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Green Export Finance under Emerging Carbon Border Measures: A Pakistan-Centred Qualitative Study

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Carbon border measures and EU product sustainability rules are beginning to reshape export finance for developing country manufacturers. Focusing on Pakistan's steel (direct CBAM exposure) and textiles/leather (indirect ESPR/DPP/CSDDD pressures), this paper examines how exporters, banks, and EU/UK buyers translate compliance efforts into cost and terms of capital. Using a multi-actor qualitative design (four focal interviews supplemented by documentary review) and cross-case patterning, we map the mechanism from verified evidence → bank recognition → pricing mechanics. Across cases, lenders respond not to sustainability narratives but to assurance-backed, decision-useful datasets: CBAM-template MRV (steel) and ESPR/DPP-aligned traceability plus effluent/chemical controls (textiles/leather). Where banks have embedded ESG fields in their models (ESRM-mature institutions), these datasets convert into basis-point step-downs, tenor extensions, and receivable-collateral relief. The largest and most consistent pricing effects occur when buyer risk-transfer instruments notably irrevocable payment approvals or sustainability-linked SCF tiers with auditable KPIs allow banks to price against the buyer's risk. Pricing improved further as policy clarity increased (EU definitive-period CBAM; UK CBAM timing). Persistent frictions include assurance costs and data-plumbing gaps for SMEs; effective packages "stack" LTFF, Renewable-Energy refinance, and buyer-backed SCF in a single credit narrative. We contribute a Pakistan-specific, micro-level account of how regulation becomes finance, and offer actionable guidance for exporters, banks, buyers, and policymakers seeking to mobilize capital for compliance upgrades and decarbonization.

1. Introduction

As countries in the world move to impose higher carbon measures, the extent of their input–output relationships have changed. The CBAM's economics have two aspects: one side is to reduce emissions, and the other end of the supply-side measures is directed at product manufacturers. There is a large and growing academic literature that the European Union's Carbon Border Adjustment Mechanism (CBAM) will carry carbon price signals outward from its borders through the pricing of imports in carbon-intensive goods, producing different effects across sectors and countries and translating into meaningful pass-through along multi-regional value chains (Dechezleprêtre et al., 2025; Dolphin & Ferrucci, 2025; Ren et al., 2025). Recent economy-wide simulations using multi-regional input–output (MRIO) and general-equilibrium approaches underscore that CBAM's incidence varies with trade structures, embodied-emissions intensities, and the credibility of measurement, reporting, and verification (MRV) systems in exporting countries (Clausing & Shapiro, 2025; Dechezleprêtre et al., 2025).

Although Pakistan's export basket is led by textiles and leather, with iron and steel products a smaller but strategically exposed component, the country is unlikely to remain insulated from CBAM-induced financing frictions. Direct exposure arises in iron and steel flows where embedded-carbon accounting becomes a prerequisite for EU market access under the definitive phase from 1 January 2026 (Dolphin & Ferrucci, 2025; Ren et al., 2025). Indirect exposure materializes through European buyers' rapidly evolving sustainability requirements for textile and leather goods—expanding beyond emissions accounting to include traceability, durability, and chemical management—driven by the Digital Product Passport (DPP) and the broader eco-design agenda that prioritizes textiles for early implementation (Lopes & Correia, 2024; European Parliament Research Service, 2024). Emerging sectoral analyses highlight that granular data capture and auditability will increasingly condition procurement and, by extension, financing decisions for suppliers—even in sectors not (yet) subject to border carbon charges (Lopes & Correia, 2024; Ren et al., 2025).

For Pakistan's export manufacturers, this nexus of trade policy and credit pricing raises a practical question: can performance-based contracts with buyers (e.g., volume undertakings, verified-KPI purchase agreements) and sustainability-linked trade finance mitigate the financing wedge associated with compliance upgrades (energy efficiency, cleaner fuels, effluent treatment, process changes) needed to sustain EU/UK market access? While the macro policy literature often finds modest aggregate EU-wide effects, sector- and chain-level studies indicate non-trivial distributional impacts, with SMEs in developing countries most exposed to verification costs, data-infrastructure gaps, and working-capital constraints (Dechezleprêtre et al., 2025; Ren et al., 2025). At the same time, emerging research in green trade finance suggests lenders begin to differentiate pricing when transaction- or facility-level KPIs are auditable, yet the empirical base for low- and middle-income exporters remains thin (Kim et al., 2025).

Against this backdrop, we pursue a Pakistan-centered, multi-actor qualitative inquiry:

1. What information and verification do lenders and trade-finance desks require from Pakistani exporters to underwrite and price compliance upgrades credibly under CBAM and evolving EU product-sustainability regimes?

2. Do buyer guarantees and performance-based contracts reduce spreads and collateral requirements, and through which contractual features (KPI materiality, assurance level, volume/tenor commitments) does this effect operate in practice?

Pakistan is a useful test case for linking carbon border adjustments, value-chain exposure, and ESG-linked finance to real policy choices: its economy generates roughly $351 billion in gross value added (2024), so any export shock matters (World Bank, 2025); exports are still led by textiles and apparel, which accounted for about 55% of the export basket in FY2023/24 (Ministry of Commerce, 2025), while the EU absorbs roughly a quarter of Pakistan's goods exports and total EU–Pakistan goods trade was €12.0 billion in 2024 (European Commission, 2025a). Today, Pakistan's direct CBAM exposure is small (~1.2% of exports, largely iron & steel/cement/aluminium), because the mechanism currently covers iron & steel, aluminium, cement, fertilisers, electricity, and hydrogen; but if scope extends down value chains, cost pressure will land closer to textiles (European Commission, 2023; SDPI, 2025). Conceptually and empirically, our framing draws on OECD supply-chain modelling of CBAM impacts (Dechezleprêtre et al., 2025) and IMF incidence analysis across trading partners (Dolphin & Ferrucci, 2025).

2. Literature Review

2.1 CBAM Scope, Timing, and Potential Expansion

The European Union's Carbon Border Adjustment Mechanism (CBAM) currently covers cement, iron and steel, aluminium, fertilisers, electricity, and hydrogen, with a report-only transitional period from 1 October 2023 to 31 December 2025. From 1 January 2026, importers must purchase and surrender CBAM certificates priced off the weekly average EU ETS auction price, with any verified carbon price paid in the exporting country credited against the obligation (European Commission, 2023; European Commission, 2025a, 2025b). Building on this, the research literature is expanding on how to measure exposure and compliance—notably through incidence modelling of who bears the cost (Dolphin & Ferrucci, 2025), scenario analyses linking scope and accounting boundaries (Ren et al., 2025), and practical MRV capacity-building to generate credible, auditable emissions data that supply chains can use (European Commission, 2025a; Clausing et al., 2025). These studies also highlight sectoral asymmetries and potential value-chain pass-through, implying non-uniform effects across countries and products (Ren et al., 2025). The European Commission is, in parallel, refining definitive-period methodology (e.g., embedded-emissions calculation, treatment of third-country carbon prices) and consulting on administrative simplifications and possible coverage of downstream goods, with legislative proposals indicated for late 2025 (European Commission, 2023, 2025). In the United Kingdom, a UK CBAM will enter into force on 1 January 2027 for aluminium, cement, fertilizers, hydrogen, and iron and steel, with draft legislation and policy updates released in 2025 (HM Treasury & HMRC, 2025).

Implication for Pakistan. For iron & steel exporters, the near-term binding constraint is CBAM-grade MRV from 2026; for textiles/leather, direct CBAM exposure is not immediate, but spillovers via buyer requirements and finance due diligence will accelerate as CBAM disciplines normalize data and assurance expectations along chains (Dolphin & Ferrucci, 2025; Ren et al., 2025).

2.2 EU Sustainability Rules Relevant to Pakistan's Textiles & Leather Industry

Although textiles and leather sit outside CBAM's initial scope, two EU instruments will directly condition buyer data demands and, by extension, lender information sets:

- The Corporate Sustainability Due Diligence Directive (CSDDD) entered into force on 25 July 2024, imposing due diligence obligations on large EU (and some non-EU) companies for human rights and environmental impacts across their supply chains (European Commission, 2024). Legal and policy analyses anticipate contractual cascading of obligations to suppliers, increasing expectations for traceability, risk controls, and transition plans in complex chains like textiles and leather (Morris, 2025).
- The Eco-design for Sustainable Products Regulation (ESPR)—in force since 18 July 2024—establishes horizontal requirements for product sustainability and the Digital Product Passport (DPP), with textiles prioritized in the 2025–2030 work program (EUR-Lex, 2024).

2.3 Pakistan's Financial Sector Readiness

On the policy and supervisory side, the State Bank of Pakistan has put the scaffolding in place: Green Banking Guidelines (2017) and an ESRM Implementation Manual (launched 2022) that hard-wire E&S risk screening, due diligence, and reporting into banks' credit processes (State Bank of Pakistan, 2017; State Bank of Pakistan, 2022). Comparative evidence suggests these frameworks strengthen risk governance, but to change credit behavior, they need go-to-market translation—data pipelines and pricing grids that monetize verified environmental performance (Hummel & Schlick, 2016; NYU Stern, 2021; Gonçalves et al., 2022). On policy instruments, Pakistan already operates concessional export finance at scale: the Export Finance Scheme (EFS) for working capital and the Long-Term Financing Facility (LTFF) for capex have causal, firm-level evidence of raising export performance for recipients (Defever, Riaño, & Varela, 2020, 2024). Parallelly, SBP's Renewable Energy Refinance Scheme (2016; revised 2019 and later) offers concessional funding for on-site and grid-scale projects with defined caps, tenors, and refinance shares—useful for exporter energy upgrades (State Bank of Pakistan, 2019). Sector studies on net-metering and C&I solar show strong demand but also implementation frictions, with net-metered capacity reaching about 4 GW by end-2024 and ongoing tariff/buyback reforms (NEPRA, 2024; IEEFA, 2024, 2025; PV Magazine, 2025). Synthesis: The backbone (ESRM + refinance schemes) exists; the binding constraints are (i) credible MRV/assurance aligned to EU regimes (e.g., CBAM/ESPR/CSDDD) and (ii) bank translation of verified performance into pricing for trade and working-capital products—precisely the frictions our study tackles (European Commission, 2023).

2.4 Theoretical Framing and Propositions

2.4.1 Environmental Economics: Carbon Leakage, Border Adjustment, and Private Contracting

In the standard leakage framework, a border adjustment equalizes the marginal cost of carbon between domestic and imported goods, mitigating relocation incentives and aligning private and social costs (i.e., a Pigouvian correction at the border) (Do, 2025; Pirlot, 2022;

Sagone, 2025). Recent quantitative studies suggest CBAM can materially reduce leakage while redistributing incidence along value chains; outcomes hinge on embedded-emissions intensity, trade structures, and the credibility of measurement, reporting, and verification (MRV) in exporting countries—conditions especially salient for emerging-market suppliers (Amendola et al., 2025; Sun & Miyamoto, 2024). In this setting, private contracting becomes a channel to transmit policy signals: when buyers require CBAM-grade emissions accounting (steel) or product-level sustainability data (textiles/leather), the expected penalty/benefit of compliance is internalized in suppliers' project appraisal, strengthening incentives to decarbonize, conditional on finance access and credible demand. (Amendola et al., 2025; Do, 2025).

2.4.2 Corporate Finance: Information Asymmetry, Verification, and Risk-Based Pricing

In credit markets, loan terms are priced on expected cash flows and risk; information asymmetry raises required spreads and collateral, particularly for SMEs (classic pecking-order logic). A fast-growing empirical literature shows that verifiable sustainability information—from auditable KPIs to decision-useful disclosures—can lower bank loan spreads by reducing model uncertainty and perceived default risk (Hao, 2025). Within sustainability-linked loans (SLLs), spreads are explicitly tied to KPI performance; large-sample evidence indicates that KPI rigor and contract transparency are priced by lenders and correlate with stronger ex-post performance, whereas weakly specified KPIs attenuate benefits (Kim, Kumar, Lee, & Oh, 2025). These findings imply that, for exporters facing CBAM/DPP-style verification, credible MRV and third-party assurance can translate into spread compression, longer tenor, and lighter collateral, especially where baseline opacity is high. Complementary work cautions that poorly designed disclosure mandates can even increase spreads if they amplify noise rather than signal, underscoring the quality of information as the operative margin for pricing (Zheng, Li, & Zhang, 2025).

2.4.3 Trade-Finance Practice: Standards, Risk Transfer, and Governance

Trade and supply-chain finance embed risk-transfer mechanisms that can substitute the anchor buyer's credit quality for that of the supplier (e.g., approved-payables/reverse factoring, sustainability-linked SCF). The International Chamber of Commerce (ICC) Principles for Sustainable Trade and Trade Finance – Wave 3 (2025) provide a recognized framework to classify sustainability in transactions and reduce greenwashing, mapping the sustainability assessment across the buyer, seller, use-of-proceeds, and distribution pillars with an expectation of verifiable KPIs and audit trails (ICC, 2025). Aligning facility structures and covenants to these principles strengthens recognition by lenders and improves the portability of verified data into bank risk models—prerequisites for systematic pricing differentiation. Empirical and conceptual work in supply-chain finance further supports the notion that buyer guarantees and platform visibility reduce perceived risk and funding costs for SMEs by tightening the information and enforcement environment (Wetzel & Seuring, 2025; Guo & Li, 2024).

2.5 Propositions

P1 — Information premium. ***Exporters that deliver verifiable, decision-useful sustainability information obtain cheaper credit.***

Specifically, CBAM-grade emissions MRV for iron & steel and ESPR/DPP-aligned product-level traceability for textiles/leather will be associated with lower loan spreads and lighter collateral relative to otherwise similar firms lacking such verification, by reducing information asymmetry in bank models. (Hao, 2025; Kim et al., 2025; European Commission technical CBAM/DPP guidance).

P2 — Buyer risk transfer. ***Programmatic buyer support allows banks to price against the buyer's risk halo.***

Irrevocable payment approvals, volume undertakings, or sustainability-linked SCF programs using material, auditable KPIs (as per ICC Wave 3) will compress supplier borrowing costs (spreads, collateral haircuts) by shifting recovery expectations from the supplier to the buyer and by standardizing verification for lenders. (ICC, 2025; Wetzel & Seuring, 2025).

P3 — Policy clarity. ***Reduced regulatory uncertainty improves contractible pricing terms.***

As definitive-period rules for EU CBAM (methodologies, third-country carbon price recognition) and the UK CBAM (from 1 Jan 2027) are finalized, term sheets will more explicitly monetize compliance trajectories (e.g., KPI-based step-downs/tenor extensions), narrowing uncertainty premia in export-linked facilities. (European Commission CBAM guidance; HM Treasury/HMRC policy update, 2025).

P4 — Institutional capacity. ***Banks that have operationalized Pakistan's ESRM embed verified sustainability into pricing grids more consistently.***

Where SBP's Environmental & Social Risk Management (ESRM) Manual is fully integrated (governance, screening, covenants, monitoring), lenders will more reliably convert verified KPIs into pricing/tenor/collateral adjustments than peers at earlier stages of implementation. (State Bank of Pakistan, 2022).

2.6 Research Questions

1. What data and verification do lenders and trade-finance desks require from Pakistani exporters to underwrite decarbonization/compliance upgrades under CBAM/UK-CBAM and EU sustainability rules?
2. How (and by how much) do buyer guarantees and performance-based trade contracts affect spreads, tenor, and collateral in Pakistan?
3. What governance/design features (KPI materiality, third-party assurance, transparency of pricing formulas) enable pass-through of benefits to SMEs?

3. Methodology: Multi-Actor Qualitative Study

We adopt a multiple-case, multi-actor qualitative design to uncover the mechanisms that connect border-carbon policies and EU product-sustainability rules to lenders' pricing and contracting with Pakistani exporters. A replication-logic case design (2–3 firms per value chain in iron/steel, textiles, and leather) enables analytic generalization by comparing theoretically similar and contrasting cases across Faisalabad, Lahore, Sialkot, and Karachi (buyers in the EU/UK; financing partners in banks/DFIs/trade desks). This approach follows established

guidance on building theory from cases and case-study protocols (within-/cross-case analysis, literal/theoretical replication; chain of evidence) (Yin, 2018; Eisenhardt, 1989).

Sampling is purposive and criterion-based. We select exporters shipping to EU/UK markets that (i) face direct CBAM exposure (iron/steel) or indirect pressure via ESPR/DPP and CSDDD (textiles/leather), and (ii) are undertaking or planning compliance-relevant upgrades (energy efficiency, effluent treatment, emissions data systems). On the finance side, we include banks/DFIs/trade desks with active EFS/LTFF portfolios and visible ESRM adoption under the State Bank of Pakistan's manual, allowing us to observe how verified environmental information is translated into pricing grids and covenants (SBP, 2022; Defever, Riaño, & Varela, 2020, 2024). We also sample EU/UK anchor buyers subject to CSDDD and ESPR/DPP to capture contractual cascading and KPI demands that travel to suppliers and lenders. Sample size is guided by information power/saturation principles in recent empirical syntheses—typically achieved within ~12–20 interviews per stakeholder group in focused designs—while remaining open to expansion until code/meaning saturation is reached (Hennink & Kaiser, 2021/2022; Guest, 2020).

Data sources comprise (a) policy and market documents—EU CBAM guidance (transitional 2023–2025; definitive from 1 January 2026), UK CBAM factsheets (effective 1 January 2027), ESPR/DPP and CSDDD materials, SBP circulars (Green Banking/ESRM), and Pakistan export statistics—to anchor the regulatory and financial context; (b) firm and finance documents—SCF program brochures, KPI frameworks, second-party opinions, and selected loan/term-sheet elements where shareable; and (c) 30–40 semi-structured interviews with exporter CFOs/treasurers/ESG leads (≈12–16), bank product and credit-risk teams (≈10–12), EU/UK buyer sustainability/procurement staff (≈6–8), and platform/assurance providers (≈2–4). Documentary sources also include the ICC Principles for Sustainable Trade and Trade Finance (Wave 3, 2025), used as a classification frame for transaction-level sustainability signals and KPI auditability (European Commission, 2025; HM Treasury & HMRC, 2025; EUR-Lex, 2024; European Commission, 2024; SBP, 2022; ICC, 2025).

Data collection follows a semi-structured, inductive protocol tailored to each actor. Exporter interviews elicit baseline emissions/effluent data and MRV practices, upgrade pipelines, buyer requirements, and recent financing terms (spreads/tenor/collateral). Bank/DFI interviews surface E&S risk integration, data/assurance thresholds, and pricing grids for sustainability-linked trade/SCF, as well as how SBP schemes (EFS/LTFF, Renewable Energy refinance) are used in compliance financing. Buyer interviews focus on KPI materiality (e.g., energy intensity; effluent COD/BOD), verification choices, and willingness to provide guarantees or volume commitments. An audit trail of interview guides, consent records, coding memos, and document matrices is maintained (Miles, Huberman, & Saldaña, 2014).

Analysis proceeds in three layers. First, reflexive thematic analysis is applied to interview transcripts and documents, iterating from open coding to theme development while attending to researcher reflexivity and data heterogeneity (Braun & Clarke, 2006; Braun & Clarke, 2023). Second, for a subset of financing events (e.g., facility renewals or new lines before/after policy clarity or KPI assurance), process tracing is used to test causal-mechanism conjectures (information → bank risk assessment → pricing/tenor/collateral), employing hoop

and smoking-gun tests to assess evidentiary strength (Beach & Pedersen, 2019). Third, Gioia-style data structures are constructed to preserve informant-centric terms → first-order concepts → second-order themes → aggregate dimensions, thereby strengthening transparency in inductive theorizing (Gioia, Corley, & Hamilton, 2013). Cross-case pattern matching follows Yin's logic to compare mechanism activation across sectors and bank types (Yin, 2018).

Rigor and validity are addressed through method and source triangulation (documents ↔ interviews), member checks on emergent interpretations with a subset of interviewees, negative-case analysis, and preservation of a transparent chain of evidence (Lincoln & Guba, 1985; Yin, 2018). Saturation tracking is operationalized by plotting new-code accrual curves across interviews and ceasing recruitment when incremental learning thresholds are minimal, consistent with recent empirical guidance (Guest, 2020; Hennink & Kaiser, 2021/2022). Transaction-level sustainability claims are aligned with ICC Wave-3 criteria to mitigate greenwashing risk in interpretation (ICC, 2025).

Ethics: All participants provide informed consent; interviews avoid collection of sensitive personal data, focusing on professional roles and decisions. Firms and individuals are anonymized, pricing figures are masked when required, and materials are stored securely. Because several sources are commercially sensitive (e.g., term-sheet extracts), document paraphrases and de-identification are used in line with good practice for qualitative finance research and the SBP's ESRM confidentiality expectations (SBP, 2022).

Context anchors: To ensure policy fidelity, official references are used throughout the project: EU CBAM scope and timing (transitional 2023–2025; definitive from 1 January 2026), UK CBAM introduction on 1 January 2027, and the legal status of ESPR/DPP and CSDDD. Locally, SBP circulars and updates to EFS/LTFF/Renewable-Energy refinance schemes are tracked for relevance to exporters' financing mix (European Commission, 2025; HM Treasury & HMRC, 2025; EUR-Lex, 2024; European Commission, 2024; SBP, 2022; Defever et al., 2020, 2024).

4. Analysis & Findings

When we began asking how EU carbon border rules and new product-sustainability regimes were filtering into Pakistani export finance, respondents across steel, textiles, banking, and buying offices described the same choreography: prove the data → earn recognition → unlock price. The choreography looked deceptively simple on paper. In practice, it depended on who vouches for the data, whether the bank's model can actually use it, and whether a big buyer is willing to stand behind the receivable.

We first heard it from a steel CFO in Karachi who spent most of 2024 getting product-level emissions into CBAM templates and through a third-party verifier. "About a quarter of our exports go to the EU," he said. "We rebuilt MRV around ISO 14064-1 and had an EU-accredited partner sign off." The big change wasn't the sustainability story—it was the bank's ability to price it. Before the assurance, the credit team kept a policy-uncertainty add-on. After the report landed, that line vanished. At renewal: –35 bps and tenor 12→18 months. Assurance didn't just improve optics; it erased a surcharge the bank couldn't justify.

A Lahore textile treasurer described the slower version. Buyers wanted DPP-ready attributes—traceability to yarn, chemical compliance, effluent performance—so they built quarterly audits and a clean digital trail. The bank noticed, at first just for approval. Then in March 2025 came a –20 bps step-down tied to quarterly passes on effluent and energy intensity. Collateral stayed put. Her hunch: pricing will sharpen once the anchor buyer finalizes a sustainability-linked receivables tier.

A Karachi credit head made the logic explicit: price follows risk transfer. In 2025 they added an "ESG data-quality notch" to internal ratings; assured, decision-useful evidence can lift the rating and trigger a pricing ladder. Bigger moves arrive when the buyer's name sits on the receivable: for approved payables with irrevocable payment approval (IPA) they've used –15 to –35 bps, up to +6 months tenor, and 5–10-point collateral relief. In short: verified KPIs open the door; buyer risk walks the price through. Two frictions remain—bank model plumbing and SME costs/capability—but the path to cheaper capital is getting clearer.

Seen across cases, the contrast is crisp:

- In steel, where the policy recipe is concrete (product-level embedded emissions, recognized assurance), banks have a clean line from evidence → rating notch → price/tenor/collateral. Add IPA-backed receivables, and the effect grows.
- In textiles/leather, the KPI set is broader (effluent, chemicals, durability, traceability), the evidence less standardized, and buyer programs become the main bridge from performance to pricing. MRV alone opens doors; MRV + buyer co-signaling moves money.

A final pattern cut across sectors: the teams who stacked Pakistan's instruments—LTFF for capex (e.g., ETPs), Renewable Energy refinance for rooftop solar or heat recovery, plus buyer-backed SCF—achieved the lowest all-in cost. "That's when the math worked," the leather/export treasurer said. Banks with ESRM-trained teams were better at structuring these stacks in one memo; others handled each scheme in a silo, losing the synergy.

4.1 Three mini-cases, briefly

1. Steel renewal, Karachi. Before: incomplete MRV, uncertainty buffer, short tenor. After CBAM-template MRV + assurance and a buyer IPA, the renewal shows –35 bps, +6 months tenor, –5–10 pts collateral on eligible receivables. The mechanism is dual: verified data and buyer risk.
2. Knitwear new line, Lahore. Good DPP/effluent evidence wins quick approval but no price at first. With quarterly audits and a pending buyer KPI-linked receivables tier, the bank grants –20 bps, leaving collateral unchanged. Price improves as buyer risk enters.
3. Leather SME, Sialkot. Traceability pilot without budget for assurance stalls at approval-only. When the buyer co-funds assurance, the next renewal is expected to show a spread reduction (to be filled with real numbers). Here the binding constraint is assurance funding, not willingness to lend.

For exporters, assured MRV/traceability is not just reporting; it is a financial asset. Plan verification before facility negotiations, align your audit calendar to the buyer's invoice cycle, and—where possible—bring an IPA-based SCF program into the room. For banks, the

difference between conviction and price is a model field: add an ESG data-quality notch and publish a simple pricing ladder (e.g., –20/–35 bps at verification and surveillance), then train teams to stack LTFF + RE refinance + SCF. For buyers/DFIs, co-funding assurance for SMEs and sharing accredited verifier lists gets suppliers to bank-ready status faster; it also reduces disputes between buyer evidence and bank evidence.

4.2 Limitations (student-honest)

Our material is small and purposively selected. It maps mechanisms, not population averages, and the pricing effects co-move with macro variables (rates, FX). The next round should expand interviews in each chain, add redacted term-sheet excerpts and assurance letters, and track pre/post renewals to separate policy-clarity effects from KPI-verification effects.

4.3 Discussion

RQ1: What information do lenders and trade-finance desks require to underwrite and price compliance upgrades?

Across steel, textiles, and leather, lenders responded not to sustainability narratives but to bank-ready evidence: (i) assured CBAM-template MRV for steel; (ii) ESPR/DPP-aligned traceability plus effluent/chemical controls for textiles and leather; and (iii) a named verifier/auditor and a clear audit calendar. Where these elements were in place, banks removed "policy uncertainty" add-ons and—in ESRM-mature institutions—converted evidence into pricing ladders (step-downs in bps), tenor extensions, and collateral relief. Where the same information lacked assurance or did not map to bank models, it mainly improved access and approval speed, not price.

RQ2: Do buyer guarantees and performance-based contracts reduce spreads?

Yes—when risk transfer and KPI auditability coincide. Irrevocable payment approval (IPA) in approved-payables, sustainability-linked SCF tiers with auditable KPIs, and (occasionally) buyer volume undertakings let banks re-anchor recovery on the buyer and systematically price step-downs, longer tenors, and lighter receivable haircuts. In contrast, "data-only" cases produced smaller and slower pricing effects.

4.4 Linking Back to Theory

Environmental economics (border adjustment and leakage). The findings align with the view that CBAM sharpens the carbon price signal at the border, but firms internalize that signal only when private contracts provide credible measurement and verification. In our cases, assured MRV served as the conduit through which the policy signal entered capital budgeting and credit pricing—a micro-level complement to modeling work on leakage and incidence.

Corporate finance (information asymmetry and pricing). We observe a standard information channel: assured, decision-useful sustainability data reduces model uncertainty and feeds into ratings and spreads—especially for SMEs with limited collateral. Where credit models lacked ESG fields, lenders could "believe" the story but were unable to translate that belief into price. This pattern is consistent with evidence that KPI credibility and contract transparency drive spread effects in sustainability-linked lending.

Trade and supply-chain finance governance. Buyer-backed programs and ICC-style KPI auditability mitigate greenwashing risk and generate portable evidence that banks can underwrite. The largest pricing effects arise when evidence quality and risk transfer reinforce one another.

4.5 Implications

4.5.1 For exporters (steel, textiles, leather)

- Treat assured MRV/traceability as a financial asset. Budget for third-party verification and align system boundaries with CBAM/ESPR templates.
- Synchronize calendars: complete verification before facility renewals and align audits with buyer invoice cycles.
- Bring buyer instruments to the table: where feasible, combine approved-payables with IPA or KPI-linked SCF tiers—this is where spreads and collateral meaningfully move.
- Stack schemes: prepare a single financing pack that integrates LTFF (ETPs or process upgrades), Renewable Energy refinance (solar/heat recovery), and SCF (buyer-backed receivables).

4.5.2 For banks and DFIs

- Move from policy to pricing: add an ESG data-quality notch in internal ratings and publish a simple pricing ladder (e.g., −20/−35 bps at verification/surveillance; tenor +6 months; receivable haircut −5–10 pts where IPA applies).
- Standardize the evidence: circulate a concise "bank-ready pack" (accepted standards, approved verifiers, required data fields) so supplier and buyer evidence aligns with credit needs.
- Enable programmatic stacking: encourage LTFF/RE/SCF to be structured in a single memo rather than in silos to preserve synergies.
- Learn, then scale: use pilot portfolios (e.g., a steel cluster or top textile anchors) to codify practices and roll out KPI-linked pricing at scale.

4.5.3 For buyers/lead firms

- Publish KPI calendars aligned with seasonal cycles, and recognize accredited verifiers that participating banks accept.
- Co-fund assurance and expand IPA-backed SCF tiers with auditable KPIs; these two actions most reliably lower suppliers' cost of capital.
- Where volume undertakings are not feasible, use documentation guarantees (e.g., clear dispute windows, irrevocable approvals) to strengthen banks' risk assessments.

4.5.4 For policymakers (SBP, MoC, MoI&P)

- Issue a technical note showing how ESRM evidence → pricing ladders should flow in bank models; encourage disclosure of standard bps step-downs tied to assurance.
- Scale assurance vouchers for SMEs (co-funding via DFIs) and a national verifier registry that aligns with EU/UK expectations.

- Allow ESG-verified step-down clauses within LTFF/RE refinance rules where prudentially sound.
- Coordinate trade and industry outreach: one "CBAM/DPP pack for banks" per sector (steel; knitwear; leather).

5. Conclusion

This study examined how emerging carbon border measures and EU product-sustainability rules are traveling through credit markets for Pakistani exporters. We find that assurance-backed, decision-useful evidence is the primary currency banks recognize; when paired with buyer risk-transfer instruments, it consistently converts into lower spreads, longer tenor, and lighter collateral. The strongest and fastest pricing effects surfaced in steel (direct CBAM exposure), while textiles/leather required buyer-backed SCF to transmit benefits. Pakistan's ESRM framework and existing concessional schemes can support this transition, but only if banks embed ESG evidence into rating engines and if SMEs receive targeted support for assurance and data plumbing. In short, the path from regulation to cheaper capital runs through verification, model design, and contracting.

5.1 Limitations and Future Research

Our corpus is small and purposively sampled; pricing observations co-move with macro conditions (policy rates, FX). Confidentiality also constrained access to full rating models and complete term sheets. The pilot interview excerpts should be replaced with verbatim quotes from fieldwork before submission.

5.2 Future Research

1. Broader sampling: expand interviews within each value chain and add upstream/downstream nodes (mills, processors, logistics).
2. Documentary depth: collect redacted facility letters, pricing grids, and assurance reports to strengthen causal tracing.
3. Pre/post identification: run simple within-firm pre/post comparisons at renewal (before/after verification or buyer IPA) and—where data permit—difference-in-differences around CBAM calendar milestones.
4. Pricing heterogeneity: test whether effects differ by bank ESRM maturity, firm size, or buyer type (brand vs. retailer).
5. Costs of verification: quantify assurance and data-system costs and evaluate co-funding models (buyers/DFIs) for SME uptake.

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