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The Impact of Dynamic Capabilities on Business Model Effectiveness: Evidence from Japanese Firms

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Abstract

Dynamic capabilities enable firms to reconfigure and adapt their business models in response to environmental changes, positioning them as a central concept in research on business model innovation. While prior studies acknowledge the heterogeneity of business models, limited attention has been paid to how dynamic capabilities influence different model types. This study addresses this gap by examining two archetypal business models—efficiency-oriented and novelty-oriented—and analyzing both their individual and interaction effects. Using firm-level data from Japanese companies during the transition from the COVID-19 pandemic to the post-pandemic normal, we provide empirical evidence on the role of dynamic capabilities in shaping business model outcomes. By tackling fundamental questions regarding the interplay between dynamic capabilities and business model innovation, this research advances theoretical understanding and offers practical insights for firms navigating turbulent environments.

Keywords

Dynamic capabilities, business model innovation, competitive advantages, Japanese firms

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1 INTRODUCTION

This study contributes to theory by clarifying how dynamic capabilities differentially shape outcomes across efficiency- and novelty-oriented business models—particularly during environmental transitions—and to practice by offering evidence-based guidance for managers on configuring sensing, seizing, and reconfiguring capabilities to sustain competitive advantage in turbulent contexts.

Research on dynamic capabilities originated with the seminal work of Teece, Pisano, & Shuen (1997), who defined dynamic capabilities as "a firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997). Then Adner and Helfat (2003) classify organizational capabilities into two categories: operational capabilities and dynamic capabilities. Operational capabilities are embedded at the functional or departmental level (Cepeda & Vera, 2007; Leemann & Kanbach, 2022) and consist of routines and practices that support the efficient execution of established tasks within existing business models (Dosi, Nelson, & Winter, 2000; O'Reilly & Tushman, 2008; Zollo & Winter, 2002). In contrast, dynamic capabilities operate at the firm level (Adner & Helfat, 2003; Frankenberger & Stam, 2020; Helfat & Martin, 2015; Helfat & Peteraf, 2015; Zahra, Sapienza, & Davidsson, 2006) and refer to the ability to orchestrate a firm's asset portfolio in response to environmental change (Adner & Helfat, 2003; Sirmon & Hitt, 2009).

Subsequent research has expanded the concept of dynamic capabilities by introducing the notion of business models (Teece, 2007, 2010, 2012; Winter, 2003). Dynamic capabilities are commonly categorized into three subcomponents: sensing, seizing, and reconfiguring capabilities (Schoemaker, Heaton, & Teece, 2018; Teece, 2007). In particular, seizing and reconfiguring capabilities involve designing new business models and realigning resources to

implement these designs (Helfat & Peteraf, 2015; Witschel, Döhla, Kaiser, Voigt, & Pfletschinger, 2019).

Despite this progress, prior studies often overlook differences among business models (Pang, Wang, & Wu, 2023; Teece, 2007), while others classify them into distinct patterns, such as efficiency-oriented and novelty-oriented models (Leppänen, George, & Alexy, 2023; Zhu, Xiao, Dong, & Gu, 2019; Zott & Amit, 2008). This study addresses these heterogeneities by examining how dynamic capabilities enable firms to adapt to environmental changes and sustain competitive advantage across different business models. We develop several hypotheses and test them using data from Japanese firms during the transition from the COVID-19 pandemic to the post-pandemic normal. In doing so, this research advances the literature on dynamic capabilities and business model innovation.

The remainder of this paper is structured as follows: Section II reviews prior literature on business models and dynamic capabilities and presents hypotheses regarding their interactions. Section III describes the data collection process. Section IV outlines the analytical methods and reports the results. Finally, Section V discusses the findings and concludes the study.

II. THEORY AND HYPOTHESES DEVELOPMENT

In this section, we review prior research on business models and dynamic capabilities. Specifically, we focus on two widely referenced business model archetypes—efficiency-oriented and novelty-oriented models—which have been extensively discussed in previous studies (Leppänen et al., 2023; Zhu et al., 2019; Zott & Amit, 2008). We then develop hypotheses regarding each concept and their interaction.

2.1 Business Models

Early research on business models proposed various definitions before converging on a few widely accepted ones (Miroshnychenko, Strobl, Matzler, & De Massis, 2021; Rodríguez, Molina-Castillo, & Svensson, 2020; Yuan, Xue, & He, 2021). One influential definition, proposed by Teece (2018) and widely adopted in subsequent studies (Snihur & Zott, 2019), conceptualizes a business model as encompassing activities related to value creation, value capture, and value delivery. Another widely cited definition, emphasized by Foss and Saebi (2017) and referenced in numerous prior works (Arbussa, Bikfalvi, & Marquès, 2017; Inigo, Albareda, & Ritala, 2017), identifies three core elements: Content – the set of fundamental activities a firm performs; Organizational structure – the internal units conducting these activities and their interrelationships; Governance of transactions – the mechanisms for managing internal and external entities and their linkages. This study primarily adopts the latter definition as the basis for analysis.

Focusing on the characteristics of different business models, prior research has proposed several classification frameworks (Chesbrough, 2013; Saebi & Foss, 2015; Zott & Amit, 2008). Commonly cited categories include efficiency and novelty (Zhu et al., 2019; Zott & Amit, 2008), complementarity and lock-in (Leppänen et al., 2023; Zott & Amit, 2002), as well as user-centric, collaborative, and platform-based models (Saebi & Foss, 2015). Among these, this study concentrates on efficiency-oriented and novelty-oriented models, which are the most frequently referenced in the literature (Cruz-Sánchez, Cruz-Cázares, & Hernandez-Vivanco, 2026; Zott & Amit, 2010).

The rationale for selecting these two archetypes is grounded in competitive strategy and activity system theory, which suggest that firms can position themselves along a continuum ranging from cost focus to differentiation based on non-price value creation, within the productivity frontier of best practice (Porter, 1980, 1996). Cost focus requires operational efficiency, which is reflected in efficiency-oriented business models, whereas differentiation

through non-price value creation necessitates novelty for customers and clients, as embodied in novelty-oriented business models (Porter, 1996; Saebi & Foss, 2015; Zott & Amit, 2010). Therefore, these two models provide a suitable basis for examining heterogeneity in business model design and its interaction with dynamic capabilities.

In the following section, we analyze each model in detail based on Foss and Saebi (2017) framework and its defining elements—content, organizational structure, and governance of transactions.

Efficiency-Oriented Business Model

An efficiency-oriented business model fundamentally focuses on exploiting existing knowledge and leveraging resources and organizational capabilities to optimize processes and minimize costs (Wang, Yi, & Wei, 2023; Zott & Amit, 2010). In other words, it emphasizes exploitative learning and lean production systems (Randhawa, Wilden, & Gudergan, 2020; Yuan et al., 2021). Based on Foss and Saebi (2017) framework, an efficiency-oriented model simplifies its activity content by actively utilizing outsourcing and concentrates investments on core advantages such as procurement, manufacturing, and distribution (Saebi & Foss, 2015; Zott & Amit, 2007). Its organizational structure is typically characterized by a functional and mechanistic system (Burns & Stalker, 1961; Lawrence & Lorsch, 1967). Governance mechanisms for transactions are generally straightforward, as firms adopting this model tend to procure standardized parts and materials and sell standardized products and services through arm's-length transactions (Porter, 1980; Saebi & Foss, 2015).

However, firms with strong competitive advantages—such as Walmart and Toyota—often exhibit variations within efficiency-oriented models. These firms tightly couple activity content and maintain highly integrated organizational structures, while governance mechanisms involve close coordination with suppliers (Adler, Goldoftas, & Levine, 1999;

Liker, 2003). To ensure smooth operations, they continuously monitor and revise supply chains, including providing guidance on suppliers' internal management practices (Clauss & Spieth, 2016; Dyer, 1996).

In summary, efficiency-oriented business models vary considerably in terms of content, organizational structure, and governance mechanisms. Prior research indicates that such models positively influence performance, particularly financial outcomes (Bouncken, Lehmann, & Fellnhofer, 2016; Pang et al., 2023; Yuan et al., 2021; Zhao, Jiang, Peng, & Hong, 2021). Accordingly, we propose the following hypothesis:

H1: A firm adopting an efficiency-oriented business model can sustain its competitive advantage.

Novelty-Oriented Business Model

A novelty-oriented business model emphasizes explorative learning, experimentation, and the integration of new knowledge (Randhawa et al., 2020; Yuan et al., 2021; Zott & Amit, 2010). Firms employing this model target specific market segments that demand differentiated features compared to standardized products and services (Leppänen et al., 2023; Nieto & Santamaría, 2007). To tailor offerings to these segments, firms actively invest in transaction-specific assets that cannot be substituted by standardized parts, materials, or channels (Williamson, 1979, 1981). Consequently, the activity content must include diverse functions—from R&D and procurement to production, marketing, sales, and after-sales service (Kogut & Zander, 1992, 1996).

Novelty-oriented models typically require decentralization and knowledge sharing, while fostering internal collaboration (Mezger, 2014; Witschel et al., 2019). Thus, their organizational structure combines functional specialization with organic mechanisms that

facilitate knowledge flow across units (Lawrence & Lorsch, 1967; Lawrence, Lorsch, & Garrison, 1967), while maintaining integration to adapt to evolving user preferences (Inigo et al., 2017; Minatogawa, Franco, de Souza Pinto, & Batocchio, 2018; Snihur & Zott, 2019). In some cases, firms establish separate entities—such as spin-offs—to enhance integration of core operation (Cruz-Sánchez et al., 2026; Kogut, 1991; Matarazzo, Penco, Profumo, & Quaglia, 2021; Teece, 2018).

Furthermore, governance mechanisms in novelty-oriented models are loosely coupled with external entities, enabling broad access to external knowledge sources (Chesbrough, 2007; Saebi & Foss, 2015). Firms actively collaborate with partners such as lead users and specialized suppliers to acquire cutting-edge knowledge and foster innovation (Bouncken et al., 2016; Chesbrough, 2007; von Hippel, 1986).

Prior research suggests that novelty-oriented business models positively influence performance, particularly market outcomes (Bouncken et al., 2016; Pang et al., 2023; Yuan et al., 2021; Zhao et al., 2021). Accordingly, we propose the following hypothesis:

H2: A firm adopting a novelty-oriented business model can sustain its competitive advantage.

2.2. Dynamic Capabilities

To operate a given business model, firms require resources and organizational capabilities. Prior research generally classifies organizational capabilities into two categories: operational capabilities and dynamic capabilities (Helfat & Martin, 2015; Schilke, 2014; Teece, 2012; Winter, 2003).

Operational capabilities consist of routine skills, coordination know-how, and experience in managing internal processes and external relationships. These capabilities are embedded in

the current activity content, organizational structure, and governance mechanisms, enabling firms to meet existing demand for established products and services. They are essential for generating revenue under the prevailing business model (Helfat & Peteraf, 2015; Teece, 2007, 2012).

However, when firms face environmental shifts, operational capabilities alone may become insufficient or even obsolete. In such contexts, firms must pursue new product designs, architectural changes, and business model innovation—requiring dynamic capabilities (Achtenhagen, Melin, & Naldi, 2013; Henderson & Clark, 1990; Sosna, Trevinyo-Rodríguez, & Velamuri, 2010; Wirtz, Pistoia, Ullrich, & Göttel, 2016). Dynamic capabilities refer to firm-level competencies that enable adaptation to changing environments (Teece, 2007; Teece et al., 1997). These higher-order capabilities allow firms to modify functional-level activities, organizational structures, and governance mechanisms, thereby facilitating business model innovation (Foss & Saebi, 2017; Helfat & Winter, 2011; Teece, 2010).

Dynamic capabilities are commonly conceptualized as comprising three interrelated components: sensing, seizing, and reconfiguring (Teece, 2007). Firms equipped with these capabilities can sense external opportunities and threats, identify technological possibilities, and anticipate market shifts (Adner & Helfat, 2003; Sirmon & Hitt, 2009). They then seize these opportunities by redesigning business models and safeguarding intellectual property. Finally, they reconfigure business models by realigning both existing and newly developed operational capabilities (Teece, 2007, 2012). Because these components directly involve business model transformation, dynamic capabilities are closely linked to research on business model innovation (Foss & Saebi, 2017, 2018).

Dynamic capabilities are particularly valuable during periods of environmental turbulence (Danneels, 2012; Eisenhardt & Martin, 2000; Schilke, 2014). Under such conditions, managers can identify emerging problems and devise solutions based on industry experience

(Adner & Helfat, 2003; Eisenhardt, 1989; Sirmon & Hitt, 2009). However, even experienced managers may struggle to reallocate resources or develop new operational capabilities when changes occur too rapidly. Prior research suggests that dynamic capabilities are most effective under moderate levels of environmental change and complexity (Eisenhardt & Martin, 2000).

Empirical evidence consistently demonstrates that dynamic capabilities positively influence firm performance (Khan, Lew, & Marinova, 2019; Limaj & Bernroider, 2019; Müller, Buliga, & Voigt, 2021). Accordingly, we propose the following hypothesis:

H3: A firm equipped with dynamic capabilities can sustain its competitive advantage.

2.3 Interaction between Business Models and Dynamic Capabilities

An efficiency-oriented business model is designed to deliver standardized products and services (Foss & Saebi, 2017). To sustain competitive advantage under this model, firms must optimize processes and reduce costs, regardless of whether their activity content, organizational structure, and governance mechanisms are loosely or tightly coupled. When a firm occupies a cost focus position along the productivity frontier, it typically relies on incremental process innovation using existing operational capabilities to maintain its position (Porter, 1985, 1996). Under these conditions, a complete redesign of the business model may not be necessary, even in response to environmental changes.

However, the coexistence of an efficiency-oriented model and dynamic capabilities introduces potential trade-offs. If dynamic capabilities are derived from managerial experience without significant cost implications, they may complement efficiency objectives. Conversely, when dynamic capabilities require highly skilled managers commanding premium salaries, the associated costs may erode competitive advantage. Moreover, managers may pursue unnecessary business model innovation, diverting the firm from its cost-focused position and

undermining performance. Accordingly, we hypothesize:

H4: A firm adopting an efficiency-oriented business model will experience a deterioration in competitive advantage when it is also equipped with dynamic capabilities.

Next, we consider the relationship between the novelty-oriented business model and dynamic capabilities. A novelty-oriented model is premised on the idea that customer preferences fluctuate over time, requiring firms to continuously fine-tune products and services to meet the needs of target segments (Foss & Saebi, 2017, 2018). To provide differentiated offerings for these segments, such firms should prioritize product innovation over process innovation (Slater, Mohr, & Sengupta, 2014; Zhou & Wu, 2010). Capabilities for product innovation are generally classified as operational capabilities embedded at the functional level, particularly within R&D and marketing (Slater et al., 2014; Zhou & Wu, 2010).

A novelty-oriented business model typically incorporates flexibility, often relying on loosely coupled functions to adjust to changing customer preferences. At the same time, firms may need high integration across specialized functions to optimize the business model as a whole (Lawrence & Lorsch, 1967; Lawrence et al., 1967). In other words, firms would integrate activity content, organizational structure, and governance mechanisms to enhance the effectiveness of the novelty-oriented model (Foss & Saebi, 2018; Saebi & Foss, 2015).

Research on innovation indicates that incumbents equipped with sustaining innovation capabilities can adapt to changes in current customer preferences, yet may struggle with disruptive or architectural innovation (Christensen & Bower, 1996; Cooper & Schendel, 1976; Henderson & Clark, 1990). In summary, strong operational capabilities and tight integration tend to be adaptable to predictable change, but they increase vulnerability to unanticipated or

discontinuous change—even when firms pursue a novelty-oriented model.

Under such conditions, sensing capability—a subcomponent of dynamic capabilities—may not always facilitate the effective identification of environmental changes, including disruptive and architectural innovation (Christensen & Bower, 1996; Cooper & Schendel, 1976; Henderson & Clark, 1990). Even though a firm may subsequently sense environmental shifts and seize the opportunity to redesign its business model, we are skeptical that reconfiguring capability can transform a highly integrated current business model into a newly designed one for the following reasons.

When a focal firm occupies a non-price value position along the productivity frontier, rivals may consider migrating to the same position. In this situation, rivals face the dual challenge of uncertainty regarding successful migration and the need to relinquish existing profits. The uncertainty arises from the requirement to redevelop new activities and their interdependent systems (Porter, 1985, 1996). Rivals ultimately avoid these trade-offs and forgo imitation of the polar position.

We believe the above logic is largely applicable to the focal firm under environmental change. Specifically, even managers possessing dynamic managerial capabilities face uncertainties in successfully divesting unnecessary operational capabilities and dismantling a highly integrated existing business model, developing new operational capabilities, and aligning both existing and new capabilities with a newly designed business model to migrate to a new strategic position (Porter, 1996; Porter & Siggelkow, 2008; Rivkin & Siggelkow, 2003). In addition, turnaround managers with dynamic managerial capabilities may command higher salaries than incumbent managers. Thus, the combination of a highly integrated novelty-oriented business model and dynamic capabilities is likely not to culminate in successful business model innovation, but rather to deteriorate competitive advantage.

H5: A firm equipped with a novelty-oriented business model will experience a deterioration in competitive advantage when it is also equipped with dynamic capabilities.

Figure 1 shows our hypotheses and model. The straight lines represent our hypotheses, and the dotted lines represent the controls.

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III. RESEARCH METHODOLOGY

3.1 Research Sample and Data Collection

3.1.1 Research Sample

This study draws on archival data and questionnaire responses from Japanese firms. Japan's economy is highly diversified, encompassing key sectors such as industrial materials, machinery and automobiles, electronics and telecommunications equipment, software, and distribution (Cumings, 1984). This economic resilience and diversity provide an ideal context for testing our hypotheses.

3.1.2 Data Collection

We collected data from two sources: publicly available archival data and a questionnaire survey administered to Japanese firms. Prior to conducting the survey, we adhered to recommended procedures for developing non-English questionnaires (Troilo, De Luca, & Atuahene-Gima, 2014; Yang & Tsai, 2019). Specifically, we first created an English-language version of the questionnaire by referencing instruments used in prior studies (Wilden, Gudergan, Akaka, Averdung, & Teichert, 2019; Zott & Amit, 2002), and then translated it into Japanese.

To ensure accuracy, our research collaborators back-translated the Japanese version into English and compared it with the original. Consistency between the two versions was confirmed before fielding.

Next, we identified the target population using the Executives and Managers Information File database provided by Diamond Corporate Data Services, Inc. (Tokyo). We specifically selected executives and managers in R&D and information technology (IT) functions who recognize not only their business model but also technological opportunities and threats. This approach yielded a sampling frame of 3,783 private and publicly listed firms.

We distributed the questionnaire to selected executives and managers in late July 2023, requesting completion via our web platform or by mail by early September 2023. The timing was chosen to examine the effects of external change, specifically the transition "back to normal" following the COVID-19 pandemic (Akram, Islam, Chauhan, & Yaqub, 2024; Duan, 2024; El Baz & Ruel, 2024; Gupta, Sardana, & Lee, 2024). We received responses from 615 firms, including 327 mail replies and 288 web submissions, yielding a response rate of 16.26%, which is comparable to rates reported in similar studies (Miroshnychenko et al., 2021; Wilden et al., 2019). We excluded two firms due to extreme outliers—pharmaceutical ventures reporting returns on sales exceeding 5,000%—as these observations could distort the analysis. The final sample comprised 613 firms, of which 299 (48.7%) were publicly listed.

3.1.3. Bias check

We assessed potential sources of bias using established procedures recommended in prior research.

First, to examine nonresponse bias, we employed the traditional extrapolation method in which late respondents are assumed to approximate nonrespondents (Rogelberg & Stanton, 2007). We selected number of employees and total assets for comparison and conducted

independent-sample t-tests between the early and late respondent groups. The results revealed no statistically significant differences, suggesting that nonresponse bias is unlikely to affect our findings.

Second, we assessed common method bias (Podsakoff, 1986; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). To mitigate this concern, we employed both ex ante and ex post remedies recommended in the literature (Scott & Bruce, 1994; Simonin, 1997). For the ex ante remedy, we designed the questionnaire to reduce the likelihood of respondents using identical response patterns across items. Specifically, we adopted different scale formats: dependent variables were measured using four- or seven-point scales, whereas independent variables employed five-point scales (Chang, van Witteloostuijn, & Eden, 2010). For the ex post remedy, we incorporated publicly available archival variables—except for market dynamism—as control variables to reduce the influence of respondents' subjective evaluations. We also conducted Harman's single-factor test. The first unrotated factor accounted for 15.84% of the total variance, well below the commonly accepted threshold of 50%. This indicates that common method bias is unlikely to threaten the validity of our results.

Taken together, the analyses addressing potential nonresponse bias and common method bias suggest that our sample is sufficiently robust for testing the study's hypotheses.

3.2 Measurement

3.2.1 Independent Variables

Business Models

In this study, we measure the efficiency and novelty dimensions of business models using the scales developed by Zott and Amit (2007), which have been widely applied in recent research (Leppänen et al., 2023; Yuan et al., 2021; Zhu et al., 2019) (see Appendix A). Executives and managers evaluated each item on a seven-point Likert scale (1 = strongly

disagree, 7 = strongly agree). Following data collection, we conducted principal component analysis (PCA) to construct the business model variables.

Dynamic Capabilities

Dynamic capabilities were measured using a multi-item scale widely employed in prior research. Specifically, we adopted the instrument developed by Wilden, Gudergan, Nielsen, and Lings (2013), which captures the three sub-dimensions of dynamic capabilities: Sensing capability (4 items), Seizing capability (5 items), and Reconfiguring capability (5 items). This scale has been applied in subsequent studies (Fainshmidt & Frazier, 2017; Wilden et al., 2019; Wilden & Gudergan, 2015) (see Appendix C). Executives and managers rated all items on a seven-point Likert scale. After collecting responses, we aggregated the fourteen items into a single dynamic capabilities construct using PCA.

3.2.2 Dependent Variable

Following dynamic capabilities theory, which argues that dynamic capabilities enhance organizational performance through competitive advantage (Peteraf, Di Stefano, & Verona, 2013; Schilke, Hu, & Helfat, 2018; Teece, 2014), we adopted qualitative measures of competitive advantage. Specifically, we used the scale developed by Jap (1999), which has been applied in several studies (Schilke, 2014; Weerawardena, 2003). The measure comprises two dimensions: Strategic performance (3 items) and Financial performance (3 items) (see Appendix D). Executives and managers rated each item using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). After collecting responses, we aggregated the fourteen items into a single dynamic capabilities construct using PCA.

3.2.3 Instrumental Variables

To address potential reverse causality—specifically that competitive advantage may enhance dynamic capabilities by enabling resource investment—we also estimated two-stage least squares (2SLS) models. As instrumental variables (IVs), we used the extent of a firm's external collaborations.

The rationale is that although firms may collaborate with external partners, competitive advantage (the dependent variable) is unlikely to cause collaboration behavior. Therefore, collaboration is unlikely to correlate with the error term in a way that explains competitive advantage, while prior literature indicates that external collaborations can enhance dynamic capabilities through open innovation processes (Chesbrough, Heaton, & Mei, 2021; Teece, 2020; Von Krogh, Netland, & Wörter, 2018). Executives were asked to indicate the extent of collaboration on a four-point Likert scale (1 = not collaborate, 4 = frequently collaborate).

3.2.4 Control Variables

We included several control variables to account for potential confounding effects: firm age, firm size, market dynamism, a publicly listed dummy, and industry dummies. With the exception of market dynamism, all control variables were obtained from the Executives and Managers Information File database provided by Diamond Corporate Data Services, Inc.

IV. RESULTS

4.1. Methodology

Table 1 reports descriptive statistics and the Pearson correlation matrix for all variables, including the instrumental variables. All independent and dependent variables—as well as market dynamism (constructed via PCA)—were standardized, yielding means equal to zero. Public listing status and industry were coded as dummy variables.

All correlation coefficients were below 0.700, except for the relationships between dynamic capabilities and two instrumental variables—collaboration with laboratories and collaboration with universities—which are theoretically expected based on the open innovation literature (Chesbrough et al., 2021; Teece, 2020; Von Krogh et al., 2018).

To validate our estimation approach, we first conducted a Breusch–Pagan test to examine whether the variance of the error terms exhibited homoscedasticity. The results indicated acceptable homoscedasticity; therefore, we proceeded to test our hypotheses using hierarchical ordinary least squares (OLS) regression (see also Table 2).

Because of potential reverse causality concerns noted above, we additionally employed two-stage least squares (2SLS). In the first stage, we regressed dynamic capabilities on the extent of external collaborations (multiple instruments; see Appendix G). We rejected the null hypothesis H_0: all instruments = 0 at the 95% confidence level. The first-stage F-statistic was 12.490, exceeding the conventional threshold of 10, indicating strong instruments. We also conducted the Sargan/Hansen test for overidentifying restrictions; the null was not rejected, indicating that the instrumental variables are valid (i.e., exogenous with respect to the structural error term).

In the second stage, we used the predicted values of dynamic capabilities as independent variables and estimated the full models. To analyze the relationships between business models and dynamic capabilities, we entered all control variables in Step 1, followed by the independent variables in Step 2, and the interaction terms in Step 3. The results are presented in Table 2.

Across the series of models, p-values, R^2, and adjusted R^2 are reported at the bottom of Table 2. All models were statistically significant ($p < 0.01$). The maximum variance inflation factor (VIF) was 1.874, and the average VIF was 1.296—well below the conventional cutoff of 10—indicating that multicollinearity is not a concern in our specifications.

4.2. Main analysis

We primarily interpret the results based on the 2SLS estimations. The efficiency-oriented business model, novelty-oriented business model, and dynamic capabilities were each positively and significantly associated with competitive advantage across all models ($p < 0.01$ or $p < 0.05$), thereby supporting Hypotheses 1, 2, and 3.

The interaction between the efficiency-oriented business model and dynamic capabilities was negative and weakly significant in Model 12 ($p < 0.10$), offering limited support for Hypothesis 4. In contrast, the interaction between the novelty-oriented business model and dynamic capabilities was negative and statistically significant in Models 13 and 14 ($p < 0.01$ or $p < 0.05$), thereby supporting Hypothesis 5. Figure 2 visualizes the effect of dynamic capabilities under novelty-oriented models; a one standard deviation (SD) increase in both dynamic capabilities and novelty orientation is associated with a −0.089 change in competitive advantage (i.e., −0.092 SD).

Regarding control variables, firm age was negatively and significantly associated with competitive advantage across all models ($p < 0.01$, $p < 0.05$, or $p < 0.10$), while firm size was positively and significantly associated across all models ($p < 0.01$, $p < 0.05$, or $p < 0.10$). The publicly listed dummy was positively and significantly associated in all models ($p < 0.01$ or $p < 0.05$). Pharmaceuticals exhibited a negative association in Models 8 and 9 ($p < 0.05$), whereas medical devices showed a positive association across all models ($p < 0.01$). Finally, semiconductors were negatively and significantly associated across all models ($p < 0.01$ or $p < 0.05$).

To assess the robustness of these results, we conducted additional analyses. Recognizing that firms often face long and complex processes from R&D to monetization, which may complicate the isolation of business model and dynamic capability effects on

competitive advantage, we employed innovation performance as an alternative dependent variable to capture upstream outcomes (Heubeck & Meckl, 2022; Khan, Atlas, Ghani, Akhtar, & Khan, 2021; Nguyen, 2022). We collected innovation performance data via executive and manager surveys using items adapted from Scaliza et al. (2022) (see Appendix F). The innovation performance items loaded onto a single principal component (eigenvalue = 2.353), and reliability was high (Cronbach's alpha = 0.870). The robustness results were broadly consistent with our main analyses (please request the table if necessary).

Ⅴ. DISCUSSION AND CONCLUSION

5.1. Discussion

Our results indicate that the efficiency-oriented business model, novelty-oriented business model, and dynamic capabilities each have positive effects on competitive advantage, consistent with prior research (Cruz-Sánchez et al., 2026; Heubeck, 2024; Zhu et al., 2019; Zott & Amit, 2008). By contrast, the interaction patterns diverge: efficiency-oriented models are barely affected by dynamic capabilities, whereas novelty-oriented models are more vulnerable when combined with dynamic capabilities.

A plausible explanation is that efficiency-oriented models generally rely on simple, loosely coupled activities, which can be managed with relatively modest dynamic capability inputs. In novelty-oriented models, however, activities are often highly integrated, leaving limited flexibility for reconfiguration (Leppänen et al., 2023; Rivkin & Siggelkow, 2003). In our measurements, higher scores on the novelty-oriented model (five-point Likert scale) likely reflect greater integration, which makes it more difficult to reconfigure content, organizational structure, and governance of transactions—even when firms possess dynamic capabilities (Funke, Wilden, & Gudergan, 2023; Hock, Clauss, & Schulz, 2016). Additionally, maintaining

such capabilities may entail high managerial costs (e.g., salaries for turnaround managers), suggesting that firms operating novelty-oriented models face heightened vulnerability to environmental change accompanied by substantial costs.

Our survey was conducted during the back-to-normal transition following the pandemic. This period may be characterized not as moderate change (Eisenhardt & Martin, 2000; Sirmon & Hitt, 2009; Tasheva & Nielsen, 2022) but rather as discontinuous change (Nikookar & Yanadori, 2022; Oxtorp, 2014). Under such conditions, firms face limited predictability regarding future industry trajectories and may struggle to adjust to environments that differ materially from pre-pandemic contexts. Consequently, both efficiency- and novelty-oriented models can contribute to competitive advantage in their main effects. Dynamic capabilities may enhance competitive advantage under lightly integrated models but face reconfiguration challenges under highly integrated models—even when dynamic capabilities are present.

5.2 Managerial Implications

Our findings suggest that dynamic capabilities can erode competitive advantage when the business model is highly integrated and therefore less adaptable to environmental change. This erosion may result from incomplete reconfiguration and high costs associated with capability maintenance—such as compensating experienced managers whose contributions may not yield proportional benefits. Managers should, therefore, weigh the costs of reconfiguring highly integrated business models (Rivkin & Siggelkow, 2003; Siggelkow & Rivkin, 2005). They should assess business models not only in terms of content, organizational structure, and governance of transaction, but also the degree of integration among these elements. Managers operating highly integrated models should recognize inherent vulnerabilities and proactively prepare for future discontinuities.

5.3 Limitations and Future Research

This study has several limitations. First, it relies on cross-sectional data, which constrains our ability to establish causality between business models and dynamic capabilities. Specifically, the impact of dynamic capabilities may not be fully captured in a single period, even though the survey was conducted shortly after the pandemic. While reverse causality is conceivable, we consider it unlikely that firms experiencing competitive disadvantages would simultaneously adopt novelty-oriented models and invest in dynamic capabilities. We addressed endogeneity using two-stage least squares (2SLS) with instrumental variables; nevertheless, future research should employ panel data to confirm causal relationships.

Second, this study is based on survey data, with both dependent and independent variables derived from respondents' perceptions. Such data may be subject to subjective biases. We minimized these risks using established ex ante and ex post remedies (Scott & Bruce, 1994; Simonin, 1997) and confirmed that the data were suitable for hypothesis testing. Even so, future studies should incorporate objective indicators (e.g., publicly available statistics), although measuring operational capabilities, dynamic capabilities, and business models objectively remains challenging.

Finally, this study focuses on Japanese firms, thereby contributing by extending research beyond Western and Chinese contexts (Snihur & Zott, 2019; Zhu et al., 2019; Zott & Amit, 2008). To assess generalizability, similar studies should be conducted in other regions and institutional settings.

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Figures and tables

Figure 1. Theoretical model and hypotheses: Business model and dynamic capabilities

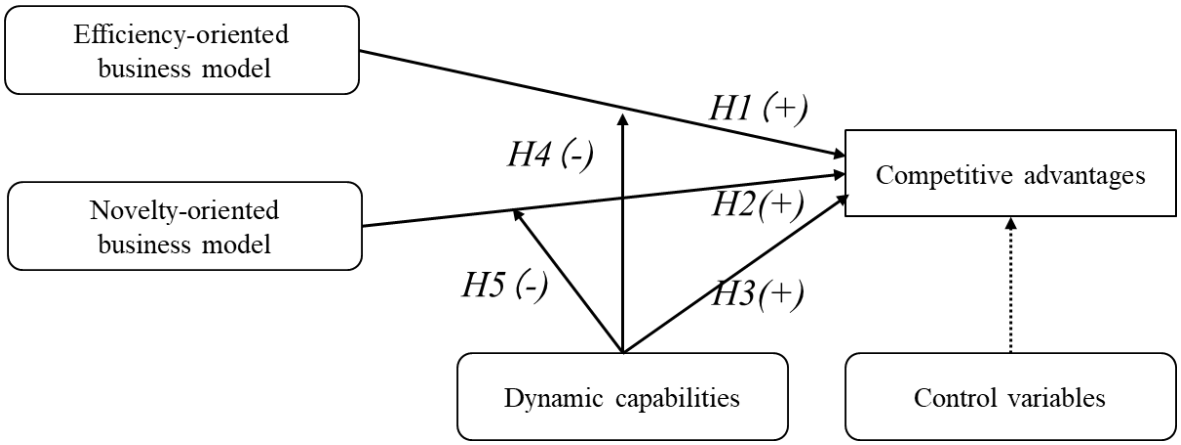

Figure 2. Interaction plot: Novelty-oriented business model and dynamic capabilities

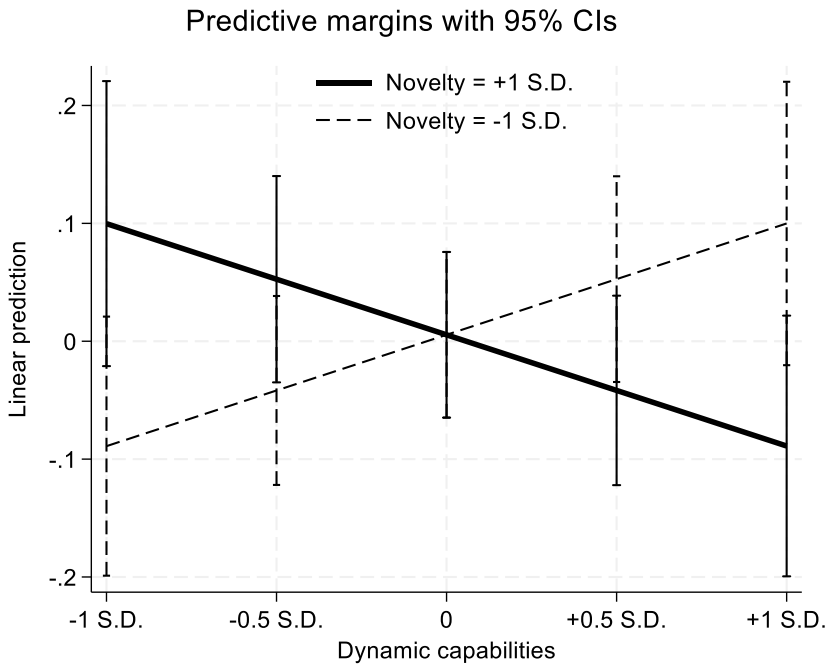

Table 1. Descriptive statistics and correlations

	Variable	Obs.	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1)	Competitive advantages	607	0.000	0.961	-2.403	2.049	1																				
(2)	Firm age	613	4.033	0.556	1.386	4.898	-0.060	1																			
(3)	Firm size	610	5.910	1.255	2.398	10.028	0.166*	0.174*	1																		
(4)	Market dynamism	605	0.000	0.999	-2.222	1.727	0.048	-0.123	0.154*	1																	
(5)	Public-listed dummy	613	0.488	0.500	0	1	0.201*	0.040	0.330*	0.103	1																
(6)	Chemical	613	0.072	0.258	0	1	0.046	0.116	0.025	-0.067	0.057	1															
(7)	Pharmaceutical	613	0.015	0.120	0	1	-0.098	-0.041	-0.006	0.056	0.044	-0.034	1														
(8)	Medical device	613	0.005	0.070	0	1	0.081	0.013	0.029	0.008	0.025	-0.020	-0.009	1													
(9)	Printing	613	0.015	0.120	0	1	-0.027	0.072	0.061	0.036	-0.011	-0.034	-0.015	-0.009	1												
(10)	Semiconductor	613	0.033	0.178	0	1	-0.066	0.010	0.058	0.037	0.041	-0.051	-0.022	-0.013	-0.022	1											
(11)	Telecom device	613	0.005	0.070	0	1	0.017	0.023	0.071	0.074	0.072	-0.020	-0.009	-0.005	-0.009	-0.013	1										
(12)	ICT industries	613	0.018	0.133	0	1	-0.017	0.004	-0.084	0.074	-0.107	-0.038	-0.017	-0.010	-0.017	-0.025	-0.010	1									
(13)	Software	613	0.044	0.205	0	1	-0.002	-0.097	0.031	0.272*	-0.035	-0.060	-0.026	-0.015	-0.026	-0.039	-0.015	-0.029	1								
(14)	Efficiency-oriented business model	609	0.000	0.947	-1.858	2.461	0.298*	-0.110	0.027	0.161*	0.124	0.059	-0.054	-0.051	-0.012	-0.009	-0.064	0.059	0.059	1							
(15)	Novelty-oriented business model	604	0.000	0.952	-1.416	2.779	0.340*	-0.112	0.077	0.185*	0.187*	0.003	-0.019	-0.008	-0.004	-0.013	0.013	0.083	0.016	0.589*	1						
(16)	Dynamic capabilities	610	-0.001	0.359	-0.921	1.043	0.200*	0.013	0.220*	0.091	0.143	0.045	0.005	0.056	-0.014	0.053	0.001	0.033	-0.146	0.067	0.14	1					
(17)	Competitors' collaboration (IV)	612	3.145	0.667	1	4	0.050	-0.052	0.126	0.026	0.047	0.036	-0.128	-0.015	-0.067	0.029	0.020	-0.011	-0.071	0.065	0.015	0.405*	1				
(18)	Consultants' collaboration (IV)	612	2.219	0.764	1	4	0.076	-0.037	0.144	0.093	0.015	-0.020	-0.053	0.041	-0.017	-0.005	0.041	0.074	-0.093	0.015	0.105	0.754*	0.159*	1			
(19)	Laboratories' collaboration (IV)	612	2.351	0.771	1	4	0.182*	0.060	0.161*	0.059	0.174*	0.074	0.103	0.029	0.032	0.071	-0.032	-0.014	-0.108	0.100	0.135	0.795*	0.097	0.408*	1		
(20)	Universities' collaboration (IV)	611	2.496	0.832	1	4	0.2331*	0.069	0.154*	0.052	0.164*	0.051	0.074	0.099	0.009	0.056	-0.042	-0.007	-0.100	0.018	0.087	0.672*	0.062	0.229*	0.575*	1	
(21)	Government institutions' collaboration (IV)	611	2.427	0.807	1	4	0.186*	0.024	0.164*	0.029	0.115	0.029	0.053	0.021	-0.031	0.051	-0.008	0.081	-0.041	0.034	0.106	0.644*	0.163*	0.293*	0.533*	0.610*	1

* $p<0.05$

※ IV means instrumental variable

Table 2. Results: OLS and 2SLS analyses (Competitive advantage as dependent variable)

	OLS (Dependent variable: Competitive advangates)							2SLS (Dependent variable: Competitive advangates)						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Constant	0.018	0.275	-0.082	0.010	0.200	0.167	0.200	0.018	0.120	-0.082	0.010	0.013	-0.021	-0.021
	(0.320)	(0.307)	(0.311)	(0.309)	(0.307)	(0.306)	(0.308)	(0.317)	(0.312)	(0.312)	(0.308)	(0.300)	(0.293)	(0.294)
Control variables														
Firm age	-0.191***	-0.134*	-0.147**	-0.150**	-0.122*	-0.120*	-0.122*	-0.191***	-0.180**	-0.147**	-0.150**	-0.121*	-0.114*	-0.114*
	(0.072)	(0.069)	(0.070)	(0.070)	(0.068)	(0.068)	(0.068)	(0.071)	(0.070)	(0.070)	(0.068)	(0.066)	(0.065)	(0.066)
Firm size	0.103***	0.026	0.095***	0.082**	0.036	0.040	0.036	0.103***	0.080**	0.095***	0.082**	0.066*	0.070**	0.069**
	(0.033)	(0.033)	(0.032)	(0.032)	(0.033)	(0.033)	(0.033)	(0.036)	(0.036)	(0.034)	(0.034)	(0.034)	(0.033)	(0.033)
Market dynamism	0.015	-0.054	-0.018	-0.031	-0.077*	-0.076*	-0.077*	0.015	-0.001	-0.018	-0.031	-0.050	-0.047	-0.048
	(0.041)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.042)	(0.042)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Public-listed dummy	0.326***	0.227***	0.267***	0.238***	0.195**	0.187**	0.194**	0.326***	0.302***	0.267***	0.238***	0.204**	0.185**	0.186**
	(0.081)	(0.079)	(0.079)	(0.079)	(0.078)	(0.078)	(0.079)	(0.083)	(0.082)	(0.082)	(0.082)	(0.081)	(0.081)	(0.081)
Chemical	0.142	0.174	0.075	0.137	0.139	0.143	0.139	0.142	0.119	0.075	0.137	0.097	0.103	0.104
	(0.148)	(0.143)	(0.143)	(0.142)	(0.141)	(0.141)	(0.141)	(0.134)	(0.134)	(0.123)	(0.125)	(0.121)	(0.123)	(0.123)
Phamaceutical	-0.926***	-0.640*	-0.567*	-0.556*	-0.560*	-0.523	-0.558*	-0.926**	-0.914**	-0.567	-0.556	-0.541	-0.509	-0.512
	(0.330)	(0.334)	(0.340)	(0.337)	(0.329)	(0.329)	(0.330)	(0.387)	(0.384)	(0.402)	(0.404)	(0.408)	(0.410)	(0.412)
Medical devices	0.996*	0.982*	1.194**	1.062**	1.102**	1.080**	1.098**	0.996***	0.896***	1.194***	1.062***	1.035***	1.012***	1.011***
	(0.536)	(0.506)	(0.516)	(0.511)	(0.498)	(0.499)	(0.499)	(0.132)	(0.172)	(0.221)	(0.079)	(0.148)	(0.188)	(0.185)
Printing	-0.202	-0.185	-0.166	-0.192	-0.155	-0.144	-0.154	-0.202	-0.194	-0.166	-0.192	-0.149	-0.159	-0.157
	(0.331)	(0.313)	(0.318)	(0.316)	(0.307)	(0.308)	(0.308)	(0.318)	(0.304)	(0.270)	(0.288)	(0.260)	(0.250)	(0.251)
Semiconductors	-0.429**	-0.327	-0.404**	-0.393*	-0.357*	-0.346*	-0.357*	-0.429**	-0.456***	-0.404**	-0.393**	-0.420**	-0.426**	-0.426**
	(0.212)	(0.205)	(0.203)	(0.207)	(0.207)	(0.207)	(0.207)	(0.169)	(0.167)	(0.181)	(0.187)	(0.187)	(0.188)	(0.188)
Telecom devices	-0.054	0.169	0.244	0.008	0.265	0.265	0.264	-0.054	0.001	0.244	0.008	0.177	0.201	0.198
	(0.539)	(0.510)	(0.520)	(0.514)	(0.503)	(0.503)	(0.503)	(0.700)	(0.685)	(0.774)	(0.664)	(0.689)	(0.709)	(0.707)
Telecom	0.052	-0.110	-0.076	-0.135	-0.162	-0.170	-0.161	0.052	0.033	-0.076	-0.135	-0.132	-0.115	-0.114
	(0.299)	(0.283)	(0.288)	(0.286)	(0.279)	(0.279)	(0.279)	(0.282)	(0.257)	(0.264)	(0.256)	(0.231)	(0.236)	(0.236)
Software	-0.143	-0.016	-0.159	-0.082	-0.015	-0.016	-0.015	-0.143	-0.015	-0.159	-0.082	0.011	0.002	0.003
	(0.198)	(0.188)	(0.191)	(0.189)	(0.185)	(0.185)	(0.185)	(0.223)	(0.224)	(0.202)	(0.195)	(0.196)	(0.192)	(0.193)
Independent variables														
Dynamic capabilities		0.381***			0.268***	0.260***	0.267***		0.411***			0.360***	0.326***	0.329***
		(0.045)			(0.050)	(0.050)	(0.051)		(0.121)			(0.115)	(0.112)	(0.111)
Efficiency-oriented business model			0.273***		0.118**	0.131***	0.118**			0.273***		0.143***	0.139**	0.138**
(Efficiency)			(0.040)		(0.048)	(0.047)	(0.048)			(0.045)		(0.055)	(0.054)	(0.054)
Novelty-oriented business model				0.302***	0.134***	0.131**	0.135***				0.302***	0.203***	0.215***	0.215***
(Novelty)				(0.040)	(0.052)	(0.052)	(0.052)				(0.042)	(0.053)	(0.052)	(0.052)
Interaction variables														
Dynamic capabilities × Efficiency					-0.059		-0.056					-0.189*		-0.025
					(0.037)		(0.049)					(0.106)		(0.136)
Dynamic capabilities × Novelty						-0.045	-0.005						-0.292***	-0.276**
						(0.040)	(0.053)						(0.104)	(0.137)
Observations	597	584	595	589	576	576	576	597	596	595	589	587	587	587
R-squared	0.091	0.190	0.155	0.167	0.225	0.223	0.225	0.091	0.112	0.155	0.167	0.201	0.208	0.208
Adjusted R-squared	0.072	0.172	0.136	0.149	0.203	0.201	0.201	0.072	0.092	0.136	0.149	0.179	0.186	0.184
VIF(Max)	1.193	1.284	1.207	1.203	1.860	1.867	1.874	1.193	1.236	1.207	1.203	1.624	1.639	1.651
VIF(Average)	1.066	1.097	1.074	1.076	1.204	1.202	1.296	1.066	1.077	1.074	1.076	1.152	1.153	1.221

Standard errors in parentheses * p<0.10 **<0.05 ***<0.01

Appendices

Appendix A. Business model measurement scale

Please specify to what extent the following statements fit to your business model.	
Item	Literature source
Efficiency-oriented business model	Leppanen et al. (2023)
Transactions are simple from the user's point of view	Yuan (2021)
Our business model enables fast transactions	Zott & Amit (2007)
Costs other than those already mentioned for participants in our business model are reduced (i.e., marketing and sales costs, transaction processing costs, communication costs, etc.)	
Our business model, overall, offers high transaction efficiency	
Novelty-oriented business model	
The focal firm has continuously introduced innovations in its business model.	
The business model offers new combinations of products, services and information.	
Incentives offered to participants in transactions are novel.	
Overall, the company's business model is novel.	

Appendix B. Dynamic capabilities measurement scale

Please indicate the extent to which the following statements pertain to your company's adaptations to external environments.	
Item	Literature source
Sensing capability	Fainshmidt & Frazier (2017)
In my organization…	Wilden & Gudergan (2015)
People participate in external institutions (trainings, conferences, etc.) to develop our market knowledge	Wilden et al. (2019)
We follow market and social trends	
We observe best practices in our sector	
We compare our processes and procedures with those of competitors	
We carefully discuss trends and innovations with our cooperation partners and suppliers	
Seizing capability	
In my organization…	
We invest funds in the development and commercialization of services	
We invest in our competences to identify new solutions for client problems	
We adopt the best practices in our sector	
We respond to defects pointed out by employees	
We can rely on our existing knowledge when market opportunities arise	
Reconfiguring capability	
How often have you carried out the following activities over the past five years.	
Implementation of new kinds of management methods	
Implementation of new or substantially changed organizational structures	
Implementation of new or substantially changed business models	
Implementation of new or substantially changed business processes	
Implementation of new business procedures and systems	

Appendix C. Competitive advantage measurement scale

Please indicate your level of agreement with your firm's performance over the past three years.

Item	Literature source
Strategic performance	Jap (1999)
We have gained strategic advantages over our competitors.	Schilke (2014)
We have a large market share.	Weerawardena (2003)
Overall, we are more successful than our major competitors.	
Financial performance	
Our EBIT (earnings before interest and taxes) is contiguously above industry average.	
Our ROI (return on investment) is continuously above industry average.	
Our ROS (return on sales) is continuously above industry average.	

Appendix D. External collaboration measurement scale

Please indicate which of the following sources of information your organization has used to innovate. Please assess the level of importance of the sources used.	
Item	Literature source
Competitors and other enterprises from the same industry	Chen et al. (2011)
Consultants	Ferreras-Mendez et al. (2015)
Laboratories or R&D companies	Murovec and Prodan (2009)
Universities or other higher education institutes	
Government or private non-profit research institutes	

Appendix E. Market dynamism measurement scale

Please specify to what extent the following statements fit the market dynamism in your industry.	
Item	Literature source
Competitive intensity	Jaworski & Kohli (1993)
There are many 'promotion wars' in our industry	Olson et al. (2005)
Anything that one competitor can offer, others can match readily.	Yang & Tsai (2019)
One hears of a competitive move almost every day.	
Technological turbulence	
The technology in our industry is changing rapidly.	
Technological changes provide big opportunities in our industry.	
Technological developments in our industry are significant.	
Market turbulence	
In our kind of business, customers' preferences for products and services change quite a bit over time.	
In our kind of business, our customers tend to look for new products and services all the time.	
We constantly consider how to better exploit new technologies.	
We easily implement new technologies in new products.	

Appendix F. innovation performance measurement scale

Please indicate your level of agreement with your firm's performance over the past three years.	
Item	Literature source
The overall performance of our new product development program has met our objectives.	Jap (1999)
From an overall profitability standpoint, our new product development program has been successful.	Schilke (2014)
Compared with our major competitors, our overall new product development program is far more successful.	Weerawardena (2003)

Appendix G. First stage results on endogenous variables dynamic capabilities for model 9 and model 12 to14 presented in Table 2, n = 587

	Dynamic capabilities
Firm age	-0.001
	(0.002)
Firm size	0.002
	(0.001)
Market dynamism	-0.002
	(0.001)
Public-listed dummy	-0.001
	(0.002)
Chemical	-0.001
	(0.004)
Phamaceutical	0.006
	(0.009)
Medical devices	-0.015
	(0.009)
Printing	-0.010 **
	(0.005)
Semiconductors	0.002
	(0.006)
Telecom devices	0.007
	(0.011)
Telecom	0.023 **
	(0.010)
Software	0.011 *
	(0.006)
Efficiency-oriented business model	-0.001
	(0.001)
Novelty-oriented business model	0.001
	(0.001)
Competitors' collaborations	0.147 ***
	(0.002)
Consultants' collaborations	0.225 ***
	(0.002)
Universities' collaborations	0.180 ***
	(0.002)
Government institutions' collaborations	0.140 ***
	(0.002)
Constant	-1.738 ***
	(0.010)
R-squared	0.196
F(15, 571)	12.490

F statistic below tests whether all instruments = 0

Standard errors in parentheses * p<0.10 **<0.05 ***<0.01