УДК: 339.92:502.131.1:504.06:519.83
DOI: https://doi.org/10.30838/EP.213.515-522

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CLIMATE POLICY AS A TOOL OF DEVELOPMENT CONTAINMENT: GREENWASHING AND TAXONOMIC FRAGMENTATION IN A GAME-THEORETIC PERSPECTIVE

The study provides a game-theoretic explanation of greenwashing and taxonomic fragmentation as rational strategies under localized regulatory logic. It demonstrates that the coexistence of multiple sustainable finance taxonomies and persistent greenwashing practices reflect strategic behavior rather than institutional failure. Greenwashing and inter-jurisdictional taxonomic arbitrage are shown to be functionally isomorphic strategies based on a common chain of information asymmetry, interpretive flexibility, manipulative redefinition, and rent extraction. The study establishes that taxonomic fragmentation represents a higher-order strategy that shifts regulatory conflict from compliance with common rules to the formation of those rules. The scientific novelty lies in the development of a game-theoretic framework that interprets greenwashing and taxonomic fragmentation as rational responses within climate regulation, and in introducing the concept of regulatory climate isomorphism.

Keywords: *environmental regulation, decarbonization, climate change, regulatory competition, green economy, sanctions, arbitration, climate policy, Paris Agreement, CBAM.*

JEL classification: *F18, F53, Q54, Q56, Q58, C72.*

ISSN друкованої версії: 2224-6282
ISSN електронної версії: 2224-6290

КЛІМАТИЧНА ПОЛІТИКА ЯК ІНСТРУМЕНТ СТРИМУВАННЯ РОЗВИТКУ: ГРІНВОШИНГ І ТАКСОНОМІЧНА ФРАГМЕНТАЦІЯ У ТЕОРЕТИКО-ІГРОВІЙ ПЕРСПЕКТИВІ

Мета дослідження полягає в обґрунтуванні гріновошингу і таксономічної фрагментації як раціональної поведінки учасників кліматичного регуляторного простору в умовах конкуренції регуляторних режимів, а також у концептуалізації функціонального ізоморфізму гріновошингу і міжюрисдикційного таксономічного арбітражу. В статті розглянуто сутність таксономічної фрагментації як стратегії вищого порядку в архітектурі політики стримування розвитку. Обґрунтовано, що співіснування більш ніж двох десятків таксономій сталої діяльності і практика гріновошингу у корпоративній сфері не можуть бути адекватно пояснені через категорії інституційної слабкості, технічних труднощів гармонізації або недостатньої політичної волі. Окреслені явища становлять раціональну поведінку учасників в умовах, коли правила колективної дії подаються як універсальні, але фактично функціонують як механізм асиметричного перерозподілу вигод.

У результаті дослідження показано, що практика конкуренції регуляторних режимів у сфері кліматичного регулювання структурно відповідає п'яти класичним стратегічним конфігураціям взаємодії: проблемі безбілетника, стратегії «розори сусіда», трагедії громад, дилемі в'язня і проблемі асиметричної інформації. Встановлено, що гріновошинг на корпоративному рівні і таксономічний арбітраж на рівні юрисдикцій становлять функціонально ізоморфні стратегії, які ґрунтуються на тотожному структурному ланцюгу: асиметрія інформації - інтерпретативна гнучкість - маніпулятивне переозначення діяльності - отримання ренти без відповідних витрат на структурну адаптацію. Обґрунтовано, що таксономічна фрагментація виконує роль стратегії вищого порядку, яка переносить регуляторний конфлікт з рівня поведінки учасників у межах єдиних правил на рівень самих правил, переозначуючи відхилення від кооперації як «альтернативну кооперативну стратегію».

Наукова новизна одержаних результатів полягає у формуванні теоретико-ігрової рамки, яка інтерпретує гріновошинг і таксономічну фрагментацію не як дисфункції, а як раціональні стратегії учасників у фрагментованій регуляторній практиці. Запропоновано концепт регуляторного кліматичного ізоморфізму як структурної тотожності стратегічних конфігурацій у різних сегментах кліматичного регуляторного простору, що виявляється у відтворенні єдиного функціонального ланцюга незалежно від масштабу актора, інституційного рівня і типу регуляторного інструменту; у межах цього концепту корпоративний гріновошинг і міжюрисдикційний таксономічний арбітраж розкрито як дві масштабні маніфестації єдиного патерну. Удосконалено підхід до типологізації регуляторних відповідей на гріновошинг і таксономічний арбітраж. Дістало подальшого розвитку положення про стримувальну функцію конкуренції регуляторних режимів, що реалізується через асиметричний доступ учасників до формування таксономій.

Ключові слова: *екологічне регулювання, декарбонізація, зміни клімату, регуляторна конкуренція, зелена економіка, санкції, арбітраж, кліматична політика, Паризька угода, CBAM.*

Formulation of the problem. In the decade since the Paris Agreement, the global climate regulatory space has developed a paradoxical architecture. Despite the formal centrality of the multilateral framework, an increasing share of the regulatory burden has shifted to localized instruments, namely the EU Carbon Border Adjustment Mechanism, the US Inflation Reduction Act, and the PRC's dual carbon policy. In parallel, more than two dozen taxonomies of sustainable activities circulate globally with no signs of convergence. These empirical facts constitute the study's working assumption.

The dominant explanation appeals to institutional weakness, technical difficulties of harmonization, and insufficient political will, treating greenwashing and taxonomic fragmentation as dysfunctions to be eliminated through stronger oversight. Yet the persistence of both phenomena despite years of effort suggests an alternative reading, according to which both are rational behavior of participants in conditions where the rules of collective action are presented as universal but in fact function as mechanisms for asymmetric redistribution of benefits. On this reading, their persistence is not a paradox but a natural consequence of the incentive structure. An adequate theoretical response should therefore be sought not in the technical improvement of individual instruments, but in the game-theoretic disclosure of the structure of strategic interaction.

The central thesis is that localized regulatory logic in the climate sphere is embedded in the architecture of development-containment policies and reproduced through five classic game-theoretic configurations: the free-rider problem, the beggar-thy-neighbor strategy, the tragedy of the commons, the prisoner's dilemma, and the problem of asymmetric information. Taxonomic fragmentation, however, is not merely another illustration of these models, but a higher-order strategy that allows a participant deviating from cooperation within uniform rules to redefine non-cooperative behavior as an "alternative cooperative strategy" by creating an alternative set of rules. Disclosing this thesis requires conceptualizing the functional isomorphism between greenwashing and taxonomic arbitrage as structurally similar phenomena, and introducing a working concept of regulatory climate isomorphism that spans both

corporate and interjurisdictional scales.

Analysis of recent research and publications. Methodological foundations for assessing environmental regulation and the green economy are developed by V. Chala and Yu. Orlovska [1–4], while R. Clift and L. Wright [5] examine the link between environmental impact and value creation in supply chains. Theoretical interpretations of neoprotectionism and the liberal international economic order are presented in [6] and elaborated by R. Sally [7]. The institutionalization of climate policy and decarbonization is analyzed in [8], and geoeconomic decoupling in [9]. The evolution of the European climate policy framework, including the European Green Deal and legal instruments of environmental governance, is reflected in the works of V. Dankevych, E. Dankevych, N. Bondarchuk and V. Strilchuk [10], A. Getman, O. Danilyan, O. Dzeban, Y. Kalynovskyi and J. Crespo [11], and M. Medvedieva, R. Yedeliev, A. Nanavov and G. Grydasova [12]. The transformation of the EU climate policy mix is analyzed by S. Oberthür and I. von Homeyer [13], while the distributive effects of carbon border instruments are critically assessed by X. Sun, Z. Mi, L. Cheng, D. Coffman and Y. Liu [14]. Theoretical developments in ecological modernization and sustainability transitions are further elaborated by A. Tsybuliak [15; 20], while institutional mechanisms for supporting circular economy development are considered in [16; 17]. O. Ptashchenko and D. Arkhypova [18] examine broader global challenges and sustainability-oriented transformations, as do H. Duhinets and O. Yatsenko [19].

The institutional dimension of structural similarity is reflected in the concept of isomorphism by P. DiMaggio and W. Powell [21]. At the same time, the theoretical basis for analyzing strategic interaction in the climate regulatory space is grounded in the classical contributions of game theory and the economics of information. The logic of collective action and the free-rider problem is developed by M. Olson [22]. The concept of the tragedy of the commons is introduced by G. Hardin [23] and further institutionalized in the theory of common-pool resource governance by E. Ostrom [24]. R. Axelrod [25] analyzes the dynamics of cooperation and non-cooperative equilibria. The problem of asymmetric information is conceptualized by G. Akerlof [26], while signaling mechanisms in such environments are developed by M. Spence [27].

Despite significant research on greening international trade, climate regulation, green finance, and the circular economy, the literature lacks a comprehensive game-theoretic justification of greenwashing and taxonomic fragmentation as rational behavior, mostly interpreting them as institutional weakness. The functional isomorphism between corporate greenwashing and interjurisdictional taxonomic arbitrage remains insufficiently understood, as does the role of fragmentation as a higher-order strategy that shifts regulatory conflict to the rules of the game themselves. This creates a need for a framework that covers both scales and explains their persistence through the apparatus of game theory.

The purpose of the article is to provide a game-theoretical justification of greenwashing and taxonomic fragmentation as rational behavior of participants in the climate regulatory space under conditions of localized regulatory logic, to conceptualize the functional isomorphism of corporate greenwashing and interjurisdictional taxonomic arbitrage, and to justify taxonomic fragmentation as a higher-order strategy in the architecture of development containment policies.

Research methods. Game-theoretic analysis was used to interpret greenwashing and taxonomic arbitrage through five classical models of non-cooperative interaction. Method of analogy was used to substantiate the functional isomorphism of the two manifestations; structural-logical analysis - to reveal the transition from behavior within rules to changing the rules themselves; the comparative method - to examine their characteristics in a functional-isomorphism table, and theoretical generalization method - to derive propositions about the architectural role of taxonomic fragmentation in development containment policy.

Presentation of the main results of the study. The reading of localized regulatory logic as a non-cooperative game proceeds from the recognition that each leading regulatory center acts as a rational actor whose objective function is not reduced to the collective good of a stabilized climate. Alongside decarbonization, it includes maximizing technological and financial leadership in green sectors, protecting the national industrial base, preserving regulatory autonomy, and setting standards for external actors. In such a policy-goal configuration, climate stabilization is one component, but not necessarily the dominant one, and any step that raises a participant's decarbonization costs without improving its position on the other goals meets rational resistance. The game-theoretic models are applied not as formalized constructions with payoff matrices, but as conceptual schemes revealing the structure of strategic incentives, consistent with the institutional game theory of E. Ostrom [24], who used the apparatus diagnostically rather than to predict numerical equilibria.

The free-rider problem [22] describes incentives to use an indivisible collective good without contributing to its production. In climate terms, the good is climate stabilization, and the contribution is the decarbonization cost. The multiplicity of taxonomies adds a degree of freedom, since under a single taxonomy, free-riding is obvious, but with alternatives, a participant can satisfy the most lenient criteria while claiming cooperative status. The inclusion of "transitional" activities in national taxonomies that fail the stricter European criteria illustrates legitimized free-riding enabled by alternative rules.

The beggar-thy-neighbor strategy refers to unilateral actions that improve the initiator's position at third parties' expense, without compensation; classically, currency devaluation and interwar protectionism. Its climate version is reflected in CBAM and IRA localization requirements. CBAM, justified as a measure to prevent leakage, in fact redistributes rents from external producers to the European budget and restores European price competitiveness. The empirical study of H. Sun et al. [14] show it is ineffective in its declared function while generating unfair distributive consequences, including welfare losses for third countries. The IRA's localization requirements similarly redirect global investment to the US and exclude competitors from

value-chain segments. The defining feature of climate adaptation is its presentation as a universal norm rather than a discriminatory instrument, which complicates attribution to unilateral action in disputes.

The tragedy of the commons [23] describes depletion of a common resource through rational individual exploitation, in climatology, the atmosphere's absorptive capacity. The taxonomic version shifts the object of depletion from the physical resource to the informational resource of verifiability. With a single taxonomy, the «sustainable» label carries high information value, but across two dozen taxonomies, total verifiability declines. E. Ostrom showed that the tragedy is resolvable only within a single-rule system providing monitoring, sanctions, and mutual recognition of boundaries, conditions that the multiplicity of taxonomies structurally excludes, reproducing the problem through the very architecture of the regulatory space.

The prisoner's dilemma describes how rational deviation from cooperation yields a suboptimal collective outcome even when recognized by all. In climate regulation, it manifests as a gap between declared cooperation at the Conferences of the Parties and actual behavior through unilateral instruments that violate the spirit of coordination but not formally agreed norms. R. Axelrod [25] and DiMaggio and Powell [21] showed that, in repeated play, cooperation can stabilize through tit-for-tat, but only with comparable strategies and transparent moves. Taxonomic fragmentation undermines both comparability through divergent criteria and transparency through selective non-financial reporting, so the climate version loses the properties that create prerequisites for a cooperative solution.

The problem of asymmetric information [26] describes markets in which poor goods crowd out good ones because quality cannot be verified, and M. Spence [27] added the idea of signals that high-quality participants use to differentiate. Green activities are goods of hidden quality, and taxonomies serve as signals. Their multiplicity, however, generates signal inflation, since if almost any project can find at least one qualifying taxonomy, the signal value of any single taxonomy tends to zero, turning signal into noise and depriving the high-quality participant of an effective differentiation mechanism.

The five models provide the basis for a deeper structural thesis that requires terminological clarification. Functional isomorphism, in the system-theoretic sense, denotes the structural identity of functional mechanisms in systems differing in scale, institutional nature, or empirical manifestation, but reproducing an identical configuration of strategic incentives, sequence of actions, and method of rent generation. It is not external similarity, but identity of the internal architecture of strategic interaction. This concept should be distinguished from the institutional isomorphism of DiMaggio and Powell [21], where structural similarity arises diachronically from coercive pressure, mimesis, and normative professionalization. Here, isomorphism has a different status. It is not gradual convergence among actors, but a synchronous identity of strategies, namely a simultaneous rational response of participants at different scales to an identical configuration of information asymmetry and rent-seeking. The two approaches capture distinct dimensions of regulatory reality, procedural-institutional and structural-strategic.

On this basis, the article proposes the concept of *regulatory climate isomorphism*, defined as the structural identity of strategic configurations in different segments of the climate regulatory space, manifested in the reproduction of a single functional chain *(information asymmetry, interpretive flexibility, manipulative redefinition, and rent without structural costs)* regardless of the scale of the actor, institutional level, or type of instrument. Its defining feature is the combination of structural identity with formal-legal dissimilarity: corporate reporting, national taxonomy, and supranational classification are regulated by different branches of law and bodies, yet functionally implement a single strategy. This combination makes the pattern difficult to identify within sectoral analysis while being critical for understanding the holistic architecture of the regulatory space.

The central manifestation of regulatory climate isomorphism is the structural identity of corporate greenwashing and jurisdictional taxonomic arbitrage. Corporate greenwashing is a rational response to information asymmetry between a company and external stakeholders, in which a company manipulates external perceptions through selective disclosure, favorable metrics, and the redefinition of operations to gain reputational and financial rents without bearing the structural costs of decarbonization. Taxonomic arbitrage arises from the same premise at the jurisdictional level: a jurisdiction that constructs a taxonomy tailored to its industrial structure gains access to international capital and technological legitimacy without the structural costs of decarbonization under stricter criteria. The isomorphism rests on the identity of the functional chain, since information asymmetry creates interpretive flexibility, which opens space for manipulative redefinition, generating rent without corresponding costs, differing only in the nature of the actor, the object of manipulation, and the mechanism of action. A fundamental consequence is that the regulatory response should be structurally similar. In practice, the two are addressed by distinct mechanisms (anti-greenwashing directives and reporting standards versus harmonization initiatives and sustainable-finance platforms), which reduces effectiveness because both rely on the same prerequisite. The combined comparison is given in Table 1.

The central conceptual contribution is identifying taxonomic fragmentation as a higher-order strategy. Within a single taxonomy, deviation from cooperation is unambiguous and punishable, which is a precondition for any sanction mechanism. Creating an alternative taxonomy changes this, since a participant failing the dominant criteria leaves the non-cooperative state if it simultaneously satisfies an alternative taxonomy created by itself or an allied participant, redefining deviation as an «alternative cooperative strategy» and shifting the conflict from the implementation of rules to the question of which rules are real. This replacement of the game space transforms fragmentation into a strategy that operates not within existing rules but at the level of their formation. The analogy is a chess player who, losing under classical rules, proposes a modified set of rules favoring his position. In chess, this is rejected because

a central body maintains uniform rules, but in the climate regulatory space, no such arbiter exists, so the creation of alternative rules is not a violation but an exercise of regulatory sovereignty. The consequence is a change in the subject of regulatory discussion. The fight against greenwashing operates within the rules, requiring truthful reporting, clear metrics, and independent verification, whereas countering taxonomic arbitrage requires action at the level of the rules themselves, namely, harmonization of metacriteria, a hierarchy of taxonomies, and mechanisms of mutual recognition. Most current initiatives operate at the first level and are therefore structurally unable to solve a second-level problem, a gap that explains the persistence of fragmentation despite declared interest in harmonization.

Table 1

Functional isomorphism of greenwashing and taxonomic arbitrage

Characteristics	Greenwashing (corporate level)	Taxonomic arbitrage (jurisdictional level)
Actor	*Company*	*State or regulatory block*
Object of manipulation	External perception of the company's activities	International perception of jurisdictional climate policy
Mechanism of action	Selective disclosure of data, choice of the most favorable metrics, and redefinition of activities	Creating one's own taxonomy with criteria adapted to national preferences
Informational effect	Decrease in the verifiability of corporate green declarations	Reducing comparability of cross-jurisdictional sustainability data
Consequence for the collective good	Deterioration of the quality of the market signal about sustainability	Deteriorating quality of international climate coordination
Type of rent	Reputational and financial rent from the "green" brand without corresponding costs	Access to capital markets and technological legitimation without structural costs of decarbonization
Regulatory response	Anti-greenwashing directives, non-financial reporting standards	Taxonomy harmonization initiatives, international sustainable finance platforms

Source: compiled by the authors.

A generalized reading interprets localized regulatory logic as functionally embedded in development containment policy, implemented through structural asymmetry of access to taxonomy formation. Jurisdictions with well-developed institutions, leadership in green technologies, and large domestic markets can establish «ultra-prestigious» taxonomies that serve as criteria for access to capital and trade markets. Jurisdictions protecting their industrial base can establish «protected» taxonomies admitting transitional activities. Peripheral countries, lacking both, become mandatory respondents, obliged to meet ultra-prestigious criteria for market access yet unable to decarbonize rapidly or establish recognized protected taxonomies. This asymmetry reproduces and amplifies the development gap while formally contradicting no principle of the Paris Agreement or any WTO norm. The deterrent function operates not through direct discrimination, but through a localized regulatory logic that turns fragmentation into an instrument of protected access to the collective good. It is not a defect, but a working mechanism of structural redistribution reproducible within the formal-legal norms of the multilateral framework.

Conclusions. The research allows several theoretical propositions. Greenwashing at the corporate level and taxonomic arbitrage at the jurisdictional level are not dysfunctions but forms of rational behavior under conditions where universal rules of collective action function in practice as mechanisms of asymmetric redistribution. This rationality is captured by five classical game-theoretic models in their climate and taxonomic adaptations, each revealing a specific dimension of strategic interaction and, together, forming a coherent map of the behavioral foundations of localized regulatory logic.

The functional isomorphism between greenwashing and taxonomic arbitrage rests on a single structural chain: information asymmetry, interpretive flexibility, manipulative redefinition, and rent extraction without corresponding adaptation costs. It implies the need for a structurally equivalent regulatory response, which the current dispersion of instruments does not provide. The proposed concept of regulatory climate isomorphism reframes this dispersion as a systemic problem rather than a natural feature of the field, providing a methodological basis for integrated regulatory design.

Taxonomic fragmentation functions as a higher-order strategy embedded in the architecture of development containment, shifting competition from compliance with rules to rule formation and thereby creating institutional entry barriers for actors that do not control taxonomy-setting. Its specificity lies in moving regulatory conflict from behavior within unified rules to the rules themselves, redefining non-cooperative behavior as an «alternative cooperative strategy». The structural deterrent function is realized through asymmetric access to taxonomy formation: leading jurisdictions set ultra-prestigious taxonomies as access criteria, challenger jurisdictions develop protective taxonomies, and peripheral economies are positioned as rule-takers. This configuration operates effectively in line with the multilateral climate framework and WTO norms.

For economies that are not among the leading architects of the new order, the practical implication is the need to design strategies addressing both the behavioral and meta-game dimensions of the regulatory space. For Ukraine, in the context of post-war reconstruction on a sustainability basis, this means simultaneously complying with ultra-prestigious criteria to secure market access and financing while developing its own regulatory framework to maintain strategic autonomy in setting sustainability priorities. Future research includes climate-technological decoupling as a limiting form of localized regulatory logic, the structural consequences of the emerging order for the Global South, and the applicability of regulatory climate

isomorphism to adjacent domains such as the digital economy and AI sandboxes, where divergent eligibility criteria reproduce the logic of arbitrage through a plurality of rules.

Declaration on the use of artificial intelligence. The authors declare that the generative artificial intelligence tools Grammarly were used in the preparation of this manuscript solely for linguistic editing, grammar correction, stylistic improvement, and technical formatting of the text in accordance with the requirements of the journal. The conceptual framework, theoretical foundations, analytical interpretations, empirical analysis, and conclusions presented in the article are the result of the authors' own intellectual work and were neither created nor significantly developed by artificial intelligence. The authors bear full responsibility for the scientific quality and content of the manuscript.

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Дата надходження статті: 30.04.2026 р.
Дата прийняття статті до друку: 25.05.2026 р.
Дата публікації (оприлюднення) статті: 12.06.2026 р.