitive to left and right-tail variance.

Leontief production, in which all workers are interdependent:

$$Q(N^r, N^v) = A(N) \cdot min(x_r, x_{v,1} ... x_{v,n})$$

The throughput of the system is equal to the lowest performing individual or station, then scaled by some function A(N).

Beyond the obvious applications to assembly-line manufacturing, many small companies also, effectively, operate on this kind of production. Consider a firm with three employees: an engineer, a sales agent, and a consultant/delivery expert. To generate revenue, the engineer must produce a product, the sales agent must sell it, and the consultant must implement it. A bad performance from any one person nullifies the entire organization's output (Kremer, 1993; Perrow, 1984).

The Leontief is the most sensitive to left-tail variance and is unable to extract any value from right-tail variance. In this, it is the opposite of additive production. The latter has workers that are perfectly independent; the former perfectly interdependent. In practice, most organizations fall somewhere between these two. For example, organizational decoupling (Orton & Weick, 1990; Weick, 1976), and slack in intra-organization handoffs effectively provide a buffer against events or shocks by allowing two functions to be nominally interdependent but practically disconnected and temporally independent (Bourgeois, 1981; Cyert & March, 1963; Meyer & Rowan, 1977). Likewise, resource redeployability and organizational ambidexterity reduce the costs of production slowdowns elsewhere in the organization (Helfat & Eisenhardt, 2004; O'Reilly & Tushman, 2013; Sakhartov & Folta, 2014). The extent to which these management interventions are effective determines where, on the Additive-Leontief continuum an organization falls and how much weight each of the model's respective predictions should receive.

Competitive or Tournament production in which only the best performance within a team or organization matters:

$$Q(N^r, N^v) = A(N) \cdot max(x_r, x_{v,1}...x_{v,n})$$

Within an organization, functions and teams may have different levels of interdependence, with different production functions at the business unit or organizational level. It is difficult to imagine an entire organization with competitive production, but many individual functions will follow this kind of "sweepstakes" in which the best idea or concept is employed elsewhere in the organization (K. J. Boudreau et al., 2011; Dahan & Mendelson, 2001). Consider a lab in which a team of inventors each produce their own prototype: the organization selects the best of the prototypes and puts it into production and the second best idea is scrapped. Competitive production is largely immune to left tail variance (so long as the organization has a single Reliable-type employee, as I will discuss), and benefits fully from right-tail variance.

Competitive production also helps address a category of production in which two or more complementary inputs generate outsized value when paired together (Athey & Stern, 1998). These cooperative or synergistic production functions lie on a continuum between competitive and additive production and share a relative immunity to left-tail variance and ability to capture right-tail variance.

Terminal Failure

Should the organization exhaust its resources, it fails and receives no profits in the future. This is the fulcrum of the model and a relatively standard feature of ecological or other chance models in strategy (Denrell, 2004, 2005; Denrell & Liu, 2012; Levinthal, 1991; J. G. March, 1991) . In exchange for taking on marginal failure risk by hiring a volatile worker, the hiring manager requires compensation commensurate with the risk. Because organization size, composition, and features interact to make the organization more durable or fragile, the preference for workers of a certain type varies over time and across settings.

Hereafter, I refer to this state of exhaustion as ”failure” though it need not only represent cases where an organization ceases to function. Instead, this is designed to capture any disproportionately negative outcome for the decision-maker. The failure state embeds two additional assumptions about the organization. First, the consequences of failure (firm failure, investor displeasure, margin calls, etc.) must apply directly to the decision-making entity. If the hiring manager can realize private or personal gains from hiring volatile workers at the cost of increased organizational risk, I would expect them to do so. By construction, there is no principal-agent risk (Jensen & Meckling, 1976) in the model. In cases where the decision-maker internalizes only a fraction of the organization’s failure penalty, their preference for volatility may be suboptimal for the organization (Coles et al., 2006; Gompers & Lerner, 1999). This is not modeled explicitly but I instead flag it as a caveat to the model results.

Second, left-tail risk and consequences must resolve at a relevant frequency. If worker output is highly volatile at the daily level, but the organization only realizes the consequences when payroll runs every month, then the law of large numbers takes hold. On the other hand, a sales representative with volatile annual performance can cause a promising organization to fail with a sufficiently bad week at year-end. The flow of the model is such that the organization hires a single worker, then all workers work, and the organization realizes profits or losses. A company may hire a third worker months after their second, but employees 99 and 100 might start on the same day. For convenience, I do not specify the length of a period, but the model assumes that the performance and profit intervals are identical and non-negligible (Samuelson, 1963). Performance on any time scale can function as an aggregation of many smaller-scale draws, so x_v is the convolution of however many individual draws the worker may make in the same period as the organization realizes its performance. Still, to avoid unsupportable claims, I make no magnitude comparisons across different parameter sets and instead build theory off of comparative statics.

The Hiring Manager's Problem

This model differs from Markowitz (1952), March (1991), and other antecedents in its emphasis on a single marginal worker. Portfolio management and exploration-exploitation models optimize the allocation of resources across a set of alternatives and allow for a complete rebalancing of investments in each period. In finance, this is entirely appropriate: an investor whose risk tolerance or liquidity needs change can sell or trade assets in response. Investments in existing products and/or new product development entail discrete commitments to both workers and fixed assets, and so are more difficult to unwind. To be clear, this is not a criticism of March (1991); his work is concerned first with the firm's posture towards learning and is given proper microfoundations and frictions by Siggelkow and Levinthal (2003) among others. Rather, I note the distinction because this kind of broad rebalancing is neither allowed nor considered in the below model. Instead, I examine a single, marginal hire to determine the relative value or cost of volatility at that point in time.

The state at time t is defined by the organization's wealth and the number of each employee type that it currently employs: (W_t, N^r, N^v). Resources and profits carry forward according to: $W_{t+1} = W_t - \omega_t + Q(N^r, N^v)$ and the organization fails and liquidates if $W_{t+1} < 0$. The probability of survival is $S(W_t, N^r, N^v) = Pr(W_{t+1} \geq 0 | W_t, N^r, N^v)$.

I collapse all future period payoffs into $V(W_t + 1, N^r, N^v)$, which is bounded and does not depend the choice of candidate except through the state transition. This discounted continuation value conditions on survival and captures organization-specific planning horizons, discounting, and the future value of re-invested profits.

The hiring manager chooses whether to hire one reliable worker or one volatile worker in an attempt to maximize total payoff:

$$\begin{aligned} max\{ &\underbrace{E[Q(N^r+1, N^v)] + S(W_t, N^r+1, N^v)V(W_{t+1}, N^r+1, N^v),}_{\text{reliable}} \\ &\underbrace{E[Q(N^r, N^v+1)] + S(W_t, N^r, N^v+1)V(W_{t+1}, N^r, N^v+1)}_{\text{volatile}}\} \end{aligned} \tag{1}$$

The two candidates differ only in the spread of their performance and the resulting impact on survival: $S(W_t, N^r+1, N^v) \neq S(W_t, N^r, N^v+1)$. To capture this difference, I introduce the Reliability Premium (λ) which is paid out in the initial period. This compensating differential reflects the relative value of a reliable worker compared to a volatile worker in a given state. A higher reliability premium means that hiring managers would require greater expected performance or lower wages to be indifferent between the two candidates. Absent this reliability premium, the expected performance of the two candidates is the same $Q(N^r+1, N^v) = Q(N^r, N^v+1)$ and so the indifference equation simplifies to the difference in survival rates multiplied by the value of future production for the entire organization:

$$\lambda = \underbrace{[S(W_t, N^r+1, N^v) - S(W_t, N^r, N^v+1)]}_{\text{difference in survival rates}} \underbrace{V(W_t+1, N^r+1, N^v)}_{\text{future organization output}} \tag{2}$$

The hiring manager prefers the volatile employee if the difference in their performance or compensation compared to a reliable employee is, in expectation, greater than the marginal risk of failure multiplied by expected productivity in future periods. I interpret the reliability premium as the difference in net performance required for the organization to be indifferent.

By construction, there is no reliability premium when the hiring manager's choice has no impact on survival. If failure is certain, survival is guaranteed, or some other feature of the organization provides insurance against worker volatility ($S(W_t, N^r+1, N^v) = S(W_t, N^r, N^v+1)$), λ will be equal to zero and the hiring manager will be free to choose the "best" candidate by expected performance.

In most cases, the volatile-type worker will introduce a greater likelihood of failure than the risk-free alternative: $S(W_t, N^r+1, N^v) > S(W_t, N^r, N^v+1)$. Except where noted, I evaluate the model with this non-degenerate survival as a scope condition. This allows the magnitude of the reliability premium to represent the firm's level of exposure to worker volatility risk. These states are also areas where strategic behavior is possible. The reliability premium can represent the difference in expected organization performance between a sophisticated entity with an awareness of worker volatility and one that is more naive or the value of information about a worker's performance distribution.

Finally, recall that the primary objective of this paper is to determine which organizations are exposed to performance volatility risk. The reliability premium on a marginal hire sufficient to gauge the direction and magnitude of this risk. A thoughtful reader may immediately jump to portfolio-esc organizational implications (hiring, redeployment, ambidexterity, etc.) à la Markowitz or March, but this is outside the scope of my inquiry and thus reserved for the discussion.

IMPLICATIONS

I first develop the model using additive production. I then show how findings from this base case evolve in response to more interconnected or competitive production functions.

Additive Production and The Volatility Tax

Consider a brief numerical example. Workers are paid \$100,000 per period. Their expected output in the firm is worth $\$105,000$ ($x_r = \$5,000$) and the volatile employee's performance is normally distributed around this mean with standard deviation of \$30,000. The firm has two reliable employees already ($N^r = 2$). For simplicity, the firm has neither resource reserves ($W_t = 0$) nor exposure to any resource shocks ($\omega_t = 0$) and the value of future productivity scales such that the discounted sum of all future periods is equal to the value of the present period ($V(\cdot) = Q(\cdot)$). With three employees, expected profits are \$15,000. If the third worker is volatile, probability of failure rises from 0% to 31% ($\Phi(\frac{0-15,0000}{30,000}) = \Phi(-0.5) = 0.3085$) and expected profits are $\$15,000 \cdot 0.69 = \$10,400$. To hire the volatile worker, a hiring manager would require a compensating differential in the form of discounted wages or increased productivity for the difference, a reliability premium of $\sim \$4,600$. With \$10,000 in cash on hand, the risk of failure falls to $\sim$ 20% and the reliability premium to $\sim \$3,000$. If the organization instead had \$20,000 cash on hand and 20 reliable workers instead of 2, the risk of failure is 0.0015% and the reliability premium is a measly \$1.62.

Interpreting the reliability premium in terms of wages, this means a large and wealthy organization can hire workers with the exact same expected performance at a $\sim$ 4.6% discount. Holding wages constant, the mature organization will instead hire employees that are $\sim$ 4.6% better, in expectation. As the example suggests, both scale and wealth impact this gap, which I label the Volatility Tax. Below, I present simple comparative statics, then discuss both scale and wealth in more detail.

The reliable worker is risk-free with positive performance, and so both the survival rate $S(\cdot)$ and future value $V(\cdot)$ are monotonically increasing in W_t and N^r for all production functions. Additionally, the value of the organization's future productivity is increasing in N^v for all forms of $Q(\cdot)$. Given that volatility is uncorrelated across workers, additive production also produces a monotonically increasing survival rate in N^v, though it grows more slowly than N^r.

It follows that increases in the number of employees reduce the reliability premium by increasing the chance of survival. This is the scale effect:

$$\Delta_{N^r}\lambda < 0, \Delta_{N^v}\lambda < 0 \tag{3}$$

When the organization is sufficiently large, the probability of survival is independent of the choice and so the reliability premium goes to zero, leaving the organization indifferent between candidate types on the basis of volatility: $\lim_{N^r+N^v\to\infty} \lambda = 0$.

The same mechanics apply to resources and wealth. An organization possessing a large stock of valuable resources cannot fail as a result of individual, non-systemic volatility. Thus, the reliability premium is decreasing in resources (W_t) so long as survival is not deterministic. This is the wealth effect:

$$\frac{\partial\lambda}{\partial W_t} < 0, \lim_{W_t\to\infty} \lambda = 0 \tag{4}$$

Model features which affect resource accumulation/transfer (x_r, σ_ω) and, therefore, the survival rate behave similarly under mild assumptions.

The Volatility Tax has three interpretations. It can represent the gap between sophisticated organizations (those with an understanding of performance as a random variable and the ability to measure it) and naive hiring managers (those who attend only to expected performance). If all parties are aware of a candidate's penchant for bad days, the Volatility Tax represents the value of correct information about the spread of a worker's performance. However, most notably, in an environment with full information and sophisticated hiring practices, the Volatility Tax is a structural penalty imposed only on small, poor, and fragile organizations. Calling back to the initial example, a higher volatility tax means that the hiring firm is less able to weather periods in which the focal candidate produces nothing of value. These are the organizations that should choose the unremarkable candidate over the superstar, and they are worse for it.

Volatility as Liability of Smallness

Resource and capability constraints represent a well-documented hazard (Stinchcombe, 1965). Organizations lacking cash reserves, human capital, credit, or reputation are less able to weather shocks, respond quickly to opportunities, or make larger and more efficient investments. The Volatility Tax can be added to these "liabilities of smallness" because it presents resource-constrained organizations with a dilemma in which every alternative carries with it some cost that can only be defrayed by growing large or wealthy. Hire the best employees but risk failure due to one bad day? Hire mediocre workers? Overpay for workers who are neither mediocre nor volatile? Or make costly investments to redesign internal processes and structures? There is no right answer, but organizations that fail to navigate this choice space effectively are likely to disappear.

As a general rule, the liabilities of smallness exert a pull which only organizations that are sufficiently lucky and capable can escape. Those that make it out of the gravity well do so by expanding their resources and capabilities. As a result, the antecedents, mechanisms, and impacts of growth are central to entrepreneurial strategy (DeSantola & Gulati, 2017). The volatility tax represents a novel contribution to this literature, though it also complicates our understanding of growth strategy.

Conventional wisdom suggests that entrepreneurs need to take large risks in order to succeed. Some of this is definitional: every founder wagers that their business can create value that is either overlooked or inaccessible to better-resourced organizations. More materially, scale conveys a compounding advantage. Organizations in a lagging position need to take risks in order to avert a vicious cycle in which the rich get richer and the small and nascent inevitably close up shop (Aghion et al., 2001; Cabral & Mata, 2003; Denrell, 2005; J. G. March, 1991). But startups that play high-variance human capital strategies, are likely to incur the volatility tax, further diminishing the likelihood of success. Worker volatility compounds preexisting challenges in hiring and so is akin to the tyranny of the Tsiolkovsky rocket equation in which the weight of fuel needed to proceed to space requires exponentially more fuel to lift it to the point where it can be burnt. However, this also suggests that better management of volatility is one path to more effective entrepreneurial strategy.

Wealth as Treatment

Just as gravity wanes with distance, so too do the liabilities of smallness and poorness. When an organization reaches sufficient scale, volatility begins to work in its favor. Compared to smaller organizations, larger organizations can either hire better workers for the same wages or the same workers at a discount. This is consistent with our understanding of assortative matching, which suggests that workers and organizations mutually sort and match with similar quality counterparts (Kremer, 1993). There are a variety of mechanisms, but assortative matching is typically framed as a function of a richer organization being able to pay better wages, make complementary investments, or otherwise become more attractive to candidates by *using* its resources (Abowd et al., 1999; G. S. Becker, 1973; Ouimet & Zarutskie, 2014). Uniquely, in this model, the organization does not pay a premium for talent. Rather, because it has a lower reliability premium, it is more able to absorb talent that is high mean but high volatility. So long as there is sufficient dry powder (in the form of capital, credit, scale, or reputation) to weather small-scale, uncorrelated shocks, the wealthy organization gets better talent without paying for it.

In this, heterogeneous worker performance risk exposure functions like reputation with regard to hiring. Highly regarded organizations can attract top talent without paying a commensurate premium (Burbano, 2016; Sorkin, 2018) which, in turn, creates a self-reinforcing cycle of sustained competitive advantage.

This also bears directly on our understanding of the role of venture capital in firm success. While there is strong evidence that venture capital helps firms grow (Davila et al., 2003; Hellmann & Puri, 2002; Kortum & Lerner, 2000; Puri & Zarutskie, 2012), it is sometimes difficult to separate treatment and selection effects (Nanda & Rhodes-Kropf, 2013; Sørensen, 2007; Sorenson & Stuart, 2001). Consistent with evidence that wealth alone can produce better outcomes (McKenzie, 2017), this model suggests that added investment benefits the receiving organization by allowing it to ignore the volatility tax and instead hire better employees than less well-funded competitors.

The implication is that access to capital is even more important for small organizations and that the specific use of funds is important. Whereas venture capitalists or aggressive leaders may strive to be on the frontier of growth, an organization with enough unspent funds to insure against worker volatility (Puri & Zarutskie, 2012) can hire better workers than otherwise. This partially offsets the opportunity cost of making fewer hires and allows these capital reserves to remain as a store of organizational slack and a hedge against other types of risk (so long as these risks are uncorrelated with worker volatility). Unspent funds thus convey some of the benefits of scale without imposing any compensating liabilities.

Many investors contribute not just their capital but also their imprimatur. Taking the broader definition of resources, this suggests that small and new businesses might benefit as much from the implied backstop of a wealthy investor as they do from the capital itself (Stuart et al., 1999). And because the reserves of a high-profile venture capital fund are functionally unlimited compared to those of a startup, a growth-oriented founder can spend every penny of liquid capital on capable and volatile talent, effectively borrowing against their funders' reputations to hire "better" employees than would otherwise be optimal.

The reverse of this wealth effect suggests that the optimal growth path for a small organization is more conservative than conventional wisdom suggests (Aldrich & Ruef, 2018). No matter how compelling the business idea, an organization with neither cash reserves nor famous investors should be careful to avoid following in the footsteps of its unicorn forebears and gazelle peers.

The Failing Venture

But if the Volatility Tax incents small organizations to hire reliable workers, why does it seem like the opposite is true? We associate larger organizations with more conservative hiring and startups with colorful and eccentric personalities. The staid, Swingline stapler-loving accountant simply doesn't work at a startup and the brilliant ayahuasca enthusiast has no time for the bureaucracy and formality of an established firm.

While no empirical work has examined the volatility of startup workers, there is strong evidence that early hires in small firms are younger, less-skilled, less educated, more likely to have been previously unemployed, and more likely to be non-majority demographics such as women, immigrants, or minority ethnicity (Coad et al., 2014, 2017; Dahl & Klepper, 2015). So, how do we square the implications of the model – small organizations should hire conservatively – with evidence that startups are not hiring purely for expected performance (by most conventional metrics)?

One possible answer emerges when we examine the model's behavior at the edge of failure. If an organization's position is sufficiently precarious (low wealth, low quality, volatile market, etc.), the marginal failure probability of a single volatile hire is negligible. As organizations receive a payout of zero when they fail (and the entrepreneur/manager can collect on their outside option), there is, effectively, downside protection at high failure rates. A Reliable-type employee has limited value because the organization will likely fail with or without them. A Volatile-type employee's left-tail variance has little downside because the marginal probability of failure is small but the right-tail of the Volatile-type employee offers potential returns and a stay of execution. In these cases, the reliability premium is non-positive and decreasing in worker volatility (σ):

$$\text{While } S(W_t, N^r + 1, N^v) < S(W_t, N^r, N^v + 1) : \frac{\partial \lambda}{\partial \sigma} < 0, \lambda < 0 \tag{5}$$

This is a third kind of hiring strategy. Large/rich organizations are mean focused. They can ignore volatility and hire the best employee. Small and resource-constrained organizations must carefully manage left-tail risk and pay a tax for doing so. But doomed organizations are primarily concerned with right-tail events. They prize volatility for its own sake and hire workers who are, on average, worse performers, so long as said workers are also unstable, erratic, and capricious.

So how common is this category of strategies? Such risk-taking behavior is commonly observed in both management and investment decisions and is consistent with the behavioral theory of the firm (Cyert and March 1963). Organizations with strong prior performance take fewer risks. Those in dire straits take more risks and consequently perform worse, even after conditioning on resources/wealth (Bromiley, 1991; Eisdorfer, 2008; Leland, 1998). Hedge funds take riskier bets as they near the end of a reporting period in which present performance is poor (Agarwal et al., 2011) and mutual fund managers whose returns lag behind competitors or peers increase fund volatility in the hopes of resurrecting their performance ranking (Brown et al. 1996). Precarious startups behave similarly (Angus, 2019; Ref et al., 2024).

This model requires that the focal organization be at risk of imminent failure before this kind of risky hiring is optimal, but with minimal loss, we can allow only that the decision-maker believes that they are at risk of failure. The real failure rate for an organization is unknowable, so a boundedly rational hiring manager may conclude that they should hire volatile workers when the opposite is true. The reverse is also possible, though excessively hiring reliable workers is unlikely to be a terminal mistake. In either case, optimal hiring (and, therefore, growth) depends on being able to accurately gauge the quality of a theory of business, which is no small task (Felin & Zenger, 2009).

And for many founders, the belief that failure is always close by may not be entirely wrong. The overwhelming majority of startups will fail (Fairlie et al., 2023), but not before experiencing a brief indemnification from performance volatility risk. In any population, some number of these organizations will survive thanks to a favorable draw from a less-than-reliable employee. The unexpected stroke of genius can become a part of an organization's mythology, which, when paired with survivorship bias, would account for the salience of oddballs in any history of high-growth firms. It also makes it difficult to separate a good growth strategy from a very bad (but very lucky) one.

This period of extreme fragility and almost-certain failure is, by definition, fleeting. Organizations either hit on a long-shot or fail and disappear. The model thus suggests an inverted, U-shaped relationship, globally, between the riskiness of a startup's optimal hiring strategy and its likelihood of failure. A startup that escapes disaster actually grows more vulnerable to performance volatility. Only once it has grown sufficiently large or wealthy can it ignore volatility once more, albeit for different reasons (Ref et al., 2024). This is consistent with evidence that capital infusions into startups cause hiring behavior to conform to patterns usually reserved for more established organizations (Dahl & Klepper, 2015; Ouimet & Zarutskie, 2014) and provides another dimension to the treatment effect of venture capital.

Interconnected Production

Thus far, I've only considered the case in which two workers are entirely independent of each other. However, one of the most foundational features of an organization is that they coordinate the efforts of more than one person towards a common goal (Scott & Davis, 2000). And, in fact, the more complex and interconnected an activity, the greater the advantage conveyed by performing it within an organization compared to using market mechanisms. At a minimum, a set of interchangeable specialists benefit from sharing overhead: law firms employ accountants so that they don't have to spend attorney time on invoicing and billing. At the other extreme, the production of complex products can mean that every role in the plant performs a crucial task without which the semiconductor, lithography machine, or aircraft cannot be completed. The Leontief production function best represents the latter pole, but also applies to a class of organizations in which the objective function is, itself, the elimination of negative outcomes (air traffic controllers, nuclear power plant operators, etc.) (Weick & Sutcliffe, 2001).

The first and most obvious difference in Leontief or assembly-line production is that volatility of any kind is punishingly expensive. One bad period from one worker can nullify an entire business, and so the organization requires an enormous premium for any risk at all. The larger the invoice, the more important good accounting becomes. The more expensive the machinery, the more important is every step in assembly and quality-assurance.

Because wealth is independent of the production function, the wealth effect remains: resources make a volatile employee slightly more palatable. Increases in baseline failure chance and employee performance standard deviation further increase the costs of volatility. However, whereas under additive production, survival rate ($S(\cdot)$) is monotonically increasing in N^v, the opposite is true when inputs are interdependent. As a result, the edge-case in which a failing organization values volatility disappears because the Leontief organization cannot capture any right-tail variance, even at the brink of failure. As a result, the reliability premium is strictly non-negative: $\lambda \geq 0$.

More importantly, the relationship between previous hires and the reliability premium reverses.

Larger organizations have more to lose and gain no benefit from "good days." Likewise, if the organization's baseline quality/profitability increases, as indicated by the return from a Reliable employee, volatility becomes ever more expensive. Every additional worker increases the value of future production. Reliable workers increase the likelihood of survival and volatile workers decrease it, widening the gap and raising the reliability premium. Formally, under Leontief production:

$$\Delta_{N^r}\lambda > 0, \Delta_{N^v}\lambda > 0, \Delta_{x_r} > 0, \lambda > 0 \tag{6}$$

To any operations scholar, this is both intuitive and obvious. Variability at any station in the production workflow damages throughput and creates periods of idleness/crunch. Early innovations in industrial management were largely directed at mitigating against or eliminating worker volatility to prevent expensive disruptions and bottlenecks (Hopp & Spearman, 2011; Taylor, 1911). However, there are interesting implications for the growth of organizations. Consider a startup founder who must work closely with their second employee. If the first is volatile (a common descriptor of entrepreneurs), then the second should be their opposite. A volatile entrepreneur with a bad business idea and a reliable co-founder can outperform one with an excellent idea and a volatile peer. In fact, if production is highly interconnected, all subsequent workers should be reliable: the premium will only grow as the organization does. At some point early in the organization's lifetime, the founder will need to consider whether it is better to hire reliable workers ad infinitum or instead invest in decoupling each function. The latter is likely to entail a substantial fixed-cost and thus suggests yet another potential treatment effect of venture capital (Hellmann & Puri, 2002). It also may be an intentional or incidental effect of HCM process maturation and formalization and so should be incorporated into the relevant cost-benefit calculation (Cardon & Stevens, 2004).

Reliability as Insurance

Finally, I consider cases in which production output is entirely dependent on the single best input. Usually, this kind of competitive or tournament-style production function surfaces in creative or innovative industries. Only one slogan becomes the brand asset. One actor or actress gets to play the lead. One franchisee gets the territory. And only one invention receives a given patent. Given the non-cooperative nature of this work, it's not uncommon for each idea or entry in the contest to come from a separate organization. Still, many leading firms set up internal R&D functions which follow a similar logic. Some large technology companies, for example, make promotions contingent on shipping the best version of a desired product and in many sales organizations, only the top-performing agent earns a spiff or prize.

In competitive production, the organization only needs one Reliable-type employee. This worker gives a lower bound to the organization or team's output and indemnifies it from any and all risk of left-tail variance and, thus, failure, liquidation, or exhaustion. It also allows the organization to realize greater expected returns by adding more volatile workers, even if the volatile workers are worse.

Though the first Reliable-type employee is important, they provide no other value to the organization besides insurance and benchmarking. Consider a team with only volatile workers. Each additional volatile worker reduces the probability that the organization fails and increases the expected return (and, thus, the cost of failure). There will be a point at which the probability that the maximum draw is less than the reliable worker's output is negligible, and so insurance adds no value. Likewise, a second reliable employee duplicates the functions of the first, adding no value.

Thus, the scope condition permits only states in which the organization has neither a single reliable worker ($N^r = 0$) nor a sufficiently large population of volatile workers. In this case, competitive production functions similarly to additive production. Wealth and scale effects (with regard to reliable workers) remain. Features of the model which increase the likelihood of failure also make reliability more valuable. The reliability premium is strictly positive and substantially larger than in an equivalent organization with additive production. Formally, under competitive or tournament-style production:

$$\frac{\partial \lambda}{\partial W_t} < 0, \Delta_{N^r}\lambda < 0, \frac{\partial \lambda}{\partial \sigma} > 0, \lambda > 0 \tag{7}$$

In short, in environments where organizations have an unlimited ability to capture right-tail variance, an entity still derives value from hiring a low-performing and reliable employee. Mathematically, the reliable worker provides insurance but we can also imagine that they make it easier to identify truly exceptional ideas by comparison (Maitlis, 2005). Without the benchmark of an unexceptional but reliable worker, how can an organization tell whether a new design is good enough? In finance terms, a reliable worker makes it easier to identify the alpha (Jensen, 1968) of an idea or contribution from a more volatile employee.

A marginal volatile employee can either increase or decrease the reliability premium, depending on whether that worker increases the chance of failure more than they increase the expected returns. However, once the organization has procured insurance against worker volatility in the form of a reliable employee or a large enough population of volatile workers for the law of large numbers to take hold ($\bar{N}^v$), additional reliable workers add no value:

$$\text{While } N^r > 0 \text{ or } N^v > \bar{N}^v : \lambda = -\infty \tag{8}$$

Ideally a team would build from scratch with an understanding of volatility. The optimal sequence of hiring for a small, innovative or creative organization will be to hire a single reliable employee as soon as possible, then focus only on the highest mean performers available. The same holds for team composition within larger organizations: no matter the environment, teams benefit from at least one level-head.

However, this last finding suggests that some teams, perhaps led by naive hiring managers, can built to such a size that insurance results from scale, rather than a balanced portfolio. In this case, no reliability is required or warranted, but the team is vulnerable. While it remains large and coherent, the law of large numbers protects against worker volatility. But should the team be split or otherwise reorganized such that the effective size and span of control shrink, there can be a sudden, material exposure to performance volatility risk. This is slightly counterintuitive: adding another manager should increase oversight and reduce worker volatility but may instead accidentally and invisibly eliminate the primary source of stability for the team's output.

Finally, in considering the needs of the individual, more complications emerge. For one, a reliable employee provides a fundamentally different service to the team from their peers, but they do so unwittingly. Reliability is not a deliberate act, but rather an artifact of an individual's disposition, skill, and approach to work. An organization with competitive production benefits from this consistency but the value is largely invisible in day-to-day operations and, thus, difficult to manage or compensate. To single out the reliable worker for differential treatment is to threaten the behaviors that the organization values (Kerr, 1975). But treating them identically to their more erratic peers can be demoralizing for all involved (Greenberg, 1987). The reliable employee never wins the tournament. By construction, their work is never featured or selected for greater attention and yet they remain a member of the organization in good standing and an example to their peers. Neither employee type is likely to be entirely happy with this arrangement.

DISCUSSION

Whether because of measurement challenges or faith in the law of large numbers, HCM research has almost entirely neglected the strategic impact of worker volatility. In many cases, this is a costless omission. To safely disregard the spread of worker performance, an organization need only be large, wealthy, and/or possessed of a highly sophisticated HCM architecture which minimizes principal-agent conflicts and aligns managerial incentives perfectly with those of the organization. Yet, there are many organizations that lack these things: startups, struggling incumbents, family firms, non-market/non-profit organizations, universities, government agencies, and informal or quasi-formal movements. For them, this model suggests that volatility should be a core consideration in human capital management and organizational design.

Volatility and Strategic HCM

Volatility makes hiring strategic. In a mean-only world, selection is an optimization problem. Given comparable information and constraints, similar organizations converge on the same candidate because a higher expected contribution is all that matters. Differences in outcomes reflect operational effectiveness (signal extraction, screening cost, speed) instead of strategy (Mortensen & Pissarides, 1999; Spence, 1973; Stiglitz, 1975). Introducing within-person volatility creates mean–variance dilemmas in which the "right" choice depends on organization-specific (wealth, size, internal organization, prior hires, etc.) exposure to downside risk and ability to capture upside. Two rational organizations, facing the same applicant pool but different Reliability Premiums, can choose differently and both be right. That contingency is the hallmark of strategy: non-obvious tradeoffs under uncertainty where alternatives are attractive enough to split even expert opinion.

Handled well, volatility can also be a driver of sustained advantage through at least three channels. First is identification or the the ability to distinguish reliable from volatile types (and good from lucky) and make appropriate hiring, retention, and promotion decisions. Second is individual volatility management, which captures the ability to reduce or buffer performance volatility with traditional human capital management interventions and organization design. And finally, portfolio management: composing teams across roles and functions and adjusting this mix in response to changing world states.

This is similar to the classic Becker-Gerhart (1996) model in which human capital management supports sustained competitive advantage by creating a wedge between a worker's market value and their value to a firm (Campbell et al., 2012; Huselid, 1995; Lepak & Snell, 1999; Wright et al., 1994). Both rely on the inherent difficulty in imitating complex strategies (Rivkin, 2000), but volatility-informed HR strategy doesn't require organizations lock employees into a wage below their value or invest heavily in firm-specific human capital to generate persistent performance differences. Rather, value results from intertemporal smoothing of human capital risk. Even at market wages, an organization that is sophisticated with respect to performance volatility will outperform (or at least outlast) competitors in the long run.

Future Directions: Human Capital Portfolio Management

The idea that organizations should compose their workforce as an investor does their portfolio naturally suggests a new research direction. I define Human Capital Portfolio Management (HCPM) as an approach to workforce management in which organizations make hiring, process, and management decisions with an explicit understanding of within-person performance volatility. Workers are not fixed producers of output, but stochastic assets whose realized performance fluctuates over time. Organizations, in turn, hold portfolios of such assets, with the objective of maximizing performance returns while managing exposure to human capital risk.

This model provides only a very simple representation of HCPM in the context of hiring and yet raises a series of open theoretical and empirical questions which can can be addressed by a more robust HCPM research agenda.

Measurement Questions

Perhaps the greatest challenge in implementing HCPM is that volatility is challenging to measure. For organizations and researchers alike, it can be difficult or impossible to distinguish between excellent performance and good luck. Worse, though individual volatility is somewhat stable in relation to peers, workers are not static. They change for better and for worse. Even with some understanding of a worker's baseline quality (though these signals are noisy as well), how should organizations determine whether performance in a period is representative of things to come? Or, without even the benefit of being able to observe prior performance, how should organizations think about hiring? Are there signals of reliability that are not also highly valued signals of quality or expected performance?

This seems a daunting empirical challenge, but I should note that it is not radically different from efforts to determine signals of worker quality. The difference is simply that we've had a half-century or more of sophisticated research on the latter.

One opportunity of note: signals of volatility grow more obvious and will accumulate on a worker's resume over time. Conditional on industry and market dynamics, frequent job/firm/role changes, rapid promotions, geographic mobility, changing careers, and emerging skills may all be indicative of volatility. On the other hand, reliability is likely to look like none of these. Drawing from discussions with hiring managers and my own experience, I would suggest that we begin with signals such as time-in-grade. A highly reliable worker is never bad enough to be fired nor exceptional enough to be promoted. There may also be demographic or socio-economic features which operate on a worker's drive/motivation and so enforce discipline or inject chaos in their work habits. And, of course, researchers with access to firm-specific performance data may be able to find new and creative signals of reliability.

Performance Management Questions

Traditional performance management assumes that the role of HR interventions is to raise mean performance, reduce underperformance, or align behavior with organizational goals. But if we accept that some portion of observed variability is due to within-person volatility, then a new question emerges: How, if at all, do existing performance management practices affect the volatility of performance?

Management oversight, for instance, is generally assumed to suppress volatility—though sometimes at the cost of efficiency, autonomy, or innovation. But what of other interventions? We do not know whether performance feedback, coaching, incentives, or formal appraisal schemes reduce volatility, have no effect, or even increase it. The same applies to non-HR levers like team composition, job design, and reporting structure. Can organizations dampen volatility without suppressing performance or do more volatile workers require different performance management systems than their more consistent peers. Are they more responsive to incentives? More sensitive to feedback? Or simply less influenceable overall?

There are also questions about complementarity and role-specific sensitivity. Do volatile and reliable workers interact in productive ways (informal anchoring, peer/social regulation, or division of labor, etc.)? Do reliable coaches and mentors help temper their more volatile charges? If so, performance management becomes as much about team construction as individual oversight. Further, how does volatility shape or constrain performance management across roles and levels? Volatile output from an R&D scientist may be tolerated or even expected. Volatility from a low-level individual contributor might be costless to the organization and easily ignored. But, the same behavior from an auditor, security specialist, or plant manager might be grounds for dismissal.

Ultimately, if present systems are not up to the task, it will fall to researchers to identify new processes and best practices to manage both volatility and mean performance.

Behavioral Questions

Are hiring managers and executives even attuned to within-person volatility? Classic attribution research suggests that observers systematically underestimate situational variability and over-infer stable traits (Ross, 1977). Performance appraisals reinforce this tendency by collapsing behavior into single ratings delivered infrequently. If evaluators mentally smooth sequences of highs and lows into an average, volatility becomes invisible, resurfacing only when an extreme draw triggers a post-mortem investigation (Kahneman & Tversky, 1973). Field evidence on managerial attention to volatility is sparse. We do not know whether supervisors track consistency, recall only peaks and troughs, or default to simple heuristics like “recent performance = true ability.” Even when volatility is noticed, how is it priced relative to skill? Do managers value signals of reliability for their own sake? Or are they used only as a tie-breaker between two similarly skilled candidates.

Finally, how do organizations currently infer reliability? If evaluators rely on coarse proxies: tenure in role, uninterrupted employment, punctuality, or milestones like home ownership or parenthood, the drive to find reliable candidates might inject biases into hiring and HR practices. For instance, men receive a “fatherhood bonus” because their children are interpreted as a signal of stability and commitment but women with children face a motherhood penalty, likely due to presumed absenteeism and/or competing priorities (Correll et al., 2007). Likewise, age can be taken as steadiness, ethnicity, accent, or immigration status as unreliability, and frequent job changes as flightiness, regardless of actual performance data. Further research can provide alternative measures/signals and prevent these heuristics from amplifying existing biases.

Organizational Design Questions

Finally, a key implication of this paper is that intentionally hiring reliable or volatile employees is co-constitutive with strategic organizational design. Organizations choose their internal ordering and boundaries strategically as a way of minimizing costs or maximizing productivity and scale. This model suggests that they should also simultaneously consider the composition of their human capital portfolio in making these choices. The location of a function within the organization – its dependencies, relationships, management span of control, and coupling to other functions – should determine which kind of employee organizations seek, retain, and promote.

There are also questions about the reverse relationship. Conditional on the workers currently employed and the candidates available, how should organizations design their internal workflows? Are flatter organizations more vulnerable to worker volatility? Should production be modular, rather than tightly coupled? Should volatile workers be shunted to peripheral tasks? Does the existence of volatility bear on the boundaries of the firm? Would it make sense to outsource highly volatile tasks? Does the make-or-buy literature still hold if the resource in question is stochastic labor?

Model Extensions

Finally, two important extensions of this model are not explored here but are worthy of a brief discussion. First is the expansion of worker performance volatility to multiple organizations. I have thus far assumed that the hiring manager's dilemma and, therefore, the Reliability premium is independent of the behavior of other organizations. In practice, the hiring decisions of large incumbents shape the wages and availability of talent for new entrants. We can imagine a case in which a startup with additive production values reliabilty, but is unable to afford the wages set by a large incumbent with Leontief production and, therefore, a considerably higher reliability premium. Other organizations also affect the payoff function and the availability of resources. Startups engaging in a winner-take-all race to receive scarce venture capital may have no use for reliability, even if, in a vacuum, the risk-free worker would be the more responsible and rational choice.

A second extension concerns competition within the organization. In practice, teams and business units are neither homogeneous nor independent. Competition for promotions, coalition formation, and internal networks create complex and dynamic incentives which shape the hiring manager's decisions distinct from those recommended by the organization-level reliability premium. As in the multi-organization case, the decisions of other hiring managers directly alter the focal manager's tolerance for volatility within their team and their willingness to take risks with their own career and compensation.

In addition to promising interesting additions and caveats to this model, these extensions are important in developing our intuition around HCPM. It's likely that hiring managers and organizations have some concept, already, of worker volatility, so the development of HCPM as a research agenda depends on the credible theoretical extension of this paper's very simple model.

Conclusion

There is something delightfully subversive in the idea that any organization, all else being equal, might rationally and correctly choose to hire a candidate who is simply worse than the alternative. It is the human capital management equivalent of backing Aesop's tortoise over the faster hare. And yet, the tortoise does win and the hare's propensity to nap or idle is a feature of its performance distribution. Perhaps in a rematch the speedier racer would be more focused. But what about the third race or the fourth? Would the hare's focus wane? Would boredom set in? Does the lure of the nap in the shade eventually grow too strong once again? And do oddsmakers take this into account? The tortoise may not win many races, but slow and steady will win some.

Researchers and practitioners alike have a blindspot with regard to performance. Despite evidence to the contrary, we overwhelmingly treat performance as a constant. For hiring managers and entrepreneurs, that blindspot is an opportunity. A portfolio-style strategy that integrates hiring with organizational design, forecasting, and goal-setting is likely to be more performant and more difficult to imitate. For researchers, this is a call to deepen and broaden our pool of knowledge and better explain how to get the most out of human capital. Put another way: in a world of tortoises and hares, success goes to those who understand that the age-old parable is not a morality tale, but a lesson in portfolio management.

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