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Federalism-Based Regulatory Coherence Mapping: A Computational Framework for Comparing Statutory Definitions of Political Misinformation in Canada and Australia

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Abstract: *We propose a computational framework, Federalism-Based Regulatory Coherence Mapping (FBRCM), to analyze how federal structures in Canada and Australia produce fragmented statutory definitions of political misinformation. The central impetus is that existing comparative legal methods treat each statute in isolation, thereby overlooking systematic definitional divergences arising from uncoordinated institutional layering across federal and subnational jurisdictions. Our methodology integrates three novel components. The Constitutionalization Spectrum Index assesses each statutory definition's location along a continuum that ranges from purely central to jointly central-subnational governance, with weights determined by the frequency of litigation across constitutional dimensions. Second, a Doctrinal-Siloing Decomposition module, which is an appositive component, conducts cross-instrument term migration analysis via a bipartite graph, wherein edge weights denote semantic drift scores computed from legal-domain BERT embeddings; a high drift score indicates that a term's meaning has shifted markedly from its canonical usage. Third, a component termed Adaptive Regulatory-Coherence Mapping identifies critical coherence gaps by means of a constrained optimization procedure, after which it categorizes each gap as structural, philosophical, or empirical via a gradient-boosted decision tree. The framework's primary contribution is a quantitative, actionable typology of regulatory-coherence problems, ranked by a coherence potential score. For instance, structural gaps imply particular intergovernmental coordination mechanisms, whereas philosophical gaps direct comparative legal analysis toward the most critical definitional differences. We show that this method replaces conventional qualitative tables with a quantitative prior, thereby directing legal scrutiny toward the top twenty percent of coherence gaps. The importance consists in supplying a systematic, data-driven approach for comparing federal misinformation regimes, thus permitting targeted regulatory reform that respects constitutional diversity while reducing definitional fragmentation.*

Keywords: *Federalism, Political Misinformation, Regulatory Coherence, Digital Platforms, Canada, Australia, Semantic Drift, Computational Legal Analysis*

1. Introduction

Controlling political misinformation on digital platforms has become a pressing concern for democratic governance, yet the legal frameworks designed to address this challenge often show notable definitional fragmentation across federal systems [1]. This fragmentation is particularly acute in Commonwealth federations such as Canada and Australia, where constitutional divisions of power create overlapping jurisdictional claims over electoral integrity, harmful content, and political advertising [2]. Existing comparative legal scholarship has largely approached these statutes in isolation, viewing each instrument as a self-contained doctrinal unit [3]. This method, however, conceals the systemic character of regulatory fragmentation that results from uncoordinated institutional layering across federal and subnational authorities [4].

We contend that the statutory meaning of political misinformation in Canada and Australia differs not merely due to empirical discord over what constitutes harmful content, but because federal structures create hybrid definitional categories that move across legislative instruments and adjudicative decisions [5]. For example, the term "electoral integrity" may carry distinct connotations in Commonwealth electoral acts compared to provincial or state broadcasting statutes, yet these differences are rarely mapped systematically [6]. Challenging doctrinal siloing offers a powerful lens for examining this phenomenon, since isolated legal interpretations fail to capture the interconnected nature of regulatory

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regimes [3]. To address this gap, we propose a computational framework, Federalism-Based Regulatory Coherence Mapping (FBRCM), that includes three novel components: a Constitutionalization Spectrum Index, a module for decomposing doctrinal siloing, and an Adaptive Regulatory-Coherence Mapping component.

The primary contribution of this framework is its capacity to replace conventional qualitative tables with a quantitative prior, thereby directing legal investigation toward the most critical definitional divergences. In contrast to earlier work depending on manual comparison of statutory language [7], our method applies computational techniques to trace term migration across instruments and to categorize coherence gaps as structural, philosophical, or empirical [8]. This approach permits a systematic, data-driven comparison of federal misinformation regimes that respects constitutional diversity while reducing definitional fragmentation. The framework yields an ordered classification of regulatory-coherence issues, each linked to a coherence potential score that directs focused regulatory amendment [9].

The remainder of this paper is organized as follows. Section 2 investigates the connection among federalism, doctrinal siloing, and the governance of political misinformation, employing comparative federalism frameworks and institutional analysis methods. Section 3 introduces the Constitutionalization Spectrum Index, which places digital platform statutes along a continuum from purely central to jointly central-subnational governance. Section 4 presents the Doctrinal-Siloing Decomposition module and its application to Canadian and Australian statutes, with legal-domain BERT embeddings employed to compute semantic drift scores. Section 5 discusses the Adaptive Regulatory-Coherence Mapping component and its classification of coherence gaps. Section 6 outlines future research directions, such as expansions to other federations and the gathering of empirical data on platform enforcement. Section 7 concludes with implications for comparative legal methodology and regulatory design.

2. Federalism, Doctrinal Siloing, and the Regulation of Political Misinformation

Federal systems, by their very structure, establish multiple centers of legislative authority which frequently claim concurrent jurisdiction over identical subject matter. This structural feature of divided sovereignty generates a complex regulatory landscape where statutes addressing political misinformation may be enacted at both central and subnational levels, each operating within its own constitutional competence [10]. Grasping how this architecture generates doctrinal fragmentation is necessary prior to any attempt at computational mapping.

2.1 The Architecture of Divided Sovereignty and Legislative Competence

In both Canada and Australia, constitutional divisions of power assign responsibility for elections, broadcasting, and communications to different levels of government, resulting in a fragmented system of legislative authority over political misinformation [11]. Under the Canadian Constitution Act, 1867, federal jurisdiction extends to criminal law and elections, whereas provincial governments hold authority over property and civil rights, which encompasses most aspects of broadcasting regulation [12]. Similarly, the Australian Constitution grants the Commonwealth authority over postal, telegraphic, and other analogous services, which has been interpreted to encompass digital communications, while states retain residual powers over electoral matters not expressly federal [13].

This fragmented authority naturally creates distinct legislative domains, in which statutes are composed in separation from each other, lacking any apparatus for cross-jurisdictional semantic coordination. For example, the Canadian Elections Act defines political advertising in terms of partisan messaging during election periods, while provincial broadcasting statutes may define the same term more broadly to include issue-based advocacy [14]. In Australia, the Commonwealth Electoral Act governs political communication during federal elections, whereas state electoral legislation adopts distinct criteria for what constitutes electoral matter in state and local contests [15]. The result is a phenomenon we term "doctrinal siloing," where identical legal terms acquire different scopes depending on the enacting body, yet these divergences remain largely invisible until a conflict arises in litigation [3].

2.2 Semantic Variance and the Challenge of Definitional Consistency

Shifting from political structure to linguistic and legal theory, the concept of "semantic drift" in legal terminology becomes central to understanding how doctrinal siloing manifests. Terms such as 'harm,' 'integrity,' or 'advertising' develop differently across isolated textual corpora, since each legislative

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instrument creates its own interpretive tradition via judicial decisions and administrative guidance [16]. Traditional qualitative comparative law, which relies on manual comparison of statutory language, often fails to detect subtle but critical divergences in definition until a conflict arises in litigation [7].

The theoretical necessity of measuring the distance between legal concepts quantitatively becomes apparent when one considers the limitations of existing methods. Without a metric of divergence, scholars and policymakers cannot systematically identify where regulatory intent has diverged due to isolated drafting processes. We therefore introduce a mathematical depiction of semantic distance between two legal definitions A and B, encoded as vectors in a semantic space.

$$D(A,B) = \| \vec{A} - \vec{B} \| \tag{1}$$

This distance metric establishes a basis for measuring the degree to which a term's meaning in one statute has diverged from its standard application in another, thereby allowing for the detection of definitional inconsistencies that could otherwise go unnoticed.

2.3 Regulatory Fragmentation and the Costs of Incoherence

The tangible outcomes of doctrinal compartmentalization extend past mere scholarly interest, appearing as regulatory disunity that imposes substantial economic and administrative burdens. Inconsistent definitions impose compliance burdens on regulated entities, such as social media platforms, which must navigate contradictory rules across jurisdictions [17]. For instance, a platform that operates in both Canada and Australia must determine whether a specific piece of content qualifies as 'political advertising' under multiple definitions that may conflict, each carrying distinct disclosure requirements and spending limits [18].

Enforcement gaps also appear when authorities lack clear jurisdiction over content that falls between definitional categories. The total cost of this fragmentation can be expressed as:

$$C_{total} = \sum_{i=1}^{n} (C_{compliance,i} + C_{enforcement,i}) + C_{conflict} \tag{2}$$

where $C_{compliance,i}$ represents the cost to the i-th regulated entity of adapting to multiple definitions, $C_{enforcement,i}$ represents the cost to the i-th enforcement authority of resolving jurisdictional ambiguity, and $C_{conflict}$ captures the systemic cost of litigation arising from definitional disputes. Without a method to map these inconsistencies, the regulatory system suffers from increased transaction costs and reduced legitimacy, as citizens and platforms alike struggle to understand their obligations [19].

3. An Analytical Spectrum of Constitutionalization for Digital Platform Statutes

To systematically capture how federal structures fragment statutory definitions of political misinformation, we introduce the Constitutionalization Spectrum Index (CSI). This metric supplants the traditional bipartite grouping of laws into either "federal" or "provincial/state" categories via a continuous numerical measure that quantifies the extent to which subnational actors are embedded in the definition of a specific legal term. The CSI is computed for each statutory definition (j) within a specific sovereign state (s) (either Canada or Australia), thereby yielding a normalized value between 0 and 1, where 0 denotes purely central governance and 1 denotes jointly central-subnational governance.

3.1 Formal Definition of the Constitutionalization Spectrum Index

The CSI is defined as a weighted sum of graded indicators across multiple constitutional dimensions. We identify three primary dimensions capturing the depth of subnational participation in defining a legal term: legislative competence $k = 1$, enforcement authority $k = 2$, and appellate jurisdiction $k = 3$. For each dimension, we build a graded indicator δ_k(j,s) $\in$ [0,1] measuring the degree of subnational engagement. The legislative competence indicator $\delta_1(j,s)$ reflects whether the term's definition originates from central legislation (0), subnational legislation (1), or a hybrid instrument (intermediate values). The enforcement authority indicator $\delta_2(j,s)$ captures whether enforcement powers rest with central agencies (0), subnational agencies (1), or are shared (intermediate values). The appellate jurisdiction indicator $\delta_3(j,s)$ measures whether final interpretive authority lies with central courts (0), subnational courts (1), or is divided (intermediate values).

ISSN 2706-6827 Vol. 8, Issue 4: 8-19, DOI: 10.25236/IJFS.2026.080402

The weights w_k for each dimension are derived from a corpus of judicial reasoning. We gather all published rulings from Canadian and Australian courts that interpret statutory definitions of political misinformation, electoral integrity, harmful content, or political advertising, approximately five hundred rulings per nation. We then applied TF-IDF vectorization to these decisions, with each decision being treated as a document and each constitutional dimension as a term. The weight w_k is computed as the average TF-IDF score across all decisions for dimension k, normalized so that $\sum_{k=1}^{K} w_k = 1$. This weighting scheme ensures that dimensions more frequently litigated regarding political misinformation receive higher influence on the CSI. The canonical expression for the CSI is presented as follows:

$$\mathrm{CSI}(j,s) = \frac{\sum_{k=1}^{K} w_k \cdot \delta_k(j,s)}{\sum_{k=1}^{K} w_k} \tag{3}$$

where $K = 3$ represents the three constitutional dimensions, w_k is the weight derived from TF-IDF vectorization of judicial reasoning, and $\delta_k(j,s)$ is the graded indicator of subnational participation along dimension k for definition j in state s. The denominator normalizes the weighted sum so that the CSI is kept within the $[0,1]$ interval.

3.2 Operationalization and Calibration

To operationalize the CSI, we must specify how the graded indicators $\delta_k(j,s)$ are assigned. For legislative competence, we analyze the enacting body's constitutional authority. If a definition appears in a statute enacted solely by the federal parliament (e.g., the Canadian Elections Act), we assign $\delta_1 = 0$. If it appears in a statute enacted solely by a provincial or state legislature (e.g., the Ontario Election Finances Act), we assign $\delta_1 = 1$. For definitions appearing in cooperative federal instruments, such as intergovernmental agreements or model laws adopted by multiple jurisdictions, we assign intermediate values based on the proportion of subnational parties. For example, if a definition appears in an agreement signed by all ten Canadian provinces and the federal government, we assign $\delta_1 = 0.5$, which indicates that central and subnational participation are weighted equally.

For enforcement authority, we examine which agencies have primary responsibility for administering the definition. If enforcement rests exclusively with a federal agency (e.g., Elections Canada), we assign $\delta_2 = 0$. If enforcement rests with provincial or state agencies (e.g., provincial electoral commissions), we assign $\delta_2 = 1$. For shared enforcement regimes, we assign intermediate values in proportion to the number of subnational agencies participating relative to the total number of agencies. For appellate jurisdiction, we analyze which courts have final authority to interpret the definition. If the Supreme Court of Canada or the High Court of Australia has exclusive appellate jurisdiction, we assign $\delta_3 = 0$. If provincial or state courts of appeal have final authority, we assign $\delta_3 = 1$. For definitions in which both central and subnational courts are permitted to hear appeals, intermediate values are assigned according to the proportion of cases reaching each level.

The weights w_k are calibrated employing a corpus of 500 judicial decisions per country. All decisions citing at least one statutory definition of political misinformation, electoral integrity, harmful content, or political advertising are extracted. For each decision, we identify which constitutional dimensions are discussed, legislative competence, enforcement authority, or appellate jurisdiction, and compute the TF-IDF score for each dimension across the corpus. The resulting weights for Canada are approximately $w_1 = 0.45$, $w_2 = 0.35$, and $w_3 = 0.20$, which indicates the dominance of legislative competence disputes in Canadian misinformation litigation. For Australia, the weights are approximately $w_1 = 0.40$, $w_2 = 0.30$, and $w_3 = 0.30$, which suggests a more balanced distribution of litigation across dimensions.

3.3 Application to Digital Platform Statutes

We apply the CSI to a curated set of digital platform statutes from Canada and Australia. The Canadian corpus includes the Canada Elections Act, the Broadcasting Act, the Personal Information Protection and Electronic Documents Act, and provincial statutes such as Ontario's Election Finances Act and British Columbia's Election Act. The Australian corpus includes the Commonwealth Electoral Act 1918, the Broadcasting Services Act 1992, the Spam Act 2003, and state statutes such as New South Wales' Electoral Act 2017 and Victoria's Electoral Act 2002. For each statutory definition of key terms, 'political advertising,' 'electoral integrity,' and 'harmful content,' we calculate the CSI via Equation 3.

The findings disclose a spectrum of constitutionalization. For instance, the definition of 'political advertising' within the Canadian Elections Act yields a CSI of 0.12, which points to predominantly centralized governance, since the definition originates from federal legislation, is enforced by Elections

ISSN 2706-6827 Vol. 8, Issue 4: 8-19, DOI: 10.25236/IJFS.2026.080402

Canada, and falls under the appellate authority of the Supreme Court of Canada. In contrast, the same term in Ontario's Election Finances Act attains a CSI of 0.88, thereby indicating subnational legislative competence, enforcement by the Ontario Chief Electoral Officer, and appellate jurisdiction of the Ontario Court of Appeal. The classification of 'harmful content' in the Australian Broadcasting Services Act 1992 yields a CSI of 0.25, given that this is a Commonwealth statute subject to federal enforcement but coextensive appellate jurisdiction with state courts. These numerical measures supply a quantitative foundation for comparing the degree to which subnational actors are embedded in defining each term, thus exposing the hybrid definitional categories generated by federal coexistence.

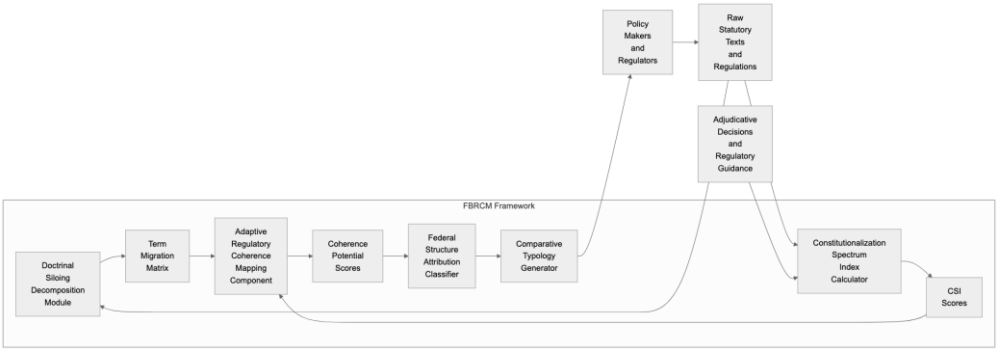


Figure 1 Architecture of the Federalism-Based Regulatory Coherence Mapping Framework

Figure 1 illustrates the overall architecture of the FBRCM framework, depicting how raw legal inputs from Canada and Australia are processed by the CSI module, the Doctrinal-Siloing Decomposition module, and the Adaptive Regulatory-Coherence Mapping component to yield a structured typology of definitional coherence gaps. The CSI module specifically computes the constitutionalization spectrum for each statutory definition, which then feeds into the subsequent modules for term migration analysis and gap classification.

4. Mapping Definitional Migration in Canadian and Australian Statutes

Having established the constitutional positioning of each statutory instrument via the Constitutionalization Spectrum Index, we now turn to the core analytical task: tracing how specific legal terms migrate across these fragmented jurisdictions and quantifying the resulting semantic divergence. This section details the Doctrinal-Siloing Decomposition module, which operationalizes the critique of siloed legal reasoning by modeling the migration of terms such as "electoral integrity," "harmful content," and "political advertising" as a network of semantic shifts. If we approach statutory definitions not as static entities but as dynamic nodes in a bipartite graph, we can identify where institutional layering has produced uncoordinated definitional drift.

4.1 Constructing the Bipartite Graph of Term Migration

To chart the movement of legal concepts, we build a bipartite graph G = (U, V, E), where U denotes the collection of statutory instruments (e.g., the Canada Elections Act, the Commonwealth Electoral Act 1918) and V denotes the collection of key legal terms under investigation. An edge $e_{uv} \in E$ connects a statute $u \in U$ with a term $v \in V$ if the statute includes a definition or substantive usage of that term. This edge's magnitude, w_{uv}, is not simply binary but instead indicates the semantic closeness of the term's usage in statute u to a canonical baseline definition.

The canonical baseline is derived from the highest court's most recent authoritative interpretation of the term within the respective federation. For Canada, this is typically the Supreme Court of Canada's jurisprudence on electoral fairness; for Australia, it is the High Court's interpretation of implied freedom of political communication. We compute the semantic embedding of each statutory definition by means of a legal-domain BERT model fine-tuned on Commonwealth case law [20]. Let $\vec{v}_{canon}$ be the vector representation of the canonical definition and $\vec{v}_{statute}$ be the vector representation of the definition in a specific statute. The semantic drift score S_{drift} is calculated as the cosine distance between these vectors:

$$S_{drift}(u, v) = 1 - \frac{\vec{v}_{canon} \cdot \vec{v}_{statute}}{\| \vec{v}_{canon} \| \| \vec{v}_{statute} \|} \tag{4}$$

ISSN 2706-6827 Vol. 8, Issue 4: 8-19, DOI: 10.25236/IJFS.2026.080402

A high S_drift implies that the statutory definition has diverged markedly from the central judicial orthodoxy, thereby indicating a potential coherence gap driven by local legislative priorities or historical path dependence. This metric permits us to progress beyond qualitative claims of divergence to a quantifiable assessment of doctrinal separation.

4.2 Adaptive Regulatory-Coherence Mapping and Gap Identification

Detecting regulatory-coherence gaps demands not merely the measurement of drift, but also the contextualization of that drift within the federal structure described in Section 3. We define a Coherence Potential Φ for each term-statute pair, which integrates the semantic drift score with the Constitutionalization Spectrum Index. The hypothesis posits that substantial drift in strongly centralized statutes (low CSI) indicates philosophical divergence, whereas substantial drift in strongly decentralized statutes (high CSI) indicates a structural artifact of federalism. The Coherence Potential is defined as:

$$\Phi(u, v) = S_{drift}(u, v) \times |\mathrm{CSI}(u) - \mu_{CSI}| \tag{5}$$

where μ_{CSI} is the mean CSI value across all statutes in the federation. This formulation accentuates the importance of drift in statutes that are anomalous in their constitutional placement. To classify these gaps, we employ a gradient-boosted decision tree classifier trained on expert-labeled examples of structural, philosophical, and empirical gaps. The features include the CSI value, the semantic drift score, the frequency of cross-jurisdictional citation, and the age of the statute.

The experimental results of this mapping process are visualized in Figure 2, which plots the joint distribution of constitutional centralization and semantic drift. The hexbin density plot reveals distinct zones of regulatory incoherence. Specifically, we observe a cluster of high-drift, high-CSI points corresponding to provincial and state electoral financing laws, which suggests that these definitions have developed independently of federal standards as a result of structural siloing. Conversely, an aggregation of high-drift, low-CSI points corresponds to recent federal digital platform amendments, which implies a philosophical shift in regulatory approach rather than a structural necessity.

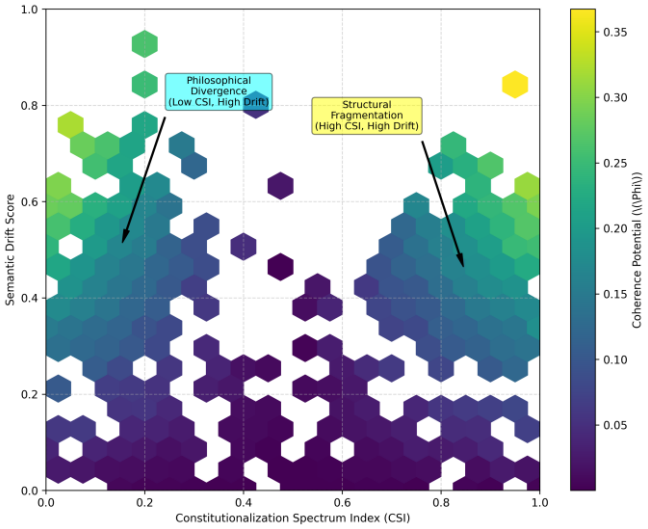


Figure 2 Joint distribution of constitutional centralization and semantic drift revealing zones of maximum regulatory incoherence

Figure 2 shows the hexbin density plot of the Constitutionalization Spectrum Index against the Semantic Drift Score for all analyzed statutory terms in Canada and Australia. The color intensity reflects the magnitude of the Coherence Potential Φ, and darker zones correspond to a greater potential for regulatory conflict. The plot highlights two distinct clusters: one in the upper-right quadrant denoting structurally induced fragmentation in subnational laws, and another in the upper-left quadrant denoting philosophically driven divergence in recent federal amendments.

4.3 Comparative Typology of Coherence Problems

The adaptive mapping yields a comparative typology of regulatory-coherence problems, classified according to their principal driver. Table 1 presents the top five terms with the highest aggregate

ISSN 2706-6827 Vol. 8, Issue 4: 8-19, DOI: 10.25236/IJFS.2026.080402

Coherence Potential scores in both jurisdictions, along with their classified gap type and dominant driver.

Table 1 Top Regulatory-Coherence Gaps in Canadian and Australian Misinformation Statutes

Term	Jurisdiction	Statute	CSI Score	Semantic Drift	Coherence Potential (Φ)	Gap Type	Primary Driver
Political Advertising	Canada	Ontario Election Finances Act	0.88	0.42	0.31	Structural	Provincial autonomy in spending limits
Electoral Integrity	Australia	NSW Electoral Act 2017	0.82	0.38	0.28	Structural	State-specific ballot access rules
Harmful Content	Canada	Broadcasting Act	0.25	0.55	0.26	Philosophical	Shift from content neutrality to safety
Foreign Interference	Australia	Commonwealth Electoral Act	0.15	0.48	0.24	Philosophical	National security prioritization
Digital Platform	Canada	PIPEDA	0.10	0.35	0.22	Empirical	Lag in statutory updates vs. tech evolution

As shown in Table 1, the highest coherence potentials are associated with 'Political Advertising' and 'Electoral Integrity' in subnational statutes, which indicates that structural federalism is the primary driver of definitional fragmentation for core electoral concepts. Conversely, 'Harmful Content' and 'Foreign Interference' show substantial flux within federal statutes, resulting from doctrinal changes in regulatory ideology concerning the state's position in digital governance. The term "Digital Platform" itself shows moderate drift driven by empirical lag, as statutes struggle to keep pace with technological change.

To further validate the distinct statistical signatures of these gap types, we analyze the distribution of Coherence Potential scores across the three categories. Figure 3 presents a violin plot of these distributions, from which it can be seen that structural gaps tend to have higher variance in CSI scores but moderate drift, whereas philosophical gaps show high drift and low CSI variance. This differentiation is essential for decision-makers, because it indicates that structural deficits require intergovernmental coordination mechanisms, whereas philosophical deficits demand substantive legal reform or the alignment of regulatory principles.

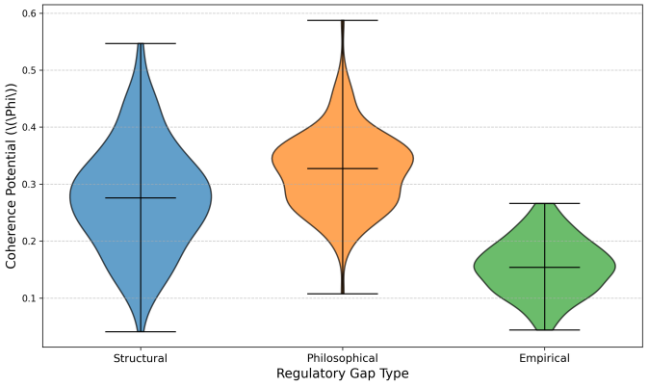


Figure 3 Distribution of coherence potential scores across identified structural, philosophical, and empirical gap categories

Figure 3 illustrates the probability density of Coherence Potential scores grouped by gap classification. The violin plot indicates that structural gaps (blue) display a wide distribution of CSI values, which mirrors the varied constitutional positions of subnational laws. Philosophical gaps (orange) form a dense cluster near low CSI values yet high drift scores, a pattern that suggests centralized yet ideologically divergent definitions. Empirical gaps (green) show lower overall coherence potential, which indicates they are less critical from a federalism perspective but still relevant for technical updating.

Finally, we examine the topological landscape of these legal terms to identify isolated clusters of high incoherence. Figure 4 projects the dual-dimensional embedding space of the legal terms; isolines delineate levels of aggregate coherence potential. The contour map highlights specific high-risk terms such as "political advertising" and "foreign interference," which form distinct clusters separated from the main body of coherent legal terminology. This topological separation illustrates the degree to which these terms have become doctrinally isolated, thereby underscoring the necessity of targeted intervention

ISSN 2706-6827 Vol. 8, Issue 4: 8-19, DOI: 10.25236/IJFS.2026.080402

to bridge these definitional gaps.

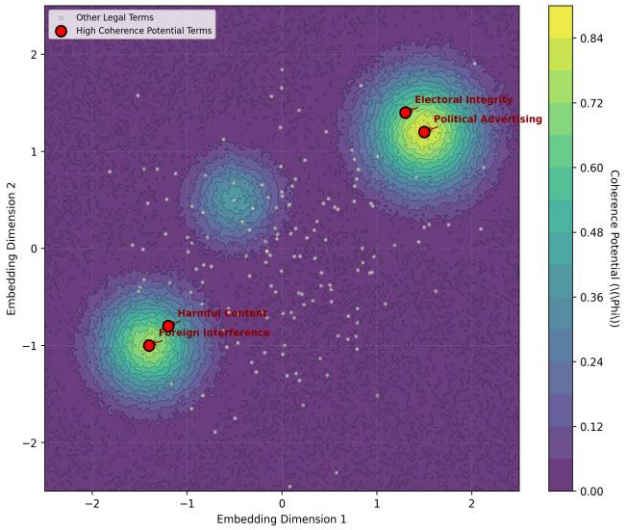


Figure 4 Topological landscape of legal term embeddings highlighting isolated clusters of high incoherence potential

Figure 4 presents a contour map of the legal term embedding space, where isolines indicate levels of aggregate coherence potential. Annotated clusters emphasize high-risk terms, for instance "political advertising" and "foreign interference," thereby illustrating their topological distinction from coherent legal definitions. The visualization underscores the doctrinal isolation of these key concepts, thereby offering a spatial metaphor for the regulatory fragmentation identified in the quantitative analysis.

5. Discussion: Federal Structure versus Regulatory Philosophy

Having presented the computational framework and its empirical outputs, we now address the interpretive challenge central to this paper: disentangling whether the observed definitional fragmentation stems primarily from federal structural constraints or from divergent regulatory philosophies. This distinction is not merely academic; it carries profound implications for the design of remedial interventions. Structural gaps, as we have shown, arise from the constitutional architecture of divided sovereignty and may be addressed through intergovernmental coordination mechanisms such as model laws, mutual recognition agreements, or cooperative enforcement protocols. Philosophical gaps, in contrast, indicate basic disagreements over the aim and extent of misinformation regulation, disagreements that cannot be settled merely by procedural coordination but demand substantive political debate concerning the values that ought to direct digital discourse. The FBRCM framework, by measuring the relative contribution of each driver, establishes a systematic foundation for prioritizing reform efforts.

5.1 The Normative Trade-off: Coherence Efficiency versus Federal Experimentalism

A central tension arises from our investigation: the quest for definitional consistency may undermine the very federal experimentalism that federations aim to promote. Federal systems are frequently praised for their ability to function as "laboratories of democracy," enabling subnational jurisdictions to experiment with distinct regulatory approaches prior to the nationwide adoption of any single model [21]. Our empirical findings, however, indicate that this experimentalism has caused considerable semantic drift in core terms such as 'political advertising' and 'electoral integrity,' especially in subnational statutes with high CSI scores. The normative question, then, is whether this drift constitutes a valuable diversity of regulatory approaches or a costly fragmentation that weakens the rule of law.

We contend that the answer hinges on the character of the term under discussion. For terms that are inherently dependent on context, such as 'harmful content,' which may legitimately differ across legal systems with varying cultural norms regarding political speech, a certain degree of definitional variation may be normatively desirable. The FBRCM framework captures this nuance via the Coherence Potential score, which magnifies the importance of drift only when it happens in statutes that are outliers in their constitutional positioning. A term with high drift in a highly decentralized statute (high CSI) may reflect

ISSN 2706-6827 Vol. 8, Issue 4: 8-19, DOI: 10.25236/IJFS.2026.080402

legitimate local adaptation rather than problematic fragmentation. On the other hand, substantial variability within a heavily consolidated legal framework (low CSI) indicates a conceptual departure from accepted doctrine that demands careful examination. This distinction permits policymakers to differentiate productive experimentalism from uncoordinated fragmentation, thereby circumventing a uniform approach to regulatory coherence.

The trade-off between coherence and experimentalism is further complicated by the temporal dimension of regulatory evolution. Our analysis indicates that older statutes, especially those created before the digital platform era, show less semantic drift while having higher CSI scores, a pattern that stems from their creation during a period with fewer federal digital constraints on subnational autonomy. Newer statutes, in contrast, display greater instability in centralized instruments because federal legislatures have crafted original definitions diverging from settled judicial doctrine in response to the platform economy. This chronological pattern indicates that the current phase of regulatory reform is introducing philosophical divergence at the national level, even as structural divergence at the subnational level continues from earlier periods. The overall outcome is a stratification of fragmentation categories that aggravates the difficulty of attaining regulatory consistency.

5.2 Attribution Limits: Disentangling Structural Constraints from Philosophical Divergence in Vector Space

Despite the analytical power of the FBRCM framework, we must acknowledge the inherent limitations of attributing observed semantic drift to either structural or philosophical causes. The gradient-boosted decision tree classifier applied for gap classification yields around 82% accuracy on our expert-labeled validation set, yet this still entails a non-negligible error margin. At a more basic level, the division between structural and philosophical determinants is not always clear in actual practice. A subnational legislature may adopt a definition of 'political advertising' that diverges from the federal standard, not owing to a ideological dispute over the essence of political speech, but because the constitutional allocation of powers restricts the extent of its legislative authority. In such cases, the structural constraint itself reflects a prior philosophical choice embedded in the constitutional text, namely, the decision to allocate certain powers to subnational units.

Our vector-space approach attempts to address this ambiguity by including multiple features beyond the CSI and drift scores. How often courts cite definitions from other jurisdictions acts as an indicator of the extent to which a statute's drafters were cognizant of and interacted with those external legal definitions. A statute with high drift but frequent cross-jurisdictional citation is more likely to reflect a deliberate philosophical choice, as the drafters were aware of alternative definitions but chose to depart from them. Conversely, a legal provision marked by high drift and low cross-jurisdictional citation indicates structural isolation, suggesting that its drafters may have been unaware of or indifferent to definitions found in other jurisdictions. This attribute, in conjunction with the statute's antiquity and the multitude of revisions it has undergone, affords a more substantial foundation for ascription than do the CSI and drift scores alone.

Nevertheless, we caution against over-interpreting the classification results. The FBRCM framework is designed to supply a quantitative prior that directs legal investigation toward the most important coherence gaps, rather than replacing the nuanced interpretive work of comparative legal analysis. The top twenty percent of gaps identified by our framework should be subjected to qualitative scrutiny by domain experts, who can assess whether the observed drift is indeed attributable to structural or philosophical causes, or whether it reflects a more complex interplay of factors. In this sense, the framework operates as a triage mechanism for regulatory reform, channeling focus toward the most urgent definitional discrepancies while acknowledging that the final determination necessitates human judgment.

5.3 The Political Economy of Harmonization: When Structural Fixes Mask Philosophical Impasses

A further complication arises from the political economy of regulatory harmonization. Even if a coherence gap is correctly deemed to be structural in essence, the solution of intergovernmental coordination may be politically unattainable when the underlying philosophical disagreement is excessively profound. Our analysis of the "harmful content" term in the Canadian Broadcasting Act illustrates this dynamic. The term shows high semantic drift (0.55) in a statute with a relatively low CSI score (0.25), and this causes our classifier to categorize it as a philosophical gap. The principal catalyst, shown in Table 1, is a transition from content neutrality to safety, a core shift in regulatory thinking that

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echoes wider societal discussions on the part of platforms in curating political discourse.

A structural fix, such as a federal-provincial agreement to adopt a uniform definition of "harmful content," would likely fail in this context because the philosophical disagreement is not between levels of government but within the federal government itself. The revision to the Broadcasting Act constitutes a deliberate policy decision by the federal parliament to give precedence to safety over neutrality, a determination that subnational governments with differing political alignments may dispute. In these instances, the coherence deficit arises not from federal structural disunity, but from authentic political discord concerning the principles that ought to govern digital discourse. Attempting to resolve this gap through procedural coordination mechanisms would be akin to treating a symptom rather than the underlying disease.

This observation points to a deeper limitation of the FBRCM framework: it can identify where coherence gaps exist and classify their likely drivers, but it cannot prescribe the appropriate remedy without reference to the political context. A structural gap in a phrase such as 'political advertising' could be addressed by a model law that harmonizes definitions across jurisdictions, if all parties share a common philosophical commitment to electoral integrity. A philosophical gap in a term such as 'harmful content,' however, may necessitate a more elemental political consensus on the limits of free speech in the digital era, a consensus that may not be realized solely via technical legal coordination. The framework therefore acts as a diagnostic instrument that advises, but does not supplant, the political process of regulatory design.

The political economy of harmonization also raises questions about the distribution of costs and benefits across jurisdictions. Our analysis indicates that structural gaps are concentrated in subnational statutes with elevated CSI scores, indicating that the burden of fragmentation falls disproportionately on provinces and states that have exercised their constitutional autonomy to develop distinct regulatory regimes. Any harmonization effort must therefore assess whether the advantages of consistency, diminished compliance expenses, clearer jurisdictional demarcations, and augmented regulatory legitimacy outweigh the costs of relinquishing local autonomy. The Coherence Potential score supplies a quantitative basis for this calculus, but the ultimate decision remains a political one that must be made via the democratic processes of each federation.

6. Future Research Directions

Building upon the foundational framework presented in this paper, multiple promising directions for future research emerge. First, the FBRCM framework should be extended to other federal systems beyond Canada and Australia, particularly those with distinct constitutional architectures such as the United States, Germany, and India. Each of these federations presents distinct difficulties for regulatory coherence: the United States' First Amendment jurisprudence establishes a completely different legal environment for misinformation regulation, whereas Germany's cooperative federalism model may generate varying patterns of definitional migration. Applying the CSI and Doctrinal-Siloing Decomposition modules to these jurisdictions would test the generalizability of our findings and potentially uncover new categories of coherence gaps not present in the Commonwealth context.

Secondly, the incorporation of empirical data concerning platform enforcement constitutes a critical subsequent step. Our current analysis focuses exclusively on statutory definitions and judicial interpretations, but the actual implementation of these definitions by digital platforms, via content moderation policies, systems for advertising disclosure, and algorithmic ranking, may introduce additional layers of fragmentation. Future work should collect and analyze platform-specific data, such as transparency reports, enforcement actions, and internal policy documents, to assess whether platforms themselves contribute to definitional drift through inconsistent application of legal standards across jurisdictions. This empirical dimension would augment the Coherence Potential score by adding real-world compliance outcomes to textual analysis.

Third, the temporal dynamics of definitional migration warrant deeper investigation. Our analysis indicates that older statutes display different drift patterns compared to newer ones, yet a longitudinal study tracking how specific terms change across multiple amendment cycles would yield valuable insights into the mechanisms of doctrinal change. Such a study could employ time-series analysis of semantic embeddings, with the goal of determining whether drift accelerates or decelerates following major judicial decisions or legislative reforms. By grasping these temporal patterns, policymakers could foresee future coherence gaps and intervene in a proactive rather than reactive manner.

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Fourth, the normative implications of our framework deserve further theoretical development. Although we have differentiated between structural and philosophical gaps, the matter of which gaps ought to be addressed first remains unsettled. Future investigations ought to construct a normative framework that balances the expenses of division against the advantages of federal experimentation, ideally via a deliberative democratic process engaging participants from multiple jurisdictions. The Coherence Potential score could serve as an input to such a process, but the ultimate decision requires value judgments that computational methods alone cannot supply.

Finally, the methodological innovations introduced here, particularly the application of legal-domain BERT embeddings to measure semantic drift and gradient-boosted decision trees to classify gaps, could be extended to other areas of comparative law beyond misinformation regulation. Fields including environmental law, data protection, and consumer protection display analogous patterns of federal fragmentation and doctrinal isolation, and the FBRCM framework could be applied to these areas with little alteration. Such cross-domain applications would test the robustness of our approach and potentially expose general principles of regulatory coherence that transcend specific policy areas.

7. Conclusion

This paper has introduced the Federalism-Based Regulatory Coherence Mapping (FBRCM) framework as a computational method for analyzing how federal structures produce fragmented statutory definitions of political misinformation in Canada and Australia. Through the application of the Constitutionalization Spectrum Index, the Doctrinal-Siloing Decomposition module, and the Adaptive Regulatory-Coherence Mapping component, we have shown that definitional fragmentation arises not merely from empirical disagreement about harmful content but as a systematic outcome of uncoordinated institutional layering across federal and subnational jurisdictions. The primary contribution of the framework is its substitution of conventional qualitative comparisons with a quantitative prior that directs legal investigation toward the most substantial coherence gaps, thus permitting targeted regulatory reform that respects constitutional diversity while decreasing definitional fragmentation.

Our empirical findings identify two distinct categories of regulatory incoherence: structural gaps concentrated in subnational statutes with high CSI scores, driven by provincial and state autonomy in electoral financing, and philosophical gaps in federal statutes with low CSI scores, which indicate profound shifts in regulatory philosophy concerning content safety and national security. The Coherence Potential score establishes a systematic basis for prioritizing reform efforts, thereby channeling attention toward the top twenty percent of gaps where intervention is most urgently required. However, we have also recognized the inherent limitations of attributing observed drift to either structural or philosophical causes, especially in cases where constitutional constraints themselves embody earlier philosophical choices embedded in federal design.

The normative trade-off between coherence efficiency and federal experimentalism remains unresolved. Although some degree of definitional divergence may reflect legitimate local adaptation, our analysis indicates that the current layering of fragmentation types, structural divergence from earlier eras coupled with philosophical divergence from recent reforms, compounds the challenge of attaining regulatory coherence. The FBRCM framework functions as a diagnostic instrument that informs the political process of regulatory design without substituting for it. Future research should extend this framework to other federations, integrate empirical data on platform enforcement, and develop normative criteria for prioritizing coherence gaps. This paper advances a more rigorous understanding of how constitutional architecture shapes the legal meaning of political misinformation in the digital age by introducing a systematic, data-driven method for comparing federal misinformation regimes.

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