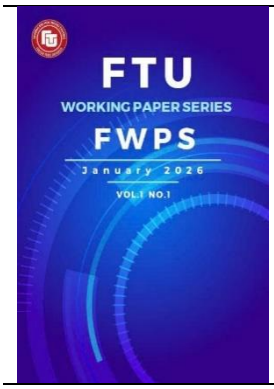

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VAI TRÒ KHO NGOẠI QUAN TRONG PHÂN PHỐI THƯƠNG MẠI ĐIỆN TỬ XUYÊN BIÊN GIỚI: TRƯỜNG HỢP CAINIAO NETWORK (TẬP ĐOÀN ALIBABA) TẠI TRUNG QUỐC VÀ HÀM Ý CHO VIỆT NAM

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Tóm tắt

Nghiên cứu đánh giá vai trò của kho ngoại quan trong nâng cao hiệu quả phân phối thương mại điện tử xuyên biên giới (CBEC) bằng nghiên cứu định tính công ty Cainiao Network (Tập đoàn Alibaba) tại Trung Quốc, từ đó rút ra các hàm ý cho Việt Nam. Kết quả cho thấy, khi tích hợp trong một hệ sinh thái logistics dựa trên dữ liệu, kho ngoại quan cải thiện tốc độ giao hàng, hiệu quả chi phí và tăng độ tin cậy nhờ bố trí hàng tồn kho sớm, hoãn nộp thuế và đẩy nhanh thủ tục thông quan. Cainiao cho thấy tầm quan trọng của sự phối hợp chặt chẽ giữa cơ quan hải quan, các nền tảng thương mại điện tử và nhà cung cấp dịch vụ logistics, vượt ra ngoài vai trò của cơ sở hạ tầng vật chất đơn thuần. Tuy nhiên, mô hình kho ngoại quan cũng tồn tại những thách thức như rủi ro tồn kho, yêu cầu vốn lớn và sự phụ thuộc vào khung pháp lý. Tại Việt Nam, dù có tiềm năng lớn trong CBEC, hệ thống logistics còn phân mảnh, mức độ tích hợp thể chế hạn chế, cản trở việc áp dụng hiệu quả mô hình này. Nghiên cứu gợi ý các bài học và hàm ý chính sách nhằm điều chỉnh và vận dụng mô hình kho ngoại quan cho sự phát triển thương mại điện tử xuyên biên giới của Việt Nam.

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THE ROLE OF BONDED WAREHOUSES IN CROSS-BORDER E-COMMERCE DISTRIBUTION: A CASE STUDY OF CAINIAO NETWORK (ALIBABA GROUP) IN CHINA AND IMPLICATIONS FOR VIETNAM

Abstract

This study examines the role of bonded warehouses in enhancing cross-border e-commerce (CBEC) distribution through a qualitative case study of Cainiao Network (Alibaba Group) in China and draws implications for Vietnam. The analysis shows that bonded warehouses, when integrated into a data-driven logistics ecosystem, improve delivery speed, cost efficiency, and service reliability by enabling inventory pre-positioning, deferred taxation, and faster customs clearance. The Cainiao case highlights the importance of coordination between customs authorities, e-commerce platforms, and logistics providers beyond physical infrastructure alone. However, bonded warehousing also involves challenges such as inventory risk, capital intensity, and regulatory dependence. In Vietnam, despite strong CBEC potential, fragmented logistics systems and limited regulatory integration constrain effective adoption. The study identifies key lessons and policy implications for adapting the bonded warehouse model to Vietnam's cross-border e-commerce development.

Keywords: bonded warehouse, cross-border e-commerce, Cainiao Network, China, Vietnam

1. Introduction

In recent years, international economic integration and rapid advancements in information technology have significantly accelerated the growth of cross-border e-commerce (CBEC) worldwide. While digital platforms enable seamless cross-border transactions, logistics has emerged as a critical bottleneck that determines the scalability and efficiency of CBEC (Thái Hằng, 2025). Despite its rapid expansion, CBEC continues to face substantial logistical challenges, including complex customs procedures, lengthy clearance times, tax-related issues, and high distribution costs. Traditional logistics models, originally designed for conventional trade, have increasingly become a major barrier to the further development of cross-border e-commerce, highlighting the need for more efficient and flexible logistics solutions.

In this context, bonded warehouses have emerged as an effective logistics model for CBEC by allowing goods to be stored in advance without immediate tax payment, with duties imposed only when products are sold and released into the domestic market. This model significantly reduces delivery time, lowers logistics costs, and enhances supply chain flexibility, making it particularly suitable for the fast-paced nature of e-commerce (Thị Trang Trần, Huỳnh Phương Thảo Nguyễn and Vy, 2025). Among emerging economies, China stands out as the world's largest cross-border e-commerce market and has developed the most extensive bonded warehouse system globally, supported by comprehensive policies and digital platforms (Thanh and Hiếu, 2026), notably those operated by major e-commerce firms - Alibaba. Thus, the Cainiao Network of Alibaba Group and China represent a best-practice case for enterprises and countries seeking to improve their CBEC logistics infrastructure.

Vietnam has also witnessed rapid growth in cross-border e-commerce in recent years and currently ranks among the leading e-commerce markets in Southeast Asia (Vũ et al., 2023). However, despite this growth potential, Vietnam continues to face notable constraints in logistics capacity, customs facilitation, and the development of bonded warehouse systems. Compared to China, the application of bonded warehouses in Vietnam remains limited, and empirical research on their role in supporting CBEC distribution is still scarce. Existing studies tend to focus primarily on bonded warehouse management (Đặng, 2016) or its general services (Nguyễn, 2022; Nguyễn, Nguyễn and Nguyễn Mậu, 2022); moreover, case-based analyses of successful international bonded warehouse models and their applicability to Vietnam remain scarce, leaving a gap in understanding their strategic role in cross-border e-commerce ecosystems in Vietnam.

Against this background, this study examines the current state and operational effectiveness of bonded warehouses in China through an in-depth case analysis, identifying opportunities and challenges, drawing implications for adapting successful elements of China's bonded warehouse performance to Vietnam's national context. By that, this research will answer the following questions: i. What lessons can Vietnam learn from China's experience? ii. What opportunities and challenges does Vietnam face in developing bonded warehouses for cross-border e-commerce? iii. How can China's successful practices be adapted to Vietnam's national context?

This paper is organized as follows: Section 2 summarizes literature review about bonded warehouse and cross ecommerce; Section 3 presents the research methodology; Section 4 interprets the case analysis; and section 5 presents implication for the Vietnam bonded warehouse and section 6 for conclusion.

2. Literature review

2.1. Cross-border e-commerce logistics

Cross-border e-commerce (CBEC) has experienced rapid global expansion in recent years, driven by digitalization and further accelerated by the COVID-19 pandemic. CBEC refers to online commercial transactions conducted across national or continental borders, encompassing various transaction models such as business-to-consumer (B2C), business-to-business (B2B), and consumer-to-consumer (C2C) (Rusachenko, 2020).

Within CBEC, logistics, particularly in the B2C segment, presents distinctive challenges. Long delivery lead times and high international transportation costs are common characteristics of cross-border logistics operations. These factors often result in inconsistencies in consumer preferences and may even trigger preference reversals, ultimately increasing the likelihood of product returns (Wang, Xie and Fan, 2020). Compared to domestic e-commerce, CBEC distribution channels are significantly more complex and exposed to higher levels of risk (Giuffrida et al., 2019). This complexity stems from several factors, including extended geographical distances, prolonged delivery times, reliance on third-party logistics providers, and procedural barriers related to customs clearance. In addition, CBEC logistics must operate across diverse cultural contexts, which further complicates logistics management and coordination (Gao and Liu, 2020).

Ensuring efficient delivery in CBEC remains particularly challenging due to unreliable and lengthy transit times, unclear or complicated return procedures, and potential bottlenecks at customs checkpoints (Van Heel et al., 2011). To address these issues, specialized CBEC logistics service providers have increasingly emerged. However, unlike traditional freight forwarders, CBEC logistics providers face highly unpredictable demand patterns, as orders arrive randomly and fluctuate significantly across regions. Consequently, logistics planning, facility location decisions, and service capacity allocation become highly complex tasks.

Given these persistent logistical challenges, the need for alternative logistics solutions has become increasingly evident in supporting the efficient operation and scalability of cross-border e-commerce.

2.2. Bonded warehouses in cross-border e-commerce

Warehousing is a core component of supply chain networks and has become increasingly important as a source of competitive advantage in modern logistics systems. However, due to the substantial investments required, warehousing is often among the most expensive elements within the supply chain (Opoku et al., 2019). In response to these cost pressures and the growing complexity of international trade, bonded warehouses have emerged as an increasingly efficient alternative, particularly in cross-border supply chains.

Bonded warehouses can be operated under either public or private ownership and are defined as facilities in which imported goods are stored under customs supervision until specific conditions are fulfilled, such as the payment of duties and taxes or the transfer of goods to another bonded location or customs-controlled area (Opoku et al., 2019). This institutional arrangement makes bonded warehouses particularly suitable for cross-border trade activities, where flexibility in customs procedures and inventory management is essential.

From a financial perspective, bonded warehouses provide firms with liquidity by allowing the deferral of customs duties and taxes, thereby easing short-term cash flow constraints (James, 2012). Prior studies suggest that investment in bonded warehouse systems can generate substantial cost-saving benefits for companies engaged in import and export activities across multiple countries (Kalinicheva et al., 2016). Despite the additional operational complexity involved, the literature generally agrees that the advantages of bonded warehouses often outweigh their drawbacks. Documented benefits include reductions in logistics and customs-related costs, as well as the mitigation of cross-border risks (Brooks et al., 2018; Prataviera et al., 2020; Wong et al., 2014).

Nevertheless, the implementation and operation of bonded warehouses are more complex than those of conventional non-bonded facilities. Bonded warehouses require strict monitoring, auditing, and compliance with customs regulations, which increases both operational costs and implementation risks (Löwerot and Nilsson, 2022). Furthermore, the cost of operating a bonded warehouse is generally higher than that of a standard warehouse, further amplifying the risks associated with inappropriate implementation strategies (Prataviera et al., 2020). As a result, firms must adopt suitable implementation frameworks and resource allocation strategies to avoid inefficient use of capital and operational resources.

The growing relevance of bonded warehouses is widely acknowledged in the literature,

particularly in the context of globalization, where raw materials, semi-finished products, and finished goods frequently cross multiple national borders before reaching final consumers (Prataviera et al., 2020; Xu et al., 2019). The preferential duty regimes applied to bonded warehouses further enable firms to benefit from favorable import regulations (Wang et al., 2018). Overall, existing studies identify multiple advantages of bonded warehouses, including cost avoidance and postponement, reduced lead times, and improved management of demand uncertainty benefits that are particularly valuable in the context of cross-border e-commerce operations (Prataviera et al., 2020; Wong et al., 2014).

Studies on bonded warehouses and cross-border e-commerce logistics mainly adopt analytical and exploratory approaches, focusing on determining factors, risk management, and general challenges of bonded warehouse implementation. While these studies provide useful theoretical insights, they are largely descriptive and lack in-depth, practice-based analysis. To address this gap, this study employs a case study of Alibaba's bonded warehouse system in China to derive practical and policy-relevant implications for Vietnam.

3. Research methodology

3.1. Research method

This study adopts a qualitative research method to examine the roles of bonded warehouses as distribution nodes in cross-border e-commerce, using a case study of Cainiao Network's bonded warehouse operations within China's CBEC ecosystem. A single embedded case study design is employed as it allows the analysis of multiple units within a single case context, such as customs facilitation mechanisms, warehousing operations, and downstream distribution outcomes, thereby enhancing analysis depth alongside contextual coherence (Yin, 2018).

3.2. Data collection

Data has been mainly collected from secondary information sources. These include academic journal articles on bonded warehousing, CBEC logistics, and industry reports and corporate publications released by Cainiao's official website and Alibaba Group. Documents were selected based on relevance to the topic using keywords such as "bonded warehouse", "cross-border e-commerce logistics", "China CBEC", and "Cainiao".

4. Case study of Cainiao (Alibaba Group)

4.1. Overview of China's bonded warehouse model operations in cross-border e-commerce

China has developed one of the world's most advanced bonded warehouse systems within its cross-border e-commerce logistics framework, transforming bonded facilities into strategic distribution hubs that actively mitigate supply chain constraints. A bonded warehouse in this context refers to customs-supervised storage facilities that allow imported goods to be stored without immediate payment of tariffs and taxes until their sale or domestic distribution, enabling deferred taxation and shorter delivery times for CBEC operators (Španěl, 2021). In CBEC supply chains, the bonded warehouse mode serves as an alternative to traditional direct mail logistics by facilitating bulk inbound procurement and subsequent domestic fulfillment, thereby shortening lead times, and lowering overall logistics costs (Xu et al., 2019). In practice,

China's bonded warehouse networks have expanded across major coastal and inland logistics hubs, particularly near key logistics gateways, including major ports and Free Trade Zones such as Ningbo, Shanghai, and Guangzhou, supporting a redistribution of inventory toward consumption centers (SFC, 2025).

The transition toward bonded warehouse logistics in China has been closely linked with government-led pilot policies that aim to foster efficient trade facilitation and enhance competitiveness in global online markets. Since the mid-2010s, the Chinese government has systematically established Comprehensive Cross-Border E-Commerce Pilot Zones, which integrate bonded logistics with streamlined customs procedures and tariff deferment regimes (Huynh & Le, 2026). Within these zones, bonded warehouses serve not only as storage sites but as operational nodes that support inventory pre-positioning closer to consumer markets, critical for delivering rapid domestic fulfillment in CBEC operations. These pilot zone policies have been shown to significantly influence logistics practices by reshaping how firms balance transportation, customs clearance, and delivery performance.

From a supply chain perspective, bonded warehouses help address two structural challenges inherent in CBEC: geographical distance and customs friction. China's CBEC market involves cross-border flows that create trade-offs between direct shipping times and inventory holding costs, with bonded warehouses positioned to reduce the negative impact of both by enabling bulk import, deferred clearance, and integration with domestic express networks. A theoretical model comparing logistics modes in CBEC (bonded warehouse vs. direct mail) demonstrates that the bonded warehouse mode can improve supply chain equilibrium under certain demand and cost conditions, making it a preferred strategy for high-volume, time-sensitive segments (Xu et al., 2019). Storing goods in domestic bonded facilities shortens the transport distance and thereby significantly increases delivery speed with the customers often receiving orders within 1-6 days in comparison with 7-30 days when products are delivered individually from overseas suppliers (Španěl, 2021).

Considering the cost perspective, with bonded warehouse mode, firms are not required to pay import duties immediately upon the arrival of goods at the port but pay duties only when a specific product is ordered by the customer, significantly alleviating cash flow pressure compared with conventional import models. Moreover, this mode allows firms to benefit from preferential tax rates depending on product categories (for example, reductions of up to 70% for cosmetics), and from quantity discounts due to bulk importation, resulting in lower per-unit logistics and shipping costs than individual overseas shipments (Španěl, 2021).

Moreover, China's bonded warehouse system interacts with broader logistics digitalization trends, where information sharing, integrated customs systems, and platform coordination (e.g., with e-commerce marketplaces and express carriers) further enhance distribution efficiency and reduce administrative cost. Scholars point out that such integration, often facilitated by data-driven customs declarations and coordinated logistics planning, is essential for realizing the full distribution potential of bonded warehouses in CBEC supply chains (Song et al., 2023).

The policy context, empirical evidence, and analytical findings suggest that bonded warehouses in China are no longer merely facilities for customs storage. Instead, they have

developed into distribution-focused logistics hubs that actively support cross-border e-commerce performance by accelerating order fulfillment, optimizing cost efficiency, and strengthening the linkage between global sourcing activities and domestic delivery needs. As one of China's largest cross-border logistics providers, Cainiao's operations exemplify how bonded warehouses function within a platform ecosystem to support rapid fulfillment and flexible distribution, setting the stage for the subsequent case analysis in the next section.

4.2. Cainiao's bonded network operations

Since its launch in 2013, Cainiao has operated as an asset-light logistics data platform that coordinates logistics activities across Alibaba's ecosystem. To support Tmall Global and achieve the "Global 72-hour delivery" target, the company uses a wide network of bonded warehouses across China's pilot zones (Cainiao Network Technology Co., 2020). This setup means international merchants can stock goods locally, which effectively turns complex cross-border flows into faster and domestic-like deliveries.

The reason why Cainiao Network's bonded fulfillment model were chosen to study is that Cainiao is one of the four largest global cross-border logistics firms, with its prominent role in operating platform-led bonded warehouse networks that enable inventory pre-positioning, deferred customs clearance, and rapid order fulfillment, enhancing logistics speed and accuracy (Mao, H. and Mao, Z., 2025).

4.2.1. Global network and inbound logistics

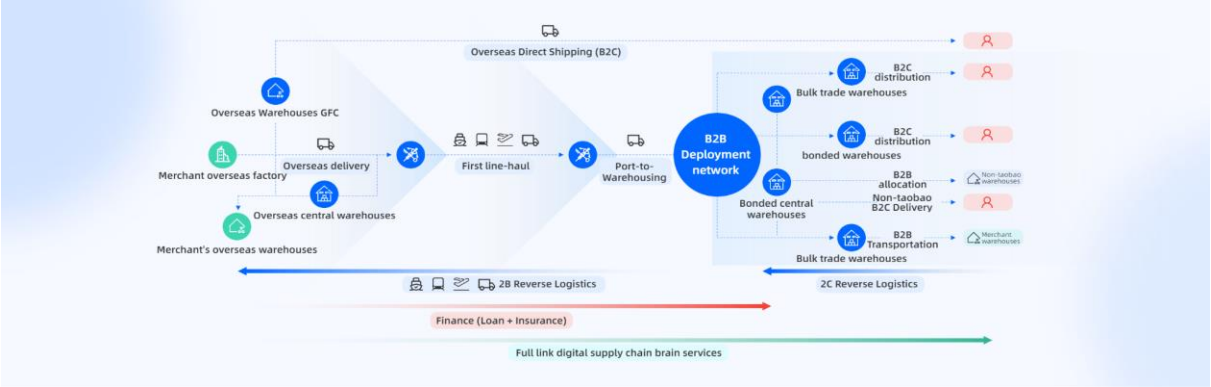

Figure 4.1. Global Supply Chain Process

Source: Cainiao Network.

To support the bonded import model, Cainiao has established a specialized B2B deployment network. At the upstream stage, the physical flow begins at "Merchant's overseas factories" or "Overseas central warehouses". Subsequently, instead of fragmented parcel shipping, this network utilizes a "First line-haul" system to transport consolidated freight via sea or air directly to "Bonded central warehouses". Moving to the downstream stage, these bonded hubs are integrated directly with China's domestic logistics infrastructure. This implies that, once customs clear the inventory, the shipment moves immediately into the "Last-mile delivery" network, which is managed by local courier partners. Therefore, the final leg of the journey, from the pilot zone to the consumer, can achieve delivery speed and tracking visibility comparable to a domestic transaction.

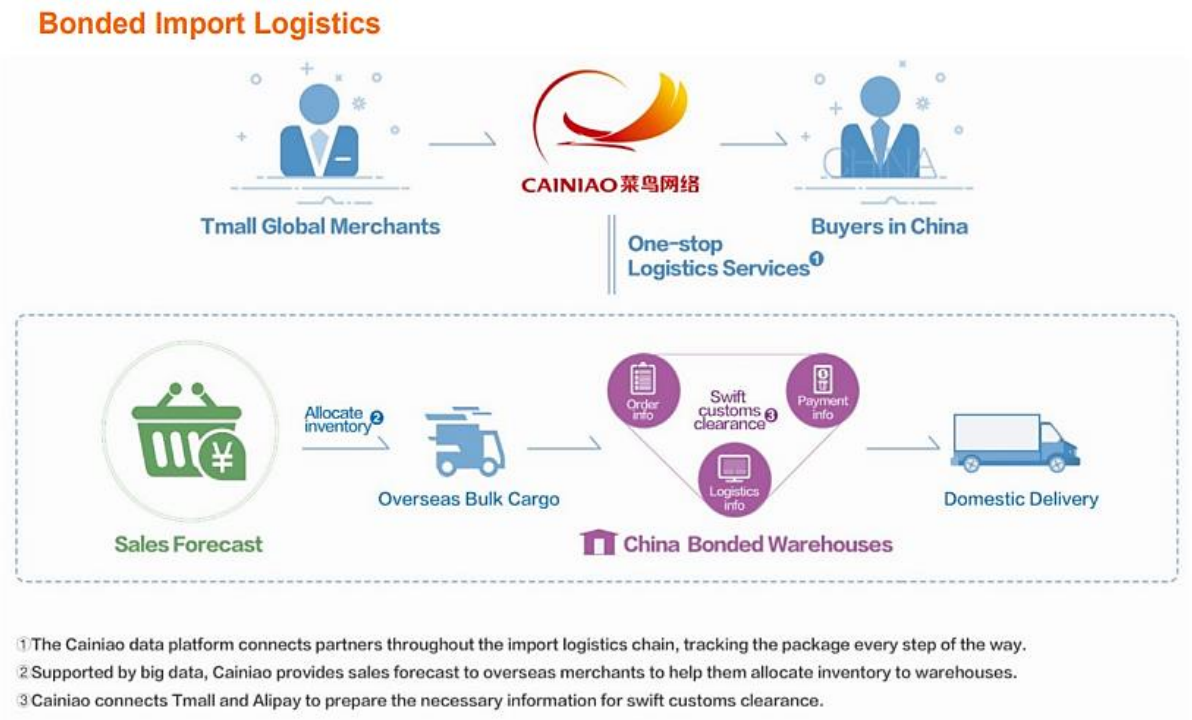

Figure 4.2. Bonded Import Logistics

Source: Cainiao Network, 2016

Within Cainiao's bonded import logistics service, the process follows a "Stock-First, Clear-Later" protocol. In this model, the inbound operation relies on a data-driven "Sales Forecast" strategy, under which merchants prepare "Overseas Bulk Cargo" in advance, even before the consumers place their orders (Cainiao Network., 2016). As soon as the system receives the order, payment, and logistics details simultaneously, the "Customs Clearance" stage is automatically triggered. This allows inventory to enter the warehouse in a tax-suspended status, therefore, merchants can stockpile goods domestically without the cash flow burden of duty payments.

4.2.2. Bonded inventory management

Cainiao's smart infrastructure is governed by a strict SKU Selection Model. Because the system relies on standardized data inputs for automation, Gong, H. & Bi, C. (2023) note that the bonded channel is strategically limited to "high-frequency, standardized commodities" such as FMCG and cosmetics. As a result, Cainiao filters out its non-standard items so that the infrastructure focuses on products with rapid turnover rates and thereby maximizes the return on technical investment.

Cainiao uses MaxCompute, a large-scale data warehousing system, to drive an "anticipatory logistics" model for stock management (Falcone, E., Kent, J. & Fugate, B., 2019). Rather than relying on a passive "push" approach, this technology enables a "data-driven pull" mechanism. In practice, the system utilizes historical data to predict inventory demand and order scale to allow merchants to pre-position inventory in the bonded zone. This aligns supply with predicted demand and helps merchants prevent stockouts during peak seasons while maintaining lean inventory (Chen, L., 2025).

4.2.3. Bonded outbound logistics and distribution

Within the bonded warehouse model, Cainiao plays an important role as a real-time data provider to facilitate the customs clearance process. According to Cainiao Network (2016), once a consumer places an order on Tmall Global, Cainiao's system immediately transmits the relevant logistics, payment and order data to the customs authorities. This capability results from the company's deep integration within the broader platform ecosystem, where logistics data is synchronized with order and payment information (Gong, H. & Bi, C., 2023). Therefore, customs can verify the transaction authenticity instantly, enabling goods stored in the bonded zone to be declared and released rapidly without unnecessary delays.

After the clearance is granted, Cainiao manages the transition of goods from the bonded zone into the last-mile delivery network. The system uses the standardized waybill data generated directly at the warehouse to coordinate effectively with downstream third-party logistics partners. As a result, the parcels can be handed over without the need for relabeling or secondary data entry (Gong, H. & Bi, C., 2023). Moreover, since the inventory is pre-positioned locally within the bonded warehouse, Cainiao can dispatch goods immediately upon release. Consequently, the shipments of cross-border products can achieve delivery speeds comparable to domestic e-commerce, creating a competitive advantage.

4.3. Performance outcomes of Cainiao's bonded warehouse model

4.3.1. Lead time reduction

The core advantage of Cainiao's bonded model is its use of "pre-positioned inventory", where goods are bulk-imported into domestic zones before sales occur. Chen, J. (2018) indicates that this approach stabilizes lead times at around 2-5 days window, compared with the 15-30 days commonly observed under direct shipping model. As a result, keeping stock within bonded zones helps Cainiao's customers to reduce their dependency on long-haul international transit and make delivery faster and more predictable.

4.3.2. Cost efficiency and profitability

Cainiao's bonded model has notably changed the cash flow dynamics by separating importation from taxation. According to TMO Group (2024), within this model, customs duties are not levied when the goods enter bonded zones but are deferred until a business-to-consumer (B2C) transaction is finalized. Under China's Cross-border E-commerce Comprehensive Tax regime, eligible goods processed through bonded warehouses are subject to 70% of the statutory value-added tax, resulting in an effective tax rate of approximately 9.1% for many consumer goods categories. This level is far lower than the 13% - 50% Personal Postal Articles Tax applied to Direct Mail shipments, as well as the combined import duties and VAT imposed under the General Trade imports (Hannah, 2022). In consequence, the company provides Tmall's merchants with a more transparent and measurable net margin advantage**.**

Beyond taxation, Cainiao's bonded model also improves cost efficiency through economies of scale in both logistics and financial operations. Chen, J. (2018) argues that batch-based logistics structures of Cainiao can increase load factors and reduce repetitive handling and administrative activities in CBEC supply chains so that the cost is significantly lowered. In addition, centralized bonded inventory allows fulfillment operations to be more standardized;

thus, Cainiao can reduce operational fragmentation and improve resource utilization across storage, picking, and fulfillment processes. From a financial perspective, this bulk import structure of Cainiao also mitigates financial risk under exchange rate uncertainty. Li, X., Yu, H. & Sun, C. (2024) highlight that importing inventory at a single point in time can stabilize the cost basis of inventory batches, thereby reducing exposure to short-term exchange rate fluctuations.

4.3.3. Service reliability and returns

Cainiao leverages its massive logistics infrastructure to maximize the product availability within China. Therefore, this extensive footprint can support substantial forward deployment of inventory (Cainiao Network Technology Co., 2020). Moreover, by utilizing this infrastructure to buffer stock domestically, merchants are able to decouple their sales performance from cross-border transit times. Specifically, Gong, H. & Bi, C. (2023) notes that this strategic placement ensures a high order fill rate even during demand surges like Double 11, as products are physically ready for dispatch. This, thereby, offering a superior service stability that direct shipping model simply cannot match.

In addition, Cainiao can enhance customer trust in imported goods by its high level of traceability throughout the bonded network. Falcone, E., Kent, J. & Fugate, B. (2019) found that the Cainiao Network has integrated real-time data and advanced information sharing technologies to enhance visibility and coordination across all supply chain partners. This transparency not only accelerates "pre-arrival" customs clearance but also provides consumers with verifiable proof of authenticity. By replacing manual checks with digital verification, the model helps reduce counterfeit concerns and strengthens consumer confidence over time.

Finally, Cainiao's bonded model also addresses the complexity of CBEC returns. According to SFC (2025), the ability to process returns at a domestic bonded warehouse can provide a more cost-effective solution. Unlike direct mail, where returning goods overseas is often too expensive, the bonded framework allows returned items to be inspected and restocked locally. This capability drastically reduces inventory loss and shortens refunds processing times, which help lower a major psychological barrier for consumers when purchasing cross-border products.

4.3.4. Cainiao's bonded warehouses model limitations

The requirement for pre-stocking forces Cainiao's customers is a trade-off between speed and capital efficiency. Gong, H. & Bi, C. (2023) notes that the bonded import model poses a high risk of "dead stock" if demand forecasts fail. For this reason, platforms like Tmall Global have to employ a selective inventory strategy by stocking only high-turnover items. This view is also shared by Chen, L. (2025), who argues that without precise "pull-based" inventory control, merchants can face a higher risk of obsolete stock compared to the direct mail model.

The operational complexity of Cainiao primarily stems from its asset-light and collaborative nature. Because Cainiao does not own physical infrastructure, it lacks direct operational control over warehouses and personnel. Consequently, the system is heavily dependent on the willingness of partners to cooperate. This dependency becomes a critical vulnerability when conflicts over data ownership arise. A clear example is the standoff with SF

Express regarding consumer records, which served as a strategic 'flash point.' Ultimately, orchestrating a fragmented network where partners resist sharing exclusive information requires significant administrative effort to maintain a standardized system (Falcone, E., Kent, J. & Fugate, B., 2019).

Another factor affecting Cainiao's model is regulatory favor. TMO Group (2024) emphasizes that bonded operations are geographically restricted to specific CBEC Pilot Zones. Moreover, the model's speed and cost advantages also rely entirely on policies regarding deferred taxes and simplified inspections. Therefore, these mentioned benefits of Cainiao could disappear by any legislative shift toward the traditional model.

In summary, Cainiao's bonded import logistics is not a universal solution but a conditional one. Its advantages depend significantly on specific product characteristics, a favorable regulatory environment, and advanced ecosystem coordination. Together, these requirements lead to heavy financial investment to establish and maintain the infrastructure. These combined constraints are the key factors to consider when evaluating the potential applicability of this model to our Vietnamese market in Section 5.

5. Discussion and implications for Vietnam

5.1. Opportunities and challenges for Vietnam

5.1.1. Current state of Vietnam's CBEC logistics system

Vietnam's current CBEC environment is in the process of rapid development; however, it is still in the nascent stage. The government's newly adopted 2026-2030 E-Commerce Master Plan is promising in this regard, as it makes cross-border e-commerce the central pillar in the country's export growth. This signals a strategic vision: the plan calls for "coordinated initiatives to improve policy frameworks, strengthen business capabilities, and enhance partnerships with major global platforms" (Vu, 2025). Moreover, Vietnam is in the process of developing its comprehensive E-commerce Law (Law No. 122/2025/QH15) that will clarify seller verification, taxation, and consumer protections for cross-border trade. Such policies utilized Vietnam' s strong manufacturing export base and a young, tech-savvy population. Rising incomes and mobile adoption mean consumers are eager for international brands and quality imports. Combined with Vietnam's multiple FTAs (ASEAN, CPTPP, EVFTA, RCEP), these factors make Vietnam an attractive CBEC hub, both as a market and as a source of exports.

Nevertheless, there remain considerable policy and infrastructure gaps in Vietnam. On the one hand, while the existing policy environment, Decree 52/2013, which was subsequently amended by Decree 85/2021, is widely viewed as outdated, with fragmented rules on customs, e-commerce, and data flow. Companies also complain of overlapping, for example, where a trader may be required to register for a trade single-window system while also having to register separately for a customs system. Ultimately, this patchwork of regulations can hinder CBEC transactions. In terms of infrastructure, there remain relatively few dedicated CBEC projects. For example, there remains a lack of a special customs procedure or codes for B2C Ecommerce, which, according to the findings of Huynh & Le (2026)'s study, should be addressed by introducing bonded CBEC zones in key logistics hubs (Hanoi, Ho Chi Minh City, Can Tho), which will be equipped with their unique codes for supervision.

Another area that can be considered a potential bottleneck in Vietnam is in terms of logistics infrastructure. Vietnam's bonded warehouses and free zones are not large in size and are more leaned toward traditional manufacturing exports rather than retail parcels. The last mile delivery in Vietnam is not well developed in rural or suburban areas. According to Luthra (2025), "last-mile delivery, cross-border warehousing, and reliable payment integration remain underdeveloped in some regions." Furthermore, Vietnam's single window and customs system is not yet "paperless-data-driven", according to (Huynh & Le, 2026). Integrating logistics data with customs like in Singapore's "TradeNet/NTP" or Korean "UNI-PASS" is still in the aspiration phase in Vietnam. Without having such a system in place, Vietnam cannot manage CBEC risks in a timely manner. Vietnam's aspiration is clear but not yet supported by a complete framework like in the leading economies.

5.1.2. Opportunities and challenges for applying CBEC in Vietnam

Despite the mentioned gaps, Vietnam possesses some key opportunities. Firstly, strategic geography and FTAs would grant exporters access to preferential tariffs in the European Union, the United States, and the rest of the ASEAN region. Moreover, Vietnam's digitalization drive, such as e-invoicing, e-payments, and national ID programs, would be an important avenue for CBEC logistics. The government's emphasis on supporting SMEs, such as its plan for providing "digital export vouchers" to help co-finance marketing and logistics costs for exporters, like Korea's program of providing export grant funds (Huynh & Le, 2026). This would help enable these businesses to participate in international trade. Vietnam's trade facilitation drive, such as its upgrading of ports and its efforts at creating express links with China via road and rail, would help reduce transit times for freight. Lastly, Vietnam would be able to leverage platforms developed and deployed by its trade partners such as China and Singapore. For instance, many international e-commerce platforms such as Amazon's Global Selling and Alibaba's AliExpress are actively seeking Vietnamese sellers and are looking at creating logistics solutions with Vietnamese businesses.

Nonetheless, the major challenges still include the cumbersome customs processes, such as complicated import/export documentation, which are frequently complained about by companies. There are still problems related to the current fragmented regulatory frameworks, such that companies have to contend with multiple authorities and uncertain liability. For example, the new rules that require foreign online platforms to appoint local representatives. Another problem facing the inbound logistics sector is the limited bonded capacity. While Vietnam has only a few bonded warehouses, unlike the 179 pilot zones that exist in China, none are yet dedicated CBEC facilities. Data is another problem that has not yet been resolved. There currently remains the lack of a unified risk management system that supports CBEC, such that the risk of fraud can easily pass through. Lastly, the sector still has the problem of intense competition, such that the domestic merchants not only have the task of satisfying the foreign buyers, but also the task of competing with the region's online retail leaders, such as Shopee, Lazada, etc., that are expanding their bonded warehouse facilities.

5.2. Implications for Vietnam

5.2.1. Implications for Vietnamese government

Firstly, the Vietnamese authorities should speedily develop the pilot sites of the CBEC in the country's main logistics centers, which should include special customs codes for e-commerce trade. This is similar to China's strategy of developing its free trade zones, which now boast more than 160 pilots, as well as special codes, which the China authorities found essential for scalable growth, according to (Huynh & Le, 2026). Secondly, the Vietnamese authorities should digitally upgrade the country's customs system, which should include the introduction of a single-window system that is completely digital or paperless, as is the case in China, which is a result of the country's digital revolution in recent years. Thirdly, the government can adopt targeted SME support, such as grants, logistics subsidies or co-financed vouchers, so that small exporters can afford inventory and marketing abroad, as recommended by the Vietnam CBEC policy review. Incentivizing the building of overseas bonded warehousing, which could include special benefits or public-private partnerships, could help Vietnamese exporters keep inventories in the US, the EU, or even the ASEAN region, according to (Huynh & Le, 2026). Finally, Vietnam should prioritize data as well as integration, by engaging with 4PL service providers or platforms, whereby they would share data on demand forecasts as well as inventory, thus avoiding stock-mismatch issues as observed in China (Chen et al., 2025).

5.2.2. Implications for Vietnamese e-commerce platforms, logistics providers, and SMEs

The implications drawn from the Cainiao Network case suggest that Vietnamese companies, including e-commerce platforms, logistics service providers, and SMEs, involved in cross-border e-commerce need to transition from the fragmented and transaction-based logistics model to the integrated and data-based logistics model.

First, the inventory pre-positioning strategy using bonded warehouses is important for Vietnamese companies. This strategy allows for the storage of high-turnover and standardized products prior to sale, which helps to shorten delivery time and delay tax payment until the actual sale. This strategy calls for the improvement of demand forecasting skills, where historical sales data and platform analytics are used to support the anticipatory logistics model and avoid stockouts and inventory buildup. Second, digital integration of the supply chain is important for Vietnamese companies. This is because Cainiao's success story indicates the importance of interconnecting warehouse management systems, order management systems, transportation systems, and customs systems to allow for the sharing of data among merchants, logistics service providers, and customs. Third, the Cainiao Network case highlights the importance of data-based customs coordination. Instead, companies should engage with the authorities to facilitate pre-declaration and risk management through transactional data, which could help reduce clearance times significantly. Fourth, smart SKU and inventory management is critical to address the inherent risks in the bonded warehouse model. Companies need to ensure that they prioritize standardized and fast-moving products and utilize real-time inventory tracking and analytics to continually adjust inventory allocation in bonded warehouses. Finally, the Cainiao case highlights the importance of platform ecosystems and partnerships. In the context of Vietnamese SMEs' limited scale and resources, it may be more viable for them to

engage with large platforms or logistics companies rather than investing in capabilities themselves. By integrating themselves into digitally integrated logistics ecosystems, Vietnamese companies can leverage the capabilities of advanced logistics providers and thus compete more effectively in the global market.

6. Conclusion

The case of Cainiao Network in China's Alibaba Group demonstrates that a bonded warehouse, in a digitally integrated logistics ecosystem, plays a crucial role in improving the efficiency and reliability of cross-border e-commerce. The case study analysis revealed that China's success in this sector is not only attributed to its physical infrastructure but also to the close coordination between customs, e-commerce platforms, and logistics providers in a data-driven systems that enable pre-positioning inventory, deferring taxation, accelerating customs clearance, and providing domestic-like speeds to customers. Cainiao's use of a bonded warehouse revealed its benefits in reducing lead time, cost efficiency, and service reliability in a highly competitive logistics market and its limitations in terms of inventory risk, capital requirements, and regulatory support. In terms of implications for Vietnam, this study revealed that despite the country's high potential for cross-border e-commerce, favorable free trade agreements, and a young and tech-savvy population, its logistics and regulatory environment remains fragmented and underdeveloped compared to China. To address this gap, Vietnam will have to implement a package of reforms, including the establishment of dedicated CBEC bonded zones, modernization of customs via a truly digital single window, and support mechanisms for firms, particularly SMEs, in gaining access to bonded warehousing and advanced logistics services. At the level of firms, e-commerce platforms, logistics service providers, and exporters in Vietnam have to look beyond conventional and reactive forms of logistics management and adopt more integrated and data-driven forms of fulfillment, typically via ecosystems rather than individual firms.

Nevertheless, there are some limitations in this study, as it relies mainly on secondary data, such as government reports, industry publications, and news articles and lacks access to primary data from Vietnam's cross-border e-commerce operations. The study is a single-case study of Cainiao, thus its findings may not be generalizable to all firms or even countries. Therefore, while the study is insightful, its findings may not fully address the unique circumstances of Vietnam's CBEC bonded warehouse operations. To address such research gaps, further research should include access to primary data and more quantitative studies. Primary data collection in Vietnam should include interviews and surveys of logistics operators, customs officials, and e-commerce firms to gain practical insights. Quantitative research, such as econometric or simulation studies of policy effects or efficiency gains from bonded warehouse operations, would add to the findings of this study.

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