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Impact of regional characteristics on firm capabilities and new product performance

Byung-Hwan Hyun[1*]
[1]Daejeon University, Republic of Korea; hyunvv@gmail.com (B.H.H.).

Abstract: This study investigates the impact of various corporate capabilities on market performance among firms in Korea, with a particular focus on the disparities between those located in capital and non-capital regions. Specifically, the study examines how research and development (R&D), dynamic capability, network capability, and technology commercialization capability contribute to market performance. New product performance is incorporated as a mediating variable to better understand the pathway through which these capabilities exert their influence. In addition, dynamic capability is explored not only as a direct factor but also as a moderating variable that potentially enhances the relationship between R&D and new product performance. Methodologically, the study adopts a multi-analytical approach, utilizing importance-performance map analysis (IPMA), multigroup analysis (MGA), and fuzzy-set qualitative comparative analysis (fsQCA) to uncover key drivers and combinations of capabilities that lead to superior market outcomes across different regional contexts. The findings underscore significant regional heterogeneity, emphasizing the need for region-specific business strategies and policy interventions to enhance firm competitiveness and innovation outcomes.

Keywords: *Dynamic capabilities, Fuzzy-set qualitative comparative analysis, Moderation effects of regional characteristics, New product development, Regional strategy dynamics.*

1. Introduction

Corporate capabilities have long been vital for competitiveness, with continuous research reflecting societal and cultural shifts driven by technological advancements. These evolving competencies have led to more diverse and in-depth research on corporate capabilities. The rise of large language models, such as Chat GPT, within the low-code, no-code frameworks, has made advanced technological capabilities accessible to non-programmer corporate employees. Additionally, significant progress in fields such as digital biotechnology, intelligent automation, and renewable energy marks remarkable advancements in green technologies [1, 2]. In the current era of frequent technological innovation, the competencies required of corporate talent have changed dynamically. This presents a particular challenge for small- and medium-sized enterprises (SMEs) in South Korea, which are striving for continuous performance and stable operational management [3].

South Korea's workforce and corporate concentration in the capital region are notable amid global urbanization trends. Large electronics industrial parks in non-capital regions moved to China and Vietnam around 2019 owing to labor costs, while semiconductor factories and research and development (R&D) hubs shifted to the capital for talent acquisition and agglomeration benefits. This shift reduces regions' capability to export goods, leading to disparities in urban competitiveness between capital and non-capital areas [4]. A decline in local infrastructure and talent attraction exacerbates these disparities [5, 6]. However, this concentration posed environmental and social challenges in the capital region Ehrlich and Holdren [7] with recent studies suggesting clean technology and sustainable supply chain management or Energy, Social, Governance (ESG) activities as mitigations [8, 9]. The capital region's

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* Correspondence: hyunvv@gmail.com

market grows as the non-capital market declines, leading to industrial hollowing and capability reduction in non-capital areas. This phenomenon is acute in South Korea and requires further studies on regional differences in corporate capabilities. Choi [10] and others have analyzed corporate performance from a resource-based theory (RBT) perspective, including its evolution into theories such as the resource dependence theory [11].

In the 21st century, technological advancements drive economic, social, and cultural developments. Research on innovation capabilities, represented by absorptive capacity, dynamic capabilities, and R&D capabilities, has begun to address the need for the rapid assimilation of technological competitiveness in response to changing technological trends [12-15]. These issues, coupled with South Korea's societal problems, such as the concentration and cliff situation of the productive population, exacerbate the difficulties faced by non-capital regions, which are geographically more vulnerable. Amid the deepening polarization between capital and non-capital regions, the Ministry of SMEs and Startups of South Korea announced plans to restructure key regional industries and promote the innovation growth of regional SMEs. Similarly, the Ministry of Science and ICT has expanded the role and authority of regions in the national science and technology basic plan. The Ministry of the Interior and Safety, which is the primary government department in South Korea dealing with regional issues, and other central government departments are continuing efforts to converge policy initiatives.

Innovation ecosystems are critical for business sustainability and equipping companies with the dynamic capabilities to adapt to rapid environmental changes [16]. This highlights the importance of a robust corporate ecosystem in both capital and non-capital regions. Although recent studies have examined the differences between companies in these regions [17, 18]. Research on how varying capabilities influence performance disparities or the specific capabilities needed for performance generation is limited [10]. Building on identified research gaps, this study examines how firm capabilities differ in their impact on performance between capital and non-capital regions, explores the pathways through which these capabilities affect financial outcomes via new product performance, and identifies optimal capability combinations for firms in diverse regional contexts. These questions drive the study's aim to clarify regional disparities in capability effectiveness and to inform tailored business strategies. This study distinguishes between corporate groups in capital and non-capital regions and empirically assesses the relationship between key corporate capabilities (R&D, dynamics, network, and technology commercialization capabilities) and market performance. It explores whether differentiated capability development is required for performance generation in these regions, identifies the optimal capability combinations for each region, and examines how these capabilities impact performance. It also considers new product performance as a mediating variable for financial market performance based on a company's core capabilities [19, 20]. And investigates its mediating role in capital and non-capital region companies. To address these research questions, the study employs importance-performance map analysis (IPMA), multigroup analysis (MGA), and fuzzy-set qualitative comparative analysis (fsQCA) to explore strategies for effectively leveraging firm capabilities in different regional contexts

This study is expected to facilitate the development of tailored policy measures for businesses in various regions. Moreover, from a macro perspective, it aims to enhance the economic conditions of stagnant areas by focusing on SMEs. It also seeks to establish strategies grounded in the regional innovation system framework to promote self-led development by regions that understand their unique characteristics and needs.

2. Literature Review and Hypothesis Development

2.1. Firm Capabilities in Resource-Based Theory

In an uncertain business management environment, companies constantly consider their future directions and capabilities they need to develop. A resource-based approach is employed to explain these complex managerial issues. Barney [21] and Wernerfelt [22] emphasize the importance of the resource-based view (RBV) as a theoretical basis for understanding and explaining the effectiveness of capabilities and organizational characteristics in managing these issues. A core focus of the RBV in a

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company's sustained growth is that its critical competitive advantage stems from its internal resources [23]. However, the RBV has limitations and needs academic expansion, as there is still uncertainty about how and what value a company's diverse capability resources can contribute to its competitive performance [24].

Some critics argue that the RBV is static and overlooks external environmental factors that affect a firm [23, 24]. However, these limitations of the RBV can be sufficiently compensated for by incorporating the dynamic capability view. Dynamic capabilities include the identification of strategic organizational processes, reconfiguration of resources (integration, acquisition, and deployment), and identification of paths to achieve a competitive advantage [25]. Additionally, organizations can adapt and respond to a constantly changing business environment through dynamic capabilities by upgrading their technology and capabilities, and learning and applying both internal and external company resources and technology [26]. However, by integrating dynamic capabilities theory, this study addresses these gaps by exploring how firms can continuously reconfigure and align their resources to respond to changing environments [26]. Dynamic capabilities enhance a firm's learning efforts and align its internal resources with the external environment, thus complementing the RBV. Therefore, this study prioritizes dynamic capabilities within the resource-based perspective and selects R&D, network, and technology commercialization capabilities as the primary resources.

2.2. R&D Capability and New Product Development

R&D capabilities refer to a company's capacity to manage R&D strategies and projects, portfolio management of projects, and the overall execution, operation, and administration of R&D expenditures [27]. This is because a firm's competitive advantage emanates from the efficiency and capabilities derived from new product development (NPD) [28].

New product innovation is closely linked to capability accumulation, with R&D being pivotal for technological innovation and expenditure Evangelista [29]. Seo and Hyun [30] assert that R&D capabilities are crucial for corporate performance. Increased technological cooperation among SMEs drives innovation Hwang and Sung [31]. Seo and Hyun [30] observe that R&D capabilities significantly affect non-financial managerial outcomes, although they do not always affect financial performance. Despite some contradictory findings Pindado, et al. [32] the consensus is that R&D investments generally benefit corporate performance and value [32, 33]. Underscoring the importance of R&D in new product performance. This is because R&D capabilities enhance a firm's ability to innovate, continuously adapt to evolving market conditions, and develop new products that meet changing customer needs. Through effective R&D, firms can reconfigure their existing resources, create new knowledge, and improve product quality, which is essential for sustaining competitiveness in dynamic environments. Hence, we propose the following hypothesis.

Hypothesis 1: R&D capabilities positively affect NPD performance.

2.3. Dynamic Capability and New Product Development

Today, the success or failure of business management depends on how swiftly a company responds to rapid changes. The most explanatory variable is dynamic capabilities. Possessing dynamic capabilities means that a company has positioned itself in a more advantageous ecosystem than others. Therefore, it not only emphasizes the characteristics and processes required to secure a good position but also suggests the ability to detect and capture new strategic considerations and opportunities Teece [34].

Park and Cho [35] empirically demonstrate that dynamic capabilities positively affect a firm's operational capabilities, which in turn positively impact a firm's new product and market performances. Dynamic capabilities enable firms to continuously reconfigure and adapt their resources in response to shifting market conditions, ensuring that they remain competitive and innovative. These capabilities are especially critical in turbulent environments, where the ability to swiftly adapt to technological advancements and customer demands directly influences the

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success of new product development. Ahn and Kang [36] examine the mediating effect of dynamic capabilities on the impact of entrepreneurship in startups on non-financial performance, including new product performance. The results show that dynamic capabilities influence corporate performance, and that entrepreneurship effectively mediates this impact on performance. Therefore, dynamic capabilities are more valuable than ever in such turbulent times and are crucial for creating new product performances that deliver high value to customers, leading to the following hypothesis.

Hypothesis 2: A firm's dynamic capabilities positively impact new product performance.

2.4. Technology Commercialization and New Product Development

Technology commercialization capability has the ability to implement technology for product development, convert technological developments into mass-produced products, and tailor products to customer needs through effective marketing planning Han and Heo [37] and Yam, et al. [27] define manufacturing capability as the capacity to transform R&D outcomes into market-ready, batch-manufacturable products and marketing capability as the ability to promote and sell products by understanding consumer needs and market dynamics. Their empirical analysis indicates that production capability has a significant positive impact on new product sales performance, while marketing capability does not significantly affect new product sales performance. Kim and Bae [38] find that higher levels of technology commercialization and convergence capabilities in R&D activities lead to improved commercialization performance, including new product technological advancement and completeness. Thus, we derive the following hypothesis.

Hypothesis 3: Technology commercialization capability has a positive impact on a firm's new product performance.

2.5. Network Capability and New Product Development

Finally, we examine prior studies explaining the impact of network capabilities on new product performance. Network capability is the capacity to build close relationships with customers, suppliers, research institutions, and competitors and use these relationships as a unique corporate capability to handle, exploit, and utilize inter-organizational relations Ritter and Gemünden [39].

Kim and Lee [40] highlight the positive impact of network capabilities on inter-organizational technological cooperation and innovation in products and processes. Seo and Hyun [30] emphasize the necessity of networks for companies, advocating specific methodologies and concepts related to networks. They indicate the role of network capabilities as a complete mediator in which the direct effects of R&D capabilities and corporate innovation activities on performance are mediated through networks, leading to positive outcomes. Hwang and Song [41] also recognize the impact of network capabilities in creating corporate innovation outcomes such as new products. Thus, network capabilities are considered to have a positive effect on a company's NPD performance, leading to the following hypothesis.

Hypothesis 4: Network capabilities positively affect the creation of new product performance in a firm.

2.6. Moderation by Dynamic Capability and Company Location

Building on previous studies that differentiated business groups into capital and non-capital regions, this study aims to assess statistically significant differences in the hypothesis outcomes between these groups [17, 18]. Compares location satisfaction and relocation intentions of innovation-driven startups in capital and non-capital regions. Choi [10] finds considerable differences in the impact of innovation capabilities on business performance in these regions, with convergence capabilities being more influential in non-capital areas and open innovation being predominant in the capital region. Yoon and Choi [18] identify significant innovation disparities between regions using propensity score matching with ICT venture panel data, noting a preference for internal research in the capital region and

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collaborative research in non-capital regions. These varied effects between groups form the basis for the following hypothesis.

Hypothesis 5: Dynamic capabilities significantly moderate the impact of a firm's R&D capabilities on NPD performance.

2.7. Market Performance and Mediating Effect of the New Product Development

New product performance involves accumulating production technology know-how, quantitative performance of product launches, development team commitment, and customer response [42]. These elements are integral to the success of new product development (NPD), as they reflect the firm's ability to translate technological advancements into marketable products. Kim and Bae [38] validate this concept against Insead, et al. [43] theory, focusing on technical performance and product completion and establishing a significant positive correlation between these aspects. According to Kang and Seo [44] technological innovation performance comprises all stages of R&D to patenting and product launches, with a focus on technological innovation aspects and market introduction. From an RBV, network capabilities are crucial for optimizing external resources and positively impacting NPD and corporate performance. Pisicchio and Toaldo [45] examine the effects of strategic and innovation orientation on marketing performance. Against this background, the following hypothesis is proposed.

Hypothesis 6: New product performance positively influences the creation of market performance.

Furthermore, based on the above verification results, this study aims to test the mediating effect of new product performance on the path of each independent variable, representing corporate capability resources, on market performance. Accordingly, the following hypotheses are established.

Hypotheses 7: The positive impact of a firm's R&D capabilities on market performance is mediated by the performance of new products developed through these capabilities.

Hypothesis 8: Dynamic capabilities of a firm, such as adaptability and rapid response to market changes, positively influence market performance, mediated by the success of new product performance.

Hypothesis 9: The effectiveness of technology commercialization processes within a firm mediates the relationship between these processes and market performance through their impact on new product performance.

Hypothesis 10: A firm's network capabilities, including partnerships and alliances, influence market performance, with this effect mediated by the performance of new products developed using these network resources.

Hypothesis 11: The interaction of a firm's dynamic capabilities with its R&D capabilities enhances new product development, which in turn positively affects market performance.

Hypothesis 12: The firm's location has a moderating effect on each research hypothesis pathway effect.

2.8. Combined Effect of the Firm Capabilities on New Product Development

Finally, this study conducts a combinatorial effect analysis to elucidate whether there are any combined effects of various corporate capabilities on corporate performance in addition to their independent effects. If such combined effects exist, this study aims to determine which combination conditions are effective. Although some similar studies have been conducted, recent research (Hwang et al., 2021, 2022) has actively explored the relationship between corporate capabilities and new product performance. Studies are being conducted to determine how a company's capabilities contribute to creating significant combinatorial effect solutions in generating outcomes such as entrepreneurial success and academic–industry collaboration results. In this context, from an RBV, this study posits that corporate capability elements have more than one combined solution for generating new product performance and conducts a fuzzy-set qualitative comparative analysis (fsQCA) to investigate this. fsQCA was chosen because it identifies multiple configurations of capabilities that lead to new product performance. It is ideal for analyzing complex relationships where different combinations of factors can result in similar outcomes, which fits the interdependent nature of corporate capabilities in this study.

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3. Methodology

3.1. Data and Samples

The demographic characteristics of the sample included 245 males (68.6%) and 112 females (31.4%) (Table 1). Most importantly, examining the location-based characteristics of the companies, which are the main subject of this empirical study, we observed that 252 individuals (70.6%) were from the Seoul/Incheon/Gyeonggi (capital) region and 105 individuals (29.4%) were from other regions (non-capital regions). Although a concentration in the capital region exists, this is representative given that most companies are concentrated in the capital region.

To ensure relevant insights, the sample included employees at the managerial level or higher, as they are better positioned to represent their firms in management and operational decisions. The study targeted firms from across the country to produce generalizable findings, avoiding regional bias. Although focusing on a specific industry could provide deeper insights, this study included firms from various industries to enhance applicability across the broader corporate ecosystem. Smaller firms such as self-employed businesses and freelancers were excluded to focus on corporations driving national innovation. The sample was randomly selected to minimize bias and ensure representative data.

Table 1.
Characteristics of the sample.

Category		Classification		Frequency	%
Personal trait	Sex	Male		245	68.6
		Female		112	31.4
	Education	~ High school		21	5.9
		~ College		26	7.3
		~ Bachelor		240	67.2
		~ Master or doctor		70	19.6
	Age	30–39 years old		9	2.5
		40–49 years old		209	58.5
		50–59 years old		118	33.1
		60+ years old		21	5.9
Company characteristics	Region (Headquarter location)	Capital Region (n = 252)	Seoul	175	49.0
			Gyeonggi, Incheon	77	21.6
		Non-Capital Regions (n = 105)	Chungcheong, Daejeon, Sejong	31	8.7
			Gangwon	9	2.5
			Gyeongsang, Busan, Ulsan, Daegu	53	14.8
			Jeolla	12	3.4
	Firm year	1–7 years		27	7.5
		8–10 years		40	11.2
		More than 10 years		290	81.2
n = 357.0					

3.2. Variable Measurement

R&D capability involves forming strategies, implementing projects, and managing the overall R&D activities within a company [30]. It includes factors such as R&D personnel, investment, organization, objectives, capabilities, and information. Park and Cho [35] define dynamic capabilities as the competencies required to restructure businesses for economic gain in changing markets and technologies. This includes decision-making and regulatory establishment, measured through resource acquisition, knowledge combination, absorptive capacity, adaptability, and innovation capabilities.

Technology commercialization capability, which comprises manufacturing, production, and marketing planning capabilities, is crucial for developing and converting technology into marketable products [27, 37]. This study seeks an in-depth analysis of technology commercialization as an upper construct, integrating these aspects based on prior research.

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Network capability involves building and managing relationships with stakeholders such as customers and partners Ritter and Gemünden [39] and actively creating networks for new information and ideas [30].

New product performance, which serves as a mediating variable, includes the accumulation of production technology, launch performance, team commitment, and customer responses [40]. Innovation performance includes non-financial aspects such as customer satisfaction and sometimes new product performance [46, 47].

The outcome variable, which is crucial for corporate performance, includes both financial and non-financial indicators [48, 49]. Financial performance is viewed as a quantifiable outcome akin to market performance and involves corporate market share, competitiveness, new market development, and revenue growth [50, 51]. Measures of the construct are detailed in Appendix 1.

4. Data Analysis

4.1. Measurement Validation

Studies have investigated the effects of firm capabilities such as technology commercialization on firm performance such as NPD. This study defined technology commercialization capability as a composite of three independent aspects: production, manufacturing, and marketing capacities. As the three aspects of technology commercialization were assumed to be independent, technology commercialization was a reflective–formative two-order model.

Data analysis of the reflective–formative model of technology commercialization was conducted using the PLS–SEM algorithm and bootstrapping procedures. The output shows that all indicators of the three first-order reflective models of production, manufacturing, and marketing capacities achieved construct validity and reliability (loading > 0.70, $p < 0.05$; Rho A > 0.70; AVE > 0.50; Cronbach's alpha and composite reliability > 0.70) and discriminant validity (Fornell–Larcker, cross-loading, and HTMT). In addition, no multicollinearity between the indicators was observed (VIF < 5.0); thus, the three first-order models of technology commercialization achieved the benchmarks of construct validity and reliability.

Appendices 2, 3, and 4 show the outer loadings of lower order construct, discriminant validity based on the Fornell and Larker criterion and collinearity statistics of lower order construct (VIF), respectively.

An analysis of the second-order formative model of technology commercialization with redundancy and collinearity analyses showed that the model achieved convergent validity (B = 0.809, $p < 0.05$) and discriminant validity (VIF: production capacity = 3.269, manufacturing capacity = 2.233; marketing capacity = 2.897).

Furthermore, the analysis of the structural model shows significant effects of technology commercialization on firm performance in NPD (B = 0.766, $p < 0.05$, $f^2 = 1.422$) and management (B = 0.769, $p < 0.05$, $f^2 = 1.444$). Technology commercialization contributed 58.7% of the variance in firm performance ($R^2 = 0.587$). Figure 1 shows the final models of the study.

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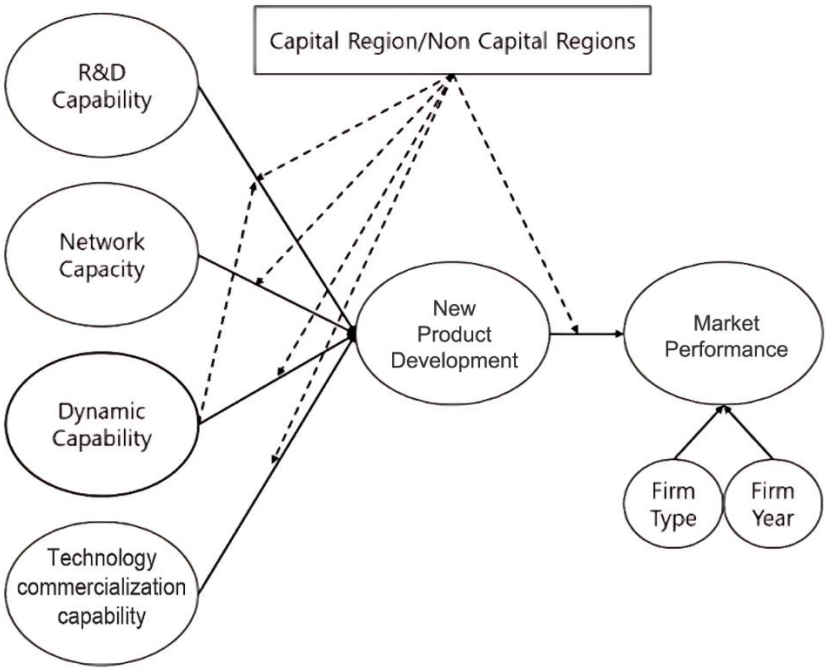

Figure 1.
Final models of the study.

Finally, the output of the PLS predict analysis yielded positive Q^2 Predict values for the dependent variable (Q^2 Predict: NPD 0.575), and the PLS–SEM RMSE values of the indicator were smaller than the LM RMSE value. This indicates that the final model possessed a large predictive power. Tables 2–5 present the results of the redundancy test, VIF, effect size, and predictive analysis of the higher order constructs.

Table 2.
Redundancy test: Path coefficients, outer loading and weights of the higher order construct.

Path coefficients	Original sample		Sample mean		Standard deviation		T statistics		*p*-values	
	C	N	C	N	C	N	C	N	C	N
LV scores - TC(MKT + MNF) → LV scores - PDT	0.844	0.833	0.845	0.835	0.022	0.033	37.518	25.46	0.000	0.000
Outer loadings										
LV scores – TC_MKT → LV scores - TC	0.923	0.908	0.922	0.905	0.021	0.041	43.643	22.04	0.000	0.000
LV scores – TC_MNF → LV scores - TC	0.948	0.946	0.947	0.94	0.016	0.040	59.175	23.519	0.000	0.000
LV scores - TC_PDT ← LV scores - TC_PDT	1	1	1	1	0	0	n/a	n/a	n/a	n/a
Outer weights										
LV scores – TC_MKT → LV scores - TC	0.483	0.469	0.481	0.466	0.068	0.137	7.146	3.41	0.000	0.000
LV scores – TC_PNF → LV scores - TC	0.584	0.607	0.585	0.605	0.066	0.129	8.825	4.714	0.000	0.000
LV scores – TC_PDT_ ← LV scores - TC_PDT	1	1	1	1	0	0	n/a	n/a	n/a	n/a

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Table 3.
VIF for the higher order construct.

Higher order construct	VIF	
	C	N
LV scores – TC_MKT	2.894	2.572
LV scores – TC_PNF	3.157	2.932
LV scores – TC_PDT	3.480	3.254

Table 4.
Effect Size.

R-square	R-square		R-square adjusted	
	C	N	C	N
MP	0.681	-	0.677	-
NPD	0.631	-	0.623	-
F square	MP		NPD	
	C	N	C	N
R&D	-	-	0.000	0.168
NTW	-	-	0.062	0.182
DC	-	-	0.015	0.034
Firm Type	0.002	0.009	-	-
TC	-	-	0.130	0.029
MP	-	-	-	-
NPD	2.058	2.044	-	-
Firm Year	0.003	0.031	-	-
DC * R&D	-	-	0.024	0.005

Table 5.
Predictive power analysis.

LV prediction summary	Q^2predict		RMSE		MAE		Mean		Median	
	C	N	C	N	C	N	C	N	C	N
MP	0.558	0.549	0.671	0.691	0.506	0.526	-0.044	0.009	0.023	0.009
NPD	0.608	0.727	0.631	0.537	0.460	0.412	-0.053	0.011	-0.011	-0.044
MV Prediction Summary	Q^2predict		PLS–SEM_RMSE		PLS–SEM_MAE		LM_RMSE		LM_MAE	
	C	N	C	N	C	N	C	N	C	N
MP	0.557	0.544	0.685	0.642	0.518	0.490	0.670	0.669	0.514	0.517
NPD	0.607	0.722	0.651	0.485	0.475	0.373	0.647	0.499	0.483	0.381

Thus, the reflective–formative two-order model of technology commercialization can be used to predict firm performance among managers in the study population. Enhancing production, manufacturing, and marketing capacities of managers of public companies in Korea would indirectly enhance their NPD.

4.2. Multigroup Analysis

Further analysis was conducted to examine measurement invariance across the two regional groups. The outputs of MICOM show that almost full measurement invariance was achieved for the three measurement models (the results of Steps 2, 3a, and 3b were nonsignificant with $p > .05$, except for one variable). Thus, the data of the two groups can be pooled, which permits a comparison of the moderating effect between the two regional groups using the PLS–MGA test (Table 6).

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Table 6.
MICOM procedure.

Step 1		Step 2		Partial measurement invariance established	Step 3a			Step 3b			Full measurement invariance established
Const.	Configuration invariance	Compositional invariance			Equal mean assessment			Equal variance assessment			
		Original correlation	5.00%		Dif.	Confid. interval	Equal	Dif.	Confid. interval	Equal	
DC	Yes	0.996	0.993	Yes	-0.096	(-0.225, 0.229)	Yes	0.269	(-0.377, 0.422)	Yes	Yes
MP	Yes	1.000	0.999	Yes	-0.025	(-0.237, 0.229)	Yes	0.178	(-0.331, 0.344)	Yes	Yes
NPD	Yes	1.000	0.999	Yes	-0.101	(-232, 0.223)	Yes	0.261	(-0.317, 0.370)	Yes	Yes
NTW	Yes	0.999	0.998	Yes	-0.110	(-224, 0.233)	Yes	0.349	(-0.305, 0.325)	No	No
RnD	Yes	1.000	0.999	Yes	-0.110	(-0.235, 0.226)	Yes	0.275	(-0.288, 0.306)	Yes	Yes
TC	Yes	1.000	1.000	Yes	-0.076	(-0.222. 0.222)	Yes	0.120	(-0.315, 0.329)	Yes	Yes

4.3. Hypothesis Testing

The bootstrapping results to determine the direct impact of corporate capabilities on the creation of NPD outcomes are as follows. First, the R&D capabilities in non-capital regions have a significant impact on new product performance. However, this was not the case in the capital region. Similarly, dynamic capabilities in non-capital regions showed a significant positive effect on new product performance, but not in the capital region. Conversely, technological commercialization (TC) capabilities in the capital region showed a significant positive impact on new product performance, which was not observed in the non-capital region. Regardless of region, higher network capabilities significantly aided in new product performance for companies. Consistent with previous studies, we confirmed that a company's NPD performance, based on a high level of statistical significance, helps in improved market performance.

An interesting finding is that in the capital region, the moderating effect of dynamic capabilities appeared in the relationship between R&D capabilities and new product performance. This suggests that in the capital region, leveraging high dynamic capabilities in conjunction with R&D capabilities increases the likelihood of achieving higher NPD outcomes. Thus, in metropolitan areas, such as the capital region, it is necessary to monitor market changes and conditions vigilantly while conducting R&D activities for NPD.

The study's findings on the mediating effects of various capabilities on market performance via NPD are summarized as follows: In non-capital regions, NPD significantly mediated the impact of R&D on market performance, indicating a partial mediating effect. However, this effect was not observed in the capital region. Additionally, NPD partially mediated the effect of dynamic capabilities on market performance in non-capital regions but not in the capital region. In contrast, the impact of TC capabilities on market performance was significantly mediated by NPD in the capital region but not in non-capital regions. NPD mediated the effects of network capabilities on market performance in both regions. Finally, the path through which R&D influences market performance through NPD, moderated by dynamic capabilities, was significant only in the capital region.

The output of the PLS–MGA test showed significant differences between the capital and non-capital region groups for the six paths in the regression model (capital region vs. non-capital regions: p (1-tailed) < 0.05), indicating that the regions moderated the six paths in the regression model. The six paths are listed in Table 7. Regarding corporate NPD performance, the paths that showed significant differences between the regional groups were the relationship between R&D and NPD, the moderating effect of dynamic capabilities on this relationship, and the relationship between TC and NPD. Furthermore, in terms of generating market performance for companies, statistically significant regional group moderating effects were also observed in the impact mediated by the aforementioned paths. This indicates that companies in the capital and non-capital regions must develop different alternatives to achieve such performance outcomes. The results are summarized in Table 7 and Figure 2.

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Table 7.
Test Results.

Hypothesis	Relationship	Path - *T* value (*p*-value)					*p*-value difference	Supported (H12)
		Group (C)	Supported	Group (N)	Supported	Difference	MGA Test	
H1	RnD → NPD	0.212 (0.416)	No	3.813*** (0.000)	Yes	-0.335**	0.004	Yes
H2	DC → NPD	1.62 (0.053)	No	1.999* (0.023)	Yes	-0.020	0.429	No
H3	TC → NPD	5.195*** (0.000)	Yes	1.344 (.090)	No	0.312*	0.026	Yes
H4	NTW → NPD	3.721*** (0.000)	Yes	4.007*** (.000)	Yes	-0.074	0.232	No
H5	DCxRnD → NPD	2.103* (0.018)	Yes	.904 (.183)	No	0.122*	0.021	Yes
H6	NPD → MP	34.642*** (0.000)	Yes	22.955*** (.000)	Yes	0.012	0.393	No
H7	RnD → NPD → MP	0.212 (0.416)	No	3.807*** (0.000)	Yes	-0.271**	0.004	Yes
H8	DC → NPD → MP	1.610 (0.054)	No	2.010* (0.022)	Yes	-0.014	0.435	No
H9	TC → NPD → MP	5.173*** (0.000)	Yes	1.322 (0.093)	No	0.259*	0.026	Yes
H10	NTW → NPD → MP	3.640*** (.000)	Yes	4.010*** (0.000)	Yes	-0.057	0.246	No
H11	DCxRnD → NPD → MP	2.110* (0.017)	Yes	0.902 (0.184)	No	0.100*	0.021	Yes

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

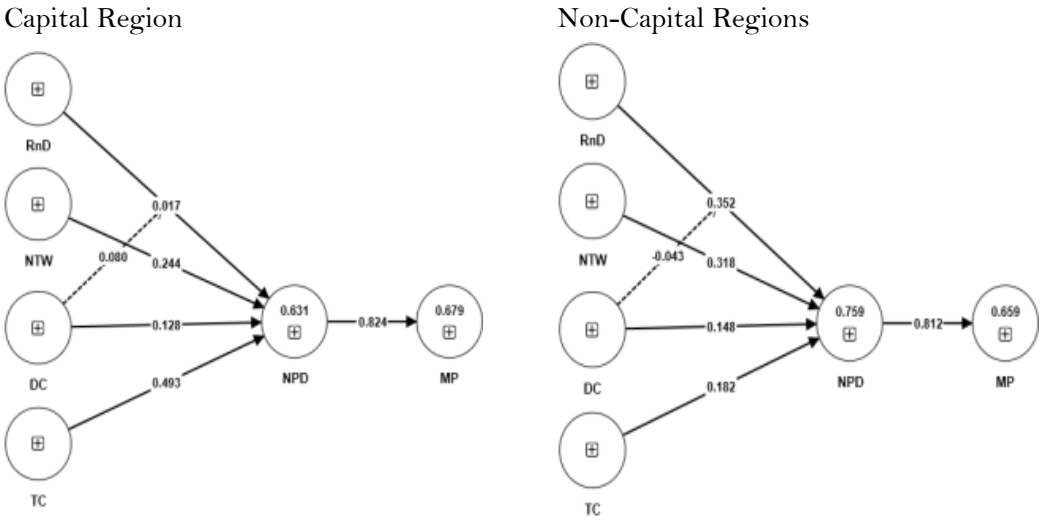

Figure 2.
MGA Results.

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4.4. Necessity and Sufficient Analyses

After correcting for each corporate capability and performance variable, a necessary condition analysis revealed that for a variable to independently influence outcomes, its consistency must exceed .8 [52]. In the capital region, dynamic capabilities, including production, R&D, productization, marketing, and network capabilities, exceeded this threshold, suggesting an independent impact on new product performance. Similarly, in non-capital regions, all these capabilities also surpassed the .8 threshold for new product performance. This suggested that these causal variables independently affected the outcomes. Consequently, for effective new product performance, all these factors must be developed sufficiently, implying that a minimum standard should be established for all capabilities with sustained investment (Table 8).

Table 8.
Corporate requirements analysis results (Dependent variable: New product development).

Verified Conditions	Companies in Capital Region		Companies in Non-Capital Region	
	Consistency	Coverage	Consistency	Coverage
Dynamic capabilities	0.825255	0.796634	0.825635	0.827631
~ Dynamic capabilities	0.533768	0.524832	0.521053	0.548419
R&D capabilities	0.846843	0.794664	0.879614	0.829166
~ R&D capabilities	0.519755	0.526446	0.487293	0.549467
Manufacturing	0.868921	0.796386	0.888518	0.808575
~Manufacturing	0.492139	0.511646	0.467446	0.550700
Production	0.816620	0.814363	0.846596	0.842066
~Production	0.552261	0.525871	0.500649	0.531299
Marketing	0.856049	0.823059	0.855500	0.855183
~Marketing	0.505499	0.499076	0.481543	0.508322
Network capacity	0.847088	0.825500	0.843072	0.838871
~Network capacity	0.538412	0.524357	0.540716	0.573593

Note: * Marks indicate that competency was absent.

To explore sufficient conditions for truth table creation, sorted by frequency and consistency Pappas and Woodside [53] this study focuses on differentiating between metropolitan and non-metropolitan corporate groups. A frequency threshold of 1 Ragin [52] was set to reflect the bifurcated group and sample. This threshold was used to determine case exclusion from further analyses when the number of cases was low. The consistency cutoff, which determined whether to include a result set, was set at the minimum recommended level of .75 in the fsQCA [54]. In Table 9, a large black circle (●) denotes a core condition, indicating factors present in both intermediate and parsimonious solutions. A small black circle (●) signifies a peripheral condition, representing causal requirements found only in parsimonious solutions [55].

Through the fsQCA, sufficient condition combination solutions necessary for new product performance creation in metropolitan corporate groups were derived and presented. Two solutions were derived, characterized as follows: The first solution, 1c, indicates that if high R&D, TC, and dynamic capabilities exist, the likelihood of creating new product performance is high. In this solution, R&D capability was identified as the core condition for determining new product performance. This solution's consistency was .942, significantly higher than the recommended level of .80 Ragin [52] and its explanatory power was .656 (65.6%), far exceeding the recommended level of .1 [52].

The second solution, 2c, suggests that possessing high productization, marketing capabilities, and R&D, dynamic, and network capabilities increases the likelihood of creating new product performance, particularly with R&D and network capabilities as core conditions. This indicates that even without production capabilities in metropolitan areas, new product performance creation is more likely when products are developed through open innovation R&D activities based on R&D capability and a rich pool of human and market resources and subsequently marketed dynamically. In this solution, R&D and network capabilities are the core conditions.

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fsQCA of non-capital corporate groups identified key conditions for new product performance, highlighting the significance of high R&D, TC, and dynamic capabilities. In these regions, unlike in capital areas, where network capability is vital, productization capability, alongside R&D and dynamic capabilities, is crucial for achieving new product performance. Companies in non-capital regions are more likely to succeed in new product performance when they excel in these capabilities, especially R&D and productization. The solution's consistency score of .960 and explanatory power of .679 (67.9%), both exceeding standard thresholds, indicate that non-capital companies can effectively generate new product performance through empirical R&D and productization, even in the absence of strong network capabilities, by dynamically responding to market and environmental changes.

Table 9.
Truth table analysis results for companies in the metropolitan area.

Item		Companies in Capital Region				Companies in Non-Capital Region				
		1c	2c	3	4	1d	2	3	4	5
TC										
	Manufacturing	●	●	○	○	●	●	○	●	○
	Production	●		○	○	●	●	○	○	○
	Marketing	●	●	○	○	●	○	○	○	○
R&D		●	●		●	●	●	●	○	○
DC		●	●	○	○	●	○	○	○	●
NTW			●	●			○	○	○	○
Consistency		0.942	0.952	0.828	0.828	0.960	0.924	0.832	0.838	0.853
Overall raw coverage		0.656	0.652	0.331	0.330	0.679	0.315	0.312	0.305	0.290
Unique coverage		**0.026**	**0.020**	**0.028**	**0.020**	**0.406**	**0.010**	**0.012**	**0.006**	**0.029**

Note: ● = core condition, ● = peripheral condition, ○ = does not have meaningful influence.

4.5. Importance-Performance Map Analysis

Importance-performance map analysis (IPMA) was selected to identify which capabilities are both important and performing well. It highlights key areas for improvement. In this study, IPMA compares the importance of capabilities across regions to guide strategies for improving market performance. The outputs of the IPMA show that for both regional groups, the performance of the four variables was above 50%. This indicates that the performance of the variables was sufficient for this model. In addition, R&D capabilities play a more important role than other variables, especially in non-capital regions, whereas TC capabilities play the most important role in the capital region. Therefore, the performance and importance of variables should be considered in improving new product development that significantly affects a company's market performance (Table 10).

Table 10.
IPMA test results.

NPD	Importance		Performance	
	C	N	C	N
R&D	0.014	0.350	56.349	58.706
NTW	0.244	0.312	58.418	60.658
DC	0.124	0.138	63.258	64.948
TC	0.500	0.195	60.974	62.372
AVG	0.221	0.249	59.750	61.671

5. Conclusion

5.1. Implications

This study provides several important insights. First, in the metropolitan corporate groups, dynamic capabilities, followed by R&D capabilities, do not significantly impact new product performance and new product performance do not have a significant mediating effect. This aligns with

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new economic geography theory, suggesting that in resource-rich metropolitan areas, developing internal capabilities may be less efficient than networking for external capabilities or acquiring external technologies. However, the finding that highly dynamic capabilities enhance R&D effectiveness in NPD in metropolitan areas, leading to increased sales and revenue, is considerable. This supports the view that dynamic capabilities are context-dependent and may vary in importance depending on the regional environment, consistent with previous studies indicating regional differences in corporate performance [17, 18]. The fsQCA result suggests that metropolitan corporate groups should prioritize developing TC and network capabilities, even with limited production capabilities. This aligns with the hypothesis that in dense, resource-abundant environments, commercialization and networking are more critical for leveraging internal and external technologies. For these groups, integrating TC with network capabilities is crucial.

Second, significant differences are observed between non-metropolitan corporate groups and metropolitan areas. R&D and dynamic capabilities are critical, whereas network capabilities remain important. In these areas, limitations in open innovation make commercialization capabilities less significant. Geographical advantages and ownership of production facilities enhance the importance of R&D in empirical research and manufacturing. Additionally, dynamic capabilities are vital because of information acquisition challenges. The mediation effect analysis shows that R&D, dynamic, and network capabilities significantly influence market performance through new product performance, unlike TC capabilities. Thus, non-metropolitan groups require support for empirical research and the commercialization of NPD. Policy recommendations include establishing testbeds, fostering academic–industry collaboration, and expanding urban industrial complexes. fsQCA 3.0 results identified R&D, dynamics, productization, marketing, and production capabilities as causal requirements for new product performance in non-metropolitan areas. This result directly supports the study's hypothesis that dynamic and R&D capabilities are essential for firms in these regions to overcome challenges related to resource acquisition and innovation. R&D and dynamic capabilities are the key, with network capabilities being less effective in metropolitan areas. In contrast, TC capabilities are essential for non-metropolitan groups. Developing empirical R&D capabilities based on dynamic capabilities is crucial for such groups. While no direct paths to market performance were statistically significant, various full mediating effects were observed when mediated through new product performance. Enhancing production bases, productization, and marketing capabilities is necessary for creating market-demanded products. Moreover, leveraging network capabilities is recommended to improve market performance.

Third, the results of a multigroup analysis to verify group-specific moderating effects reveal that metropolitan and non-metropolitan corporate groups must possess differentiated capabilities to create market performance through new product performance. This aligns with previous research that identified differences in the impact of innovation capabilities on management performance between metropolitan and non-metropolitan corporate groups [17, 18]. The statistically significant differences between the two groups coincided with the paths in which significant differences were evident. R&D capabilities have emerged as being important for non-metropolitan groups. Conversely, TC capabilities were found to be especially critical in metropolitan areas, which have abundant resources and a large market, and are conducive to open innovation.

For TC capabilities, while most studies broadly consider various sub-factors of its composite concepts, some research distinctively separates these concepts. Therefore, the significance of this study lies in conducting additional in-depth research after a preliminary analysis to construct higher order constructs. Moreover, this study differs from previous research by analyzing the direct effects between corporate capabilities and market performance, bifurcating the two dependent variables, and examining their combined effects. This provides unique insights compared with previous research results.

For capital region corporations, fostering TC and open innovation is essential, involving both the absorption of external technological resources and sharing of internal resources. Corporations should also prioritize short-term R&D activities that respond rapidly to market changes and facilitate agile NPD. This approach is supported by IPMA, which highlights TC as the most crucial capability in the

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capital region. By contrast, non-capital region corporations should leverage their geographical advantages for empirical R&D based on production and productization capabilities. The statistical significance of these paths provides key insights for policymakers and stakeholders in the external ecosystems. The importance of R&D capability as the most critical item in non-capital regions according to IPMA further validates this strategy.

From an RBV, the capabilities of corporate groups in capital and non-capital regions show statistical differences, necessitating distinct approaches. This study's contributions lie in its detailed analysis of region-specific capabilities and its validation of most research hypotheses, highlighting statistically significant differences and group-specific moderating effects. These insights offer valuable guidance for both academics and practitioners, advancing our understanding of how regional dynamics shape corporate performance.

5.2. Limitations and Future Research

This study explores the differential impact of resource-based corporate capabilities on management performance in capital and non-capital regions by adding detailed components to understand the specific causes and combined effects. It empirically demonstrates the mediating role of new product performance and statistically identifies distinct paths for different corporate groups. However, more research is required for a definitive diagnosis and coherent solutions, including further empirical studies on robust deductive reasoning and longitudinal research, to address this study's cross-sectional limitations. Additionally, future studies should consider expanding the scope to include other regions or countries to assess whether the findings are consistent in different economic or cultural contexts. Furthermore, qualitative research, such as expert interviews, narratives, ethnographic studies, experiments, and quantitative analyses using secondary data, is suggested to uncover factors that have been inadequately explored inductively. In non-capital regions, R&D capabilities significantly mediated new product performance to market performance, whereas in capital regions, TC capabilities were more impactful.

This study's importance lies in reexamining the polarization issue and industrial challenges in Korea from an RBT perspective, focusing on dynamic capabilities [13]. Future research should investigate the factors affecting financial performance in companies in non-capital regions by considering various variables. Policy implications for fostering regional innovation ecosystems and supporting infrastructure development should be further explored.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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Appendix 1.
Measures of the Construct.

Items		Measures	Sources
Research and Development Capability (6)	R&D Personnel	Superiority in proportion of research and development personnel to total employees	Yam, et al. [27] and Seo and Hyun [30]
	R&D Investment	Superiority in research and development investment size relative to sales	
	R&D Organization	Level of dedicated research and development organization operation	
	R&D Goals	Specificity of research and development goals	
	R&D Competence	Appropriateness of technology acquisition methods	
	R&D Information	Technology development trend monitoring implementation level	
Network Capacity (7)	Frequency of joint research with government agencies and companies		Seo and Hyun [30]
	Level of joint research-based technology security		
	Level of participation in external network activities to secure customer and market information		
	Level of participation in external network activities to identify trends of other companies		
	Level of participation in external network activities to secure business-related knowledge information		
	Frequency of external consultation		
	Effectiveness of external network strategy in winning business orders		
Dynamic Capability (5)	Resource acquisition capabilities	Ability to create new business value	Teece [34] and Park and Cho [35]
	Knowledge combination capability	Ability to systematize acquired knowledge	
	Absorptive capacity	Management of knowledge and experience, organizational capabilities	
	Adaptive capacity	Management and organizational integration capabilities	
	Innovation capability	Competitiveness of our products/services compared with that of other companies'	
Technology Commercialization Capability (15)	Manufacturing (4)	Development goal product/service performance and evaluation level	Yam, et al. [2] and Han and Heo [37]
		Maintain product/service production technology standardization standards, management level	

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		New product planning capabilities	
		Mid- to long-term product development plan level	
	Production (5)	Excellence in production system	
		Management level of inspection, measurement and test equipment for quality precision analysis	
		Level of securing production system for products/services related to meeting quality requirements	
		Level of implementation of production process	
		Quality assurance activity operation level	
	Marketing (6)	Level of organizational structure to identify and reflect customer needs	
		Marketing strategy establishment level	
		Extent of implementation of customized marketing channel analysis	
		Marketing-related external network-based information collection level	
		Awareness of competitive products' pros and cons and market position, etc.	
		Appropriateness of sales promotion and sales channel response based on product life cycle	
New Product Development (4)		Accumulation of production technology know-how through new product development	Kim and Lee [40]
		Numerical superiority of new products launched compared to other companies	
		Willingness to develop new products	
		Market reaction to new products	
Market Performance (4)		Level of market share improvement	Kim and Ahn [50]
		Level of corporate competitiveness improvement	
		Level of profit increase	
		Degree of new market development	

Appendix 2.
Construct Reliability and Validity of Lower Order Construct.

Construct	Cronbach's alpha		Composite reliability (rho_a)		Composite reliability (rho_c)		Average variance extracted (AVE)	
	C	N	C	N	C	N	C	N
Research and Development	0.929	0.888	0.931	0.890	0.944	0.915	0.739	0.641
NWT	0.909	0.879	0.909	0.886	0.928	0.905	0.647	0.578
DC	0.859	0.824	0.877	0.825	0.898	0.877	0.639	0.589
MKT	0.902	0.874	0.902	0.874	0.924	0.905	0.670	0.614
MNF	0.893	0.881	0.894	0.882	0.921	0.913	0.701	0.677
PDT	0.881	0.872	0.883	0.872	0.918	0.912	0.737	0.722
MP	0.847	0.839	0.849	0.843	0.897	0.892	0.685	0.675
NPD	0.861	0.807	0.864	0.810	0.906	0.874	0.707	0.634

Note: MKT = Marketing Capability, MNF = Manufacturing Capability, PDT = Production Capability, NWT = , DC = , MP = , NPD = New Product Development.

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Appendix 3.
Discriminant Validity Based on Fornell and Larker Criterion.

Item	1		2		3		4		5		6		7		8		9		10	
3	C	N	C	N	C	N	C	N	C	N	C	N	C	N	C	N	C	N	C	N
1	.860	.801																		
2	.711	.622	.805	.761																
3	.661	.549	.628	.52	.799	.767														
4	.119	.11	.216	.171	.001	.19	1	1												
5	.709	.734	.731	.698	.73	.724	.094	.116	.819	.783										
6	.774	.754	.721	.693	.683	.645	.089	.169	.754	.723	.837	.823								
7	.783	.730	.688	.617	.753	.614	.020	.153	.779	.756	.800	.788	.859	.850						
8	.615	.646	.678	.666	.664	.557	.106	-.011	.722	.673	.618	.672	.696	.607	.828	.822				
9	.663	.777	.698	.748	.643	.648	.102	.091	.752	.771	.652	.742	.719	.707	.824	.812	.841	.796		
10	-.085	.068	-.094	.052	-.055	.091	.154	.276	-.087	.083	-.055	.071	-.063	-.003	-.101	-.084	-.088	.052	1	1

Note: 1 = Research and Development, 2 = NWT, 3 = DC, 4 = Firm Type, 5 = MKT, 6 = MNF, 7 = PDT, 8 = MP, 9 = NPD, 10 = Firm Year.

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Appendix 4.
Collinearity Statistics of Lower Order Construct (VIF).

Construct	Indicator	VIF		Construct	Indicator	VIF	
		C	N			C	N
Research and Development Capability	RND1	2.861	1.843	Technology Commercialization	MKT1	2.359	2.212
	RND2	2.976	2.228		MKT2	2.128	2.107
	RND3	3.390	2.118		MKT3	2.243	2.078
	RND4	2.755	2.293		MKT4	2.458	2.328
	RND5	2.886	1.989		MKT5	2.148	2.038
	RND6	2.450	2.204		MKT6	2.765	2.102
Network Capability	NTW1	2.271	1.985		MNF1	2.419	2.404
	NTW2	2.274	1.979		MNF2	2.012	2.045
	NTW3	2.667	1.839		MNF3	2.146	2.297
	NTW4	2.444	1.979		MNF4	2.208	2.364
	NTW5	2.615	2.094		MNF5	2.877	2.334
	NTW6	2.142	2.276		PDT1	1.986	1.914
	NTW7	2.275	1.917		PDT2	2.381	2.764
Dynamic Capability	DC1	1.895	1.533		PDT3	2.972	2.628
	DC2	1.785	1.535		PDT4	2.966	2.685
	DC3	2.215	2.600	Market Performance	MP1	1.965	1.634
	DC4	2.261	1.943		MP2	1.851	2.049
	DC5	2.079	1.979		MP3	1.926	1.927
Control	Firm Type	1	1		MP4	1.900	1.866
				New Product Development	NPD1	1.711	1.585
					NPD2	2.	1.5

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	D2	120	73	
Firm	NP		2.	1.9
Year	D3	141	13	
	NP		2.	1.7
	D4	284	03	

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