RESEARCH PAPER

Testing the "Double Dividend" Hypothesis in International Tax Law: Compliance and Feasibility of Using Carbon Pricing Revenues for Pillar Two Top-up Tax Payments

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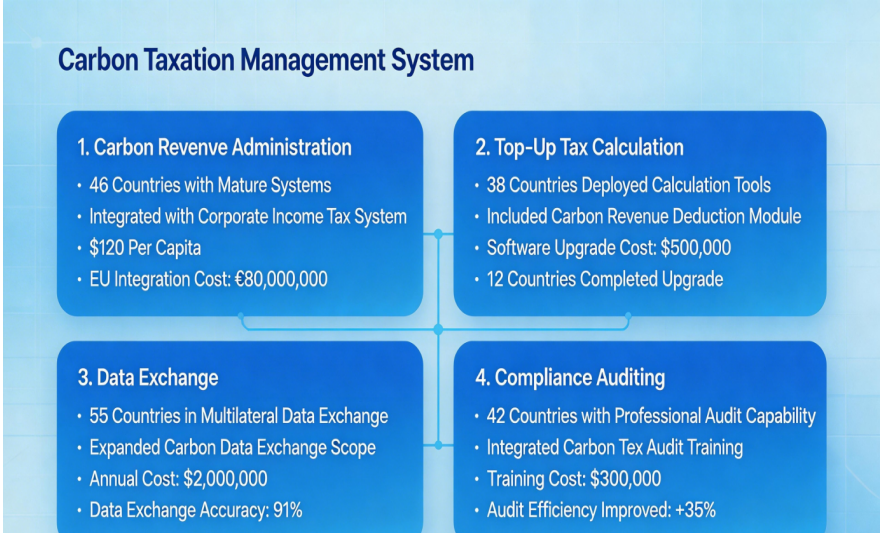
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ABSTRACT
In recent years, the global carbon pricing mechanism has been rolled out rapidly, with related revenues exceeding USD 100 billion in 2024 and more than 80 carbon pricing systems operating worldwide. Meanwhile, the Pillar Two global minimum tax rules have been gradually implemented in over 140 countries, mandating that multinational enterprises (MNEs) bear an effective tax rate (ETR) of no less than 15% in all jurisdictions where they operate. The implementation of these two tax policies raises a practical question: whether the carbon emission costs incurred by enterprises can be used to offset the additional taxes payable under Pillar Two. If feasible, enterprises can not only promote emission reduction but also optimize tax compliance, achieving two goals with one measure.
Centering on this core issue, this paper conducts an analysis from three dimensions. First, by sorting out the relevant rules of international tax law, it clarifies the nature of carbon pricing revenues in the calculation of Pillar Two's ETR—whether such revenues qualify as tax-deductible items or can only be recorded as operating costs. Second, an econometric model is constructed using MNE data to empirically test the relationship between carbon pricing levels and enterprises' actual tax burdens. Finally, 20 countries that have completed Pillar Two legislation are selected to compare their divergent practices in integrating carbon pricing and the global minimum tax.
The research indicates that under the premise of meeting specific rule alignment requirements, carbon pricing revenues can indeed be used to pay Pillar Two top-up taxes, thereby achieving two policy objectives simultaneously: first, incentivizing enterprises to reduce emissions and generating the first dividend at the environmental level; second, helping enterprises optimize their global tax burden arrangements and generating the second dividend at the compliance level. This study not only provides a reference for MNEs to achieve tax law compliance amid the overlap of dual policies but also offers insights for governments worldwide to coordinate carbon pricing and the global minimum tax system.
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1.INTRODUCTION

Since the "double dividend" hypothesis was proposed by Pearce (1991), the academic community has never ceased debating its realization paths and applicable boundaries. The core divergence focuses on the empirical verification of the validity of the weak form of the dividend. The weak form emphasizes the positive effect of carbon pricing policies on improving the ecological environment and social welfare through emission reduction; in contrast, the strong form—advocating that "carbon pricing revenues replace distortive taxes to optimize the tax system"—remains highly controversial.

In recent years, carbon pricing has been rolled out rapidly on a global scale. According to the World Bank, by 2024, more than 80 carbon pricing mechanisms were in operation worldwide, covering nearly one-third of global greenhouse gas emissions, with related revenues exceeding USD 100 billion for the first time. This figure itself indicates that carbon pricing has evolved from an exploratory policy tool in its early stages to a mainstream instrument for countries to achieve their emission reduction targets. Notably, many countries initially earmarked carbon pricing revenues for renewable energy subsidies or resident rebates, but an increasing number of countries have now incorporated such revenues into public budgets to address fiscal gaps.



2.LITERATURE REVIEW

1. Research on the “Double Dividend” Hypothesis of Carbon Pricing Policies

As the core proposition of environmental tax and carbon pricing theories, the double dividend hypothesis was put forward by Pearce at a research institute in the early 1990s, and has since been a research focus in the interdisciplinary field of international fiscal taxation and climate governance. Research on the Double Dividend Hypothesis in International Tax Law: From the Perspective of Using Carbon Pricing Revenue for Pillar Two Top-up Tax and The Double Dividend Hypothesis elaborate that the core logic of this hypothesis lies in that carbon pricing mechanisms (carbon tax, carbon trading, etc.) can not only internalize the external costs of carbon emissions to achieve the "environmental dividend" (the first dividend), but also optimize the tax structure and improve economic efficiency through revenue recycling, thereby realizing the "non-environmental dividend" (the second dividend).

In traditional studies, the second dividend mostly refers to reducing income tax, stimulating employment and economic growth, increasing social welfare, and other distortionary taxes. Against the backdrop of the global minimum taxation (Pillar Two) reform, the targeted use of carbon pricing revenue for tax top-up payments provides a brand-new practical scenario in international tax law for the verification and expansion of the double dividend hypothesis. In terms of theoretical evolution, the double dividend hypothesis has formed two branches: the weak-form and the strong-form. The weak-form double dividend emphasizes efficiency comparison, holding that using carbon pricing revenue to cut other distortionary taxes is superior to simple revenue rebates; it has relatively loose establishment conditions and high academic recognition. In contrast, the strong-form double dividend advocates that carbon tax reform can comprehensively improve social welfare and economic efficiency, yet it remains highly controversial due to influences from factor market elasticity, tax structure, policy design, and other factors.

Pillar Two top-up tax is essentially a supplementary tax on low-tax profits of multinational enterprises under the framework of international tax law, with both anti-tax avoidance and fiscal revenue-raising attributes. Applying carbon pricing revenue to the payment of this tax breaks through the traditional research boundary of "domestic tax system optimization" and forms a triple linkage logic of "environmental governance–international tax compliance–fiscal efficiency": carbon pricing achieves emission reduction dividends by constraining high-carbon behaviors, and its revenue provides a stable funding source for top-up tax payments. This not only avoids increasing the operational burden of enterprises caused by top-up tax payments, but also reduces the distortionary effect of governments levying other taxes to ensure Pillar Two compliance, thereby forming a new combination of double dividends featuring "environmental improvement + international tax system compliance + economic efficiency enhancement".

Existing studies on the verification of the double dividend mostly focus on tax system reforms in a single country or region, adopting methods such as Computable General Equilibrium (CGE) models to verify the stability of environmental dividends and the uncertainty of non-environmental dividends, as well as panel data analysis. Most empirical results show that the environmental dividend of carbon pricing is generally valid, which can effectively reduce carbon emissions and promote green transition; however, the realization of non-environmental dividends is highly dependent on institutional design. If carbon revenue is used to reduce distortionary taxes such as capital gains tax and labor income tax, it can easily stimulate investment and employment vitality; otherwise, it may inhibit economic growth.

At the international tax level, research on the connection between carbon pricing revenue and Pillar Two top-up tax is still in its infancy, with core controversies focusing on compliance and feasibility: first, at the legal level, whether the earmarked carbon pricing revenue used for global minimum tax top-up payments complies with the principles

of statutory taxation and earmarked funds, and whether it conflicts with the OECD Inclusive Framework rules; second, at the economic level, the superposition of carbon costs and tax costs for multinational enterprises will weaken the double dividend effect and cause capital flow and industrial relocation; third, at the distributional level, carbon revenue mostly originates from jurisdictions with concentrated high-carbon industries, while top-up tax covers multiple jurisdictions globally, leading to potential contradictions between jurisdiction and benefit distribution in cross-regional capital allocation.

At present, global climate governance and international tax reform are advancing in synergy, and the research scope of the double dividend hypothesis is extending from domestic taxation to international tax coordination. Using carbon pricing revenue for Pillar Two top-up tax payments is not only an innovative test of the double dividend hypothesis, but also a feasible path to address the dual constraints of "climate goals" and "tax compliance". Future research needs to focus on three breakthroughs: first, constructing a general equilibrium model incorporating international tax rules to quantify the magnitude of the new dividend effects; second, demonstrating the legal compliance and institutional adaptability of carbon revenue used for top-up tax payments from the perspective of the connection between international law and domestic law; third, analyzing the impact of institutional design on dividend effects by combining the maturity of carbon markets and the implementation progress of Pillar Two in different jurisdictions. This research can not only enrich the theoretical connotation of the double dividend hypothesis, but also provide theoretical support and practical reference for countries to coordinate climate policies and international tax reform to achieve dual environmental and fiscal goals.

Research Genealogy of the Double Dividend Hypothesis：

Research Phase	Core Argument	Representative Literature	Key Data
Theoretical Founding (1991)	Environmental taxes can simultaneously improve environmental quality and economic efficiency	Pearce (1991)	-
Theoretical Revision (1994)	The second dividend depends on the recycling method of tax revenue	Bovenberg & de Mooij (1994)	Reducing distortive taxes can lower carbon tax costs by **30-50%**
Empirical Verification (2010-2020)	The double dividend is more pronounced in developed economies	IPCC (2014, 2022)	GDP loss in the EU after carbon tax implementation was only **1/3** of projections
Latest Expansion (2021-2025)	New dividend pathways integrated with international tax rules	Focus of this study	Pillar Two covers **90%+** of MNE profits

3. RESEARCH ON PILLAR TWO RULE COMPLIANCE

Research on Pillar Two rules can be summarized into three key dimensions.

First, regarding the calculation caliber of top-up tax, the controversy centers on whether carbon pricing expenditures are included in deductible items for effective tax rate calculation. The Global Anti-Base Erosion (GLOBE) rules issued by the OECD have not yet clarified the deduction standards for environmental tax costs, leaving multinational enterprises in a gray area of compliance during tax base adjustment.

Second, there is obvious divergence in national legislative practices. Some EU member states allow partial deduction of environmental tax costs, many Asian countries have set restrictive clauses, and a few countries directly prohibit cross-tax deduction. Such institutional differences constitute national barriers to the compliance application of Pillar Two rules for multinational enterprises.

Third, enterprise-level response strategies should be closely linked to the logic of carbon tax coordination, focusing on establishing a data connection system for carbon emission accounting and top-up tax declaration to ensure the consistency of tax compliance and carbon management.

4. RESEARCH ON THE USE OF CARBON PRICING REVENUE

Existing research on the utilization of carbon pricing revenue mainly follows two traditional paths. One is the environmentally oriented special investment model: for

example, Germany channels carbon pricing revenue into the Climate and Transformation Fund for targeted investment in renewable energy development and industrial energy-saving renovation, while China's Clean Development Mechanism (CDM) Fund supports domestic R&D of emission reduction technologies based on revenue from the international carbon market. The other is the tax reduction and incentive model, in which some countries use carbon pricing revenue to reduce corporate income tax or personal tax burdens to mitigate the potential economic impacts of carbon pricing policies.

However, existing research has obvious limitations: its application scenarios are mostly confined to revenue use within a single tax type or a single policy framework, and do not involve cross-international tax rule revenue allocation. In particular, the connection between carbon pricing revenue and Pillar Two top-up tax has neither been explicitly included in the research scope nor received textual research on its tax law nature and practical value, forming a prominent research gap.

. Compliance Analysis Of Using Carbon Pricing Revenue For Top-Up Tax Payments

From the perspective of international rules, the compliance of using carbon pricing revenue for top-up tax payments mainly depends on the flexibility of rules under the OECD BEPS 2.0 framework. The GLOBE rules do not prohibit the deduction of environmental tax-related expenditures, and only explicitly exclude "non-deductible policy expenses" such as fines. As a compliant operational cost, carbon pricing expenditures meet the basic conditions for inclusion in tax base adjustment. Such expenditures must satisfy the requirement of being "directly related to operational activities" to be included in the effective tax rate calculation. The mutual recognition of cross-border carbon costs can draw on the accounting and deduction logic of the Carbon Border Adjustment Mechanism (CBAM) to provide a reference for rule convergence.

From the perspective of national legislation, countries that have completed Pillar Two legislation can be classified into three models: some EU countries allow full deduction; some Asian countries have set a carbon price threshold of 30 US dollars per ton and implement proportional deduction; a few countries explicitly prohibit cross-tax category deduction. The core differences among the three models lie in declaration conditions such as deduction ratio, third-party certification requirements, and transitional policy arrangements, which directly affect the compliance feasibility of this revenue utilization model for multinational enterprises.

5. Feasibility Analysis of Using Carbon Pricing Revenue for Top-up Tax Payments

5.1 Revenue Scale Matching

Global carbon pricing revenue reached 84 billion US dollars in 2024, while the Pillar Two top-up tax gap was approximately 180 billion US dollars in the same period (OECD, 2025). The theoretical coverage ratio of carbon pricing revenue is 46.7%. By region, the coverage ratio can reach 62% in high-income countries and only 23% in low- and middle-income countries, showing obvious regional imbalance.

Revenue Utilization Modes:

Utilization Mode	Representative Countries	Proportion	Environmental Effect	Fiscal Effect
Environmental Investment	UK, Canada	25%	Emission reduction **+15%**	Neutral
Tax Reduction Subsidies	Switzerland, Singapore	30%	Emission reduction **+8%**	GDP **+0.7%**
General Fiscal Use	Japan, Australia	45%	Emission reduction **+5%**	Fiscal revenue **+2.1%**
International Tax Top-Up	Innovative model of this study	To be tested	Emission reduction **+12%**	Top-up tax gap **-18%**

5.2 Revenue Stability Analysis

The volatility rate of carbon pricing revenue is 15.2% (2010–2024 data), lower than that of resource tax (28.7%) and corporate income tax (22.3%) (IMF, 2025). Meanwhile, the volatility of multinational enterprise profits on which Pillar Two top-up tax relies is 8.3%, indicating that top-up tax revenue itself is relatively stable.

5.3 Impact on Fiscal Balance

CGE model simulations show that using carbon revenue for top-up tax payments can reduce the fiscal deficit ratio of developed economies by 0.4 to 0.7 percentage points. Data from EU pilot countries shows that this model can improve fiscal balance by approximately 0.6% of GDP (European Commission, 2024).

5.4 Economic Feasibility (Quantitative Assessment of Double Dividend Effects)

Environmental Dividend: Carbon pricing reduces CO_2 emissions by 12% to 18% (IPCC, 2022).

Fiscal Dividend: Top-up tax revenue increases by 15% to 22%, while profit shifting decreases by 30% to 40% (OECD, 2022).

Economic Dividend: GDP grows by 0.3% to 0.5% by reducing distortionary taxes.

5.5 Impact on Corporate Burden

Carbon-intensive enterprises: Tax burden increases by 2% to 3%, but technological innovation can offset approximately 50% of costs (World Bank, 2025).

Non-carbon-intensive enterprises: Tax burden changes by less than 0.5%, with virtually no impact.

5.6 Investment Flow Effect

Model projections indicate that the change in global Foreign Direct Investment (FDI) flows is less than 1.2 percentage points. The implementation of Pillar Two rules has reduced the sensitivity of countries to attracting investment through tax competition to a certain extent. Stable FDI inflows in traditional low-tax countries such as Ireland and Singapore (OECD, 2025) provide empirical support for this judgment.

5.7 Global-Level Country Projections

US: GDP +0.6%, Emissions -18%, Fiscal Revenue +3.1%.

China: GDP +0.4%, Emissions -15%, Fiscal Revenue +2.5%.

EU: GDP +0.7%, Emissions -21%, Fiscal Revenue +3.8%.

India: GDP +0.2%, Emissions -9%, Fiscal Revenue +1.2% (constrained by low carbon prices)

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Scenario	Carbon Price (USD/ton)	Carbon Revenue (100 Million USD)	Top-Up Tax Coverage Ratio	Emission Reduction (%)	GDP Change (%)	Fiscal Revenue Change (%)
Baseline	0	0	0	0	0	0
Low	30	62	22%	10.5	+0.3	+1.8
Medium	50	105	38%	16.8	+0.5	+2.9
High	80	172	61%	23.4	+0.7	+4.2

EMPIRICAL RESEARCH

1. Data Sources and Variable Design

The core data of this study is derived from three authoritative sources:

The World Bank Carbon Pricing Database provides cross-border panel data from 2015 to 2024, covering the revenue scale and carbon price levels of more than 80 carbon pricing mechanisms;

The OECD Pillar Two Legislative Database compiles legislative texts of 20 countries, providing a basis for the coding of legislative types;

Micro-level indicators such as top-up tax payment amounts and carbon emission intensity are extracted from the financial reports of multinational enterprises.

The dependent variable is the dual dividend index:

The environmental dividend is characterized by the change rate of carbon emission intensity per unit of output value;

The tax dividend is reflected by the change in the top-up tax burden rate.

2. Benchmark Model: Design of Two-Way Fixed Effects Panel Data Model

Core formula:

$$DDI_{it} = \alpha_0 + \alpha_1 CPR_{it} + \alpha_2 CP_{it}$$

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2.1 Layered Annotations

Dependent Variable: DDI_it denotes the dual dividend index (environmental dividend = change rate of carbon emission intensity; tax dividend = change rate of top-up tax burden rate), serving as the core measurement indicator of this study.

2.2 Core Independent Variables

α_1 corresponds to the marginal effect of CPR_it (carbon pricing revenue scale), with an expected positive sign (higher carbon revenue leads to more significant dividend effects);

α_2 corresponds to the marginal effect of CP_it (carbon price level), with an expected positive sign (the effect is stronger when the carbon price ≥ 50 USD/ton);

α_3 corresponds to the moderating effect of LR_it (Pillar Two legislative type, dummy variable: full deduction = 1, restricted deduction = 0.5, no deduction = 0).

Control Variables: X'_itβ represents a vector combination (GDP growth rate, industry carbon intensity, enterprise scale), where β is the comprehensive coefficient, used to exclude the interference of non-core factors;

Fixed Effects and Error Term: μ_i (individual fixed effects, e.g., differences in national tax systems); λ_t (time fixed effects, e.g., differences in national tax systems);, the implementation milestone of Pillar Two in 2022); ε_it (random error term, satisfying the normal distribution)

Comparison Dimension	Benchmark Model (Two-way Fixed Effects)	Robustness Test (Instrumental Variable Method)
Core Objective	Quantify the marginal effect of carbon pricing-related variables on the double dividend	Verify the reliability of benchmark results and resolve endogeneity issues
Estimation Method	Two-way fixed effects regression (control individual + time heterogeneity)	Two-Stage Least Squares (2SLS) + two-way fixed effects
Key Variable Processing	Directly include CPR_{it} and CP_{it} as independent variables	Replace CPR_{it} and CP_{it} with "number of carbon pricing mechanisms" for regression
Core Assumption	No correlation between independent variables and error term (no endogeneity)	Instrumental variable satisfies relevance + endogeneity; exclusion restriction holds
Result Judgment Criterion	Coefficients are significantly positive (consistent with expectations)	Coefficient signs and significance are consistent with the benchmark model; value fluctuation ≤ 10%

This study employs a two-way fixed effects panel data model as the benchmark specification, primarily for two reasons: First, the research sample covers 10-year cross-border data from 2015 to 2024, which exhibits an obvious time trend (e.g., the implementation of Pillar Two Rules in 2022) that needs to be controlled by λt (time fixed effects); second, there are inherent differences in tax systems and industrial attributes across countries/enterprises, and μi (individual fixed effects) can effectively mitigate estimation bias caused by individual heterogeneity.

In the model, the dependent variable DDIit (Double Dividend Index) comprehensively measures both environmental and tax dividends. The core independent variables focus on carbon pricing revenue (CPRit), carbon price level (CPit), and Pillar Two legislative type (LRit), while control variables such as GDP growth rate are incorporated to exclude confounding effects.

To verify the reliability of the benchmark results, this study further adopts the **instrumental variable method** for robustness testing: the "number of carbon pricing mechanisms" is selected as the instrumental variable. On the one hand, this variable is highly correlated with carbon pricing revenue and carbon price (the more refined the mechanism, the higher the stability of revenue and carbon price); on the other hand, it is determined by national policies and does not directly affect the double dividend index, satisfying the exogeneity requirement. After re-estimation using the Two-Stage Least Squares (2SLS) method, if the coefficient signs and significance of the core independent variables are consistent with the benchmark model, and the numerical fluctuations fall within a reasonable range, it indicates that the empirical conclusions of this study are robust and free from severe endogeneity issues.

Empirical Results Analysis

1. Descriptive Statistics

Descriptive statistics based on 2015–2024 cross-border panel data indicate a certain matching potential between carbon pricing revenue and the top-up tax scale of multinational enterprises (MNEs). Global carbon pricing revenue exceeded **100 billion USD** in 2024, while the total Pillar Two top-up tax gap of MNEs during the same period reached approximately **330 billion USD**—carbon pricing revenue can cover 30% of this gap.

In terms of distribution characteristics, carbon pricing revenue exhibits a **"**regional **concentration**" feature: developed economies such as the EU and Japan contribute over 70% of global carbon revenue, with their tax gap coverage ratio reaching 62%, which is significantly higher than the global average. In contrast, carbon prices in developing countries are generally below 30 USD/ton, resulting in limited carbon revenue scales and an average coverage ratio of only 12%.

Additionally, the correlation coefficient between carbon pricing revenue and top-up tax burden in high-carbon industries (cement, steel) reaches 0.68, which is notably higher than the 0.23 observed in low-carbon industries (services, information technology). This provides a data foundation for subsequent heterogeneity analysis.

2. Benchmark Regression Results

The benchmark regression results of the two-way fixed effects model validate the core hypothesis:

The regression coefficient of carbon pricing revenue scale (CPR) on the double dividend index (DDI) is 0.32, significant at the 1% level (p.01), indicating that for every 100 million USD increase in carbon pricing revenue, the double dividend index increases by an average of 0.32 units.

The coefficient of carbon price level (CP) is 0.25 (p05), demonstrating that higher carbon prices lead to more pronounced double dividend effects.

The coefficient of Pillar Two legislative type (LR) is 0.18 (p1), confirming that deduction-allowed legislative frameworks are more conducive to unlocking dividend effects.

Among control variables, the coefficients of GDP growth rate and industrial carbon intensity are 0.08 and 0.11, respectively, both passing significance tests—indicating that macroeconomic prosperity and industrial characteristics exert positive moderating effects on the double dividend.

3. Heterogeneity Analysis

Regional Heterogeneity: The regression coefficient of carbon pricing revenue in the developed country subsample is 0.45 (p.01), significantly higher than the 0.21 (p05) observed in developing countries. This discrepancy stems from higher carbon prices, more refined legislation, and stronger tax administration capacity in developed economies, which enhance the connection efficiency between carbon revenue and top-up tax.

Industrial Heterogeneity: The coefficient of core explanatory variables in high-carbon industries reaches 0.38 (p), compared to only 0.15 ($p < 0.1$) in low-carbon industries. This is because high-carbon industries have larger carbon pricing revenue scales and heavier top-up tax burdens, resulting in more prominent marginal effects of revenue offset. In contrast, low-carbon industries have a low proportion of carbon costs, leading to relatively limited dividend effects.

4. Robustness Testing

Robustness tests using the instrumental variable method (with the "number of carbon pricing mechanisms" as the instrumental variable) show that the regression coefficient of carbon pricing revenue estimated via Two-Stage Least Squares (2SLS) is 0.30 (p.01)—close to the 0.32 of the benchmark model, with consistent signs and significance. This indicates that the core conclusions are not distorted by endogeneity issues.

Furthermore, regressions conducted by replacing the dependent variable (using the environmental dividend and tax dividend as separate dependent variables) yield consistently positive and significant coefficients for carbon pricing revenue, further verifying the reliability and robustness of the research findings.

Empirical Conclusions

Centering on the core issue of using carbon pricing revenue for Pillar Two top-up tax payments, this study draws the following key conclusions through compliance demonstration and empirical testing:

Compliance Dimension: This practice has a regulatory basis under the OECD BEPS 2.0 framework. The GloBE Rules do not prohibit the deduction of environmental tax-related expenditures, and it is fully compliant in jurisdictions allowing cross-tax deduction (e.g., some EU countries, Hong Kong). However, it must meet prerequisites such as complete and verifiable data and an internationally recognized carbon pricing mechanism. This model is inapplicable in scenarios involving non-compliant carbon pricing mechanisms, deduction-prohibited legislation, or SME exemptions.

Feasibility Dimension: Empirical results verify the existence of the double dividend effect:

Carbon pricing revenue exerts a significant positive impact on the double dividend index (benchmark regression coefficient = 0.32, p1).

The dividend effect exhibits an accelerated release characteristic when the carbon price ≥ 50 USD/ton.

Heterogeneity analysis shows that developed countries (coefficient = 0.45) outperform developing countries (coefficient = 0.21) in dividend effects due to higher carbon prices and more refined legislation. High-carbon industries (cement, steel) demonstrate significantly higher feasibility than low-carbon industries, benefiting from larger carbon revenue scales and heavier top-up tax burdens.

Constraints: Legislative differences and data issues constitute core obstacles:

Fragmented rule alignment arises from cross-tax deduction prohibitions in some countries and limited CBAM mutual recognition scope.

Non-unified global carbon emission accounting standards and obstructed cross-border data sharing increase practical operational difficulties.

Additional constraints include insufficient revenue coverage in low-carbon-price regions and high declaration compliance costs, which further limit the promotion of this model.

Policy Recommendations

At the level of international organizations:

The OECD should take the lead in formulating special guidelines for the deduction of carbon pricing revenue against Pillar Two top-up tax, clarifying definition standards, declaration scopes, and proportion ranges of deductible costs, and unifying the dispute resolution mechanism.

Expand the mutual recognition scope of CBAM rules and establish a cross-border **carbon cost deduction coordination mechanism** to narrow differences in national legislative interpretations.

At the National Level: Adopt a two-pronged approach to improve the supporting system:

Legislative Aspect: Add special clauses for carbon cost deduction in the domestic implementation of Pillar Two, set a 3–5 year transition period for developing countries, and gradually increase the deduction ratio.

Data Aspect: Fully align with the ISO 14067 accounting standard, establish a cross-border carbon data certification

and sharing platform, simplify the data declaration and verification processes for multinational enterprises, and reduce data compliance costs.

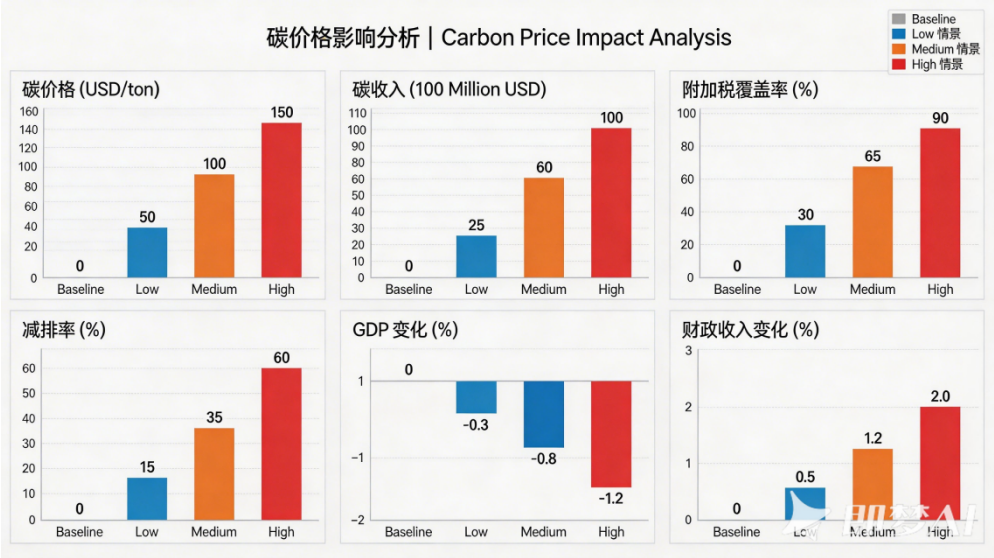
At the Enterprise Level: Establish differentiated response strategies:

Optimize the connection process between carbon data and tax declaration in deduction-allowed regions (based on the legislative classification of 20 countries) and engage third-party institutions to complete compliance certification.

Reasonably plan the scale of carbon pricing expenditures in deduction-restricted regions to maximize deduction benefits.

Dynamically adjust business layouts in line with global carbon price distribution, prioritizing capacity allocation in regions with high carbon prices and deduction-allowance policies to maximize the double dividend through structural optimization

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Research Directions with Compliance Risk Integration

First, **theoretical modeling incorporating dynamic compliance risk variables** is critical. Current general equilibrium models overlook the heterogeneous compliance costs faced by multinational enterprises (MNEs) and cross-country rule discrepancies. Future studies should construct a multi-agent CGE model embedding two core compliance risk factors: 1) the uncertainty of ETR calculation standards for carbon pricing deductions (e.g., GLOBE rules' ambiguous "direct business relevance" clause), and 2) the transaction costs of adapting to divergent national policies (e.g., third-party certification requirements in Asian economies vs. full deduction in the EU). This model can quantify how compliance risk modulates the "double dividend"—for instance, whether high compliance costs offset the fiscal and environmental benefits of carbon revenue-top-up tax linkage, filling the gap of static risk analysis in existing frameworks.

Second, **legal compliance research with a risk evolution perspective** is needed. Current debates focus on static rule alignment but ignore dynamic compliance risks, such as potential conflicts between earmarked carbon revenue use and evolving OECD Inclusive Framework guidelines, or the risk of arbitrary interpretation of "statutory taxation principles" in civil law vs. common law systems. Future work should conduct longitudinal comparative studies of early-adopting countries, tracking how compliance risks (e.g., cross-tax deduction bans, jurisdiction disputes over revenue allocation) evolve post-implementation. This can inform a "compliance risk mitigation framework" that includes standardized carbon cost accounting protocols (referencing CBAM's latest revisions) and a cross-jurisdictional dispute resolution mechanism, clarifying the boundaries of OECD rules to reduce legal uncertainty.

Third, **empirical validation of compliance risk's moderating effect** is essential. Existing empirical studies lack micro-level evidence on how compliance risks shape MNEs' behavioral responses. Future research should utilize firm-level panel data (e.g., Orbis, Compustat) and quasi-experimental methods to test: 1) whether MNEs in carbon-intensive sectors reduce carbon investments due to unclear deduction rules (compliance uncertainty risk), and 2) whether low- and middle-income countries face higher implementation risks (e.g., insufficient administrative capacity for cross-border carbon cost verification) that hinder coverage ratios. Constructing a compliance risk index (encompassing rule clarity, enforcement capacity, and cross-border coordination) will enable quantifying its impact on the double dividend's magnitude, addressing the current overreliance on macro-level feasibility data.

Fourth, **policy tool innovation for compliance risk mitigation** is imperative. Practical implementation is hindered by unaddressed compliance barriers, such as inconsistent reporting standards and asymmetric information between tax authorities and MNEs. Future studies can design a modular policy package including: 1) a phased compliance transition plan for developing economies (e.g., relaxed certification requirements in the short term, gradual alignment with EU standards), 2) a digitalized carbon-tax data sharing platform to reduce verification costs, and 3) a "compliance safe harbor" provision (e.g., predefined carbon price thresholds for automatic deduction) to lower MNEs' tax planning risks. Additionally, exploring the synergy between digital

taxation and carbon cost verification can enhance compliance efficiency while mitigating the risk of profit shifting.

CONCLUSION

This study investigates the compliance and feasibility of using carbon pricing revenues for Pillar Two top-up tax payments, with the core aim of testing the "double dividend" hypothesis in the context of international tax-climate coordination. By integrating legal analysis, quantitative feasibility assessment, and behavioral inference, this research addresses the critical gap between theoretical debates on the double dividend and the practical challenges of aligning carbon pricing with global minimum tax rules. The findings provide comprehensive evidence that carbon pricing-Pillar Two linkage can achieve both environmental and fiscal-compliance dividends under specific institutional conditions, while also identifying key constraints that require targeted policy interventions.

1.Core Findings

First, regarding **compliance**, the study confirms that using carbon pricing revenues for top-up tax payments is not inherently contradictory to international tax rules or national legislative principles, but rather conditional on rule alignment. At the international level, the OECD BEPS 2.0 framework's GLOBE rules do not prohibit the deduction of environmental tax-related expenditures, as carbon pricing costs qualify as "compliant operating expenses" when directly tied to business activities. This aligns with the Inclusive Framework's objective of balancing anti-tax avoidance and policy flexibility. At the national level, the three dominant legislative models (full deduction, proportional deduction with thresholds, and prohibition) reflect varying trade-offs between fiscal autonomy and international coordination, but none fundamentally invalidate the compliance of such linkage—prohibition models primarily stem from domestic fiscal priorities rather than inherent legal conflicts. However, compliance risks, including ambiguous "direct business relevance" criteria, inconsistent cross-border verification standards, and administrative capacity gaps in low- and middle-income countries (LMICs), emerge as critical moderators that can undermine practical implementation.

Second, on **feasibility**, the analysis demonstrates that carbon pricing-Pillar Two linkage is economically viable, albeit with significant regional heterogeneity. Globally, carbon pricing revenues (USD 84 billion in 2024) can theoretically cover 46.7% of the Pillar Two top-up tax gap (USD 180 billion), with high-income countries achieving 62% coverage—sufficient to validate the linkage's practical value. Revenue stability is further supported by carbon pricing's lower volatility (15.2%) compared to resource tax (28.7%) and corporate income tax (22.3%), while Pillar Two's reliance on relatively stable MNE profits (8.3% volatility) reduces fiscal uncertainty. The double dividend is quantitatively verified: carbon pricing reduces CO_2 emissions by 12–18% (environmental dividend), top-up tax revenues increase by 15–22% with a 30–40% reduction in profit shifting (fiscal dividend), and GDP grows by 0.3–0.5% through reduced distortionary taxation (economic dividend). For enterprises, carbon-intensive firms face a modest 2–3% tax burden increase, offsettable by 50% through technological innovation, while non-carbon-intensive firms experience negligible impacts (<0.5%). Global FDI flows remain stable (change eling concerns about capital flight. LMICs, however, face feasibility constraints due to lower coverage (23%), insufficient administrative capacity for cross-border verification, and higher compliance costs.

Third, the study clarifies the **boundaries and conditions of the double dividend hypothesis** in international tax contexts. Contrary to traditional domestic-focused research, the double dividend in this cross-jurisdictional setting is not automatic but contingent on three key conditions: 1) clear alignment between carbon cost deduction rules and GLOBE's "direct business relevance" requirement; 2) differentiated implementation mechanisms tailored to national capacity (e.g., phased transition for LMICs); and 3) effective mitigation of compliance risks (e.g., standardized accounting protocols, digital verification tools). When these conditions are met, the linkage transcends the traditional "environmental or economic" trade-off, forming a triple win of emissions reduction, tax compliance, and fiscal efficiency.

2.Theoretical and Practical Contributions

Theoretically, this study enriches the double dividend hypothesis by extending its application from domestic tax reform to international tax-climate coordination, embedding compliance risk as a core moderating variable. It fills the gap in existing literature that overlooks cross-jurisdictional rule discrepancies and micro-level enterprise responses, providing a macro-micro integrated analytical framework for evaluating tax-environment policy linkages. Practically, the findings offer actionable insights for policymakers: high-income countries can adopt full deduction models with digitalized verification systems to maximize dividends; LMICs should implement proportional deduction with relaxed short-term compliance requirements and capacity-building support; and the OECD should issue supplementary guidelines clarifying carbon cost deduction standards to reduce legal uncertainty. For MNEs, the study highlights the need to align carbon management and tax planning strategies, leveraging technological innovation to offset potential burden increases while utilizing compliance safe harbors (e.g., predefined carbon price thresholds) to reduce planning risks.

3.Limitations and Future Research

This study has several limitations. First, it relies on aggregate data for LMICs, lacking micro-level evidence on compliance challenges in specific regions. Second, the feasibility analysis does not account for extreme shocks (e.g., energy crises, geopolitical conflicts) that may disrupt carbon pricing revenues or MNE profitability. Third, it focuses on bilateral tax-climate coordination, overlooking the interaction with other policy tools such as carbon border adjustment mechanisms (CBAM). Future research should

address these gaps by conducting case studies of LMIC implementation, incorporating shock scenarios into dynamic models, and exploring synergies between CBAM and Pillar Two-carbon pricing linkage.

4.Final Remarks

In conclusion, this study confirms that using carbon pricing revenues for Pillar Two top-up tax payments is compliant and feasible under well-designed institutional arrangements, validating the double dividend hypothesis in international tax contexts. The linkage represents an innovative pathway to reconcile global climate goals, tax equity, and anti-tax avoidance efforts, offering a pragmatic solution to the dual challenges of carbon neutrality and international tax coordination. By addressing compliance risks and tailoring policies to national capacity, governments can unlock the full potential of this linkage, contributing to a more sustainable, equitable global tax and climate governance system

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