Print ISSN: 1738-3110 / Online ISSN 2093-7717
JDS website: http://accesson.kr/jds
http://doi.org/10.15722/jds.23.12.202512.27

The Determinants of Cross-Border E-Commerce Adoption in SMEs: A Resource-Based View

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Received: August 12, 2025. Revised: September 23, 2025. Accepted: December 05, 2025.

Abstract

Purpose: This study investigates how internal firm resources influence the adoption of cross-border e-commerce (CBEC) among export-oriented SMEs in China. Guided by the Resource-Based View (RBV), the research focuses on how Digital Technology, Digital Capability, Export Manager Capability, and Employee Skills enable SMEs to implement CBEC effectively. **Research design, data and methodology:** A quantitative research approach employing a cross-sectional survey was adopted, gathering data from 188 SME export managers located in Southern Shaanxi Province, China. Structured questionnaires were distributed using both online and offline methods, and data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). **Results:** The results indicate that Digital Technology, Digital Capability, Export Manager Capability, and Employee Skills each significantly enhance SMEs' adoption of CBEC. Collectively, these resources account for 27.8% of the variation in CBEC adoption, with predictive analysis (PLSpredict) showing the model's practical relevance to be small to moderate. **Conclusions:** Internal resources are critical for SMEs to adopt CBEC successfully and translate it into stronger distribution strategies and broader international market access. Enhancing digital infrastructure, managerial capabilities, and employee competencies allows SMEs to leverage CBEC to optimize export distribution and advance digital internationalization. These insights offer actionable guidance for managers and policymakers seeking to improve SMEs' competitiveness in global markets.

Keywords: Cross-Border E-Commerce, SMEs, Resource-Based View, Digital Capability, Export Manager Capability

JEL Classification Code: F23, L81, O33, L26

1. Introduction

Cross-border e-commerce (CBEC) has emerged as an important channel for Small and Medium-sized Enterprises (SMEs) to achieve internationalization (Xin & Mendonça, 2025). By reducing transaction costs, bypassing traditional intermediaries, and enabling direct access to international customers, CBEC reshapes SMEs' export distribution models and helps them overcome traditional trade barriers to compete more effectively in global markets (Pan et al., 2023). Recognizing these benefits, policymakers in many developing economies have promoted CBEC adoption through supportive initiatives and infrastructure investments (OECD, 2023). Yet despite these efforts, CBEC adoption among SMEs remains uneven due to persistent internal barriers such as limited technological infrastructure, inadequate digital capabilities, and shortages of skilled human resources (Dethine et al., 2020; Li et al., 2022). Such

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unevenness exacerbates digital inequality and heightens the risk of internationalization failure for less-equipped SMEs (Liang et al., 2024; Vassilakopoulou & Hustad, 2023). These challenges indicate that market opportunities or external incentives alone are insufficient to ensure successful adoption, highlighting the importance of firms' internal conditions in optimizing international distribution channels and expanding global trade through CBEC.

Prior research has explored both external and internal factors influencing CBEC adoption, identifying various drivers and barriers spanning technological, organizational, policy, and market dimensions (Madhavan et al., 2025; Nguyen et al., 2024). Although previous studies have advanced understanding of external determinants, the role of internal human resources and capabilities has received comparatively less attention in explaining CBEC adoption (Gonzalez-Varona et al., 2024; Held et al., 2025). To address this gap, the Resource-Based View (RBV) highlights how firm-specific resources that are valuable, rare, inimitable, and non-substitutable underpin sustainable competitive advantage (Barney, 1991). Yet, applications of RBV to CBEC have largely concentrated on digital technologies or digital capability, leaving other internal dimensions underexplored (Elia et al., 2021; Cui et al., 2025; Yang et al., 2023).

To extend this line of research, the present study applies the RBV to examine four internal resources—digital technology, digital capability, export manager capability, and employee skills—and their influence on CBEC adoption among Chinese SMEs. In addition, whereas many previous studies have conceptualized adoption as a binary outcome (adopt or not adopt), this study employs a multi-item measure that captures the extent of CBEC integration into export activities, offering a more nuanced assessment (Lefebvre et al., 2005; Abdulkarem & Hou, 2021). By broadening the scope of resources considered and refining how adoption is measured, this study contributes to a more comprehensive understanding of the internal drivers of CBEC adoption and offers practical implications for SMEs and policymakers seeking to enhance digital transformation in emerging markets, particularly in redesigning export distribution models and strengthening cross-border logistics capabilities.

2. Literature Review

2.1. CBEC Adoption

CBEC adoption has become a prominent topic in international business research, reflecting the ongoing transformation of global trade through digital channels (Cui et al., 2025). Rather than relying solely on traditional export intermediaries or offline networks, firms adopting CBEC integrate online technologies and platforms to access foreign markets directly, reshaping their international distribution by enabling more direct and flexible export pathways (Ballerini et al., 2024). Scholars argue that this shift reflects broader global trends, such as increasing digitalization, evolving consumer shopping habits, and the growing role of major e-commerce platforms (Chen et al., 2023; Wang & Zhou, 2025). As a result, understanding CBEC adoption is crucial for analyzing how firms—particularly SMEs—navigate the opportunities and challenges of international expansion in an increasingly digital trade environment, where they also face intensifying competition that requires more integrated and efficient export strategies (Peng & Yusoff, 2023).

Gibbs and Kraemer (2004) define CBEC adoption as the strategic application of e-commerce solutions into diverse export operations along the value chain, encompassing the integration of digital tools and platforms into purchasing, marketing, information exchange, customer service, and logistics processes. Rather than serving as a standalone technological enhancement, e-commerce adoption is conceptualized as a coordinated approach that supports cohesive processes, enabling firms to strengthen international customer relationships and manage cross-border transactions more effectively (Dallocchio et al., 2024; Kawa et al., 2024; Shenglong, 2022).

The process orientation of CBEC has led scholars to consistently describe CBEC adoption as an organizational-level decision rather than a purely technological acquisition, viewing it as a strategic choice that reconfigures how firms organize international distribution and customer interactions (Abdulkarem & Hou, 2021, 2022). This perspective suggests that firms must engage in strategic planning and structural adaptation to meet the demands of online international markets (Al-Qahtani, 2025; Cassia & Magno, 2025). Furthermore, the literature emphasizes that achieving effective CBEC adoption requires sustained managerial commitment and the deliberate allocation of resources to develop capabilities for handling cross-border complexity and regulatory diversity (Eduardsen et al., 2023; Li et al., 2018). Such challenges highlight the importance of internal readiness as a differentiator among firms seeking to adopt CBEC.

Recent studies have explained CBEC adoption through different theoretical perspectives. TOE-based research emphasizes technological, organizational, and environmental readiness (Nguyen et al., 2024); DOI highlights how innovation attributes influence adoption, often alongside firms' capabilities (Madhavan et al., 2025); and DMC underscores the role of managerial skills and perceptions in shaping SMEs' adoption paths (Yan et al., 2018). While these perspectives provide valuable insights,

they are less explicit in conceptualizing the heterogeneity of internal resources as the foundation of adoption outcomes. The RBV directly addresses this issue by foregrounding firm-specific resources and capabilities as the basis for explaining differences in adoption and integration (Barney, 1991; Peng & Yusoff, 2023). For instance, Elia et al. (2021) adopt an RBV perspective to show that firms with greater digital capabilities achieve more advanced levels of CBEC integration, while also critiquing the limitations of simple binary adoption measures. This suggests that adopting CBEC is not a uniform process but depends on a firm's ability to mobilize multiple types of internal resources in a coordinated way.

Building on these insights, the present study adopts a multi-dimensional measurement approach to better capture adoption sophistication and applies the RBV framework to analyze how specific internal resources support higher levels of CBEC adoption. It provides the foundation for examining the key internal determinants of CBEC adoption in the following section.

2.2. Theoretical Lens: RBV Perspective

RBV is a foundational theory in strategic management that explains how firms achieve and sustain competitive advantage through their internal resources and capabilities (Assensoh-Kodua, 2019). It argues that resources that are valuable, rare, inimitable, and non-substitutable (VRIN) enable firms to implement strategies that competitors cannot easily replicate (Barney, 1991). Rather than focusing on external market conditions, RBV emphasizes the heterogeneity of firms' internal resource bases as the primary source of strategic differentiation (Barney & Clark, 2007; Madhani, 2010). It helps move beyond external enablers to examine why some firms are better positioned to exploit digital trade opportunities.

This makes RBV a particularly useful lens for analyzing CBEC adoption, where internal human resources and capabilities often determine how effectively digital channels are integrated into international operations. In the context of technology and innovation adoption, RBV has been widely applied to understand why some firms are able to successfully deploy new systems or processes while others lag behind (Caldeira & Ward, 2003; Pan et al., 2015; Sultan, 2025). Prior studies have shown that technological assets, managerial competencies, organizational capabilities, and employee skills all contribute to a firm's readiness and capacity to adopt digital innovations (Khin & Ho, 2019; Motamedimoghadam et al., 2024). Recognizing that CBEC adoption varies across firms based on their internal capabilities, the RBV framework clarifies which resources best support effective adoption.

RBV thus helps explain how specific internal resources enable SMEs to adopt CBEC for digitally supported international operations. It enriches the analytical focus by highlighting internal foundations that support strategic digital transformation.

2.3. Firm Resources as Drivers of CBEC Adoption

Recognizing the critical role of internal resources in enabling CBEC adoption, this study focuses on four key dimensions: digital technology, digital capability, export manager capability, and employee skills. Consistent with RBV, these can be distinguished as tangible resources (e.g., digital technology) that provide the technical foundation for adoption, and intangible resources (e.g., digital capability, export manager capability, and employee skills) that are more difficult to imitate and therefore more likely to yield sustainable competitive advantage (Barney, 1991; Assensoh-Kodua, 2019). These resources represent both technological assets and human capital that SMEs need deploy effectively to manage the complexities of CBEC adoption (Elia et al., 2021; Li et al., 2022).

2.3.1. Digital Technology

Digital technology is defined as "a collection and a paradigm of various intelligent and innovative technologies which realize connectivity, communication and automation" (Li et al., 2020). It includes established technologies such as mobile platforms, cloud computing, big data analytics, and artificial intelligence, as well as emerging tools like blockchain and the Internet of Things, which enable firms to digitize operations, manage customer interactions, and optimize logistics across borders (Rane et al., 2024; Sahoo et al., 2023).

In the context of international business, digital technology has been linked to firms' ability to expand market reach, adapt offerings for foreign customers, and manage the complexities of cross-border transactions (Bhuiyan et al., 2024; Wang et al., 2020). These insights suggest that digital technology represents a strategic internal resource that can strengthen firms' capabilities and support sustainable advantage in global markets, providing a foundation for adopting and integrating cross-border e-commerce.

2.3.2. Digital Capability

Digital capability refers to a firm's ability to manage and apply digital technologies by developing the necessary skills, expertise, and organizational knowledge (Khin & Ho, 2019). Unlike technological assets alone, it reflects the firm's capacity to integrate these tools into everyday operations and adapt to changing demands over time (Hirvonen & Majuri, 2020; Wang et al., 2022). This concept has received growing attention as an internal resource that

enables firms to realize strategic value from technology investments (Ghosh et al., 2022).

Prior studies highlight that digital capability is central to supporting organizational learning and continuous improvement by enabling firms to adapt their internal processes and decision-making to evolving market conditions (Arkhipova & Bozzoli, 2017; Zhuge et al., 2023). It has also been emphasized as an important driver of innovation, as firms with strong digital capability are better equipped to develop new offerings and improve their operations (Kastelli et al., 2024; Motamedimoghadam et al., 2024). In international contexts, this capability further supports firms by enhancing their readiness for foreign market entry, facilitating the management of geographically dispersed activities, and improving customer engagement across diverse markets (Aghazadeh et al., 2022; Monaghan et al., 2020).

These insights suggest that digital capability should be seen as a strategic internal resource that enhances firms' adaptability and competitiveness. In international business context, it provides SMEs with the capacity to use digital channels effectively and sustain their performance in global markets.

2.3.3. Export Manager Capability

Export manager capability refers to the comprehensive competence of the manager responsible for finding international buyers and managing a firm's overseas sales activities (Lamprinidou et al., 2022). It reflects the manager's understanding of foreign markets and regulations, as well as the ability to plan and oversee export activities that differ from those in domestic operations (Andersen, 2006; Williams & Chaston, 2004).

Research has emphasized that export manager capability represents an important organizational resource for firms competing internationally (Elia et al., 2021). It enables firms to build trust with overseas partners, tailor approaches to local conditions, and reduce uncertainty in cross-border transactions (Andersen, 2006; Ringo et al., 2023; Sousa et al., 2010). Because it develops over time through practice and personal networks, export manager capability is not easily replicated by competitors, making it a distinctive asset for firms seeking to strengthen their international operations (Freixanet & Renart, 2020; Vardarsuyu et al., 2024).

In addition, scholars have highlighted that export managers play an important role in supporting firms' digitalization processes by guiding the adoption and integration of new technologies (Wrede et al., 2020). These insights suggest that export manager capability should be viewed as a strategic internal resource that enables SMEs to adopt CBEC channels effectively and remain competitive in global markets.

2.3.4. Employee Skills

Employee skills refer to the knowledge, technical abilities, communication competence, and critical thinking capacity that employees bring to their roles (Nyaupane et al., 2020). This concept encompasses not only task-specific expertise but also broader capabilities that support problem-solving, collaboration, and adaptability within the firm. Scholars distinguish these skills from general human resources by emphasizing their direct contribution to executing business strategies and maintaining operational efficiency (Papalexandris & Nikandrou, 2000; Peterson et al., 2001).

Prior research highlights that well-developed employee skills improve firms' operational flexibility, production quality, and responsiveness to changing demands (Bhattacharya et al., 2005; Mendes & Machado, 2015). By ensuring that employees can adjust practices and address challenges effectively, these skills also create a foundation for organizational learning and innovation (Leiponen, 2005; Potnuru et al., 2021). Together, they enable firms to adapt continuously and maintain performance in dynamic environments.

In the context of international business, employee skills have been associated with a firm's ability to adapt to diverse market requirements and maintain reliable service across cultural boundaries (López Rodríguez & Serrano Orellana, 2020). For SMEs adopting CBEC, these skills remain important even with advanced digital tools, since effective management and service delivery still depend on workforce capabilities (Ringson & Matshabaphala, 2023). This highlights the role of employee skills in enabling firms to manage CBEC adoption successfully and compete in global markets.

2.4. Hypotheses Development

Building on the RBV, this study develops hypotheses to explain how specific firm resources influence the level of CBEC adoption among SMEs. The previous section outlined four key resource dimensions that firms rely on to address the demands of international digital trade. Here, we clarify the reasoning behind the proposed relationships, emphasizing how each dimension is expected to support higher levels of CBEC adoption by strengthening firms' ability to manage CBEC activities effectively.

2.4.1. Digital Technology and CBEC Adoption

For SMEs operating internationally, limited technological infrastructure can be a significant barrier to adopting CBEC (Córdova Núñez, 2020). Digital technology offers the necessary foundation to support online transactions, data exchange, and integration with foreign markets (Yan et al., 2018). When firms have access to reliable and advanced

digital tools, they can reduce operational complexity and participate more fully in online trade, which enables SMEs to expand their reach and coordinate their export activities with greater confidence and efficiency (OECD, 2024). Moreover, having a robust technological base can reduce dependence on external service providers, giving firms greater control over customization and integration with their internal systems (Weigelt, 2009). We therefore propose that digital technology, as the essential infrastructure for online trade, is positively associated with the level of CBEC adoption:

H1: Digital technology is positively associated with the level of CBEC adoption.

2.4.2. Digital Capability and CBEC Adoption

Beyond simply acquiring technology, SMEs need the capacity to apply it effectively within their own operations and strategies. Digital capability reflects this ability to make meaningful use of digital tools in ways that fit the firm's goals and context (Sousa-Zomer et al., 2020). It enables firms to move beyond basic use toward more integrated solutions that fit their specific processes and market requirements (Daub & Wiesinger, 2015). Additionally, digital capability can support ongoing adaptation, enabling SMEs to respond flexibly to changing regulations or customer expectations in diverse markets (Hokmabadi et al., 2024). Therefore, by translating technology investments into meaningful operational improvements, firms with stronger digital capability are better positioned to adopt CBEC at a higher level and sustain their competitiveness in international markets. This core utilization ability to transform technological assets into operational advantages leads us to hypothesize:

H2: Digital capability is positively associated with the level of CBEC adoption.

2.4.3. Export Manager Capability and CBEC Adoption

Entering foreign markets through CBEC introduces additional complexity compared to domestic operations, including unfamiliar regulations and cultural expectations that can increase uncertainty (Giuffrida et al., 2021). Export manager capability reflects the experience and judgment needed to interpret these challenges and develop appropriate strategies (Madsen, 1998). This capability enables firms to evaluate risks carefully and plan for the adjustments required in different markets, ensuring that CBEC initiatives are feasible and well-coordinated (Elia et al., 2021). By providing this strategic direction, export managers help firms move beyond basic adoption toward approaches that are better aligned with international demands. Such managerial expertise can also facilitate internal coordination across departments, ensuring that marketing, logistics, and customer service functions work cohesively to support CBEC strategies (Cooper, 2006). We posit that this provision of indispensable strategic direction is key to achieving higher levels of CBEC adoption:

H3: Export manager capability is positively associated with the level of CBEC adoption.

2.4.4. Employee Skills and CBEC Adoption

Adopting CBEC often requires SMEs to adjust their internal operations to meet new demands from foreign markets (Cassia & Magno, 2022). Employee skills help firms manage these transitions by providing the capacity to understand changing requirements and support the consistent delivery of services (ILO & OECD, 2018). Skilled employees also enable organizations to implement new processes without disrupting overall performance, creating a more stable foundation for integrating digital channels (Al Naim, 2023). Furthermore, a skilled workforce can improve communication with international customers and partners, enhancing trust and reducing misunderstandings that might otherwise undermine CBEC operations (Bahrain et al., 2023). As SMEs develop these capabilities within their workforce, they are better prepared to adopt CBEC practices at a higher level and sustain them in competitive international environments. Thus, the following hypothesis is advanced, emphasizing the role of this vital execution capability:

H4: Employee skills are positively associated with the level of CBEC adoption.

2.5. Conceptual Framework

Based on the RBV, this study proposes a conceptual framework (Figure 1) that explains how internal firm resources influence the level of CBEC adoption among SMEs. The framework identifies four key resource dimensions—digital technology, digital capability, export manager capability, and employee skills—that are each expected to enable firms to address the challenges of CBEC. By improving their capacity to manage international operations and adapt to market demands, these resources are theorized to support more effective adoption of CBEC channels. This framework guides the empirical analysis that follows, which tests the hypothesized relationships between these internal resources and CBEC adoption outcomes.

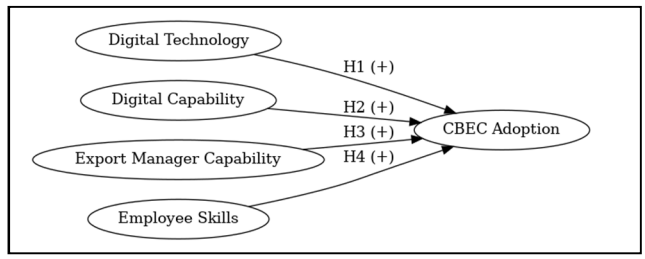

Figure 1: Conceptual Framework

3. Methodology

This study adopts a quantitative, cross-sectional survey design to test the hypothesized relationships between firm resource dimensions and CBEC adoption among export-oriented SMEs in China. Grounded in the Resource-Based View (RBV), the research focuses on how internal firm resources enable SMEs to overcome adoption barriers and effectively implement CBEC channels.

The target population comprised export-oriented SMEs in Southern Shaanxi Province. Simple random sampling was used to select firms for participation to improve representativeness while minimizing selection bias (Noor et al., 2022). Structured questionnaires were distributed both online and in paper-based formats to reach managers responsible for export operations, maximizing accessibility and response rates (Dillman et al., 2014). A total of 310 questionnaires were distributed between January and March 2025 (180 online and 130 offline). Of these, 219 were returned, and after excluding incomplete or invalid responses, 188 valid responses were retained for analysis, yielding a response rate of 60.65%. Respondents were recruited through industry networks and local business associations, ensuring that participants had direct involvement in their firm's export activities. Participation was voluntary and anonymous, and all respondents were informed about the purpose of the research before providing consent.

To assess potential mode effects between online and offline responses, group mean comparisons were conducted across key constructs. No significant differences were found, indicating that mode effects were unlikely to bias the findings. To further check representativeness, a wave analysis was conducted comparing early and late respondents. Independent-samples t-tests showed no significant differences across constructs ($p > 0.05$), suggesting that non-response bias was not present.

The survey instrument included multi-item scales adapted from established research, with all responses recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Digital Technology was measured with 5 items adapted from Khin and Ho (2019); Digital Capability with 5 items from Khin and Ho (2019); Export Manager Capability with 12 items adapted from Lamprinidou et al. (2022) and Theodosiou and Katsikea (2007); Employee Skills with 10 items from Nyaupane et al. (2020); and CBEC Adoption with 12 items adapted from Abdulkarem and Hou (2021).

Data analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. PLS-SEM was selected for its suitability in estimating models with multiple latent constructs measured through multiple indicators while accommodating relatively small sample sizes. This approach enables simultaneous evaluation of measurement reliability, construct validity, and hypothesized structural relationships, supporting prediction-oriented theoretical frameworks in management research (Hair, 2019).

4. Results

This section presents the empirical results of the study, including a descriptive overview of the sample, assessment of the measurement model, and evaluation of the structural model using PLS-SEM. The analysis was conducted in SmartPLS 4.0 with 5000-sample bootstrapping and bias-corrected confidence intervals to test the hypothesized relationships between firm resource dimensions and CBEC adoption.

4.1. Sample Profile

Table 1 summarizes the demographic characteristics of the respondents and their firms, including gender, age, education, position, firm size, and export experience. The respondents were predominantly young and highly educated, with the majority occupying specialized export management roles. The surveyed SMEs were generally small in size, with moderate levels of export experience, reflecting a representative sample of the regional SME population.

Table 1: Sample Profile

Category	Variable	Frequency	Percentage
Respondent Profile	Gender: Male	52	27.7%
	Gender: Female	136	72.3%
	Age ≤ 35	156	83.0%
	Age > 35	32	17.0%
	Education ≥ Bachelor	160	85.1%
Firm Profile	Firm size ≤ 50 employees	103	54.8%
	Firm size > 50 employees	85	45.2%
	Export experience ≤ 5 years	82	43.6%
	Export experience > 5 years	106	56.4%

4.2. Measurement Model Assessment

The measurement model was assessed to examine the reliability and validity of the constructs. As shown in Table 2, all latent variables demonstrated strong internal consistency, with Cronbach's Alpha (α) values ranging from 0.910 to 0.964 and Composite Reliability (CR) values between 0.925 and 0.973, exceeding the recommended

threshold of 0.7 (Hair, 2019). Convergent validity was supported by Average Variance Extracted (AVE) values for all constructs exceeding 0.5, ranging from 0.690 to 0.753.

Table 2: Construct Reliability and Convergent Validity Results

Construct	α	CR	AVE	Number of Items
CBEC	0.964	0.965	0.717	12
DC (Digital Capability)	0.918	0.925	0.753	5
DT (Digital Technology)	0.910	0.926	0.733	5
EMC (Export Manager Capability)	0.959	0.973	0.690	12
ES (Employee Skills)	0.956	0.959	0.719	10

Note: All values exceed recommended thresholds (Cronbach's α and CR > 0.7; AVE > 0.5)

Discriminant validity was evaluated using the Heterotrait-Monotrait Ratio of Correlations (HTMT). As presented in Table 3, all HTMT values were well below the conservative threshold of 0.85 (Hair, 2019), confirming adequate discriminant validity among the constructs. These results collectively indicate that the measurement model demonstrates acceptable reliability, convergent validity, and discriminant validity, supporting its suitability for further structural analysis.

Table 3: Discriminant Validity (HTMT Values)

	CBEC	DC	DT	EMC	ES
CBEC	–	0.404	0.332	0.358	0.342
DC		–	0.475	0.169	0.224
DT			–	0.219	0.167
EMC				–	0.446
ES					–

Note: All HTMT values are below the recommended threshold of 0.85.

4.3. Structural Model Assessment

The structural model was evaluated to test the hypothesized relationships between firm resource dimensions and CBEC adoption among SMEs. Bootstrapping with 5000 subsamples was used to assess the significance of the paths (Hair, 2019). As shown in Table 4, all four paths were positive and statistically significant ($p < 0.05$), supporting the proposed model. Digital Capability ($\beta = 0.257$), Digital Technology ($\beta = 0.141$), Export Manager Capability ($\beta = 0.221$), and Employee Skills ($\beta = 0.161$) each had a significant direct effect on CBEC adoption, and together these predictors explained 27.8% of the variance in CBEC adoption ($R^2 = 0.278$), indicating moderate explanatory power in line with recommended thresholds for PLS-SEM models (Hair, 2019).

Table 4: Structural Model Results

Path	Coefficient (β)	T-value	P-value
DC → CBEC	0.257	3.882	＜0.001
DT → CBEC	0.141	2.180	0.029
EMC → CBEC	0.221	3.524	＜0.001
ES → CBEC	0.161	2.446	0.014
R^2(CBEC)	0.278		

Note: All paths significant at $p < 0.05$. Model R^2 for CBEC = 0.278.

Beyond in-sample explanatory power, evaluating the model's out-of-sample predictive capability is important to demonstrate practical usefulness (Hair & Alamer, 2022). PLSpredict analysis was therefore conducted. As shown in Table 5, all Q^2_predict values were positive, ranging from 0.135 to 0.196, indicating small to moderate predictive relevance. In addition, PLS-SEM RMSE values were generally lower than those of the linear regression benchmark model, suggesting the model offers better out-of-sample predictive accuracy. Overall, these results support both the explanatory and predictive validity of the structural model, highlighting the role of firm resources in enabling CBEC adoption among export-oriented SMEs.

Table 5: PLSpredict Results for CBEC Indicators

Indicator	Q^2_predict	PLS-SEM RMSE	LM RMSE
CBEC1	0.142	0.544	0.587
CBEC2	0.196	0.554	0.546
CBEC3	0.181	0.555	0.598
CBEC4	0.167	0.524	0.575
CBEC5	0.171	0.549	0.574
CBEC6	0.173	0.573	0.606
CBEC7	0.152	0.545	0.586
CBEC8	0.166	0.535	0.561
CBEC9	0.135	0.552	0.595
CBEC10	0.144	0.558	0.601
CBEC11	0.194	0.542	0.588
CBEC12	0.166	0.554	0.597

Note: Positive Q^2_predict values indicate predictive relevance; lower PLS-SEM RMSE compared to LM RMSE supports superior prediction performance.

5. Discussion

5.1. Interpretation of Findings

The results of this study provide empirical support for the hypothesized relationships between firm resources and CBEC adoption among export-oriented SMEs. All four dimensions—Digital Capability, Digital Technology, Export Manager Capability, and Employee Skills—showed significant positive effects on CBEC adoption. These findings reinforce the theoretical proposition that firms'

internal resources are critical enablers of digital transformation in international trade contexts. The RBV suggests that valuable, rare, and inimitable resources underpin competitive advantage (Barney, 1991), and our results confirm that SMEs' technological capabilities, managerial competencies, and workforce skills are essential in adopting CBEC channels and incorporating them into their international operations.

The model's explanatory power, with an R^2 of 0.278, indicates a moderate ability to account for variance in CBEC adoption. This suggests that while firm resources are important drivers, other external or organizational factors may also contribute to adoption decisions. Furthermore, the PLSpredict analysis showed all Q^2_predict values to be positive, ranging from 0.135 to 0.196, indicating small to moderate out-of-sample predictive relevance (Hair & Alamer, 2022). The lower PLS-SEM RMSE values compared to the linear regression benchmark further support the model's superior predictive accuracy. Together, these results highlight the relevance of strengthening firm-level resources to enhance SMEs' capacity to manage cross-border operations for digital internationalization through CBEC adoption. Overall, these findings suggest that effectively mobilizing internal resources strengthens SMEs' ability to adopt CBEC and coordinate cross-border activities within their export operations.

5.2. Theoretical Implications

This study contributes to the theoretical understanding of CBEC adoption by applying the RBV to explain variation among SMEs. While much of the existing literature has focused on external drivers such as market conditions or platform effects (Abdulkarem & Hou, 2022; Al-Qahtani, 2025; Córdova Núñez, 2020), this research emphasizes the role of internal firm resources that enable SMEs to adopt digital channels for internationalization. The findings show that Digital Capability, Digital Technology, Export Manager Capability, and Employee Skills each have a significant positive impact on CBEC adoption, underscoring the importance of multiple resource dimensions.

By empirically validating the importance of these distinct resources, this study reinforces RBV's core proposition that internal resources are critical sources of competitive advantage (Barney, 1991). It also extends the application of RBV by demonstrating its relevance for understanding digital adoption decisions and transformation strategies in SMEs. Moreover, by providing evidence from Chinese export-oriented SMEs, this study addresses a gap in the literature on digital adoption in emerging economy contexts and offers insights relevant to similar settings. In particular, this research highlights that Chinese SMEs are increasingly leveraging digital technologies to overcome resource limitations, which is crucial for their participation in global digital trade platforms.

5.3. Practical Implications

Beyond its theoretical contributions, this study offers several practical insights for managers and policymakers aiming to promote CBEC adoption among export-oriented SMEs. The results underscore the need for firms to strengthen multiple internal capabilities to succeed in CBEC. Managers should prioritize building digital technology infrastructure and enhancing digital capability to support integrated online operations and customer engagement across international markets (Elia et al., 2021).

Furthermore, the significant roles of Export Manager Capability and Employee Skills highlight the importance of investing in human capital. Firms can benefit from targeted training programs that improve managerial competencies in international sales and develop employees' technical, communication, and problem-solving skills needed for CBEC activities (Zeng & Ding, 2020). Policymakers and industry associations may also consider supporting such capacity-building initiatives through training subsidies, knowledge-sharing platforms, or partnerships with educational institutions. Managers should also align CBEC initiatives with international distribution strategies to ensure coherent cross-border operations and fully realize the benefits of digital adoption.

For policymakers, the findings highlight the importance of providing targeted support to help SMEs strengthen the internal resources essential for CBEC adoption, such as subsidizing digital logistics infrastructure and facilitating trade compliance procedures. This could include initiatives such as subsidized training programs to build human capital, investments in digital infrastructure to improve technological readiness, and knowledge-sharing platforms to facilitate best-practice adoption. Additionally, China's government-led digital trade policies should emphasize supporting SMEs in utilizing internal resources to better engage with digital platforms.

5.4. Limitations and Future Research

While this study provides important insights into the role of firm resources in enabling CBEC adoption among export-oriented SMEs, it has several limitations that suggest directions for future research. First, the use of cross-sectional survey data limits the ability to infer causal relationships. Longitudinal designs or experimental approaches could strengthen causal claims by observing changes over time. Second, the sample was drawn from export-oriented SMEs in southern Shaanxi Province, China, which may limit the generalizability of findings to other

regions or countries. Future studies could examine diverse geographic contexts or conduct comparative analyses across emerging and developed economies. Third, although the study focused on four key internal resource dimensions identified in the literature, it did not consider other potentially relevant factors such as organizational learning capability, innovation capability, or external partnership resources. Including these variables could provide a more comprehensive understanding of CBEC adoption.

Additionally, future research could also explore how government policies and digital platform ecosystems in different countries affect CBEC adoption among SMEs, particularly in developing economies where resource constraints may be more prevalent.

6. Conclusion

This study examines how internal firm resources influence CBEC adoption among export-oriented SMEs applying the RBV framework. The findings confirm that Digital Capability, Digital Technology, Export Manager Capability, and Employee Skills significantly enhance CBEC adoption, emphasizing the importance of strengthening internal resources for digital integration into international operations.

The study extends the RBV to SME digital internationalization, highlighting how internal resources enable CBEC adoption. Practically, strengthening internal resources supports more efficient and reliable international distribution through CBEC, enabling SMEs to streamline global logistics, reduce trade barriers, and build resilient supply chains.

Future research could investigate how internal resources interact with external environments, such as global supply chain integration and logistics partnerships, to develop a more integrated perspective on CBEC's role in SMEs' international growth.

Acknowledgements

The authors are grateful to the SME owners and export managers in Southern Shaanxi Province, China, who generously completed the questionnaire and shared their experiences.

Declarations

Ethics Approval and Consent to Participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. This study was approved by the Institutional Review Board of Ankang University (January 14, 2025).

Competing Interests / Conflicts of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions

F.P. conceived the study, designed the questionnaire, conducted the data collection and analysis, and drafted the original manuscript. Y.M.Y. provided methodological guidance, supervised the study, and critically revised the manuscript. H.S.S. contributed to validation and manuscript revision. All authors read and approved the final manuscript.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the authors used ChatGPT-4 (OpenAI) to improve language and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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