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Factors Affecting The Participation Of Small And Medium-Sized Enterprises In The Electronics Supporting Industry

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ABSTRACT
In the context in which the supporting industry is identified as a critical link for increasing localization rates and deeper integration into the global value chain (GVC) of the electronics sector, this study focuses on analyzing the factors affecting the level of participation of Vietnamese small and medium-sized enterprises (SMEs) in the electronics supporting industry. Based on a review of the theoretical foundations of global value chains (GVC), the resource-based view (RBV), and dynamic capabilities, the proposed research model comprises seven constructs: (1) Attractiveness of the electronics supporting industry (HDN), (2) Incentive policies (CSH), (3) SME capabilities (NLD), (4) SME strategies (CLD), (5) Barriers to participation (RCH), (6) Participation risks (RRH), and (7) Level of participation in the electronics supporting industry (TGH). Data were collected from a survey of 450 SMEs using a questionnaire with a 5-point Likert scale; the measurement scales were tested using Cronbach's Alpha, exploratory factor analysis (EFA), Pearson correlation, and multiple linear regression. The results indicate that all seven scales exhibit very high reliability (Cronbach's Alpha > 0.90) and that the factor structure fits well with the theoretical model. The regression model explains approximately 55.3% of the variance in TGH. Specifically, SME capabilities (NLD) and incentive policies (CSH) have strong and statistically significant positive effects on the level of participation in the supporting industry; barriers (RCH) and risks (RRH) have significant negative effects; while industry attractiveness (HDN) and SME strategy (CLD) show positive but weaker effects when considered simultaneously with the other variables. Accordingly, the study emphasizes the central role of upgrading internal firm capabilities, improving supportive policies, and reducing barriers and risks in the process of participating in the electronics supporting industry. The findings contribute empirical evidence to the literature on SME participation in GVCs in developing economies and provide several policy implications for Vietnam

Keywords: *small and medium-sized enterprises; supporting industries; electronics sector; global value chains; firm capabilities; barriers and risks; Vietnam.*

1. INTRODUCTION:

1.1. The Electronics Supporting Industry and the Role of Small and Medium-Sized Enterprises

The supporting industry is commonly understood as a system of enterprises producing components, parts, materials, and technical services that directly serve the manufacturing of final products in key industrial sectors such as automobiles, electronics, textiles and garments, mechanical engineering, etc. In the electronics sector, the supporting industry comprises firms supplying printed circuit boards, semiconductor components, plastic–metal housings, precision mechanical parts, wiring, technical packaging, testing services, specialized logistics, and related inputs. In Vietnam, electronics has become the largest export category, with exports of computers, electronic products, and components exceeding USD 56 billion in the first eight months of 2025, accounting for the largest share of the country's total export turnover. However, the localization rate in the electronics industry remains low; many studies and reports indicate that most components and materials still have to be imported, and FDI enterprises mainly rely on their established global supply networks.

Small and medium-sized enterprises account for about 98% of the total number of firms in Vietnam and are regarded as the core force for developing the supporting industry and the domestic supply chain. Nevertheless, only a very small proportion of SMEs have been able to participate effectively in global supply chains; it is estimated that about 5,000 SMEs (approximately 0.001% of the total number of enterprises) have direct linkages with international supply chains. This highlights a substantial gap between "production capability" and "deep participation capability" in the supporting industry and the electronics value chain.

The electronics industry is a "producer-driven" sector in which multinational corporations (MNCs) control core technologies, product design, and global distribution networks. Firms in developing economies typically

participate in assembly, processing, and some low-tier supporting activities, with limited value added. Studies on the electronics value chain and foreign direct investment (FDI) in Vietnam indicate that, despite large inflows of FDI, backward linkages between foreign-invested firms and domestic suppliers remain weak, and technology spillovers through supply contracts and joint ventures are still limited.

In this context, the electronics supporting industry is considered a "critical link" for increasing localization rates and strengthening Vietnam's position in regional and global value chains. Therefore, understanding the determinants that enable SMEs to participate in the electronics supporting industry is of significant theoretical and practical importance.

1.2. Foundational Theories

1.2.1. Global Value Chain (GVC) Theory

Global value chain theory provides an analytical framework for understanding how production and business activities are organized and distributed across countries, as well as the roles and "positions" of different groups of firms within the chain. SMEs can participate in global value chains by directly exporting intermediate inputs or by supplying larger domestic firms, thereby indirectly integrating into global value chains.

In the electronics industry, value chain configuration is typically highly fragmented and requires strict compliance with quality standards, on-time delivery, competitive costs, and flexible order fulfillment. These requirements impose specific conditions on the capabilities, strategies, and institutional environment of SMEs that wish to participate in the supporting industry.

GVC theory also emphasizes upgrading - that is, a firm's ability to move into higher value-added activities through process, product, functional, or chain upgrading. Participation in the electronics supporting industry is therefore not merely about "obtaining orders," but rather a continuous upgrading process to meet the increasingly stringent requirements of lead firms at the top of the chain.

1.2.2. Resource - Based View (RBV) and Dynamic Capabilities

The resource-based view regards the firm as a bundle of tangible and intangible resources; sustainable competitive advantage arises when a firm possesses resources that are valuable, rare, inimitable, and non-substitutable (VRIN). For SMEs, the key resources enabling participation in the electronics supporting industry include technological capability, workforce quality, quality management and lean production systems, financial capacity, and relationships with customers and partners along the value chain.

Recent studies show that upgrading technological and managerial capabilities is a prerequisite for SME participation in high-tech supply chains and for implementing initiatives such as Industry 4.0. The literature on SMEs in global value chains further confirms that firms can maintain a sustainable presence in the chain only by building dynamic capabilities - namely, the ability to adapt, innovate, and reconfigure resources in response to rapid environmental changes.

1.2.3. Theory of FDI - Domestic Firm Linkages and Supporting Industry Policy

From the perspective of development economics and industrial policy, many studies highlight the role of backward linkages between FDI enterprises and domestic suppliers in industrialization and value chain upgrading. The formation and strengthening of domestic supporting-industry networks depend not only on firm-level capabilities but also heavily on the institutional environment, incentive policies, industrial park infrastructure, technical assistance programs, preferential credit, public procurement policies, localization requirements, and related measures.

For Vietnam, numerous policy documents and industry reports indicate that the supporting industry - especially in the electronics sector "has not yet developed sufficiently to participate deeply in global supply chains" and therefore requires stronger policies in technology support, finance, supply - demand linkage, market information, technical standards, and related areas.

2. Research Model and Hypotheses

2.1. Research Hypotheses

– Attractiveness of the Electronics Supporting Industry (HDN)

Global value chain theory suggests that firms are willing to invest resources and accept risks to participate in value chains only when they expect benefits in terms of profitability, growth, and upgrading opportunities. In the electronics supporting industry, attractiveness is reflected in market size and growth rate, the stability of demand for components, export prospects, opportunities to access technology, and the potential to expand relationships with lead firms at the top of the chain. Recent reports indicate that Vietnam's electronics industry is growing rapidly, and the demand for localization of components and supporting equipment is increasing, thereby creating a "window of opportunity" for SMEs.

Hypothesis H1: The attractiveness of the electronics supporting industry (HDN) has a positive effect on the participation of SMEs in the electronics supporting industry.

– Incentive Policies for Supporting Enterprises (CSH)

Studies on global value chain integration in Asia show that, in addition to market factors, industrial and trade policies (such as tax incentives, credit support, supply–demand linkage programs, technology upgrading support, and supplier development services) play an important role in encouraging SME participation in supply chains. In Vietnam, the Government has identified the supporting industry and electronics as priority sectors and has issued numerous programs to promote the development of supporting industries, SME development funds, digital transformation programs, and high-technology initiatives. However, recent reports emphasize that the electronics supporting industry "still needs more practical and effective policies" to raise localization rates and strengthen domestic firm capabilities.

Hypothesis H2: Incentive policies for the electronics supporting industry (CSH) have a positive effect on the participation of SMEs in the electronics supporting industry.

– SME Capabilities (NLD)

From the resource-based perspective, technological, managerial, financial, and human resource capabilities are core resources that determine a firm's ability to meet supply-chain requirements. Numerous studies indicate that SMEs can become qualified suppliers to electronics corporations only if they meet standards regarding quality, delivery time, cost, safety, and environmental performance, and if they possess continuous improvement capability.

Accordingly, the group of capability variables in the model reflects SMEs' perceptions of their own technological, managerial, human resource, and financial capacities.

Hypothesis H3: SMEs' capabilities in the electronics supporting industry (NLD) have a positive effect on SME participation in the electronics supporting industry.

– SME Strategy (CLD)

Even when possessing relatively strong resources, SMEs still require clear strategies to exploit opportunities from global value chains, such as specializing in certain components, investing in quality certifications, linking with suppliers and customers within clusters or industrial zones, and pursuing digital transformation. Studies grounded in the resource-based view and dynamic capabilities indicate that strategic orientation, proactiveness in innovation, and the ability to "reconfigure" resources are key determinants of upgrading SMEs' positions in global value chains. Accordingly, firm strategy is constructed as a group of variables reflecting the clarity, consistency, and long-term orientation of SMEs' strategies for participating in the electronics supporting industry.

Hypothesis H4: SME strategy in the electronics supporting industry (CLD) has a positive effect on SME participation in the electronics supporting industry.

– Barriers to Participation (RCH) and Participation Risks (RRH)

The literature on SMEs in global value chains identifies several major barriers, including technological and investment capital constraints, limited access to market information, difficulty in meeting technical standards, weak supply-chain management capability, lack of trust from partners, and high compliance and transaction costs. In Vietnam's electronics supporting industry, additional barriers include small scale, fragmented production, difficulty in achieving economies of scale, dependence on imported inputs, exposure to international market volatility, and increasingly stringent environmental and labor standards in supply chains.

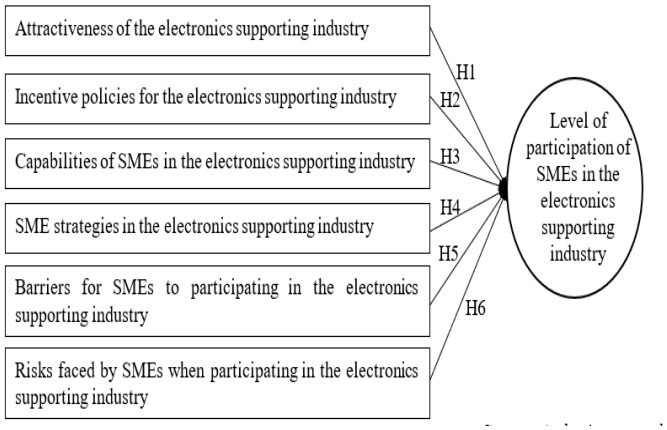
The barrier variables capture structural and institutional constraints (e.g., lack of capital, lack of information, weak support, difficulty in accessing FDI customers, weak infrastructure, administrative procedures, etc.). The risk variables reflect SMEs' perceived risks in participating in the supporting industry, such as dependence on orders from a small number of major customers, price squeezing, changes in trade and tariff policies, and technological obsolescence.

Hypothesis H5: Barriers faced by SMEs in participating in the electronics supporting industry (RCH) have a negative effect on SME participation in the electronics supporting industry.

Hypothesis H6: Risks faced by SMEs in participating in the electronics supporting industry (RRH) have a negative effect on SME participation in the electronics supporting industry.

2.2. Research Model

Based on the theoretical foundations and the above hypotheses, the author proposes the following research model to examine the effects of various factors on the participation of small and medium-sized enterprises in the electronics supporting industry:



Source: Author's proposal

Figure 1: Research model

3. Research Results

3.1. Scale Reliability

The results of the Cronbach's Alpha analysis show that all seven scales in the research model have very high internal consistency. Specifically, the Alpha coefficients range from 0.903 to 0.945: HDN = 0.914; CSH = 0.919; NLD = 0.914; CLD = 0.919; RCH = 0.922; RRH = 0.945; and TGH = 0.903.

Table 1: Scale Reliability

Scale	Number of observed variables	Cronbach's Alpha
HDN – Attractiveness of the electronics supporting industry	6	0,914
CSH – Incentive policies for the electronics supporting industry	6	0,919

NLD – Capabilities of SMEs in the electronics supporting industry	6	0,914
CLD – SME strategies in the electronics supporting industry	6	0,919
RCH – Barriers for SMEs to participating in the electronics supporting industry	6	0,922
RRH – Risks faced by SMEs when participating in the electronics supporting industry	8	0,945
TGH – Level of participation of SMEs in the electronics supporting industry	5	0,903

Source: Results of data analysis using SPSS 26

With the commonly accepted threshold of 0.7 and the "very good" level from 0.8 upward, Alpha values above 0.9 indicate that the observed variables within each scale have very high internal correlations, and that the scales are stable and consistent. No observed variable has a low enough item–total correlation to warrant elimination. Therefore, all 43 observed variables were retained for the subsequent exploratory factor analysis (EFA).

3.2. Exploratory Factor Analysis (EFA)

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,951
Bartlett's Test of Sphericity	Approx. Chi-Square	**14.044,79**
	df	903
	Sig.	,000

Source: Results of data analysis using SPSS 26

The results show that the KMO index is 0.951 (> 0.9), indicating that the sample is "highly suitable" for factor analysis. Bartlett's test of sphericity for the correlation matrix yields $\chi^2 \approx 14{,}044.79$ with df = 903 and $p < 0.001$, thus rejecting the null hypothesis that the correlation matrix is an identity matrix.

Accordingly, the data fully satisfy the conditions for conducting EFA on all 43 observed variables.

Table 3: Rotated Component Matrix (Varimax Rotation)

Observed variables	Factors 1 (HDN)	Factors 2 (CSH)	Factors 3 (NLD)	Factors 4 (CLD)	Factors 5 (RCH)	Factors 6 (RRH)	Factors 7 (TGH)
HDN1	0,765						
HDN3	0,779						
HDN6	0,793						
HDN4	0,763						
HDN5	0,764						
HDN2	0,776						
CSH1		0,780					
CSH6		0,812					
CSH4		0,786					
CSH3		0,769					
CSH5		0,763					
CSH2		0,763					
NLD2			0,799				
NLD1			0,781				
NLD3			0,766				
NLD4			0,754				
NLD5			0,791				
NLD6			0,776				
CLD1				0,797			
CLD2				0,804			

CLD 3				0,800			
CLD 4				0,823			
CLD 5				0,802			
CLD 6				0,803			
RCH 1					0,816		
RCH 2					0,802		
RCH 3					0,783		
RCH 4					0,782		
RCH 5					0,798		
RCH 6					0,813		
RRH 1						0,803	
RRH 2						0,830	
RRH 3						0,778	
RRH 4						0,815	
RRH 5						0,813	
RRH 6						0,829	
RRH 7						0,838	
RRH 8						0,810	
TGH 1							0,697
TGH 2							0,705
TGH 3							0,694
TGH 4							0,665
TGH 5							0,700

Source: Results of data analysis using SPSS 26

The factor analysis results using the PCA extraction method with Varimax rotation reveal seven factors with eigenvalues greater than 1, consistent with the proposed theoretical model comprising seven constructs (HDN, CSH, NLD, CLD, RCH, RRH, and TGH). These seven factors explain approximately 71.66% of the total variance, which is relatively high for studies in the social sciences and indicates strong information-summarizing capability of the factor model.

Regarding factor loadings, all observed variables exhibit high standardized loadings on their intended factors (mostly > 0.75) and low cross-loadings on other factors, indicating a relatively "clean" factor structure:

HDN group: variables HDN1 - HDN6 load on the HDN factor at approximately 0.76 to 0.79.

CSH group: variables CSH1 - CSH6 load on the CSH factor from 0.76 to 0.81.

NLD group: variables NLD1 - NLD6 load on the NLD factor from 0.75 to 0.80.

CLD group: variables CLD1 - CLD6 load on the CLD factor at about 0.80 to 0.82.

RCH group: variables RCH1 - RCH6 load on the RCH factor from 0.78 to 0.82.

RRH group: variables RRH1 - RRH8 load on the RRH factor from 0.78 to 0.84.

TGH group: variables TGH1 - TGH5 load on the TGH factor at approximately 0.66 to 0.71.

The EFA results indicate that: (i) the seven scales in the model exhibit good convergent validity (items within each construct load strongly on the same factor), and (ii) satisfactory discriminant validity (low cross-loadings with no item loading substantially on unintended factors). This provides a solid basis for subsequent CFA/SEM to test the measurement and structural models.

3.3. Correlation Analysis Among Factors

Table 4. Pearson Correlation Matrix Among Factors

	HDN	CSH	NLD	CLD	RCH	RRH	TGH
HDN	1,000	0,513	0,423	0,357	-0,279	-0,232	0,446
CSH	0,513	1,000	0,279	0,383	-0,290	-0,316	0,510
NLD	0,423	0,279	1,000	0,385	-0,320	-0,302	0,550
CLD	0,357	0,383	0,385	1,000	-0,206	-0,211	0,380

RCH	-0,279	-0,290	-0,320	-0,206	1,000	0,440	-0,510
RRH	-0,232	-0,316	-0,302	-0,211	0,440	1,000	-0,492
TGH	0,446	0,510	0,550	0,380	-0,510	-0,492	1,000

Source: Results of data analysis using SPSS 26

As shown in table 4, the stronger a firm's capabilities (NLD), the more positive its perception of incentive policies (CSH) and industry attractiveness (HDN), and the clearer its strategy (CLD), the higher its level of participation in the electronics supporting industry (TGH). Conversely, when firms perceive higher levels of barriers (RCH) and risks (RRH), their participation in the supporting industry tends to decrease. This is consistent with the theoretical arguments discussed earlier: "enabling" factors (capabilities, strategy, policy environment, and industry attractiveness) are positively associated with participation, whereas "constraining" factors (barriers and risks) tend to reduce the level of participation.

3.4. Regression Analysis and Hypothesis Testing

The regression model is estimated with TGH as the dependent variable and HDN, CSH, NLD, CLD, RCH, and RRH as independent variables.

Table 5. Regression Coefficients

Biến	B *Unstandardized*	Std. Error	t	p-value	Beta *Standardized*
Hằng số	2,068	0,256	8,082	0,000	0,000
HDN	0,066	0,041	1,606	0,109	0,064
CSH	0,240	0,039	6,177	0,000	0,242
NLD	0,323	0,040	7,974	0,000	0,301
CLD	0,062	0,037	1,653	0,099	0,060
RCH	-0,225	0,037	-6,152	0,000	-0,226
RRH	-0,191	0,036	-5,383	0,000	-0,198
R^2		0,553			
R^2 adjusted		0,547			
F (6, 443)		91,257			
Sig. (F)		p < 0,001			

Source: Results of data analysis using SPSS 26

As shown in Table 5, $R^2 = 0.553$ and adjusted $R^2 = 0.547$, indicating that approximately 55.3% of the variance in SME participation in the electronics supporting industry is explained by the six independent factors in the model. The F-test for the model yields $F(6, 443) \approx 91.26$ with $p < 0.001$, demonstrating that the regression model is appropriate and statistically significant overall.

The results indicate that:

- SME capabilities have the strongest positive effect on participation in the electronics supporting industry ($\beta \approx 0.301$), indicating that internal firm capabilities (technology, management, human resources, finance, etc.) are the key determinants of the level of participation.

- Incentive policies also have a significant positive effect ($\beta \approx 0.242$), showing that firms' perceptions of the relevance and effectiveness of supporting policies, incentives, and supporting-industry development programs play an important stimulative role in both participation decisions and participation intensity.

- Barriers to participation and participation risks have statistically significant negative effects on SME participation in the electronics supporting industry ($\beta \approx -0.226$ and -0.198, respectively). This is consistent with theoretical expectations: the higher the barriers (e.g., lack of capital, technology, information, difficulty in connecting with FDI customers, administrative procedures, and technical standards) and risks (e.g., dependence on orders, price squeezing, policy volatility, and technological risks), the lower and more cautious firms' participation tends to be.

- Industry attractiveness and SME strategy have positive coefficients but do not reach statistical significance at the 5% level ($p \approx 0.10–0.11$). Theoretically, the coefficient signs are as expected (greater industry attractiveness and clearer strategy are associated with higher participation), but the effects are not strong enough when other factors are controlled for (especially SME capabilities, incentive policies, participation barriers, and participation risks). If a 10% significance level is accepted, industry attractiveness and SME strategy can be regarded as having weak but positive effects; under the stricter 5% criterion, there is insufficient statistical evidence to support H1 and H4.

Comparison with the research hypotheses:

- H2 (CSH → TGH): strongly supported (positive effect, significant at $p < 0.001$).

- H3 (NLD → TGH): most strongly supported (largest β, $p < 0.001$).

- H5 (RCH → TGH, negative): strongly supported (negative β, $p < 0.001$).

- H6 (RRH → TGH, negative): strongly supported (negative β, $p < 0.001$).

- H1 (HDN → TGH): coefficient sign as expected (positive) but not significant at the 5% level; can only be considered "weakly supported" at the 10% level.

- H4 (CLD → TGH): similar to H1; positive sign but not significant at 5%; only weak evidence at the 10% level, or insufficient evidence under the 5% criterion.

4. Discussion of Research Results

4.1. The Central Role of Firm Capabilities

The regression results show that SME capabilities (NLD) are the factor with the strongest positive impact on the level of participation in the electronics supporting industry (TGH), with the highest standardized beta coefficient ($\beta \approx 0.30$). This reaffirms the arguments of the Resource-Based View (RBV) and dynamic capability theory: in a high-technology value chain such as electronics, firms can participate deeply and sustainably only if they possess sufficiently strong core resources, including technological, managerial, human resource, and financial capabilities.

In practice, many reports and empirical studies in Vietnam indicate that domestic firms, especially SMEs, often face difficulties in meeting the quality standards, on-time delivery, and cost competitiveness required by electronics corporations. The quantitative results of this study show that firms that assess themselves as having stronger internal capabilities also demonstrate higher levels of participation in the electronics supporting industry. In other words, internal capability is the most critical necessary condition, and policy interventions that are not linked to upgrading firm capabilities are unlikely to generate substantive change.

4.2. The Impact of Incentive Policies and the Institutional Environment

Incentive policies (CSH) have a significant positive impact on participation in the electronics supporting industry ($\beta \approx 0.24$). This indicates that the role of the state and support programs in SMEs' participation decisions cannot be underestimated. When firms perceive policies and incentives (tax, credit, technology support, supply - demand linkage, supplier development programs, standards support, etc.) as concrete, accessible, and effective, they are more likely to increase investment and integrate more deeply into supply chains.

Notably, in the descriptive analysis, firms rate policies at a medium - fair level (Mean ≈ 3.45), rather than outstanding; yet in the regression model, CSH still emerges as one of the most influential factors. This implies that substantial policy space remains: improvements in implementation quality, transparency, and accessibility of support programs could further strengthen SMEs' participation beyond what is observed in the current model.

4.3. The Constraining Effects of Barriers and Perceived Risks

Both barriers (RCH) and risks (RRH) exert clear and statistically significant negative effects on participation in the electronics supporting industry ($\beta \approx -0.23$ and -0.20, respectively). Statistically, these are strong "countervailing forces" that weaken participation, even when firm capabilities and policies have improved.

Notably, in the descriptive statistics, the mean scores for RCH and RRH are only at moderate levels (approximately 2.9 - 3.0), yet in the regression model they still show strong negative effects. This indicates that barriers and risks need not be "very high" to generate adverse outcomes: as long as firms perceive participation to involve a set of "unpredictable" risks and transaction costs (dependence on large customers, price squeezing, sustainability risks, technological obsolescence, etc.), long-term investment incentives are substantially eroded.

4.4. Industry Attractiveness and Firm Strategy: Important but Not Sufficient

Industry attractiveness (HDN) and SME strategy (CLD) both have positive coefficients, but they do not reach statistical significance at the 5% level when included simultaneously with other variables. This can be interpreted in two ways. First, HDN and CLD remain logically important: if the industry is unattractive and firms lack clear strategies, high participation is unlikely. However, once actual capabilities (NLD) and policy support (CSH) are controlled for, the marginal effects of HDN and CLD on TGH become weaker. In other words, industry attractiveness and "on-paper" strategies translate into participation only when accompanied by adequate capabilities and enabling policies.

In the survey sample, SMEs tend to rate HDN and CLD at medium–good levels, but not all firms have implemented their strategies in a systematic manner. When firms lack execution capability or when barriers and risks remain high, even "sound" strategies are difficult to translate into concrete participation outcomes.

This analysis suggests that support programs and strategic advisory services should go hand in hand with capability upgrading and risk reduction, rather than focusing solely on promotional messages about an "attractive industry" or "great opportunities."

5. Conclusions and Policy Implications

5.1. Policy Implications

Based on the research results, several groups of solutions can be proposed at three levels: the State and regulatory authorities, intermediary organizations and the support ecosystem, and SMEs themselves.

First, at the macro level. Improve the policy framework and support programs for developing the electronics supporting industry in a "focused and selective" manner: concentrate resources on key electronics industrial parks/clusters where FDI density is high in order to create spillover effects and reduce transaction costs for SMEs; design targeted programs rather than fragmented support; ensure policy stability and consistency in the medium and long term to mitigate "rule changes" that discourage long-term investment in supporting industries. Strengthen policies to upgrade firm capabilities in line with SME

needs: prioritize support for technological innovation, production line upgrades, implementation of quality management systems (ISO, IATF 16949, etc.), and lean manufacturing; design dedicated financial and credit packages for capability-upgrading projects tied to clear roadmaps; enhance training programs in supply chain management, quality management, and supply chain risk management for SME managers. Reduce institutional barriers and risks: simplify administrative procedures related to investment, component import/export, access to land, and registration for support programs; improve transparency around technical standards, localization roadmaps, and requirements of FDI corporations to reduce "search and negotiation costs"; establish risk-sharing mechanisms among the State, FDI corporations, and SMEs.

Second, strengthen the role of intermediary organizations and the support ecosystem. Develop technical support centers, testing and certification centers: these centers help SMEs test quality, conduct product trials, and receive process-improvement consulting at reasonable costs, thereby lowering technical barriers; strengthen direct linkages with FDI corporations to convey technical requirements and standards accurately and in a timely manner. Promote supply–demand linkage and supplier development: organize business matching programs, supplier days, and digital platforms to connect supporting-industry supply and demand in the electronics sector; support domestic firms in negotiations, capability profiling, and supplier qualification documentation required by FDI corporations. Industry associations and international organizations: associations can act as "soft bridges" between firms, regulators, and FDI corporations and propose policy adjustments based on practical feedback; collaborate with international organizations to implement technical assistance projects and share international experience in developing supporting industries (e.g., from Korea, Thailand, Malaysia).

Third, for SMEs themselves. Focus on upgrading internal capabilities: view policies as leverage rather than as the primary solution; the core determinant remains firm capability; build roadmaps for technology investment, process improvement, quality management capability, and training for technical and managerial staff; proactively pursue relevant international standards (e.g., IATF 16949, ISO 9001, ISO 14001, and environmental–labor standards in global supply chains). Improve strategies for participating in the electronics supporting industry: select niches in components, parts, and services where the firm has comparative advantages; avoid over-diversification; clearly define target customer segments (domestic assemblers, FDI firms, Tier 1, Tier 2 suppliers, etc.) and develop a phased market-entry plan; actively participate in business matching programs and industry forums to engage directly with procurement and engineering teams of electronics corporations. Proactively manage risks and barriers: periodically assess key risks (customer dependence, technological risk, exchange-rate risk, legal and trade risks, etc.); reasonably diversify the customer base to reduce dependence on a single partner while cultivating long-term relationships based on quality and credibility; actively seek policy information and support programs; use legal and trade advisory services when necessary to mitigate contractual risks.

5.2. Conclusions and Limitations

The findings provide empirical support for the proposed theoretical model and suggest key policy and managerial priorities: (i) upgrading SME internal capabilities; (ii) improving the design and implementation of policies for the electronics supporting industry; and (iii) reducing barriers and managing risks along the participation process.

Despite its theoretical and practical contributions, the study has several limitations that warrant objective consideration:

First, the cross-sectional design captures relationships at a single point in time; thus, the findings mainly indicate associations rather than strict causality. In reality, SME participation is influenced by dynamic, time-varying factors (business cycles, market fluctuations, policy changes) that a cross-sectional design cannot fully reflect.

Second, convenience and purposive sampling (focused on parks/clusters and key localities) may reduce representativeness. Firms willing to respond may already be more interested in the electronics supporting industry, introducing potential selection bias. Therefore, generalization to all Vietnamese SMEs should be made with caution.

Third, data are largely self-reported using Likert scales and reflect managerial perceptions. Constructs such as "capabilities," "strategy," "barriers," "risks," and "participation" are perception-based and subject to social desirability and cognitive biases; the study does not triangulate with objective indicators.

Fourth, the model focuses on seven firm- and policy-level factors and does not consider other potentially important influences, such as: specific value-chain characteristics (tier position, product type, standardization); organizational culture, entrepreneurship, and innovation orientation; and local institutional constraints or infrastructure development.

Fifth, methodologically, the study relies on EFA, correlations, and multiple linear regression and does not fully implement CFA and SEM to assess measurement quality (convergent/discriminant validity, composite reliability, AVE) or to simultaneously test structural relationships—limiting comprehensive model validation.

Future Research Directions

Apply longitudinal designs to track participation and its determinants over time, enabling stronger causal inference regarding policy changes, market dynamics, and capability investments.

Expand sampling scope and diversity; include emerging regions; consider stratified sampling by firm type, size, and value-chain position to enhance representativeness.

Integrate quantitative and qualitative data; conduct in-depth interviews to unpack constructs and decision processes; add objective indicators (e.g., supporting-industry revenue, number of contracts, certifications, years as FDI suppliers) to validate and enrich scales.

Extend and refine the model by adding mediators/moderators and structural-level variables (value-chain structure, relationship types with FDI clients, regional conditions).

Employ SEM approaches: CB-SEM for measurement/structural rigor (CR, AVE, MSV, HTMT; CFI, TLI, RMSEA, SRMR) or PLS-SEM for non-normal data and complex models with mediators/moderators.

Conduct cross-industry comparisons (electronics vs. automotive, machinery, textiles, footwear, medical devices) to identify common vs. sector-specific drivers and inform tailored policy design.

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