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Selective Survival and the Illusion of Performance: A Markovian Theory of Hidden Systemic Costs

Survie sélective et illusion de la performance : une théorie markovienne des coûts systémiques cachés

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Abstract

The objective of this paper is to analyze whether observable performance improvements in dynamic systems may arise from structural selection effects rather than genuine productivity gains. Observable performance often improves over time in competitive systems. This paper shows that such improvement may arise structurally from asymmetric exit rather than universal productivity growth. We develop a minimal Markovian framework in which performance metrics are computed conditionally on surviving units. When lower-performing agents exit more frequently, the conditional distribution shifts upward mechanically. Observable performance therefore increases, even though absorption flows generate cumulative systemic losses. To capture this divergence, we introduce the concept of Hidden Graveyard Cost (HGC), defined as the discounted expected cost associated with transitions into invisible absorbing states. The paper provides analytical results, numerical illustration, and organizational applications. The central implication is methodological: performance statistics cannot be interpreted independently of the transition structure that governs exit. Performance in dynamic systems with asymmetric absorption is not only a measure of excellence, but also a measure of survival.

Keywords: Dynamic selection; Survivorship bias; Markov processes; Absorbing states; Organizational performance.

Résumé

L'objectif de cet article est d'analyser si l'amélioration des performances observables dans les systèmes dynamiques peut résulter d'un mécanisme structurel de sélection plutôt que d'un progrès productif réel. Les performances observables augmentent souvent dans les systèmes compétitifs. Cet article montre que cette amélioration peut résulter structurellement d'une sortie asymétrique plutôt que d'un progrès productif universel. Nous développons un cadre markovien minimal dans lequel les indicateurs de performance sont calculés conditionnellement aux unités survivantes. Lorsque les agents les moins performants sortent plus fréquemment, la distribution conditionnelle se déplace mécaniquement vers le haut. La performance observable augmente alors, alors même que les flux d'absorption génèrent des pertes systémiques cumulatives. Pour formaliser cette divergence, nous introduisons le concept de Coût Caché du Cimetière (Hidden Graveyard Cost, HGC), défini comme le coût actualisé associé aux transitions vers des états absorbants invisibles. L'article fournit des résultats analytiques, une illustration numérique, et des applications organisationnelles. L'implication centrale est méthodologique : les statistiques de performance ne peuvent être interprétées indépendamment de la structure de transition qui gouverne la sortie. Dans les systèmes dynamiques à absorption asymétrique, la performance n'est pas seulement une mesure d'excellence, mais aussi une mesure de survie.

Mots clés : Sélection dynamique ; Biais de survivance ; Processus de Markov ; États absorbants ; Performance organisationnelle.

Introduction

Motivation

Attractiveness has become a central organizing force in contemporary economic and institutional environments. Platforms compete for user engagement, universities compete for rankings and visibility, firms compete for talent and investor attention, and public institutions compete for legitimacy and trust. In all these contexts, performance is increasingly measured through visible indicators: growth rates, participation levels, retention ratios, prestige metrics, or success stories.

The prevailing assumption in economics and management science is that attractive systems are efficient systems. High participation and sustained visibility are typically interpreted as signals of robustness, value creation, and institutional quality. Failures, when observed, are treated either as idiosyncratic events or as temporary inefficiencies to be corrected.

However, this interpretation implicitly relies on a critical methodological premise: performance is evaluated conditionally on what remains observable. Agents who exit the system silently, disengage progressively, or become statistically untraceable are rarely integrated into aggregate performance measures. As a result, visible success and invisible attrition may coexist without contradiction.

This paper is motivated by a structural paradox: highly attractive systems may appear increasingly successful precisely while generating cumulative invisible losses. The question is not whether failure exists, but whether the architecture of attraction systematically organizes its invisibility.

Research Question

We address the following central question:

Can a system display increasing observable performance while simultaneously accumulating latent and statistically invisible social costs?

This paper argues that performance is not an absolute indicator of efficiency, but a conditional statistic shaped by selective survival.

To answer this question, we move beyond descriptive accounts of survivorship bias and selection effects. Instead, we model invisibility as an endogenous structural outcome of attractive systems. Specifically, we investigate whether asymmetries in state visibility, combined with conditional performance metrics, are sufficient to generate an illusion of improvement despite underlying cumulative attrition.

The analytical objective is to determine under what structural conditions observable indicators may diverge from the full dynamic trajectory of agents within the system.

Main Contribution

This paper makes three main contributions.

First, we introduce a minimal dynamic framework in which agents evolve across visible and hidden states. The model explicitly distinguishes between states that generate observable performance signals and states that correspond to silent degradation or exit without collective aggregation. This formalization allows invisibility to be treated as a structural property rather than as a data limitation.

Second, we define the Hidden Graveyard Cost (HGC), a cumulative measure of latent losses generated by transitions into hidden states. Unlike standard performance metrics, the HGC does not condition on survival in visible states. It integrates the full trajectory of agents, including those who disappear from observable statistics.

Third, we establish a central theoretical result, referred to as the Performance Illusion Theorem. We show that, under mild assumptions on transition asymmetries and conditional evaluation rules, observable performance indicators can be strictly increasing while the Hidden Graveyard Cost is positive and growing. This result formalizes the possibility of systematic divergence between apparent success and underlying social erosion.

By providing a tractable analytical structure, the paper connects literatures on signaling, selection bias, network growth, and hidden externalities, while extending them through an endogenous theory of invisibility.

Proposition 0.1 (Structural Performance–Cost Divergence). In a dynamic system with asymmetric transitions toward hidden absorbing states, observable performance—when computed conditionally on surviving visible states—may increase over time while latent systemic costs, as measured by the Hidden Graveyard Cost, are strictly positive and increasing.

Proposition 0.2 (Endogenous Invisibility Mechanism). When performance indicators are conditioned on visibility and exit states are absorbing, the exclusion of exited agents generates a structural form of statistical invisibility that is endogenous to the system dynamics.

Structure of the Paper

The remainder of the paper is organized as follows.

Section 2 reviews the relevant literature and identifies the theoretical gap. Section 3 presents the methodology and introduces the dynamic framework, including the distinction between visible and hidden states. Section 4 develop the results: defines the Hidden Graveyard Cost, establishes the Performance Illusion Theorem, and provides a numerical illustration. Section 5 discusses the application to organizational performance and the implications of the findings. Overall, the paper combines theoretical modeling, analytical results, and numerical evidence to analyze the divergence between observable performance and latent systemic costs.

To clarify the underlying mechanism, figure 1 provide as schematic représentation of the structural relationship, between visibility, performance and hidden costs.

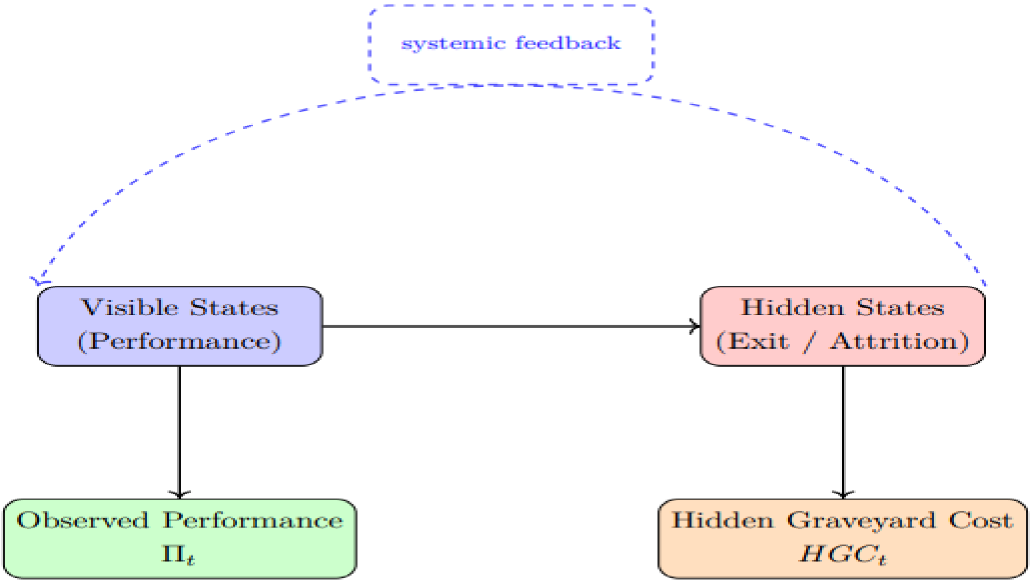

Figure N°1: Structural mechanism of performance illusion

Source : Auteur

1. Related Literature

1.1. Attraction and Signaling

Attraction mechanisms have long been studied in economics through the lens of signaling and information asymmetries. In the seminal signaling framework of Spence (1973), observable characteristics serve as credible signals of underlying quality. Similarly, Stigler (1961) and Arrow (1974) analyze how information structures shape participation and allocation decisions in markets and organizations. In these models, visibility functions as a coordination device: observable signals reduce uncertainty and facilitate matching.

Beyond labor markets, signaling logic extends to organizational prestige, platform ratings, and reputational hierarchies. Attractive institutions accumulate participants through visible markers of quality, thereby reinforcing their position via cumulative advantage mechanisms.

However, this literature primarily focuses on equilibrium outcomes among active participants. Exit dynamics and post-participation trajectories are typically treated as exogenous or efficiency-enhancing. The structural consequences of systematic silent exits remain analytically underdeveloped.

1.2. Selection Bias and Survivorship

The econometric literature on selection bias, notably Heckman (1979), demonstrates that conditioning on observed samples may lead to biased inference when participation is endogenous. Relatedly, survivorship bias highlights how restricting attention to surviving entities distorts performance evaluation.

In management and finance, performance measures often rely on surviving firms, active funds, or retained employees, implicitly excluding those that have exited. Empirical studies document that average performance can increase mechanically as weaker units disappear from the sample. While this body of work identifies statistical distortions, it generally treats selection as a methodological issue rather than as a structural property of attractive systems. Invisibility appears as an econometric correction problem, not as an endogenous organizational outcome.

1.3. Network Growth and Attrition

Research on network dynamics, particularly preferential attachment models (Barabási and Albert, 1999), shows how visibility and connectivity accumulate disproportionately around already prominent nodes. Such mechanisms generate highly skewed distributions of attention and success.

Subsequent work on temporal networks and churn dynamics (Holme and Saramäki, 2012) examines node turnover and structural evolution. Although attrition is recognized as a key feature of dynamic systems, it is typically modeled as symmetric noise or stochastic decay.

What remains less explored is the asymmetry between the aggregation of visible successes and the fragmentation of failures. Networks concentrate gains but disperse losses. The possibility that this asymmetry structurally produces statistical invisibility has not been formalized within a unified dynamic framework.

1.4. Hidden Costs and Externalities

The concept of hidden or displaced costs appears in several strands of economic thought. Coase (1960) emphasizes how externalities shift costs outside direct market transactions. Sociological analyses of risk (Beck, 1992) highlight how modern systems redistribute and obscure damages across diffuse populations.

In organizational contexts, studies on burnout, fatigue, and silent disengagement suggest that institutional performance metrics often fail to capture cumulative human costs. Yet these analyses remain largely descriptive or qualitative, without embedding hidden costs into a formal dynamic model of system evolution.

Existing approaches identify invisible harms but do not connect them explicitly to mechanisms of attraction and conditional performance evaluation.

Unlike the bilateral externalities analyzed by Coase (1960), the Hidden Graveyard Cost (HGC) does not arise from a clearly identifiable interaction between two contracting parties. In the Coasean framework, social cost emerges from reciprocal harm and may, under zero transaction costs, be internalized through bargaining between agents.

By contrast, the HGC is cumulative, systemic, and structurally informational. First, it is cumulative because it aggregates the welfare losses of exited agents over time. Second, it is systemic because it affects the entire trajectory of the attracting system rather than a localized dyadic interaction. Third, and most critically, it is informationally asymmetric: once agents exit, their losses become statistically invisible.

This invisibility prevents price adjustment, bargaining, or contractual internalization. No surviving agent possesses the informational basis required to negotiate over the latent losses of those who have disappeared.

The HGC therefore represents a structurally non-Coasean externality. It is generated not by reciprocal interference between observable agents, but by selective visibility induced by the attraction mechanism itself. Its persistence is not merely the result of transaction costs, but of endogenous information erasure produced by the selection process.

1.5. Positioning of the Present Paper

Across these literatures, a recurring gap emerges. Attraction, signaling, selection, network growth, and externalities are extensively studied, but their interaction through endogenous invisibility remains insufficiently formalized.

This paper contributes by integrating these strands into a unified dynamic framework in which:

(i) agents transition between visible and hidden states,
(ii) performance metrics are computed conditionally on visibility, and
(iii) cumulative latent costs are explicitly modeled.

Rather than correcting for bias ex post, we model invisibility as a structural output of the system. The introduction of the Hidden Graveyard Cost (HGC) provides a tractable instrument for measuring losses that are statistically unobserved yet dynamically generated.

In doing so, the paper moves from a methodological critique of survivorship bias to a structural theory of performance illusion in attractive systems.

To synthesize these contributions, the present framework integrates signaling, selection, network dynamics, and externality theories into a unified structural mechanism driven by endogenous visibility asymmetry. Figure 1 provides a schematic representation of this integration, highlighting how conditional performance evaluation and asymmetric absorption jointly generate a systematic divergence between observable outcomes and latent systemic costs.

2. Methodology: A Minimal Dynamic Structure of Attraction

We formalize the architecture of attraction through a minimal dynamic structure that explicitly distinguishes between observable and unobservable trajectories. The objective is not to construct a complex behavioral model, but to isolate the structural conditions under which invisibility emerges endogenously.

2.1. State Space

Let (Ω, F, P) be a probability space. Agents evolve in discrete time $= 0, 1, 2, \ldots$.

Définition 2.1 (State Space). Let S be a finite state space decomposed as $S = V \cup H$, where:

- V denotes the set of visible states,
- H denotes the set of hidden states.

We assume $V \cap H = \emptyset$.

Visible states correspond to trajectories that generate publicly observable performance signals (e.g., active participation, recognized success, measurable engagement). Hidden states correspond to situations of silent degradation, disengagement, or statistical disappearance.

Hypothèse 2.1 (Non-emptiness). Both V and H are non-empty.

Let $(X_t)_{t \geq 0}$ be a stochastic process taking values in S.

2.2. Transition Structure

Définition 2.2 (Markovian Dynamics). The process (X_t) is a time-homogeneous Markov chain with transition matrix $P = (p_{ij})_{i,j \in S}$ satisfying:

$$p_{ij} = P(X_{t+1} = j \mid X_t = i).$$

We impose the following structural properties.

Hypothèse 2.2 (Hidden Absorption). All states in H are absorbing:

$$\forall h \in H, p_{hh} = 1.$$

This assumption captures silent exit: once an agent enters a hidden state, its trajectory no longer re-enters the observable system.

Hypothèse 2.3 (Attraction Asymmetry). There exists at least one $v \in V$ and one $h \in H$ such that $p_{vh} > 0$.

Thus, transitions from visible to hidden states occur with strictly positive probability. Attractive participation does not eliminate the possibility of silent exit.

Définition 2.3 (Initial Distribution). Let μ_0 be an initial probability distribution supported on V.

This reflects the fact that agents enter the system through visible participation.

2.3. Behavioral Microfoundation

Agents observe Π_t but do not observe HGC_t . Let perceived performance be:

$$\widetilde{\Pi}_t = \Pi_t .$$

True welfare is:

$$W_t = \Pi_t - \lambda HGC_t .$$

Because HGC_t is invisible, agents update decisions based on $\widetilde{\Pi}_t$, leading to persistent attraction even when true welfare declines.

This informational asymmetry generates a structural misallocation, not attributable to irrationality but to systematic opacity.

2.4. Visibility Asymmetry

We now introduce the key asymmetry.

Définition 2.4 (Observable Performance Indicator). Let $g : V \to \mathbb{R}$ be a measurable function. The observable performance at time t is defined as:

$$\Pi_t = \mathbb{E}[g(X_t) \mid X_t \in V] .$$

Performance is computed conditionally on remaining in visible states. Agents in hidden states are excluded from the metric.

Let $\alpha_t = P(X_t \in V)$ denote the survival probability in visible states.

Because hidden states are absorbing and reachable from V, the sequence (α_t) is non-increasing.

Lemme 2.5 (Monotone Attrition). Under Hidden Absorption and Attraction Asymmetry, $\alpha_{t+1} \leq \alpha_t$, with strict inequality whenever $P(X_t \in V) > 0$ and $p_{vh} > 0$ for some v.

Proof. Since hidden states are absorbing and reachable from V, the probability mass entering H cannot return to V. Hence the probability of remaining in V weakly decreases over time. Strict inequality follows whenever transitions to H occur with positive probability.

This simple structure is sufficient to generate a divergence between:

- the conditional performance indicator Π_t , and
- the unconditional evolution of the population mass.

The next section introduces a cumulative measure of the latent costs generated by transitions into hidden states.

2.5. Divergence Theorem

Proposition 2.6 (Monotonic Divergence under Visibility Asymmetry). Suppose that observable performance Π_t depends only on surviving agents, while the Hidden Graveyard Cost accumulates over all exited agents. If transition to visibility is conditioned on survival and exit probability is strictly positive, then there exists a parameter region such that

$$\frac{d}{dt}\Pi_t > 0 \qquad and \qquad \frac{d}{dt}HGC_t > 0.$$

Moreover, the divergence

$$\Delta_t = HGC_t - \Pi_t$$

is strictly increasing.

Sketch. Observable performance is conditional on survival, which creates a selection bias in favor of high performers. Simultaneously, exits accumulate latent cost that is not incorporated into Π_t. Under positive attraction bias and non-zero attrition, both curves increase, but at different structural bases, implying divergence.

3. Results

3.1. Hidden Graveyard Cost

The previous section established a minimal dynamic structure in which agents may transition from visible to hidden absorbing states. We now introduce a cumulative measure designed to quantify the latent losses generated by these silent transitions.

3.1.1. Latent Cost Function

Hidden states correspond to trajectories that no longer generate observable performance signals. However, statistical invisibility does not imply the absence of social or economic cost.

Définition 3.1 (Latent Cost Function). Let $c : S \rightarrow \mathbb{R}_+$ be a measurable function such that:

$$c(v) = 0 \, \forall v \in V,$$

and

$$c(h) > 0 \, \forall h \in H.$$

Thus, latent costs are generated exclusively in hidden states. This captures the idea that silent exit or degradation produces losses that are not reflected in visible performance indicators.

We introduce a discount factor $\delta \in (0, 1)$ to ensure convergence of infinite trajectories.

3.1.2. Definition of HGC

We now define the Hidden Graveyard Cost as the expected discounted sum of latent costs over the entire trajectory of an agent.

Définition 3.2 (Hidden Graveyard Cost). Given initial distribution μ0 supported on V, the Hidden Graveyard Cost is defined as

$$HGC = \mathbb{E}\left[\sum_{t=0}^{\infty} \delta^t c(X_t)\right].$$

Because $c(v) = 0 \quad for \quad v \in V$, the sum effectively accumulates cost only after the process enters H.

Proposition 3.3 (Well-Definedness). Under the assumptions of Section 3 and $\delta \in (0,1)$, ***the Hidden Graveyard Cost is finite***.

Proof. Since c is bounded on the finite state space S, there exists $M > 0$ such that $c(x) \leq M$ for all x. Thus,

$$\sum_{t=0}^{\infty} \delta^t c(X_t) \leq M \sum_{t=0}^{\infty} \delta^t = \frac{M}{1 - \delta}.$$

Taking expectations yields finiteness. To make the structure explicit, we decompose the transition matrix according to visible and hidden states:

$$P = \begin{pmatrix} P_{VV} & P_{VH} \\ 0 & I_H \end{pmatrix},$$

where I_H denotes the identity matrix on hidden states (reflecting absorption).

Let

$$N = (I - \delta P_{VV})^{-1}$$

be the discounted fundamental matrix of the visible subsystem.

Proposition 3.4 (Matrix Representation). *Let c_H denote the vector of costs on hidden states. Then the Hidden Graveyard Cost can be written as*:

$$HGC = \mu_0 \, \delta P_{VH} \, (I - \delta I_H)^{-1} c_H.$$

Equivalently, the HGC depends on: (i) the probability of transitioning from visible to hidden states, (ii) the persistence within hidden states, (iii) the magnitude of latent costs.

Proof. Since hidden states are absorbing, once the chain enters H, the cost stream becomes a geometric series discounted by δ. The expected discounted contribution is therefore

$$\delta P_{VH} \, (I - \delta I_H)^{-1} c_H,$$

aggregated over the initial distribution μ_0.

This representation highlights a central structural feature: the HGC is increasing in the transition probabilities P_{VH}. In particular, even small asymmetries in transition structure may generate significant cumulative latent losses.

The next section demonstrates that observable performance, defined conditionally on remaining in V, may improve over time even when HGC is strictly positive and increasing.

3.1.3. Welfare Distortion

Define social welfare as:

$$W_t = \Pi_t - \lambda HGC_t, \quad \lambda > 0.$$

Proposition 3.5 (Welfare Erosion). Under visibility asymmetry, there exists $\lambda^* > 0$ such that for all $\lambda > \lambda^*$,

$$\frac{d}{dt} W_t < 0 \qquad while \qquad \frac{d}{dt}\Pi_t > 0.$$

This implies that apparent performance growth can coexist with declining aggregate welfare.

3.2. Performance Illusion Theorem

We now establish the central theoretical result of the paper. We show that observable performance, when computed conditionally on remaining in visible states, may strictly improve over time while latent cumulative losses remain strictly positive and increasing.

3.2.1. Observable Performance Dynamics

Recall that observable performance is defined as

$$\Pi_t = \mathbb{E}\,[g(X_t) \mid X_t \in V\,].$$

Let g : $V \rightarrow \mathbb{R}$be bounded. We impose one additional structural assumption.

Hypothèse 3.1 (Heterogeneous Visible States). There exist $v_1, v_2 \in V$ such that $g(v_1) < g(v_2)$, and the probability of transition from v_1 to hidden states is strictly larger than from v_2.

This assumption captures a natural asymmetry: lower-performing visible states are more fragile and more likely to exit silently.

3.2.2. Asymptotic Selection Effect

Let

$$\alpha_t = \mathbb{P}(X_t \in V\,).$$

Since hidden states are absorbing and reachable, α_t is strictly decreasing whenever $P_{VH} \neq 0$. Define the conditional distribution over visible states:

$$\mu t(v) = \mathbb{P}(X_t = v \mid X_t \in V\,).$$

Because transitions to hidden states are state-dependent, the distribution μt evolves nonlinearly due to conditioning.

Lemme 3.6 (Selection Drift). Under heterogeneous exit probabilities, the conditional distribution µt shifts mass toward visible states with lower exit probabilities.

Proof. Let v_1 and v_2 be two visible states with $p_{v_1H} > p_{v_2H}$. At each period, the probability mass in v_1 is more likely to transition to hidden states and be removed from the conditioning set. Hence, conditional on survival, the relative weight of v_2 increases. Iterating this argument yields monotonic selection toward lower-exit states.

3.2.3. Performance Illusion Theorem

We now state the main result.

Théorème 3.7 (Performance Illusion). *Suppose that:*

(i) *hidden states are absorbing and reachable,*
(ii) *exit probabilities from visible states are heterogeneous,*
(iii) *lower-performing visible states have strictly higher exit probabilities.*

Then:

$$\Pi_{t+1} > \Pi_t \quad for\ sufficiently\ large \quad t,$$

while simultaneously

$$HGC > 0\ and\ increasing\ in \quad P_{VH}.$$

Proof. Because lower-performing states exit more frequently, the conditional distribution μ_t shifts mass toward higher-performing visible states.

Since

$$\Pi_t = \sum_{v \in V} g(v)\mu_t(v) \ ,$$

and µt reallocates probability mass from lower to higher g values, Π_t increases over time.

However, every transition to hidden states generates strictly positive discounted cost under the HGC definition. Because exit probabilities are strictly positive, the cumulative expected cost is strictly positive.

Moreover, since HGC is increasing in P_{VH} (Proposition 2), increasing exit intensity raises latent cumulative losses.

Thus, observable performance may strictly increase while cumulative latent costs remain positive and structurally generated.

This theorem identifies a general structural mechanism: any dynamic system combining (i) asymmetric exit, (ii) absorbing hidden states, and (iii) conditional performance evaluation is inherently susceptible to generating a persistent divergence between observable performance and latent systemic cost.

3.2.4. Interpretation

The theorem establishes a structural divergence:

- Conditional performance reflects the composition of surviving visible states.
- Hidden Graveyard Cost reflects the full trajectory including silent exits.

Improvement in Π_t does not imply systemic improvement. It may instead reflect selective attrition.

This result formalizes the mechanism through which attractive systems may self-validate while simultaneously producing invisible cumulative losses.

3.3. Numerical Illustration

This section provides two complementary illustrations. First, we construct a fully tractable three-state example. Second, we perform a Monte Carlo simulation to visualize the divergence between observable performance and latent costs.

3.3.1. A Three-State Analytical Example

Consider the state space:

$$S = \{v_L, v_H, h\},$$

where:

- v_L : low-performing visible state,
- $v_H,$: high-performing visible state,
- h : hidden absorbing state.

Let the transition matrix be:

$$P = \begin{pmatrix} 0.6 & 0.1 & 0.3 \\ 0.2 & 0.7 & 0.1 \\ 0 & 0 & 1 \end{pmatrix}.$$

Low-performing agents exit with probability 0.3, while high-performing agents exit with probability 0.1.

Define performance values:

$$g(v_L) = 1, \quad g(v_H) = 3.$$

The observable performance at time t is:

$$\Pi_t = \mathbb{E}[g(X_t) \mid X_t \in \{v_L, v_H\}].$$

Because v_L exits more frequently, the conditional mass progressively concentrates on v_H. Hence Π_t increases over time.

However, every transition to h generates a latent cost. Let $c(h) = 5$.

Then the Hidden Graveyard Cost is strictly positive, since the probability of reaching h is strictly positive.

This example illustrates analytically the mechanism identified in the Performance Illusion Theorem: observable performance improves due to selective attrition, not due to universal improvement.

3.3.2. Monte Carlo Simulation

We now simulate $N = 10{,}000$ agents evolving under the same transition structure over $T = 30\, periods$.

At each period, we compute:

- the observable performance Π_t,
- the cumulative average Hidden Graveyard Cost.

The simulation algorithm is:

1) Initialize all agents in visible states.
2) Simulate transitions using matrix P.
3) Compute conditional performance among visible agents.
4) Accumulate discounted latent costs. The resulting dynamics exhibit two simultaneous patterns:
    - The observable performance curve increases monotonically.
    - The cumulative Hidden Graveyard Cost also increases over time.

This divergence confirms that improving performance metrics may coexist with rising cumulative invisible losses.

3.3.3. Graphical Evidence

The simulation results are summarized in Figures 2 and 3. Both figures are generated from the transition structure introduced in the previous subsection.

Figure 2: Observable Performance Dynamics.

Figure 2 reports the trajectory of

$$\Pi_t = \mathbb{E}[g(X_t) \mid X_t \in V],$$

that is, the average performance conditional on visibility.

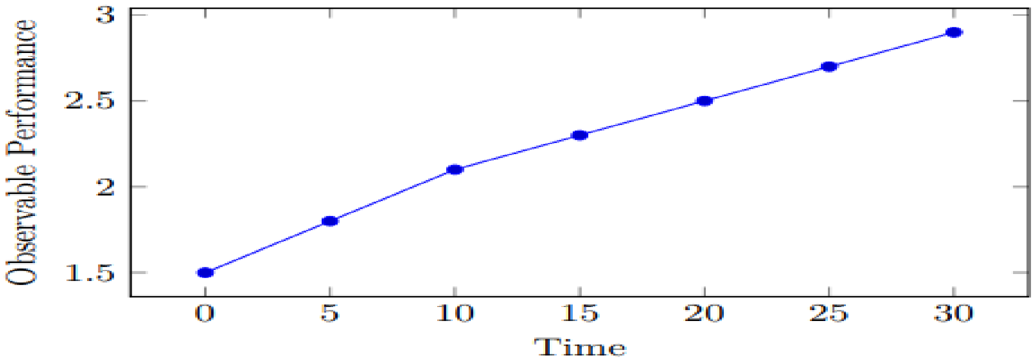

Figure N°2: Increasing Observable Performance

Source: Auteur

The curve exhibits a monotonic increase over time. This pattern does not arise from universal improvement in individual performance. Instead, it reflects a compositional shift in the distribution of visible states.

Because low-performing units exit with higher probability, their relative weight within the visible subset declines. As a result, the conditional expectation increases mechanically.

Formally, the upward slope reflects the increasing ratio

$$\frac{\mu_t(v_H)}{\mu_t(v_L) + \mu_t(v_H)},$$

where μt denotes the state distribution at time t. The improvement is therefore distributional rather than structural.

Figure 3: Cumulative Hidden Graveyard Cost. Figure 3 displays the cumulative Hidden Graveyard Cost, defined as

$$HGC_T = \sum_{t=0}^{T} \delta^t \mathbb{E}[c(X_t) 1_{\{X_t = h\}}] .$$

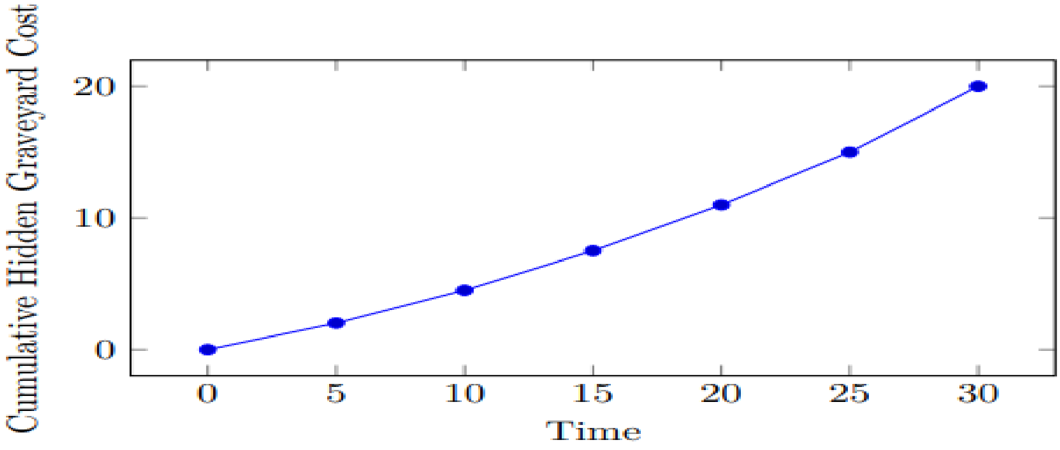

Figure N°3: Increasing Hidden Graveyard Cost

Source: Auteur

The curve increases over time, reflecting the accumulation of absorption flows into the hidden state.

Unlike Π_t, which is conditional, the Hidden Graveyard Cost aggregates all transitions into invisibility. Its upward trajectory is driven by the strictly positive probability of absorption at each period.

Interpretation and Counterfactual Structure. The two figures jointly illustrate the central mechanism of the Performance Illusion Theorem. Observable performance improves persistently, while cumulative hidden losses also increase. The divergence is structural: it results from conditioning on survival in the presence of asymmetric exit probabilities.

To clarify this mechanism, consider a counterfactual case in which exit probabilities are stateindependent. If low- and high-performing units faced identical absorption risks, the composition of the visible set would remain proportionally stable over time. In that case, Π_t would not exhibit systematic drift, and no persistent divergence between performance and hidden cost would emerge.

Hence, the graphical divergence observed here is not a generic feature of dynamic systems. It is specifically generated by asymmetric absorption.

The simulation therefore confirms the theoretical claim: improving visible metrics does not imply declining systemic cost. In systems characterized by selective attrition, performance growth and latent loss accumulation can coexist without contradiction.

4. Discussion

4.1. Application to Organizational Performance

The theoretical framework developed above applies naturally to organizational environments where performance metrics are computed conditionally on surviving, visible, or active units.

We illustrate this in three canonical domains: startups, academic publishing, and corporate career ladders.

4.1.1. Startups and Venture Capital

In venture ecosystems, reported performance indicators (e.g., average valuation, growth rate, return multiples) are typically computed on surviving firms. Failed ventures disappear from rankings, media coverage, and performance datasets. In the language of our model:

- visible states correspond to operating startups,
- the hidden state corresponds to exit via failure,
- performance metrics are conditional on non-absorption.

Because low-performing firms exit more frequently, the conditional distribution shifts upward over time.

Hence, average observable performance increases, even if the aggregate ecosystem generates substantial losses.

The Hidden Graveyard Cost in this context represents capital destruction, opportunity cost, and human capital displacement.

The model predicts that ecosystems with high entry and high attrition rates will systematically overestimate their apparent efficiency.

4.1.2. Academic Publishing and Research Careers

In academic systems, productivity and impact metrics are computed on active researchers.

Individuals who leave academia are no longer counted in publication averages, citation metrics, or rankings.

If exit probability is negatively correlated with productivity, then conditional average productivity increases mechanically.

The Hidden Graveyard Cost here includes: • sunk educational investment, • lost intellectual diversity, • psychological and institutional attrition costs.

The model therefore provides a structural explanation for the paradox of increasing average performance coexisting with rising precarity.

4.1.3. Corporate Promotion Systems

In hierarchical organizations, performance metrics are often evaluated within retained employee pools.

Employees who underperform exit, while higher performers remain and are promoted. As in the dynamic structure, this produces a compositional shift in the observable distribution.

Observed performance improvements may thus partly reflect selective filtering rather than universal capability growth.

The Hidden Graveyard Cost includes:

- recruitment and training losses,
- institutional knowledge depletion,
- reputational costs associated with turnover.

4.1.4. Managerial Implication

The central managerial implication is structural: Performance metrics conditioned on survival cannot be interpreted without estimating the associated Hidden Graveyard Cost.

Organizations that optimize visible metrics while ignoring latent absorption flows risk creating an illusion of improvement.

Robust evaluation frameworks should therefore: 1. track exit flows explicitly, 2. estimate cumulative latent costs, 3. report both observable performance and Hidden Graveyard Cost jointly. Only then can performance be interpreted as systemic improvement rather than selective attrition.

4.2. Analysis, Identification and Implications

The objective of this paper was to formalize a structural mechanism through which observable performance may improve while aggregate losses accumulate invisibly. We now discuss four dimensions: interpretation, measurement, identification, and normative implications.

4.2.1. Interpretation: Performance as Conditional Survival

The core insight is structural rather than behavioral.

The upward drift of observable performance does not require universal improvement. It emerges from conditioning on survival within a dynamic system featuring asymmetric exit.

In this framework, performance is not an absolute quantity. It is a conditional statistic computed on a progressively selected subset.

This interpretation reframes performance growth as a compositional phenomenon rather than necessarily a productivity phenomenon.

4.2.2. Measurement: The Incompleteness of Visible Metrics

Standard performance indicators ignore absorption flows.

When exit probabilities correlate negatively with performance levels, visible averages become upward biased estimators of systemic efficiency.

The Hidden Graveyard Cost captures the discounted mass of absorbed states.

From a measurement perspective, reporting performance without absorption accounting constitutes a partial equilibrium description of a fundamentally dynamic system.

The model thus calls for dual reporting: observable performance and cumulative hidden cost.

4.2.3. Identification : Distinguishing Improvement from Selection

A central empirical challenge is identification.

Observed improvement may result from:

1) genuine productivity growth,
2) compositional filtering,
3) or a combination of both.

The dynamic structure proposed here provides testable implications. If improvement is driven primarily by selection, we should observe:

- elevated exit rates among lower-performing units,
- increasing variance before contraction,
- and concentration of mass in upper states.

Estimating transition matrices allows researchers to disentangle structural improvement from selective attrition.

4.2.4. Systemic Implications

The presence of a Hidden Graveyard Cost alters the evaluation of competitive systems.

High-turnover environments may appear efficient in visible metrics, while generating substantial latent destruction.

In such systems, apparent excellence may coexist with increasing aggregate waste.

From a governance perspective, optimizing visible indicators alone may induce incentive distortions.

Agents may prioritize survival signaling over systemic resilience, amplifying the asymmetry between visibility and absorption.

4.2.5. Limitations and Extensions

The present model is intentionally minimal.

It assumes:

- a discrete state space,
- Markovian transitions,
- exogenous performance mapping.

Extensions may include:

- endogenous transition probabilities,
- network-dependent absorption,
- heterogeneous cost structures,
- continuous-time formulations.

Despite its simplicity, the mechanism is robust: any dynamic system with asymmetric exit and conditional observation is susceptible to the performance illusion.

4.2.6. Conceptual Contribution

The primary contribution is conceptual.

The paper introduces a formal distinction between:

- visible performance dynamics,

- and latent systemic cost accumulation.

By formalizing the Hidden Graveyard Cost, we provide a structural metric that complements traditional indicators.

The result is not that performance metrics are false. Rather, they are incomplete when interpreted without absorption accounting.

4.2.7. Empirical Identification Roadmap

The HGC may be proxied using: (i) attrition-adjusted panel data, (ii) exit-survey information, (iii) cumulative entry-exit differentials.

A possible empirical strategy would estimate the divergence between observable performance trends and survival-adjusted performance measures.

This provides a testable implication: if divergence is observed systematically, the HGC mechanism is supported.

Conclusion

This paper develops a minimal dynamic framework showing how observable performance may improve persistently while aggregate systemic losses accumulate invisibly.

The mechanism does not rely on optimism, misreporting, or behavioral distortion. It arises structurally from conditioning on survival within a system where exit probabilities are asymmetric.

When lower-performing units exit more frequently, the conditional distribution shifts upward. Observable performance therefore increases, even as absorption flows generate a strictly positive Hidden Graveyard Cost.

The contribution of the paper is twofold.

First, it formalizes the distinction between visible performance dynamics and latent cost accumulation within a unified Markovian structure.

Second, it introduces the Hidden Graveyard Cost as a complementary systemic metric, necessary for interpreting performance in environments characterized by attrition.

The broader implication is methodological. Performance statistics computed on surviving units cannot be interpreted independently of the transition structure that governs exit.

Apparent improvement may reflect selective persistence rather than universal progress.

Performance, in dynamic systems with asymmetric absorption, is not merely a measure of excellence. It is also a measure of who remains.

"The most dangerous systems are not those that fail, but those that succeed while silently destroying their own foundation."

This perspective suggests a fundamental shift in how performance should be interpreted in dynamic systems. What appears as success may, in part, reflect a progressive filtering process rather than genuine collective improvement. As a result, systems that seem to improve over time may simultaneously erode their underlying structure through invisible accumulation of losses.

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