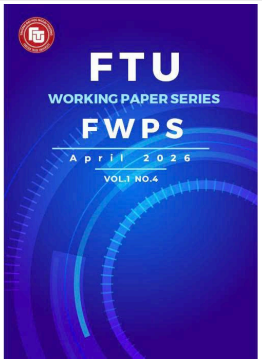

Working Paper 2026.9

- Vol.1 , No.4

BIỆN PHÁP PHI THUẾ QUAN VÀ THẨM ĐỊNH CHUỖI CUNG ỨNG: TÁC ĐỘNG CỦA CÁC QUY ĐỊNH ĐỊNH HƯỚNG BỀN VỮNG CỦA HOA KỲ ĐỐI VỚI XUẤT KHẨU LINH KIỆN ĐIỆN TỬ CỦA VIỆT

Phạm Gia Linh[1]

Sinh viên K63 Ngân hàng và Tài chính quốc tế – Khoa Tài chính – Ngân hàng

Trường Đại học Ngoại thương, Hà Nội, Việt Nam

Vũ Huyền Phương

Giảng viên Viện Kinh tế và Kinh doanh quốc tế

Trường Đại học Ngoại thương, Hà Nội, Việt Nam

Tóm tắt

Nghiên cứu này phân tích tác động của các biện pháp phi thuế quan (NTMs) từ Hoa Kỳ đối với xuất khẩu linh kiện điện tử của Việt Nam trong bối cảnh tái cấu trúc chuỗi cung ứng toàn cầu. Sử dụng phương pháp định tính tổng hợp các văn bản pháp lý và dữ liệu thứ cấp, bài viết làm rõ sự chuyển dịch căn bản của hệ thống NTMs từ các rào cản kỹ thuật truyền thống sang các công cụ quản trị chuỗi giá trị dựa trên tiêu chuẩn bền vững, điển hình là Đạo luật UFLPA và các quy định về khoáng sản xung đột. Kết quả nghiên cứu chỉ ra rằng năng lực tuân thủ và minh bạch hóa nguồn gốc đã thay thế lợi thế chi phí thấp để trở thành yếu tố quyết định khả năng tiếp cận thị trường Hoa Kỳ. Đồng thời, nghiên cứu phát hiện sự bất cân xứng sâu sắc về khả năng thích ứng giữa khối doanh nghiệp FDI và doanh nghiệp nội địa trước áp lực thực hiện chiến lược "chuyển đổi kép " (xanh và số). Trên cơ sở đó, bài viết đề xuất các hàm ý chính sách nhằm

[1] Tác giả liên hệ, Email: k63.2412340081@ftu.edu.vn

nâng cao năng lực thẩm tra chuỗi cung ứng và quản trị rủi ro, giúp ngành điện tử Việt Nam duy trì vị thế cạnh tranh bền vững.

Từ khoá: biện pháp phi thuế quan, linh kiện điện tử, thẩm tra chuỗi cung ứng, Việt Nam, Hoa Kỳ

NON-TARIFF MEASURES AND SUPPLY CHAIN DUE DILIGENCE: IMPACT OF U.S. SUSTAINABILITY - ORIENTED REGULATIONS ON VIETNAM'S ELECTRONIC COMPONENT EXPORTS

Abstract

This study analyzes the impact of U.S. Non-Tariff Measures (NTMs) on Vietnam's electronic component exports amidst global supply chain restructuring. Employing a qualitative methodology synthesizing legal frameworks and secondary data, the paper elucidates the structural shift of NTMs from traditional technical barriers to sustainable value chain governance tools, exemplified by the Uyghur Forced Labor Prevention Act (UFLPA) and conflict minerals regulations. Findings indicate that compliance capacity and supply chain transparency have superseded low-cost advantages as decisive determinants for U.S. market access. Furthermore, the study reveals a significant asymmetry in adaptive capacity between Foreign Direct Investment (FDI) enterprises and domestic firms regarding the pressure to execute the "Twin Transition" (green and digital) strategy. Consequently, the paper proposes policy implications aimed at enhancing supply chain due diligence and risk management capabilities to ensure Vietnam's sustainable competitiveness in the global electronics sector.

Keywords: Keywords: non-tariff measures, electronic components, supply chain due diligence, Vietnam, United States (US)

---

1. Introduction

In recent years, United States trade policy has experienced a marked shift from traditional tariff- based measures toward an increased reliance on non-tariff measures (NTMs) linked to sustainable development objectives. Rather than relying on import duties, the United States has increasingly integrated environmental, labor, human rights, and supply chain transparency requirements into its legal framework and trade regulations. This trend reflects a broader transformation in trade governance, in which trade is no longer viewed

solely as an instrument for promoting economic growth but also as a means of advancing global sustainable development values and norms (Mayer et al., 2021).

A prominent feature of United States NTMs oriented toward sustainable development is the imposition of supply chain due diligence obligations on importing firms. Regulations such as the Dodd - Frank Act (Section 1502 on conflict minerals), the Uyghur Forced Labor Prevention Act (UFLPA), and expanding Environmental, Social, and Governance (ESG) disclosure requirements have extended corporate responsibility beyond U.S. territorial borders to encompass entire global value chains. Consequently, market access increasingly depends not merely on price competitiveness or production capacity, but on firms' ability to manage, trace, and ensure compliance with sustainability standards throughout their supply chains (OECD, 2023).

Within this context, the electronic components sector plays a particularly important role in Vietnam's export structure to the United States. This sector is deeply integrated into global value chains, involving both foreign direct investment enterprises and extensive domestic supplier networks. The United States is currently one of the key export markets for Vietnam's electronic components, while also being among the earliest and most proactive adopters of regulations related to supply chain responsibility. Due to the sector's reliance on complex input materials sourced across multiple countries, electronic components production is especially vulnerable to the impacts of supply chain due diligence and transparency requirements (Gereffi, 2018).

The central issue is that U.S. non-tariff measures aimed at sustainable development affect Vietnam's electronic component exports not through direct mechanisms such as tariffs, but primarily through increased compliance costs, governance restructuring, and supply chain transparency requirements. These dynamics may generate "hidden" trade barriers, particularly for small and medium-sized enterprises that face constraints in financial resources and supply chain management capabilities (World Bank, 2020).

As a result, despite the growing body of literature on NTMs and global value chains, there remains a limited and fragmented understanding of how sustainability-oriented NTMs, particularly those related to supply chain due diligence, affect developing countries at the sectoral level. Existing studies often focus on general trade effects or firm-level compliance costs, but lack a structured explanation of the transmission mechanisms through which these regulations reshape supply chain governance and market access.

From a theoretical perspective, this study is grounded in institutional theory and global value chain (GVC) analysis. This study addresses this gap by focusing on Vietnam's electronic components sector, a highly GVC-integrated industry that is particularly vulnerable to traceability and ESG-related requirements. Accordingly, the paper seeks to answer the following research questions: "How do U.S. sustainability-oriented non-tariff measures affect Vietnam's electronic component exports through supply chain due diligence mechanisms?" and "How does the adaptive capacity differ between Foreign Direct Investment (FDI) enterprises and domestic firms in responding to these compliance pressures?". In doing

so, the study makes two main contributions. First, it develops a qualitative analytical framework that conceptualizes NTMs as instruments of supply chain governance rather than conventional trade barriers. Second, it provides context-specific insights into the asymmetric adaptive capacity between FDI and domestic firms in Vietnam.

2. Literature Review and Methodology

2.1. Non- Tariff Measures in International Trade and the Shift toward Sustainable Development

In modern international trade, Non-Tariff Measures (NTMs) play a central regulatory role, particularly in major import markets. According to UNCTAD (2022), NTMs encompass technical regulations, socio-environmental standards, certification requirements, and supply chain transparency obligations.

Unlike traditional tariffs, NTMs do not impact trade through direct pricing mechanisms. Instead, they function by increasing compliance costs, altering market access conditions, and reshaping the behavior of exporting firms (WTO, 2012). A prominent recent trend is the proliferation of NTMs supporting environmental goods, reflecting the tightening nexus between trade policy and sustainable development goals (OECD, 2025).

For both developed and developing nations, trade policy is defined not solely by tariffs but by participation in Global Value Chains (GVCs). Within GVCs, decisions regarding standards, transparency, and compliance exert widespread influence on trading partners, particularly developing economies like Vietnam (World Bank, 2020).

2.2. Supply Chain Due Diligence Obligations

Supply chain due diligence requires firms to identify, assess, and manage environmental, social, and governance (ESG) risks across the entire value chain (OECD, 2018). While originating in corporate governance, due diligence has been increasingly institutionalized in international trade through regulations and guidelines in major import markets.

Theoretically, supply chain due diligence functions as a "new-generation" Non-Tariff Measure (NTM). Unlike traditional measures applied at the border, these regulations impose mandatory compliance obligations on exporters, thereby influencing

costs, production organization, and global value chain (GVC) participation strategies (UNCTAD, 2022; WTO, 2012).

Previous literature indicates that due diligence obligations often create asymmetries in compliance capacity. Large firms and Foreign Direct Investment (FDI) enterprises typically hold advantages over smaller enterprises in developing countries (Gereffi, 2018). This implies that sustainability-related NTMs impact not only trade flows but also the structure and distribution of value within GVCs.

2.3. The Electronic Components Value Chain and Vietnam's Position

The electronic components industry is characterized by a highly fragmented and specialized global value chain, featuring multiple tiers of suppliers and deep cross-border interdependence (Gereffi, 2018). High value-added activities are typically concentrated in developed economies, while component manufacturing and assembly are outsourced to developing nations (World Bank, 2020).

Vietnam primarily participates in component manufacturing and supply, driven by a significant presence of FDI enterprises and a developing network of domestic suppliers (World Bank, 2024). As a critical export market, the United States imposes stringent technical standards and supply chain responsibilities. Consequently, sustainability-related NTMs exert a pronounced impact on Vietnam's electronics sector.

2.4. Research Framework and Methodology

This study adopts a qualitative, mechanism-oriented research design that integrates theoretical perspectives on non-tariff measures (NTMs) and supply chain due diligence with the specific characteristics of Vietnam's electronic components industry. Its objective is not to estimate causal effects, but to conceptualize and interpret the institutional mechanisms through which NTMs influence export performance.

For empirical consistency, the study defines "electronic components" primarily under the Harmonized System (HS) chapters 84 and 85, with a specific focus on sub-headings such as HS 8542 (electronic integrated circuits), HS 8532 (electrical capacitors), and HS 8541 (semiconductor devices).

The study applies a theory-driven analytical approach, integrating institutional theory and global value chain (GVC) perspectives to construct a mechanism-based framework. Within this framework, U.S. NTMs affect Vietnamese exporters through supply chain due diligence obligations, which in turn influence compliance capacity, operational costs, and supply chain organization. Ultimately, these factors determine firms' ability to maintain and expand access to the U.S. market.

The analysis is based on secondary data sources, including legal documents, policy reports, and prior empirical studies. While this approach enables a comprehensive understanding of regulatory structures, it does not allow for direct causal inference or precise measurement of firm-level impacts.

3. U.S Non-Tariff Measures on Electronic Components

3.1. Technical Standards and Conformity Assessment

The U.S. technical regulatory system for electronic components is characterized by a complex interplay between federal standards and state-level regulations. According to Eum (2025), Technical Barriers to Trade (TBT) constitute 54% of the total non-tariff measures faced by Vietnamese enterprises accessing this market.

The FCC Part 15 classification system categorizes electronic devices operating at frequencies of 9 kHz and above into two primary groups based on emission intent: Intentional Radiators (e.g., Wi-Fi, Bluetooth modules) and Unintentional Radiators. Intentional Radiators require mandatory Certification by a Telecommunication Certification Body (TCB), involving comprehensive spectrum and emission power testing (FCC, 2025). Conversely, Unintentional Radiators are subject to the Supplier's Declaration of Conformity (SDoC).

Regarding electrical safety, the CSA/UL 62368-1:2025 standard, published in late July 2025, officially ceased accepting legacy components approved under UL 60950-1 or UL 60065 (UL Solutions, 2025). The transition to Hazard-Based Safety Engineering (HBSE) mandates that firms revise risk assessment methodologies, restructure design processes, and modify component selection strategies.

The Fair Packaging and Labeling Act (FPLA) and Title 19 CFR 134 establish a strict legal framework for country-of-origin labeling. Given heightened scrutiny regarding transshipment

from China via third countries, the "Substantial Transformation" principle is rigorously applied. While a change in HS code at the 4-digit or 6-digit level serves as an initial indicator, the prerequisite is that manufacturing in Vietnam must result in a new article of commerce with a fundamental change in name, character, and use (U.S. Customs and Border Protection, 2025).

Environmental regulations operate on a tiered federal-state mechanism, increasing compliance complexity. Federally, the Department of Energy (DOE) mandates Level VI efficiency standards for external power supplies (U.S. Department of Energy, 2025). At the state level, California enforces Title 20 with stricter standby power requirements (California Energy Commission, 2025) and Proposition 65, which necessitates warning labels for products containing carcinogens or reproductive toxins such as lead and phthalates (OEHHA). Additionally, Washington State restricted halogenated flame retardants effective January 2025 (Washington State Department of Ecology, 2025).

3.2. Supply Chain Sustainability Compliance Requirements

3.2.1. Transparency of Inputs, Materials, and Production Processes

Transparency requirements have shifted from voluntary commitments to mandatory legal obligations. Beyond international standards like the EU's CSRD, Vietnamese firms now face direct exposure to the U.S. Securities and Exchange Commission (SEC) climate disclosure rules. These regulations compel U.S. technology corporations to trace Scope 3 emission data across their Vietnamese component supplier networks (SEC, 2024).

Under Section 1502 of the Dodd-Frank Act, supply chain transparency for "conflict minerals" (3TG: tin, tantalum, tungsten, and gold) is mandatory. Firms must verify origins to ensure supply chains are free from conflict funding and human rights violations. Tsang, Frost, and Cao (2023) emphasize that ESG disclosure

3.2.2. Compliance Pressure from the U.S. Market and Partners

California's Senate Bill 253 (Climate Corporate Data Accountability Act) stands as a primary regulatory driver. The Act mandates companies with over $1 billion in revenue to report Scope 1 and 2 greenhouse gas emissions starting in 2026, and Scope 3 by 2027 (California Air Resources Board). Given that Scope 3 emissions typically constitute over 90% of technology companies' carbon footprints, this legislation exerts direct pressure on

Vietnamese component manufacturers to provide transparent data and commit to decarbonization roadmaps (UL Solutions, 2025).

Driven by such mandates, sustainability compliance has evolved into a rigorous screening mechanism within Global Value Chains (GVCs). The Carbon Dated report (Standard Chartered, 2021) indicates that 78% of multinational corporations (MNCs) intend to remove suppliers failing to meet green transition standards by 2025. Leading corporations like Apple have further institutionalized this by making compliance with the Responsible Business Alliance (RBA) Validated Assessment Program (VAP) a contractual prerequisite.

Theoretically, these dynamics represent a coercive isomorphism effect, compelling suppliers to standardize processes (DiMaggio & Powell, 1983). However, in the Vietnamese context, external pressure must be accompanied by buyer resource support to transform reactive compliance into effective sustainable development (Xiao et al., 2025).

3.3. Supply Chain Due Diligence Obligations

3.3.1. Traceability of Components and Materials

Due diligence obligations are critical given the extensive use of 3TG minerals in electronic components. Section 1502 of the Dodd-Frank Act mandates U.S.-listed companies to conduct a Reasonable Country of Origin Inquiry (RCOI) to verify sourcing from the Democratic Republic of the Congo (DRC) or adjoining countries. The EU Conflict Minerals Regulation (effective 2021) extends these duties to metal importers. Although Vietnamese firms are not direct subjects of EU law, global clients increasingly demand dual-regime compliance.

The most significant challenge is the Uyghur Forced Labor Prevention Act (UFLPA), which establishes a "rebuttable presumption" banning goods containing Xinjiang inputs unless clear and convincing evidence is provided (Department of Homeland Security, 2025). The UFLPA applies no de minimis threshold; thus, even trace amounts of materials from high-risk regions can trigger shipment detention. This explains U.S. CBP (2025) data showing that Vietnamese electronic shipments subjected to examination exceeded $1.02 billion by August 2025, reflecting extreme sector risk.

Furthermore, the expansion of priority sectors to strategic metals like Copper, Lithium, and Aluminum creates new pressures for Vietnam’s PCB and lithium-ion battery supply chains

(DHS, 2025). Given the complexity of mineral supply chains, digital solutions such as Blockchain or Digital Product Passports are becoming essential prerequisites (Maass & Hansson, 2024).

3.3.2. Exporter Responsibility in Global Value Chains

The responsibility of Vietnamese exporters has shifted from product quality metrics to supply network ethical control. Under Dodd-Frank Section 1502, companies exercising actual influence over manufacturing bear responsibility for mineral sourcing. Consequently, Vietnamese component exporters, even if not direct mineral users, remain liable if they influence production processes or material sourcing.

Major corporations like HP, Dell, and Apple have integrated due diligence clauses into contracts. Failure to pass the RBA VAP audit poses risks of order suspension and reputational damage. However, proactive adaptation can enhance long-term financial performance (Wang & Sarkis, 2013).

4. Impact on Vietnam's Electronic Component Exports

4.1. Overall Impact

The rapid expansion of Vietnam's electronics industry has established it as a critical node in the global supply chain. According to the General Statistics Office (GSO), in the first nine months of 2025, exports of electronics, computers, and components led national turnover, exceeding $77 billion. Concurrently, imports surpassed the $100 billion threshold to reach a record $110 billion.

Despite this growth potential, Vietnamese exporters face substantial challenges from U.S. Non-Tariff Measures (NTMs), traceability mandates, Environmental, Social, and Governance (ESG) standards, and stringent trade controls.

The impact of these regulations extends beyond increased operational costs to fundamentally restructure supplier relationships, compliance capabilities, and firm-level adaptive strategies. Failure to rapidly adapt to these escalating standards poses a significant risk of exclusion from global value chains (GVCs).

4.2. Impact on Firm Compliance Capacity

Compliance capacity has emerged as a critical prerequisite for Vietnamese firms to access

stringent markets like the United States. The shift from voluntary standards to mandatory legal requirements exerts immense pressure, necessitating comprehensive structural changes in governance and cost management.

Compliance costs have become a structural component of long-term investment strategies. Firms face diverse cost categories, ranging from certification fees and third-party audits to investments in data management software and personnel. According to Maskus et al. (2005), fixed costs for Technical Barriers to Trade (TBT) compliance can reach $425,000 per firm, representing approximately 4.7% of value added. The study further indicates that a 1% increase in investment to meet importer compliance costs raises production costs by 0.06% to 0.13%, a significant burden for manufacturers.

In component manufacturing, obtaining industry-standard certifications like the Responsible Business Alliance (RBA) is mandatory for entering multinational corporation (MNC) supply chains. Beyond the initial registration fee of $500, audit costs vary based on operational complexity, significantly escalating total expenditure. Furthermore, implementing ESG standards requires substantial capital investment. Truong Thi Hanh Dung et al. (2024) found that ESG performance has a significant negative impact on firm value, profitability, and financing cash flows for Southeast Asian companies, including those in Vietnam.

A notable compliance capacity asymmetry exists between Foreign Direct Investment (FDI) enterprises and domestic firms. FDI entities (e.g., Samsung, Foxconn, Intel, LG), embedded in global production networks, leverage inherited governance systems from parent corporations and long-established compliance protocols. Conversely, domestic enterprises face substantial resource and knowledge barriers. A PwC Vietnam survey reveals that while 57% of FDI enterprises have established clear ESG commitments, 71% of total firms lack necessary reporting data, and 70% have limited or no ESG reporting mechanisms.

4.3. Impact on Supply Chain Structure and Organization

New U.S. supply chain due diligence regulations are necessitating a structural transformation within Vietnam’s electronics sector.

Currently, ESG compliance and due diligence capacity have evolved into mandatory prerequisites for Vietnamese firms seeking integration into Multinational Corporation (MNC)

supply chains. Survival and growth now depend on the "Twin Transition" strategy. According to Đào Gia Phúc and Phạm Lộc Hà (2025), this integration of digital and green transitions requires developing nations like Vietnam to proactively negotiate new-generation Free Trade Agreements (FTAs) and align domestic legal frameworks with evolving U.S. policies regarding digital services and environmental goods.

Furthermore, traceability in modern electronics manufacturing has shifted from a mere "quality control tool" to the "core foundation of production and supply chain governance" (Pablo Rosales Rodríguez, 2021). While the U.S. lacks a centralized "national traceability system" for electronics, traceability is indirectly enforced through ESG mandates, due diligence requirements, and trade regulations. This compels all supply chain participants, including Vietnamese enterprises, to establish robust internal traceability architectures to maintain market access.

4.4. Consequences for U.S. Market Access

The United States maintains its position as Vietnam's primary export market for electronic components, with import volume reaching $34.14 billion, according to data from the General Department of Vietnam Customs. However, Non-Tariff Measures (NTMs) function effectively as "soft" yet highly selective barriers. These dynamics have significant implications for market access, eroding profitability and altering Vietnam's competitive standing relative to regional peers.

Eum (2025) demonstrates that stringent Technical Barriers to Trade (TBT) from OECD nations, including the U.S., drive up production costs and diminish export efficiency. Given that the domestic value-added rate in Vietnam's electronics sector is critically low, ranging from 5% to 10% across segments, this compliance burden disproportionately consumes already thin profit margins.

Furthermore, regional competition for the U.S. market is intensifying within ASEAN. Malaysia currently leads the region in higher value-added electronics and semiconductor exports, reflecting its stronger technological capabilities and deeper integration into advanced segments of global value chains. In contrast, although Vietnam has experienced rapid export growth, its electronics sector remains constrained by low domestic value-added and heavy import dependence. These structural limitations pose significant challenges for sustaining competitiveness in the face of increasingly stringent non-tariff measures.

5. Discussion and Policy Implications

5.1. Discussion of Research Findings

The preceding analysis elucidates a critical reality: the nature of U.S. Non-Tariff Measures (NTMs) targeting the electronic component sector has undergone a structural paradigm shift. No longer confined to traditional Technical Barriers to Trade (TBT) aimed merely at consumer safety such as electrical compatibility or radio frequency standards; NTMs have evolved into sophisticated instruments of "extended value chain governance." Through legislative vehicles like the Uyghur Forced Labor Prevention Act (UFLPA), Section 1502 of the Dodd-Frank Act, and California's Senate Bill 253, the United States is effectively extraterritorializing its domestic standards. This mechanism compels partner nations like Vietnam to internalize American values regarding human rights, environmental stewardship, and governance transparency directly within their local production facilities.

Primarily, the research confirms that compliance capacity is superseding cost efficiency as the decisive factor in shaping national competitive advantage. Historically, Vietnam's allure in the global electronics value chain was predicated on low labor costs and preferential tariffs. However, as compliance costs escalate encompassing certification fees, mineral traceability audits, and carbon emission reporting the already thin profit margins of 5% to 10% typical of Vietnamese contract manufacturers are being severely eroded. Drawing on Institutional Theory, specifically the concept of coercive isomorphism, it is evident that pressure from Multinational Corporations (MNCs) is creating a rigorous screening mechanism. Enterprises lacking the resources to execute the "Twin Transition" integrating digital and green capabilities face imminent exclusion from Global Value Chains (GVCs), potentially ceding market share to regional competitors with superior technological foundations, such as Malaysia or Thailand.

Furthermore, the study identifies a profound asymmetry in adaptive capacity between Foreign Direct Investment (FDI) enterprises and domestic firms. FDI entities, such as Samsung or Intel, navigate the complex matrix of NTMs with relative ease by leveraging inherited governance systems, established data protocols, and financial backing from their parent corporations. In stark contrast, Vietnamese Small and Medium Enterprises (SMEs) struggle against significant resource constraints. The acute shortage of capital for traceability technologies like Blockchain or ERP, coupled with a deficit in personnel fluent in international legal compliance, hinders domestic firms from penetrating Tier 1 or Tier 2

supply layers. Without strategic intervention, Vietnam risks falling into a "low-end assembly trap," where domestic firms are permanently relegated to supplying non-critical packaging or consumables rather than participating in core value-creation activities.

Crucially, supply chain transparency has transitioned from a voluntary corporate social responsibility initiative to a mandatory survival imperative. Regulations regarding forced labor and conflict minerals have eliminated the margin for error. The application of the "rebuttable presumption" mechanism by U.S. Customs and Border Protection places the burden of proof entirely on the exporter. This implies that silence or data unavailability is legally equivalent to non-compliance, resulting in market bans. Consequently, verifiable data has become an asset class as critical as the physical quality of the product itself.

5.2. Policy Implications and Recommendations

To surmount these new-generation non-tariff barriers and sustain Vietnam's position in the global electronics supply chain, a synchronized strategy involving the government, industry associations, and enterprises is essential.

Regarding state governance, the government must transition from a regulator to an enabler by constructing a National Database System for Traceability and ESG. This involves establishing a national digital infrastructure that integrates data on labor, environmental impact, and material sourcing. Such a system must be designed for interoperability with international standards, such as the Responsible Business Alliance (RBA) criteria or U.S. Customs requirements, allowing firms to extract validatable data efficiently and reducing the cost of individual audits. Concurrently, the legal framework requires harmonization with international norms. Policymakers should accelerate the promulgation of a specific "Green Taxonomy" and corporate- level greenhouse gas inventory guidelines that align with the U.S. SEC's disclosure rules and California's climate laws. Domesticating these standards will allow Vietnamese firms to practice and prepare within a controlled environment before facing enforcement in export markets. Furthermore, financial support mechanisms are critical; the establishment of "Green Credit" packages specifically for the supporting industries would enable firms to access capital for investing in risk management technologies, supply chain software, and international certifications,

viewing compliance costs as an investment in national competitiveness rather than mere operational expenses.

For industry bodies, specifically the Vietnam Electronic Industries Association (VEIA) and the Vietnam Association for Supporting Industries (VASI), the focus must shift towards bridging information gaps. These associations should function as early warning centers by establishing specialized Task Forces on TBT and NTMs to monitor and interpret legislative changes from the U.S., such as updates to the UFLPA entity list or new FCC technical standards. Beyond information dissemination, associations should facilitate capacity building through specialized training on Supply Chain Due Diligence, ensuring members understand the operational nuances of Supplier Codes of Conduct enforced by major buyers like Apple or Dell. Promoting horizontal linkages is also vital; by fostering cooperation among domestic firms, associations can facilitate the shared procurement of data services, software solutions, or legal consultancy, thereby lowering the unit cost of compliance for individual SMEs.

Finally, at the firm level, a fundamental shift in mindset from "reactive compliance" to "proactive risk management" is required. Enterprises must aggressively pursue the "Twin Transition" strategy, embedding digitalization into production governance to ensure real-time transparency of emission data and material flows. This involves adopting technologies such as AI and Blockchain to meet the rapid traceability demands of U.S. partners. Strategically, firms must diversify their supply chains to mitigate geopolitical risks. This entails a rigorous audit of sub-tier suppliers to ensure absolute exclusion of materials from regions implicated in forced labor or conflict, as required by the UFLPA. Ultimately, to capture higher value, Vietnamese firms must advance their capabilities in R&D and design. Moving from simple assembly to Original Design Manufacturing (ODM) will grant firms the autonomy to select eco-friendly materials and components at the design phase, thereby minimizing the costs and disruptions associated with retrofitting products to meet evolving environmental regulations.

In conclusion, while U.S. non-tariff measures present formidable challenges, they simultaneously exert necessary pressure for the structural purification and upgrading of Vietnam’s electronics industry. Proactive adaptation will not only secure market share but also establish Vietnam’s global reputation as a hub for responsible and sustainable manufacturing.

6. Conclusion

This study has systematically elucidated the fundamental shift in U.S. NTMs targeting the electronic component sector, demonstrating that these regulations have evolved from mere technical barriers to trade into sophisticated instruments of value chain governance based on sustainability and ethical standards. The findings indicate that legislative frameworks, such as the Uyghur Forced Labor Prevention Act (UFLPA) and the SEC's climate disclosure rules, are reshaping the global operational paradigm. Consequently, compliance capacity and supply chain transparency have superseded low-cost advantages as the decisive determinants for market access. The research further clarifies a multidimensional impact mechanism, wherein demand-side pressures compel Vietnamese enterprises to adopt a "Twin Transition" strategy, integrating digitalization with green manufacturing to retain their positions within the supply networks of multinational corporations.

Regarding academic contributions, this study contributes to the literature in three aspects. First, drawing upon institutional theory, it extends the analysis of NTMs by conceptualizing sustainability-oriented regulations as instruments of value chain governance, rather than merely trade barriers. Second, it develops a qualitative analytical framework linking supply chain due diligence with firm-level compliance capacity and market access outcomes. Third, it provides empirical insights into Vietnam's electronics sector, highlighting the structural asymmetry between FDI and domestic firms, which remains underexplored in existing studies.

However, the study acknowledges certain limitations, primarily its reliance on qualitative analysis and secondary data sources. It has not yet empirically quantified the specific impact of compliance costs on firm-level profit margins. Future research directions should focus on quantitative methodologies or extensive field surveys to precisely measure the financial implications of ESG regulations. Additionally, comparative studies analyzing the adaptive strategies of Vietnam against regional competitors in ASEAN, such as Malaysia or Thailand, would be valuable to derive more granular, practice-oriented insights for the industry.

REFERENCES

Apple Inc. (2025). Supplier responsibility progress report 2025. https://www.apple.com/supplier-responsibility/

Bair, J. (2017). Contextualizing compliance: Hybrid governance in global value chains. New Political Economy, 22(2), 169–185. https://doi.org/10.1080/13563467.2016.1273340

California Air Resources Board. (2024). The Climate Corporate Data Accountability Act enforcement notice. https://ww2.arb.ca.gov/sites/default/files/2024-12/The%20Climate%20Corporate%20Data%20Accountability%20Act%20Enforcement%20Notice%20Dec%202024.pdf

California Energy Commission. (2025). Appliance efficiency regulations - Title 20. https://www.energy.ca.gov/rules-and-regulations/appliance-efficiency-regulations-title-20

California Office of Environmental Health Hazard Assessment. (n.d.). Proposition 65. https://oehha.ca.gov/proposition-65

Dao, G. P., & Pham, L. H. (2025). Tác động của chuyển đổi kép lên pháp luật thương mại quốc tế: Thách thức và gợi mở chính sách cho Việt Nam [The impact of twin transition on international trade law: Challenges and policy suggestions for Vietnam]. Tạp chí Khoa học Pháp lý Việt Nam, 09(193).

Department of Homeland Security. (2025). 2025 updates to the strategy to prevent the importation of goods mined, produced, or manufactured with forced labor in the People's Republic of China (Report to Congress). https://www.dhs.gov/sites/default/files/2025-08/25_0819_plcy_uflpa-strategy-2025-update-508.pdf

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), 147–160. https://doi.org/10.2307/2095101

Eum, J. (2025). Effects of technical barriers to trade on Vietnam's export performance and global value chain participation. Journal of Economic Integration, 40(1), 71–90. https://doi.org/10.11130/jei.2024053

European Commission. (2022). Directive (EU) 2022/2464 of the European Parliament and of the Council on corporate sustainability reporting. Official Journal of the European Union, L 322. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022L2464

European Parliament and Council. (2017). Regulation (EU) 2017/821 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0821

Federal Communications Commission. (2025). Equipment authorization - Radio frequency devices (47 CFR Part 15). https://www.fcc.gov/oet/ea/rfdevice

Federal Communications Commission. (2025). Telecommunication certification bodies (47 CFR § 2.960). https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-2/subpart-J

Federal Communications Commission. (2025). General technical requirements (47 CFR § 15.407). Electronic Code of Federal Regulations. https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-15/subpart-E

General Statistics Office of Vietnam. (2025, October). *Xuất, nhập khẩu điện tử, máy tính và linh kiện – Động lực tăng trưởng xuất khẩu của Việt Nam giai đoạn 2016–2025* [Exports and imports of electronics, computers and components]. Tổng cục Thống kê Việt Nam.

Gereffi, G. (2018). Global value chains and development: Redefining the contours of 21st century capitalism. *Cambridge Journal of Regions, Economy and Society, 11*(1), 61–79. https://doi.org/10.1093/cjres/rsx028

Hoekman, B., & Mavroidis, P. (2016). Trade agreements and international regulatory cooperation in a supply chain world. *The World Economy, 39*(9), 1271–1302. https://doi.org/10.1111/twec.12230

International Labour Organization. (2022). Global supply chains and forced labour. International Labour Organization.

Maass, J., & Hansson, L. (2024). *Beyond compliance: Managing the practical implications of the European Union's Digital Product Passport on companies* [Master's thesis, Lund University]. Lund University Publications. https://lup.lub.lu.se/student-papers/search/publication/9166916

Maskus, K. E., Otsuki, T., & Wilson, J. S. (2005). *The cost of compliance with product standards for firms in developing countries: An econometric study* (World Bank Policy Research Working Paper No. 3590). World Bank.

Mayer, F. W., Phillips, N., & Posthuma, A. (2021). *The political economy of governance in global value chains. Review of International Political Economy, 28*(6), 1–25. https://doi.org/10.1080/09692290.2020.1844271

Moïsé, E., & Tresa, E. (2019). Non-tariff measures affecting environmental goods trade (OECD Trade Policy Papers No. 294). OECD Publishing. https://doi.org/10.1787/81f92357-en

National Institute of Standards and Technology. (2025). Fair Packaging and Labeling Act (FPLA) and country of origin marking. https://www.nist.gov/pml/owm/packaging-and-labeling

OECD. (2023). OECD due diligence guidance for responsible business conduct. OECD Publishing. https://doi.org/10.1787/81f92357-en

PwC Vietnam. (2022). Vietnam ESG readiness report 2022: From ambition to impact. PwC Vietnam.

Responsible Business Alliance. (2026). RBA-Online. https://www.responsiblebusiness.org/

Rosales Rodríguez, P. (2021). *Traceability in the electronics manufacturing industry: A state-of-the-art review and a case study* [Master's thesis, Aalto University]. Aalto University.

Ruggie, J. G., & Nelson, T. (2015). Human rights and the OECD Guidelines for Multinational Enterprises: *Normative innovations and implementation challenges. Journal of World Business, 50*(1), 1–12. https://doi.org/10.1016/j.jwb.2014.02.002

Standard Chartered. (2021). *Multinational companies planning to cut suppliers by 2025 for failing to curb carbon emissions.* https://www.sc.com/en/media--release/multinational-companies-planning-to-cut-suppliers-by-2025-for-failing-to-curb-carbon-emissions/

Sturgeon, T. J., & Kawakami, M. (2019). Global value chains in the electronics industry: Was the crisis a window of opportunity for developing countries? Journal of Economic Geography, 19(2), 1–28. https://doi.org/10.1093/jeg/lby028

Tổng cục Hải quan. (2025). *Phân tích định kỳ* [Periodic analysis]. Cổng thông tin điện tử Hải quan Việt Nam.

Truong, T. H. D., Nguyen, T. T., & Pham, T. H. (2024). Impacts of environmental, social, and governance (ESG) performance on firm value, profitability, and cash flows: Evidence in Southeast Asia. J*ournal of Finance & Accounting research*.

Tsang, A., Frost, G., & Cao, Y. (2023). Environmental, social, and governance (ESG) disclosure: *A literature review. British Accounting Review, 55*, 101149. https://doi.org/10.1016/j.bar.2022.101149

UL Solutions. (2025). *Preparing for UL/CSA 62368-1 4th Edition: Impact on component manufacturers*. https://www.ul.com/insights/navigating-requirements-ulcsa-62368-1-4th-edition

United Nations Conference on Trade and Development. (2021). *Non-tariff measures and sustainable development*. UNCTAD.

United Nations Conference on Trade and Development. (2022). *Non-tariff measures from A to Z*. UNCTAD.

United Nations Conference on Trade and Development. (2023). *Non-tariff measures: Economic assessment and policy options*. UNCTAD.

U.S. Congress. (2010). *Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502*. Public Law 111-203.

U.S. Customs and Border Protection. (2023). *What every member of the trade community should know about: Substantial transformation*. Informed Compliance Publication. https://www.cbp.gov/sites/default/files/assets/documents/2023-Oct/ICP067R3%20Substantial%20Transformation.pdf

U.S. Customs and Border Protection. (2025). *Uyghur Forced Labor Prevention Act statistics [Data dashboard]*. https://www.cbp.gov/newsroom/stats/trade/uyghur-forced-labor-prevention-act-statistics

U.S. Customs and Border Protection. (2026). *Definitions* (19 CFR § 134.1). Electronic Code of Federal Regulations. https://www.ecfr.gov/current/title-19/chapter-I/part-134/subpart-A/section-134.1

U.S. Department of Energy. (2025). *Appliance and equipment standards program: External power supplies.* https://www.energy.gov/eere/buildings/appliance-and-equipment-standards-program

U.S. Securities and Exchange Commission. (2024). *The enhancement and standardization of climate-related disclosures for investors*. Federal Register. https://www.federalregister.gov/documents/2024/03/28/2024-05137/the-enhancement-and-standardization-of-climate-related-disclosures-for-investors

U.S. Securities and Exchange Commission. (2025). *Fact sheet: Disclosing the use of conflict minerals*. https://www.sec.gov/opa/Article/2012-2012-163--conflict-minerals.html

Wang, Z., & Sarkis, J. (2013). Investigating the relationship of sustainable supply chain management with corporate financial performance. *International Journal of Productivity and Performance Management, 62*(8), 871–888. https://doi.org/10.1108/IJPPM-03-2013-0033

Washington State Department of Ecology. (2023). Safer products for Washington - Cycle 1:

Final rule. https://ecology.wa.gov/waste-toxics/reducing-toxic-chemicals/safer-products-washington

World Bank. (2020). World development report 2020: Trading for development in the age of global value chains. World Bank. https://doi.org/10.1596/978-1-4648-1457-0

World Bank. (2024). *Viet Nam 2045: Trading up in a changing world – Pathways to a high-income future.* World Bank.

World Trade Organization. (2012). World trade report 2012: *Trade and public policies: A closer look at non-tariff measures in the 21st century*. WTO.

Xiao, C.-Y., Wilhelm, M., Pagell, M., & van der Vaart, T. (2025). The role of public and buyer- driven governance for supplier sustainability development in China. *Journal of Operations Management, 72*(1), 64–80. https://doi.org/10.1002/joom.70017