The Paradox of Reform Resistance: How Dominant Scientific Structures Convert Reform Pressure into Institutional Reproduction

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Abstract

Scientific institutions are committed to evidence-based reasoning and have generated robust empirical evidence of structural dysfunction in their own systems of funding, publication, career selection, and epistemic recognition. Reform proposals are abundant: preregistration, lottery-based funding, double-blind review, alternative metrics, participatory evaluation, and open access infrastructures. The toolkit is well stocked. The structures remain largely intact. This paper argues that the persistence of reform resistance is not explained primarily by a lack of knowledge or alternatives, but by four entangled mechanisms through which dominance structures convert reform pressure into institutional reproduction: cognitive conservatism, self-reinforcing feedback loops, epistemic dominance, and the selection bias of reform agents. These mechanisms are presented as an exploratory taxonomy, a first mapping of a complex causal terrain rather than a settled causal account. The co-optation of the Open Access movement serves as the anchor case because it is a forensically transparent contemporary instance in which all four mechanisms operate simultaneously: a reform aimed at democratizing access to publicly funded knowledge was partially absorbed into APC-based and transformative-agreement models that preserve the position of incumbent publishers while shifting exclusion from reading to publishing. The paper concludes that genuine structural change requires more than persuasion or pilot reforms: it requires diversified gatekeeping, circuit-breaking mechanisms, independent accountability, pluralized epistemic standards, and reform governance that includes actors not selected through the dominant prestige pathway.

Keywords: reform resistance; dominance structures; open access; Matthew effect; science governance; structural change; epistemic injustice

Contents

1 Introduction: A Paradox

Why do scientific institutions generate robust evidence of their own structural dysfunction while the governance, funding, publication, and career systems empowered to act on that evidence continue to reproduce the same arrangements? The evidence for structural dysfunction in scientific institutions is not obscure, contested, or recent. It is extensive, well-replicated, and distributed across multiple independent research programmes. Funding systems concentrate resources in ways that bear no demonstrable relation to research quality (Bol et al., 2018). Publication gatekeeping generates serious high-end false negatives, including cases in which work later receiving exceptional citation impact was rejected without external review (Siler et al., 2015). Career selection operates through prestige hierarchies that predict academic placement more strongly than the measured indicators of scholarly contribution available in the relevant studies (Clauset et al., 2015). Reform proposals are equally well developed: preregistration, lottery-based funding, double-blind review, alternative metrics, participatory evaluation (Budden et al., 2008; Tennant et al., 2019). The toolkit is stocked. The structures persist.

This is not a temporary developmental lag. It is not explained by ignorance, and it is not explained by individual bad faith; the mechanisms identified below require neither. It is a structural condition, and it demands structural explanation.

Two clarifications are necessary before proceeding. First, a terminological note on the concept of paradox. The term is used here in a specific, non-technical sense: not a logical antinomy in the strict sense of formal logic or set theory, but a self-undermining dynamic with quasi-antinomial structure. The institution's own epistemic standards, applied reflexively to itself, generate imperatives that the institution systematically fails to act on. This is paradoxical in the etymological sense, *para doxa*, against expectation, and in a philosophically substantive sense: the failure is not incidental but structural, and the structure that produces the failure is the same structure that produces the diagnosis of it.

Second, a necessary qualification. For the most part, science's self-correcting mechanisms do work, at least in the long run. The replication crisis in psychology, which gathered force from the early 2010s and produced genuine reform in the form of preregistration, registered reports, and open data norms, is a real counter-example that this paper must account for (Scheel et al., 2021). The argument advanced here is not that all scientific reform fails, but that reforms which threaten structural arrangements of power, revenue, and epistemic authority consistently fail in ways that reforms targeting methodological norms within the dominant paradigm do not. The replication crisis succeeded in significant part because it operated with the dominant methodological standards of empirical psychology rather than against them. The mechanisms identified below explain the asymmetry.

The argument proceeds as follows. Section 2 establishes the empirical baseline. Section 3 presents the four mechanisms as an exploratory taxonomy. Section 4 applies the framework to the Open Access case in full. Section 5 identifies the conditions under which genuine structural change becomes possible. Section 6 addresses the self-application problem.

2 The Empirical Baseline: Dominance Structures and Their Costs

The evidence for structural dysfunction in scientific knowledge production does not cluster at a single point of failure. It distributes across mutually reinforcing levels: the economic organization of research funding, the sociological conditions governing who enters and persists in academic careers, the structural mechanics of publication systems, and the epistemic consequences these mechanisms produce in combination. These levels are analytical entry points into a system whose dysfunction is overdetermined. No single mechanism explains reform resistance; each reinforces the others.

In this context, "dominance structure" means an institutional arrangement in which control over resources, recognition, and evaluative standards is concentrated in ways that make future access dependent on prior success within the same structure. Such structures are not merely unequal distributions of advantage; they are self-reproducing arrangements that define the criteria by which their own legitimacy is assessed. Four dimensions are relevant throughout the analysis: material dominance, involving control over funding and infrastructure; symbolic dominance, involving prestige and recognition; epistemic dominance, involving control over what counts as a valid question, method, or contribution; and organizational dominance, involving agenda-setting and gatekeeping authority.

2.1 Funding Concentration

An analysis of over two billion euros in research funding demonstrates that researchers who scored just above funding thresholds accumulated more than twice as much subsequent funding over eight years compared to colleagues with near-identical review scores just below the threshold, with no demonstrable difference in research quality (Bol et al., 2018). A participation mechanism compounds this: researchers who fail once apply less frequently again, not because they leave the field but because discouragement and lack of resources suppress re-entry. Inequality is not merely reproduced but accumulated.

This is the Matthew effect (Merton, 1968) operating as a constitutive structural property rather than as an unfortunate byproduct. Grant review panels are frequently instructed to assess the applicant and their track record explicitly, making past funding decisions a selection criterion for future ones and thereby institutionalizing the advantage of prior access (Bol et al., 2018). The result is a system that compounds arbitrary initial advantages across funding cycles without any corrective mechanism.

The conformity dimension of funding is equally well documented. An analysis of

the Swiss National Science Foundation showed that researchers with a track record of highly novel research, precisely the orientation that funding programmes explicitly claim to support, were systematically funded less often (Ayoubi et al., 2021). A study of the European Research Council reaches an analogous finding: despite the ERC's explicit mandate for high-risk, high-gain research, panels show structural disadvantages for applicants with demonstrably novel research profiles (Veugelers et al., 2025). The system prescribes originality and punishes it simultaneously. Bernard (2024) calls this *conditioning conformity*: proposals must claim novelty but cannot be novel, because genuine novelty unsettles reviewers by falling outside familiar evaluative frameworks (Bernard, 2024). The result is anticipatory self-censorship in which researchers shape proposals to fit the system because it is strategically rational to do so. What is gained is system access; what is lost is epistemic breadth.

2.2 Publication Gatekeeping

At leading medical journals, approximately 80% of submissions are rejected without external review, a process known as desk rejection (Siler et al., 2015). In economics journals the rate is approximately 50% (Card and DellaVigna, 2020). What unites these figures across fields is not editorial caprice but structural incentive: editors at commercially oriented publishers operate under the pressure of bibliometric indicators such as the Impact Factor. The implicit question at the editorial desk is therefore primarily mercantile rather than scientific; it concerns what a submission contributes to the journal's attention, prestige, and market position.

The highly formalized system of external blind peer review as a universal standard, and the mass desk-rejection filter operated by commercial publishing oligopolies, are largely post-World War II phenomena, driven by the consolidation of commercial publishing in the 1960s and 1980s (Biagioli, 2002; Fyfe et al., 2017). *Nature* introduced systematic peer review only in 1970; the major medical journals followed in subsequent years (Csiszar,

2016). The trigger was not an epistemic breakthrough but an organizational problem: rising submission numbers, overburdened editors, insufficient infrastructure. What began as a bureaucratic stopgap now carries the weight of scientific authority.

The epistemic cost is measurable. Of the fourteen most-cited articles in a sample of 1,008 submissions to three top medical journals, every single one had been rejected, twelve of them via desk rejection without any external peer review (Siler et al., 2015). The system failed, in this sample, precisely at the work that went on to have the greatest scientific impact. This is not a marginal finding; it is a direct empirical measure of the system's failure at its own stated purpose.

2.3 Career Access and Sociological Hierarchies

The sociological dimension of dominance structures operates mainly at the level of access: to networks, to institutions, to the implicit knowledge of how the system sounds. Submissions from prestigious institutions are evaluated measurably differently from content-equivalent work from unknown institutions, frequently without conscious intent on the part of reviewers (Peters and Ceci, 1982). Just 25% of PhD-granting institutions in the United States produced 71 to 86% of tenure-track faculty across all fields, and placement success was predicted more strongly by the prestige of the doctoral institution than by the measured indicators of scholarly contribution available in the study (Clauset et al., 2015).

An important qualification must be acknowledged here. There is a plausible alternative hypothesis: that elite institutions produce better-trained researchers and that the prestige effect reflects genuine quality differences. The counter-argument is that the magnitude of the prestige effect, even after controlling for publication records, is too large to be explained by training quality alone, and that the quality indicators available to the study are themselves system-internal, measuring performance within the existing prestige

hierarchy in ways that confound training advantage with prestige advantage (Clauset et al., 2015). The finding remains significant even under charitable interpretation.

Gender bias in funding is among the most rigorously documented instances of this dynamic. A natural experiment at the Canadian Institutes of Health Research on two parallel funding programmes with different review logics showed that female researchers received systematically lower scores than male colleagues with equivalent track records, but only when the applicant was placed at the centre of evaluation rather than the project: shifting the assessment focus to the science reduced the gender bias measurably (Witteman et al., 2019). This is one of the rare cases in which a procedural adjustment produced a demonstrable effect, and one that simultaneously illustrates how deeply implicit assumptions are embedded in evaluation processes.

The epistemic cost extends beyond individual careers. Research shows that diverse teams contribute disproportionately to scientific novelty but that these contributions are systematically undervalued at the point of recognition (Hofstra et al., 2020). Analysis of NIH grant review shows that African-American/Black scientists receive awards at lower rates, and that topic choice accounts for a substantial part of the funding gap even after controlling for multiple variables, including prior achievement (Hoppe et al., 2019). This does not reduce the disparity to individual choice, but rather shows how topical familiarity, institutional recognition, and reviewer expectations can translate existing epistemic hierarchies into funding outcomes.

2.4 Epistemic Consequences

The mechanisms described above do not only produce unfair outcomes for individual researchers. They systematically shape what the scientific record contains and what it does not. Agnotology, the study of the deliberate or structural production of ignorance, identifies a mechanism that dominance structures share: they do not only suppress

knowledge; they actively produce non-knowledge by delegitimizing alternative epistemic frameworks before they can generate findings at all (Proctor, 2008). Funding systems that penalize novelty, review procedures that reward paradigm conformity, and editorial desks that filter by market relevance collectively determine which research questions are asked by deciding which ideas are funded and which papers are published.

The aggregate epistemic cost is perhaps nowhere more concretely measurable than in one well-documented form: the average lag between clinical research findings and their adoption into standard medical practice is seventeen years (Morris et al., 2011). This delay cannot be reduced to a simple shortage of evidence. Translational lag is heterogeneous and field-dependent, but it illustrates that the existence of knowledge does not by itself ensure institutional uptake. Where implementation would require changes to established pathways, routines, and economic arrangements, evidence must pass through institutional structures that may have weak incentives to act on it. The knowledge existed; the structure was not configured to use it. The knowledge that was never generated, the questions that were never asked, and the researchers who were never admitted to the discourse leave no trace in the record the system uses to evaluate itself. This is not only unjust; it is a constitutive epistemic limitation of the structures under which contemporary science operates.

3 Four Mechanisms: An Exploratory Taxonomy

The empirical baseline established above demonstrates that structural dysfunction is real, extensive, and distributed. What it does not yet explain is why reform consistently fails to correct it. This section develops a theoretical account of the mechanisms that produce this resistance.

These four mechanisms are presented as an exploratory taxonomy of a complex causal terrain, not as a settled or exhaustive causal account. The concern is a real one: for

many of these mechanisms, the empirical record is consistent with multiple mechanistic interpretations, and the available evidence rarely permits a decisive choice between them. The taxonomy is offered in the spirit of Hoyningen-Huene's (2013) observation that the progress of science is autocatalytic; the contribution here is to identify mechanisms that function as catalytic poisons, predictable failure modes in a system otherwise oriented toward self-improvement (Hoyningen-Huene, 2013). The mechanisms are analytically distinct but empirically entangled, and none requires individual malice or conscious intent. That is precisely the analytically important point.

The four mechanisms operate at different analytical levels. Cognitive conservatism concerns individual and collective judgment. Self-reinforcing feedback loops concern institutional incentives and cumulative advantage. Epistemic dominance concerns the standards by which questions, methods, and forms of evidence become admissible. The selection bias of reform agents concerns the social composition of the actors empowered to design and implement reform. The mechanisms overlap empirically, but they should not be understood as four rival causes. They are four levels of one reproductive structure.

3.1 Cognitive Conservatism

The conformity pressure documented in Section 2.1 has a cognitive substrate that explains why it persists even when its costs are visible. The tendency to overgeneralise causal structure in a probabilistic world, documented systematically by Tversky and Kahneman (1974), produces a characteristic pattern: humans are better at explaining post-hoc why things are as they are than at reliably recognising that different structures might produce better outcomes. This is not a claim that heuristic reasoning is irrational; Gigerenzer's work on bounded rationality has established that fast and frugal heuristics are ecologically adapted and frequently effective (Gigerenzer et al., 1999). The concern is more specific: the overfiring of causal structure in institutional evaluation contexts, where hindsight bias generates cognitive inertia and the accumulated weight of prior explanatory investments

makes existing frameworks feel not merely familiar but necessary (Fischhoff, 1975).

Established paradigms are defended not only intellectually but emotionally, because they constitute the coherent worldview of the researchers who hold them. Reform proposals are therefore not evaluated solely on their merits but also according to the degree to which they disturb the existing system. The more fundamental the reform, the stronger the defensive reaction. This dynamic parallels what Kuhn (1962) identified as resistance to paradigm shifts, but operates here not only at the level of scientific theories but at the level of institutional structures themselves. Where Kuhn described resistance among individual scientists, the same cognitive architecture operates among administrators, review panellists, and institutional leaders whose positions depend on the continued legitimacy of existing structures.

A more direct mechanism is system justification: the empirically documented tendency to defend and rationalise existing social arrangements as fair and legitimate, even among those who bear their costs (Jost et al., 2004). Applied to scientific institutions, reform resistance is not simply a matter of self-interest but is cognitively motivated. Actors within dominance structures tend to perceive those structures as more meritocratic and more legitimate than external observers do, precisely because they have been selected by and through them.

3.2 Self-Reinforcing Feedback Loops

Dominance structures in science are not passively reproduced but actively self-reinforcing through three distinct sub-mechanisms.

The first is the Matthew effect. Early success makes later success more likely through preferential attachment in citation, recognition, and funding (Merton, 1968). As established in Section 2.1, this effect is explicitly institutionalised in funding systems: past

funding decisions become selection criteria for future ones, and the structural advantage of prior access compounds with each cycle. A related but analytically distinct phenomenon appears in translational lag: even when evidence exists, institutional uptake depends on pathways, incentives, and organizational routines that may not be configured to act on it (Morris et al., 2011). This is not identical to the Matthew effect, but it illustrates the broader point that evidence alone does not automatically reorganize institutional practice.

The second is social network reproduction. Access to informal mentoring structures, pre-submission advice, and prior relationships with reviewers shapes selection outcomes independently of the quality of the work being evaluated, as Section 2.3 established. At the systemic level, this operates as a property of network reproduction rather than individual advantage: each cohort selected through existing networks becomes the next generation of reviewers, mentors, and gatekeepers, reproducing not only who gets access but what counts as the tacit knowledge required to navigate the system at all.

The third is the Iron Law of Oligarchy. Democratic organisations tend toward oligarchic structures through the functional necessity of delegating responsibility, which produces specialised knowledge and ultimately irreversible power concentration (Michels, 1911). Scientific institutions are not exempt. Where individuals control research directions, personnel decisions, and resource allocation without adequate accountability mechanisms, the conditions for authoritarian structure follow, documented empirically as well as theoretically (Lasser et al., 2021). Reform efforts that do not account for the oligarchic tendency of the organisations they target will be absorbed by it. The Open Access case in Section 4 demonstrates this dynamic with particular clarity.

3.3 Epistemic Dominance Mechanisms

The epistemic dimension of reform resistance operates through two related but analytically distinct processes.

This argument belongs within social epistemology and democratic philosophy of science. Longino's account of scientific objectivity as socially organised critical interaction is directly relevant: if the social organisation of criticism is distorted by prestige, funding concentration, and restricted access, then the epistemic reliability of the resulting system is affected (Longino, 1990). Fricker's account of epistemic injustice clarifies why exclusion from credibility, uptake, and interpretive authority is not merely a distributive injustice but an epistemic loss (Fricker, 2007). Douglas's critique of the value-free ideal further shows that institutional arrangements cannot be treated as epistemically neutral background conditions, because values shape the assessment, interpretation, and uptake of evidence (Douglas, 2009). Kitcher's democratic account of science adds the corresponding governance problem: the organization of inquiry matters because scientific agendas and institutions should be answerable to more than the preferences of already dominant epistemic actors (Kitcher, 2001). The present argument extends these insights institutionally: dominance structures do not only exclude knowers; they shape the conditions under which some questions, methods, and forms of evidence become recognizable as scientific at all.

The first is the production of non-knowledge. Dominant structures delegitimize alternative epistemic frameworks not through explicit censure but through the application of dominant methodological norms as universal quality criteria (Proctor, 2008). The structural condition enabling this is what Mirowski (2011) analysed as the privatisation of scientific knowledge production: the replacement of a public epistemic commons with market-mediated knowledge regimes that systematically favour incremental, fundable, commercially legible research (Mirowski, 2011). The most direct expression of this mechanism in practice is the organised production of non-knowledge through systematic campaigns to manufacture uncertainty about established findings in order to delay regulatory and institutional response (Oreskes and Conway, 2010; Michaels, 2008). Under these conditions, the boundary between what counts as science and what does not is

drawn not by epistemic criteria but by the shape of available funding, and the shape of available funding is determined by existing power arrangements.

The second is epistemic corruption, defined not as individual misconduct but as the systematic loss of integrity in a knowledge-producing institution such that it ceases to generate the trusted knowledge that justifies its authority (Sismondo, 2021). The mechanism is the replacement of critical engagement with loyalty obligations: when scrutiny of research results or institutional decisions is interpreted as disloyalty and sanctioned accordingly, scientific honesty becomes a career risk (Martin, 1999). The empirical signature of this process is not overt falsification but systematic skew: industry-affiliated research is 3.6 times more likely to reach conclusions favourable to its sponsors than independently conducted research on identical topics, a pattern too consistent to reflect chance and too structural to be explained by individual dishonesty (Bekelman et al., 2003). The result is an institution that formally preserves the commitment to critical inquiry while practically suppressing it.

3.4 The Selection Bias of Reform Agents

The fourth mechanism concerns who is structurally positioned to initiate change. Those who have reached positions of institutional power have done so by successfully navigating existing selective hierarchical dynamics. It is not simply that they benefit from current structures and therefore lack motivation to change them, though that is also true. More fundamentally, the process of selection shapes what one is able to perceive as dysfunction in the first place. Bourdieu (1988) identifies the deeper logic: the academic field reproduces its conditions of legitimacy by selecting for those who have already accepted its rules as natural (Bourdieu, 1988). The filtering mechanisms of the existing hierarchy are internalised as meritocracy by those who passed through them, which is precisely what makes the survivorship bias operating here invisible to its beneficiaries (Wald, 1980).

The empirical evidence is clear: 25% of PhD-granting institutions in the United States produced 71 to 86% of tenure-track faculty across all fields, with placement predicted more strongly by institutional prestige than by the measured indicators of scholarly contribution available in the study (Clauset et al., 2015). The vast majority of those who populate grant review panels, journal editorial boards, and institutional leadership positions have passed through a narrow and specific path through the existing hierarchy. They are not a representative sample of the scientific community; they are a sample selected for compatibility with its dominant structures.

The reform agents who would need to correct identified patterns of dysfunction are those who have been most formed by those patterns. The cognitive mechanisms of Section 3.1 and the epistemic dominance mechanisms of Section 3.3 ensure that those at the top of the hierarchy are also those with the least structural capacity to recognise it as a hierarchy at all.

3.5 Operationalisation: Empirical Signatures and Diagnostic Criteria

An exploratory taxonomy is only analytically useful if its categories are distinguishable in empirical practice. Each of the four mechanisms identified above has a characteristic empirical signature that allows it to be identified in concrete institutional settings, and each implies a distinct class of potential intervention. The following sketches the diagnostic logic for each mechanism; fuller treatment of the intervention implications is developed in Section 5.

Cognitive conservatism is empirically recognisable when the grounds offered for rejecting a reform proposal are predominantly procedural or formal rather than substantive: when objections concern the form of the evidence rather than its content, or when the standards invoked were not pre-committed before the evidence was assembled but introduced in response to it. The intervention implication is pre-commitment to evaluation

criteria before reform proposals are assessed, combined with structured adversarial review in which proponents of change are explicitly given the evaluative role rather than the burden of proof (Kahneman, 2011).

Self-reinforcing feedback loops are empirically recognisable through their longitudinal signature: the advantage gap between structurally favoured and structurally disadvantaged actors widens over successive funding or publication cycles rather than remaining stable. The Matthew effect, as documented in funding systems, leaves exactly this signature (Bol et al., 2018). The intervention implication is circuit-breaking mechanisms that interrupt compounding: funding floors, rotation requirements for review panels, and term limits for editorial positions that prevent indefinite concentration of gatekeeping authority in a stable network.

Epistemic dominance mechanisms are empirically recognisable when the diversity of research questions funded or published narrows over time relative to the diversity of questions proposed, or when the methodological profile of funded and published work converges on the dominant paradigm's preferred methods independently of field-wide methodological trends. The intervention implication is the institutionalisation of methodological pluralism as an explicit evaluation criterion, and the separation of methodological evaluation from paradigm-internal quality assessment (Feyerabend, 1975).

Selection bias of reform agents is empirically recognisable through the demographic and institutional profile of those appointed to reform bodies: when reform committees are populated exclusively by those who have succeeded within the system under reform, the selection bias is structurally present regardless of individual intentions. The intervention implication is the mandatory inclusion of structural outsiders in reform governance, defined not by demographic characteristics alone but by career trajectory: those who did not advance through the dominant prestige pathway, including researchers from non-elite institutions, interdisciplinary scholars, and those with direct experience of the dysfunction

being addressed.

4 The Open Access Case: All Four Mechanisms in Operation

The Open Access case is selected as the full anchor case for this analysis for three reasons. It exhibits all four mechanisms simultaneously and transparently. It is fully contemporary and empirically well-documented. And its publication venue is directly relevant to this paper's own condition of production, a dimension addressed explicitly in Section 6.

4.1 The Challenge

The Budapest Open Access Initiative of 2002 and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities of 2003 were explicit challenges to commercial publisher control over the scientific record, demanding free and unrestricted online access to peer-reviewed research (Suber, 2012). The structural logic of the challenge was sound: digital distribution costs approach zero; the underlying research is produced and peer-reviewed by academics at no cost to publishers; and the vast majority of the programmes that produced the results to be published are publicly funded. That commercial publishers extracted significant value from this arrangement is not contested: Reed-Elsevier's Scientific, Technical & Medical division reported profit margins above 30% throughout 2006–2013, rising from 30.6% to 38.9% (Larivière et al., 2015); contemporary reporting on Elsevier's 2010 scientific publishing arm put profits at £724 million on just over £2 billion in revenue, a 36% margin, higher than Apple, Google, or Amazon posted that year (Buranyi, 2017). The reform was therefore not targeting a marginal intermediary but one of the most profitable rent-extraction mechanisms in the knowledge economy.

4.2 Absorption, Not Resistance

The response of commercial publishers was not resistance but absorption. Rather than opposing Open Access, they introduced the Article Processing Charge model: authors or their institutions pay fees ranging from approximately 1,500 to over 10,000 euros per article for the right to publish openly (Khoo, 2019). The key instrument was the hybrid journal: an existing subscription-based journal that simultaneously accepts APC-funded open access articles. Institutions therefore paid twice, in subscription fees for access to the journal as a whole and in APCs for their own researchers' articles to be made openly available within it.

The barrier to reading was partly replaced by a barrier to publishing: APC-based models disadvantage researchers and institutions with fewer resources, with effects stratified by field, country, and institutional context (Klebel and Ross-Hellauer, 2023), and they raise specific problems of epistemic and testimonial injustice for researchers in the Global South (Cox, 2023). A reform designed to democratise access became a mechanism for extracting more revenue from the scientific community while maintaining, and in some respects intensifying, the structural inequalities the reform was designed to address. The dominance structure did not collapse under reform pressure. It metabolised the reform.

4.3 Pattern Confirmation: Plan S and Transformative Agreements

The structural character of this dynamic is confirmed by its repetition. Plan S, launched in 2018 by cOAlition S, requires that from 2021 scholarly publications resulting from research funded by participating funders be made available through compliant open access journals, platforms, or repositories. It is being absorbed through transformative agreements. Transformative agreements are contracts between institutions or consortia and publishers in which former subscription expenditures are repurposed to support open access publishing by affiliated authors. In their official rationale, they are transitional

instruments intended to redirect subscription spending toward open access. Yet this redirection does not necessarily disrupt the APC logic; it may reproduce it at institutional scale, replacing individual author payments with centrally negotiated read-and-publish arrangements while leaving prestige, payment, and publication infrastructures bundled inside the same commercial channels (Khoo, 2019). Recent large-scale analysis of ESAC-listed agreements suggests that transformative agreements may trap institutions in the hybrid system, increasing the market power of legacy publishers, raising entry barriers, lowering competition, and increasing costs for libraries and universities (Rothfritz et al., 2024). The same structure that absorbed the Budapest and Berlin declarations has absorbed the regulatory pressure of Plan S through a different contractual vehicle. The pattern is structural, not incidental.

4.4 Diamond Open Access: The Road Not Taken

Diamond Open Access, in which no fees are charged to readers and no APCs are charged to authors, represents the reform logic that the Open Access movement originally implied. Fuchs and Sandoval (2013) introduced the diamond model as a non-commercial, non-profit publishing model that treats academic knowledge as a common good rather than a commodity. The later OA Diamond Journals Study showed that diamond journals already form a broad and diverse publishing landscape, often sustained by universities, public institutions, scholarly communities, and volunteer labour, while also facing significant operational and funding challenges (Bosman et al., 2021). Diamond Open Access therefore remains structurally marginal not because it is technically infeasible, but because the actors with the greatest capacity to scale publishing infrastructures, such as major commercial publishers, large research funders, and prestige-bearing institutions, have limited structural incentive to replace the commercial channels from which they already derive advantage. The Iron Law of Oligarchy (Section 3.2) applies directly: the organisational logic of commercial publishing, now embedded in transformative agreement architecture, absorbs any reform that negotiates with it rather than structurally

circumventing it. A non-APC non-paywall scholarly society journal would be one instance of what diamond open access looks like at the level of publication practice. Choosing a non-APC publication route does not solve the structural problem, and it should not be mistaken for individual moral purification. It is nevertheless a limited form of practical alignment with the diagnosis advanced here.

4.5 All Four Mechanisms Visible

The Open Access case exhibits all four mechanisms identified in Section 3 with particular clarity. Cognitive conservatism is visible in the readiness of institutional administrators and research councils to accept APC-funded hybrid journals as a legitimate and progressive development, having been selected through and by the prestige hierarchies that the APC model reinforces. Self-reinforcing feedback loops are visible in the way transformative agreements concentrate publishing power further in large commercial publishers with the infrastructure to negotiate at institutional scale, structurally marginalising small and society publishers. Epistemic dominance is visible in the recreation of the barrier to entry in publishing form: research from under-resourced institutions and the Global South is systematically disadvantaged under the APC model, and the epistemic diversity the reform promised remains unrealised. The selection bias of reform agents is visible in the composition of the bodies that designed and negotiated transformative agreements: drawn from the same prestige hierarchies whose interests the agreements reproduce, they were the least structurally capable of recognising the dynamic they were entering.

5 What Structural Change Requires

The four mechanisms analysed above produce a structure that is self-reproducing, self-concealing, and resistant to precisely the forms of intervention that its own logic generates as responses. Evidence of dysfunction is produced by the same institutions that maintain

the dysfunction. Those positioned to act on the evidence are those least structurally capable of recognising it as such. The knowledge forms that would justify change are delegitimized before they can accumulate sufficient force. This is not a temporary problem and it is not remediable by persuasion, by piloting, or by appeals to the goodwill of incumbents.

5.1 Why Standard Reform Strategies Are Insufficient

Persuasion fails because evidence of dysfunction is already available and has not been acted on. The four mechanisms explain why. Piloting fails because pilot programmes that do not alter the incentive structures of the surrounding system are either absorbed or marginalised; the registered reports initiative is a partial exception precisely because it operates from within the dominant methodological norms of empirical psychology rather than against them (Scheel et al., 2021). Reliance on the goodwill of incumbents fails because the selection bias of reform agents (Section 3.4) ensures that incumbents are those least structurally capable of recognising the dysfunction they would be called upon to correct.

Kuhn (1962) was right that paradigm shifts are rarely accomplished by converting the defenders of an established paradigm; they tend to occur generationally. Applied to institutional structures rather than theories, this implies that reform timelines measured in years are structurally unrealistic. The relevant unit is careers. This does not foreclose strategic intervention; it reframes its target. Rather than converting incumbents, durable reform requires changing the conditions under which the next cohort is selected and trained.

5.2 Four Conditions for Genuine Structural Change

Four conditions correspond directly to the four mechanisms identified above.

The first condition is the diversification of gatekeeping. As long as a single group

retains veto power over the direction of a reform, the Iron Law of Oligarchy (Section 3.2) will ensure that the reform is absorbed or blocked. Concrete institutional forms include lottery components in grant review, which have shown promising results in removing conformity bias while preserving quality thresholds (Röbbecke and Simon, 2023); distributed multi-body authority for classification decisions in bodies such as the International Union of Geological Sciences; and mandatory rotation of editorial board composition with demographic accountability.

The second condition is accountability that operates independently of the hierarchies it is meant to check. Internal accountability mechanisms are subject to the selection bias of reform agents: those responsible for self-evaluation are those formed by the structure being evaluated. External audit of funding body decisions, mandatory publication of reviewer demographic data, and pre-commitment to evaluation criteria in scientific classification procedures are concrete forms this condition can take.

The third condition is the pluralisation of recognised epistemic frameworks. This is the most demanding of the three and the most resistant to incremental implementation. It requires not merely tolerating alternative knowledge forms but restructuring assessment procedures so that normative conformity is not rewarded as such. As long as the evaluative criteria by which scientific work is assessed are identical to the criteria generated by the dominant paradigm, work that challenges the dominant paradigm will necessarily fail those criteria (Kuhn, 1962; Röbbecke and Simon, 2023). The development of a detailed analysis of what this restructuring requires at the level of epistemic justice will be subject to future work.

The fourth condition is reform-agent diversification. Reform bodies should not be composed exclusively of those who have succeeded within the institutional structure under review. This does not mean replacing expertise with externality. It means treating career trajectory, institutional location, and experience of exclusion as relevant epistemic

resources in reform design. Without such diversification, reform remains vulnerable to the selection bias identified in Section 3.4: those empowered to correct the structure are those whose sense of normality has been formed by it.

Cognitive conservatism requires pre-committed evaluative criteria and adversarial review. Self-reinforcing feedback loops require circuit-breaking mechanisms such as rotation, term limits, funding floors, and lottery components. Epistemic dominance requires pluralisation of recognized methods, questions, and evidentiary standards. Selection bias of reform agents requires reform bodies that include actors not selected through the dominant prestige pathway.

5.3 The Co-optation Test

These four conditions also serve as a diagnostic: reform efforts that satisfy none of them are at high risk of the co-optation dynamic demonstrated in Section 4. Registered reports currently pass the test for the reason already noted: they operate within dominant methodological norms. Their co-optation risk increases if they are commercialised, as there is already evidence of publishers introducing registered report formats with proprietary review processes. Preprint culture has accelerated knowledge circulation without demonstrably altering the prestige hierarchies that govern hiring and promotion; the co-optation risk is moderate and increasing as publishers incorporate preprint servers into their own workflows. Diamond Open Access, as the Open Access analysis demonstrated, faces not co-optation but marginalisation: the structure has no need to absorb what it can simply ignore.

The case-by-case analysis above implies a general principle: effective interventions must be matched to the mechanism they target. Circuit-breaking measures address feedback loops but leave cognitive conservatism intact; adversarial review addresses cognitive conservatism but does not by itself alter the composition of reform bodies. A serious reform programme for scientific institutions requires interventions at all four

levels simultaneously, because the mechanisms are mutually reinforcing: disrupting one while leaving the others intact creates conditions in which the disrupted mechanism is reconstituted through the remaining three. This is the structural logic that has defeated most single-point reforms in the history of science governance, and it is what distinguishes the account developed here from reform proposals that identify a single leverage point as sufficient (Tennant et al., 2019).

6 The Self-Application Problem

The argument of this paper is subject to the mechanisms it identifies. It was produced within academic institutions, and its reception will be shaped by the prestige hierarchies, gatekeeping structures, and publication pathways it analyses. This is not a reason to abandon the analysis. It is a reason to hold it with methodological honesty about its own conditions of production.

The demand for purist individual heroism in the form of publishing only in ideal venues regardless of career cost, refusing all compromised institutional roles, or treating personal consistency as a substitute for structural change is precisely the kind of reform strategy identified above as insufficient. Structural critique does not dissolve into individual ethics. What it does require is a specific kind of intellectual honesty: the willingness to apply to one's own field, institution, and publication record the same evidential standards one applies to the object of analysis.

The sociology and philosophy of science are not exempt from the Matthew effect, desk-rejection filtering, epistemic dominance, or the selection bias of reform agents. The value of this analysis depends on whether it is treated as a description of other institutions or as a description of the institution one is currently inside. A discipline that documents the mechanisms by which scientific careers and knowledge production are structurally distorted, but declines to apply that documentation to its own practices, reproduces the

very structure it purports to analyse.

For that reason, publication practice is not external to the argument. Choosing a non-APC open access route does not solve the structural problem, and it should not be mistaken for individual moral purification. It is nevertheless a limited attempt to align publication practice with the diagnosis developed here.

7 Conclusion

The paradox of reform resistance does not resolve. It reflects a real structural contradiction: science simultaneously produces the evidence for its own dysfunction and maintains the structures that produce that dysfunction. The answer is not that scientific actors are uniquely resistant to reason, nor that reform proposals are technically deficient. The answer is structural: dominance structures in science are equipped with four entangled mechanisms that convert reform pressure into institutional reproduction.

Cognitive conservatism produces an implicit defence of established paradigms that operates below the threshold of deliberate decision. Self-reinforcing feedback loops then concentrate resources, recognition, and gatekeeping authority in the hands of those who have already benefited from the current configuration. Epistemic dominance mechanisms delegitimize the knowledge forms that would constitute evidence for dysfunction. The selection bias of reform agents ensures that institutional positions carry with them the internalised filtering logic of the hierarchy that produced them. These mechanisms do not operate sequentially; they operate simultaneously and amplify one another.

The Open Access case demonstrates this with forensic clarity. The dominance structure did not fail. It functioned exactly as its self-reinforcing logic predicts. A reform explicitly designed to dismantle commercial publisher control over publicly funded research became a new revenue mechanism for the same publishers, a development now being repeated at

institutional scale through transformative agreements.

The conditions for genuine structural change are more demanding than persuasion or piloting can satisfy. They are also not technically unavailable. Gatekeeping diversification, independent accountability mechanisms, and the pluralisation of recognised epistemic frameworks are not utopian demands; they are specific institutional changes with documented precedents. The obstacle is not knowledge. It is the structure that processes knowledge, and that has, so far, proven fully capable of processing proposals for its own reform.

The paradox is structurally durable but not structurally permanent. Its reproduction depends on conditions that can, in principle, be altered, even if they cannot be altered by the kind of argumentative pressure that normally moves academic debate. The reform toolkit is full. The question is what conditions would make its use structurally possible rather than individually heroic.

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