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Industrial Competition and Innovation Dynamics in Technology-Based Economies

Ahmed Khan [a*], Ayesha Malik [b]

[a*] *Pakistan Institute for Emerging Technology Research, Islamabad, Pakistan.*
[b] *Pakistan Institute for Emerging Technology Research, Islamabad, Pakistan.*

Abstract

Economies based on technology have undergone substantial changes in the pattern of competition among companies owing to their dependence on innovations, digitization, knowledge assets, and market dynamics. Under such conditions, competition is determined not only by traditional elements such as price, productivity, and market shares but also by the capacity of the firm to develop novel technologies, innovate in product offerings, adapt to shifts in consumer preferences, and constantly enhance its competitiveness. The present study explored the correlation between industrial competition and innovation dynamics in economies that depend on technology by means of qualitative and conceptual analysis. The key elements that were considered included technological innovation, competitive intensity, research and development, digitization, market entry, and strategic adaptation. The conceptual framework revealed that competitive pressure may push the firm to engage in more innovation activities, enhance technological capabilities, and create new products and services. Moreover, fast technological changes may alter the structure of competitiveness by opening up new windows of opportunity for new firms as well as increasing competitive pressure on incumbent firms to constantly adapt. Furthermore, this study emphasized the importance of research and development spending, availability of technological resources, human capital, information and communication technologies, and the favorable institutional environment in improving innovation-based competitiveness. This conceptual framework integrates industrial competition, innovation capabilities, technological revolution, and market outcome into one coherent framework.

Keywords: Industrial Competition, Innovation Dynamics, Technology-Based Economies, Technological Innovation, Digital Transformation, Competitive Advantage, Research and Development.

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Introduction

Evolution of Industrial Competition in Technology-Based Economies

There have been significant changes in industrial competition in light of the growing significance of technologies, knowledge, digital infrastructure, and innovation capability in economic activity. Traditionally, competition was mostly about price, efficiency in production, market share, and possession of physical resources. However, in economies based on technology, companies compete by means of technological capabilities, product differentiation, R&D, intellectual property, digital platforms, data processing capabilities, and introduction of new products/services. Therefore, competition has expanded from traditional competition in the marketplace to continuous development and application of technological knowledge.

The connection between competition and innovation has received a lot of attention since the conditions of competition might have an impact on the incentives for investing in technological development. Firm-level evidence shows that competition can impact the intensity and direction of innovation efforts (Beneito et al., 2015). At the same time, studies that investigate the dynamics of innovation in different industries reveal that the link between competition and innovation varies between sectors depending on their specific features (Negassi et al., 2019).

Internationalization of the markets has contributed even more to these processes. For instance, foreign competition can lead to improvement of productivity and innovativeness within domestic companies; in addition, the level of technological gap among companies and competing organizations will affect their reaction to such pressures (Ding et al., 2016). Even more contemporary research in manufacturing and service industries has continued investigating the link between competition and innovativeness, showing the significance of taking into consideration industry variations and economic environment (Cincera et al., 2024). Therefore, industrial competition within technology-driven economies is increasingly becoming associated with firms' ability to adapt and innovate.

Emergence of Innovation-Driven Industrial Competition

The rise in innovation as an important aspect has affected how companies compete within the market. Firms have started using innovation as a way of gaining a competitive advantage through the use of innovative products and services, improved production processes, innovation in technology, and innovative solutions. As a result of all this, innovation has become a part of the competitive strategy and not a separate research process alone.

Competition may serve as an incentive for companies to make improvements in their innovation process by forcing the companies to react to competition, consumer needs, and changes in technology. For instance, there has been a study on how competitive conditions affect innovation processes among Norwegian SMEs (Moen et al., 2018). In addition, research on French firms has shown that the effect of competition on innovation processes is dependent on the firm attributes and competitive conditions in which the firms work (Mulkay, 2019). It is clear that competition may have an impact on the innovation process more than on the market consequences of innovation.

However, competition need not be completely independent of cooperation. For example, organizations can engage in competition in the markets for products and technologies while cooperating via R&D consortia, knowledge exchange, and technological alliances. This interplay between competition and cooperation can affect organizations' innovative performance (Chen et al., 2019). Evidence from projects has also informed research about the connection between competitive environments and innovation activity, emphasizing the need to study innovation beyond firm-level aggregates (Garfinkel & Hammoudeh, 2025). Thus, industrial competition can be seen as a competitive environment in which rivalry, cooperation, knowledge creation, and technological development coexist.

Role of Technological Innovation in Competitive Advantage

Technological innovation has become an important way through which firms have sought to create competitive advantage. With advancements in artificial intelligence, automation, cloud computing, data analytics, digital platforms, and other technologies, the number of avenues through which firms could improve their offerings and processes has widened. This implies that firms today need technology more than ever before to deal with competitive threats and changing market conditions.

Innovation can help in creating competitive advantage through product differentiation, efficient operations, meeting customer demands, and identifying new markets. The connection between competition and innovation is, therefore, linked with product-market conditions. Competition may affect innovation incentives for firms, while innovations may also transform market competition structures (Marshall & Parra, 2019). Research focusing on patent activities has also been conducted to analyze the effect of competitive and trade-related conditions on innovation incentives of firms (Liebman & Reynolds, 2019).

Innovation also plays a different part based on the technological position of firms. Firms that are close to the technological frontier may react in a manner that is distinct from firms that are struggling to catch up to technologically superior competitors. Competition and innovation thus have an effect that can be influenced by technology distance and technology capabilities that are at the disposal of firms (Bessonova & Gonchar, 2019). It becomes essential to factor in technological capabilities in studying how competition impacts innovation and vice versa.

Digital Transformation and Changing Competitive Dynamics

In addition, the nature of industrial competition has been transformed by digital transformation due to the integration of digital technology into products, processes, business models, and organizational practices. The application of digital technologies in increasing efficiency, developing new products or services, improving customer interactions, and enhancing decision-making has become a common practice for firms. Hence, digital transformation has been linked to firms' competitiveness and innovation.

The systematic literature review of the field of digital transformation reveals that digital technologies affect the formation and preservation of competitive advantages of firms through changes in organizational capabilities and business processes (Leão & da Silva, 2021). More extensive research also highlights the multidimensional nature of the digital transformation as an organizational process comprising changes in technology, strategy, and management rather than the adoption of certain digital technologies (Nadkarni & Prügl, 2021).

Moreover, digitalization can impact the relationship between competition and corporate innovation. It has been found that in Chinese manufacturing industries, the process of digitalization and competition strategy can collectively influence corporate innovation, reflecting the need to study the effects of digitalization in competitive situations (Wen et al., 2022). In addition to the previous studies, recent research has focused on the concept of digital transformation in manufacturers with regard to the issue of innovation and digital technology spillover in competitive settings (Liu & Gu, 2026).

Objectives

Aims of the Study Include:

1. To investigate the connection between the competitiveness of industries and the innovation process in technology-intensive economies.
2. To reveal the most important mechanisms by which competitiveness affects innovation activities.
3. To investigate the role of research and development, technological competence, and digitalization in industrial competitiveness.
4. To build an integrative conceptual framework on the linkages among industrial competitiveness, innovation, and competitive advantage.

Significance of the Study

The current research offers a conceptual framework to help understand the dynamic interplay of industrial competition and innovation in technology-driven economies. Competitive pressure, technological capacities, R&D, digitalization, and industry-specific factors are all integrated into a unified conceptual framework. The research may offer some valuable insights into companies trying to develop innovation capacity, policymakers designing innovation-focused industrial policy, and researchers investigating the complex interrelationship of competition and technological advancement.

Research Problem

Technological economies are known for rapid changes in terms of competitiveness, technological intensity, digitalization, and constant innovation pressures that firms are exposed to. While industrial competition could lead to innovation improvements through better product development, process improvement, and innovation, the impact of competitive pressure is not always consistent for different firms and different industries. In this regard, the differences in technological capability, market structure, R&D activities, digitalization readiness, collaboration, and industrial specifics result in varying innovation results. As a result, further discussion needs a unified approach to understanding the interaction between industrial competition and innovations in technology-based economies.

Literature Review

Industrial Competition and Firm-Level Innovation

Competitiveness is one of the factors that have a crucial effect on firms' motivation and ability to innovate. When firms operate in competitive markets, they may be forced to develop new products, improve production technologies, decrease costs, and distinguish themselves. Thus, competitiveness can affect not only the decision about innovation but also the scope of innovation performed by firms. At the same time, the evidence at the level of the firm shows that there exists a connection between competitive conditions and innovation behavior of firms, which is defined by the characteristics of firms and markets (Beneito et al., 2015).

In addition, the connection appears in various economic and industrial contexts. The research on Norwegian SMEs reveals that there exists a link between competitiveness and innovation behavior in small firms (Moen et al., 2018). There is also evidence for French firms, which reveals that competitive conditions affect the innovation behavior of firms depending on their features and market conditions (Mulkay, 2019). This means that competitiveness cannot be considered as the single factor of innovation stimulation since firms have various capabilities and strategic actions.

A product market context is also essential for analyzing the competition-innovation relation. Competition may affect firms' motivation to innovate, whereas innovation might transform the competitive environment and position of firms (Marshall & Parra, 2019). The empirical study based on data from the manufacturing and services industries highlights that analyzing the connection between innovation and competition should be conducted at the sector level and not consider the same relationship in all industries (Cincera et al., 2024).

Competitive Pressure and Innovation Performance

The effect of competitive pressure on the performance of innovation may be achieved through prompting companies to react to their competitors. In other words, companies may become more innovative in response to threats created by the competitive situation in order to upgrade technological competencies, develop innovations, or maintain market positions. On the other hand, too much competitive pressure can lead to resource constraints and difficulties in implementing longer-term innovation activities for companies. As a result, the effect of competition on innovation performance can be mediated by different mechanisms and may result in different consequences.

Another factor that can determine the effect of competitive pressure is the technological position of firms. Studies of the effect of import competition demonstrate that the influence of competitive pressure on innovation and productivity depends on how far companies are from the technological frontier (Ding et al., 2016). The technology distance also matters when it comes to understanding the link between innovation and competition in economies with companies that have various technological capabilities (Bessonova & Gonchar, 2019).

The aspect of competition associated with international trade can be seen as a further dimension of competitive pressures. Research grounded in empirical data on US patents reveals the connection between competitive pressures, innovations, and trade protection, proving the need for consideration of international market factors when assessing companies' innovative reactions (Liebman & Reynolds, 2019). Studies at the project level have also confirmed the link between competitive pressures and innovation actions at the project level (Garfinkel & Hammoudeh, 2025). Thus, innovation performance needs to be considered with regard to the competitive pressures faced by companies.

Competition, Research and Development, and Technological Advancement

Research and development constitute an important vehicle that helps firms develop technological competencies in response to competition. Competitive markets may act as an impetus for firms to conduct R&D to develop innovative products and technologies and keep technologically up-to-date. On the other hand, innovation practices may include cooperation of competing firms where the technological development necessitates a large amount of money and specialized knowledge.

R&D consortium is one such case of interaction of cooperation and competition. The companies can be competitors in product markets and cooperate in some technological and R&D activities. This can affect knowledge generation and innovation results because of leveraging complementary resources but at the same time keeping competitive advantage in downstream markets (Chen et al., 2019). Thus, industrial innovation cannot be analyzed from the point of view of rivalry alone since cooperation is an important part of innovation strategy of firms.

Distance in technology can also have an impact on the ability of organizations to convert competitive pressure into technology advancement. Organizations operating far away from the technological frontier may find competition motivating them to engage in technology catching up, while technologically advanced firms may concentrate more on retaining their dominance (Bessonova & Gonchar, 2019). Competition may also have varied effects on productivity and innovation among firms in the context of distance to the technological frontier (Ding et al., 2016). Moreover, there is a difference in the link between competition and innovation among sectors. There is evidence showing that the relationship between innovation and competition can vary by industry and organizations (Negassi et al., 2019).

Digital Transformation and Competitive Advantage

Digital transformation is another dimension that has emerged due to the advent of digital transformation in terms of product development, process organization, customer interactions, and value creation. Digital technology helps firms to be better equipped to gather and analyze information, automate activities, coordinate efforts, and innovate in terms of products and services. Consequently, digital transformation has increasingly become part of the connection between innovation and competitive advantage.

The literature highlights that digital transformation contributes to competitive advantage through the transformation of organizational processes and capabilities (Leão & da Silva, 2021). Likewise, a more extensive survey of the literature on digital transformation also highlights the strategic and organizational aspects of digital technologies and recognizes digital transformation as one such topic area (Nadkarni & Prügl, 2021).

In addition, digital transformation may also have a direct effect on competition strategy and innovation of corporations. The findings about the correlation between digitalization, competitive strategy, and corporate innovation in the Chinese manufacturing industry show the importance of digitalization for companies operating in competitive markets (Wen et al., 2022). Moreover, the more recent research on digital transformation of manufacturers in the context of innovation and digital technology spillovers illustrates how these three phenomena are interrelated (Liu & Gu, 2026).

Generally speaking, the literature review shows that digital transformation is able to enhance the competitiveness of organizations by helping to react to competitive pressures and find new competitive advantages. At the same time, the effects of digital transformation of corporations will depend on their technological capabilities, strategies, access to information, and digital technology integration.

Research Gap

Some of the issues that have received attention from earlier studies in the context of innovation and competition are competitive pressures, R&D collaboration, technological distance, competition in the product markets, digital transformation, and industry differences. Yet, the above-discussed issues have mostly been analyzed individually without considering a comprehensive perspective on their interconnections. It is thus necessary to develop a framework linking industrial competition with innovation capacity, technological progress, digital transformation, and competitive advantage.

Research Methodology

Research Design and Conceptual Approach

This study used a qualitative and conceptual research design to establish the association between industrial competition and innovation dynamics in tech-based economies. No primary surveys, experiments, statistical hypothesis testing, or firm-level data collection processes were carried out in the research process. It was based on synthesizing the academic literature in order to understand how competition pressure, technological change, research & development, and digital transformation affect the innovation process. This approach was deemed most suitable for the current research as the concepts of industrial competition and innovation are multidimensional and comprise multiple relationships between firms, markets, technologies, and competition strategies.

Secondary Literature Collection and Selection

The literature review focused on the secondary academic literature pertaining to topics like industrial rivalry, innovation, technological evolution, research and development, digitalization, and competitive advantage. Peer-reviewed journals as well as scholarly works were analyzed to identify the different theoretical approaches and empirical research findings on the topic of competition and innovation. Specific emphasis was placed on the studies that discussed competitive pressure, product market rivalry, innovation effectiveness, R&D activities, technological distance, digitalization, and industry differences. Literature relevant to the research problem and having some contribution to understanding how competition affects innovation was analyzed.

Thematic Analysis of Competition and Innovation Literature

The approach to analysis in this study was thematic. The reviewed literature was analyzed with regard to the themes that appear to be prevalent in studies examining competition and innovation. The major themes emerging from the reviewed literature are competition pressure and firm innovation, competition and innovation performance, research and development and technological advancement, digital transformation, and competitive advantage. The impact of competition was analyzed with regard to different aspects of influence based on the characteristics of the industry, technology, firms, and markets. The identified themes were compared and conceptualized with the purpose of connecting the themes of competitive forces, innovation, technological advancement, and business outcomes.

Development of the Conceptual Framework

In accordance with the thematic synthesis, the study constructed a theoretical framework showing the relationship between industrial competition and innovation dynamics in technology-driven economies. Some of the key dimensions used in the framework include competitive pressure, market competition, research and development, technological innovation, digital transformation, and competitive advantage. Industrial competition was seen as one of the critical external factors that can motivate companies to enhance their products, processes, technologies, and capabilities. Research and development and technological innovation were regarded as the critical means of responding to competitive pressures faced by companies, while digital transformation was seen as one of the factors shaping the competitive approaches and innovation process.

Fig.1 above demonstrates how the proposed link exists between industrial competition, capabilities of firms, innovation dynamics, and competitive outcomes. Industrial competition, in terms of market rivalry, competitive pressure, and entry of new firms, provides external motivation for firms to build their capabilities. This helps in making investments in research and development, forming collaborations, and adopting digital technologies, which in turn aid in product innovation, process innovation, and strategic change. The innovation processes thus help achieve technological advancement, competitive advantage, and good market performance.

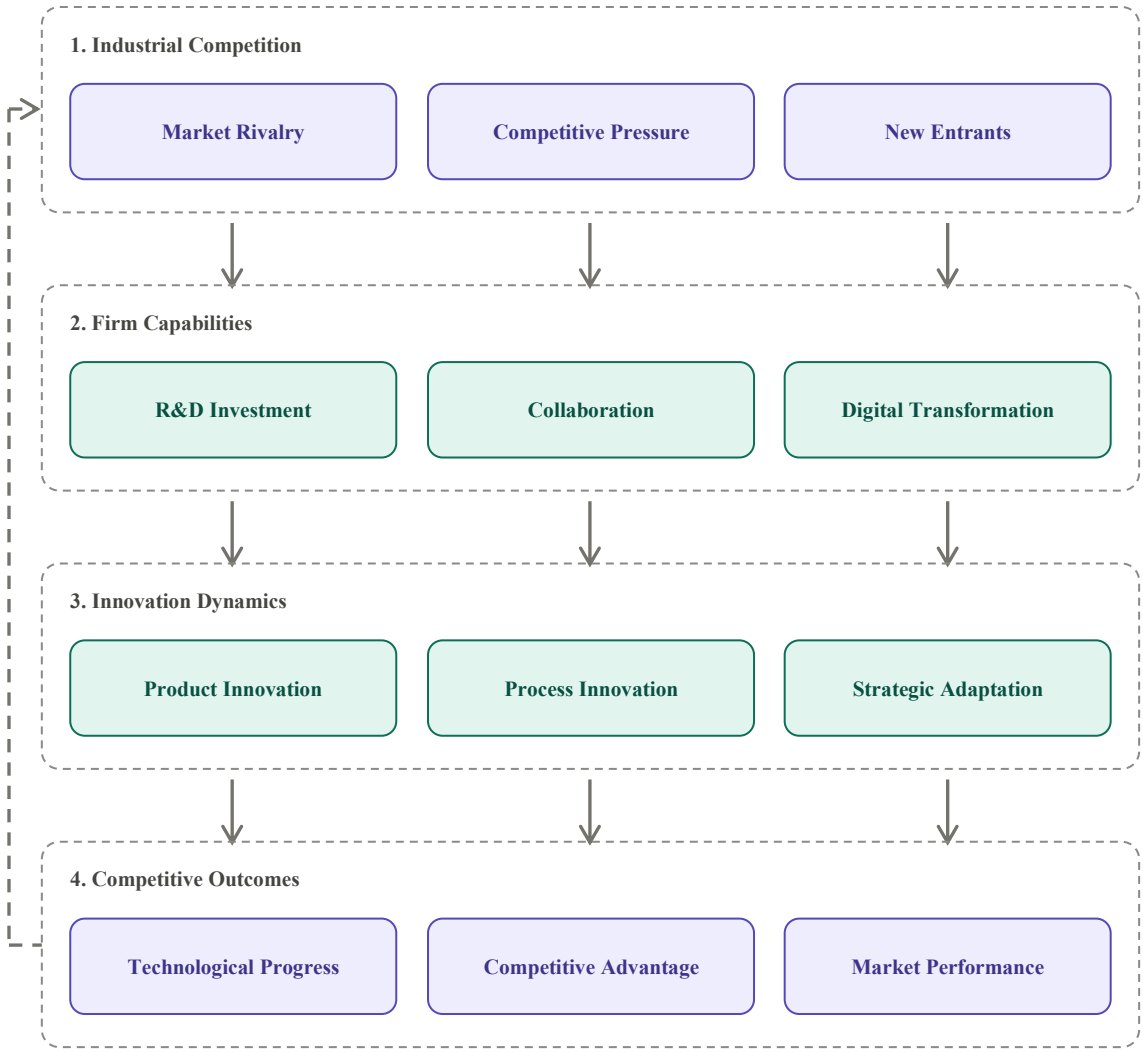


Fig. 1: Conceptual Framework of Industrial Competition and Innovation Dynamics in Technology-Based Economies

Findings and Discussion

Major Dimensions of Industrial Competition and Innovation

Competition in technology-driven economies has been found to operate in various interrelated dimensions, including market competition, competitive pressure, technological advancement, research and development, digital transformation, and continuous improvement of products and processes. Firms in competitive environments are expected to react to changes in consumer preferences, technological advancements, and activities of competing firms. Such reactions may make firms become more efficient, innovate, and adopt new technologies.\

Table 1 outlines the major aspects that link industrial competition to innovation and competitive success. This table illustrates how competition drives firms' capabilities and stimulates innovation in products, processes, and strategies. This table further indicates how innovation results in technological development and competitive and market success.

Another factor that proved to be crucial for firms responding to competitive pressure is innovation. Innovations in products, processes, technology, and organization will help the firm distinguish itself and sustain its competitive advantage. Interaction between competition and innovation, therefore, can be considered a constant process where competition shapes innovations and innovations shape competition.

Table 1: Key Factors Shaping Industrial Innovation and Competitiveness

Dimension	Key Components	Role in the Competition–Innovation Process	Influence on Innovation	Expected Competitive Outcome
Industrial Competition	Market Rivalry, Competitive Pressure, New Entrants, Customer Demands	Creates Pressure for Firms to Respond to Competitors and Changing Market Conditions	Encourages Firms to Improve Products, Processes, Technologies, And Market Responses	Stronger Competitive Responsiveness and Innovation Motivation
Firm Capabilities	R&D Investment, Technological Resources, Skilled Human Capital, Collaboration	Provides The Resources and Capabilities Required to Convert Competitive Pressure into Innovation Activities	Strengthens Technological Development, Knowledge Creation, And Innovation Capacity	Enhanced Technological Capability and Organizational Adaptability
Innovation Dynamics	Product Innovation, Process Innovation, Technological Innovation, Strategic Adaptation	Transforms Competitive Pressure and Firm Capabilities into New or Improved Products, Processes, And Strategies	Supports product differentiation, efficiency improvement, technological advancement, and market adaptation	Greater differentiation, efficiency, and innovation performance
Digital Transformation	Artificial Intelligence, Automation, Cloud Computing, Big Data, Digital Platforms	Enables Firms to Respond Rapidly to Market Changes and Integrate Technology into Business Activities	Accelerates Digital Innovation, Decision-Making, Process Improvement, And Service Development	Greater Agility, Digital Competitiveness, and Market Responsiveness
Collaboration and Knowledge Creation	R&D partnerships, Knowledge Sharing, Technology Alliances, Research Cooperation	Combines Complementary Knowledge and Resources While Firms Continue to Compete in Markets	Facilitates Knowledge Transfer, Technological Learning, And Joint Innovation	Faster Technological Development and Broader Innovation Capabilities
Competitive Outcomes	Technological Progress, Competitive Advantage, Market Performance, Market Position	Represents the Results of Successful Innovation and Strategic Adaptation	Sustained Innovation Improves Firms' Ability to Respond to Competitive and Technological Changes	Improved Market Position, Technological Advancement, and Competitive Performance

Competitive Pressure and Innovation Behavior

Competitive pressure was found to impact the innovation behavior of firms by providing incentives for improving the products that were already available in the market, developing new products, lowering production costs, and adapting to the demands of the market environment. Firms under greater competitive pressure could intensify efforts in improving technology, production processes, service delivery, and efficiency. In this case, competition could act as an incentive to innovate provided that firms had enough resources, technological capability, and flexibility to respond to the challenges.

Nevertheless, the impact of competitive pressure on innovation behavior was not regarded as the same for all firms and organizations. Excessive competitive pressure could lead to reduced capacity for experimenting over a longer period of time and an increased focus on short-term results. In this way, firms with different market positions and different capacity to deal with competitive pressures could adopt different innovation strategies. The results show that effective competition could stimulate innovation provided that firms transformed competitive pressures into technological and organizational opportunities.

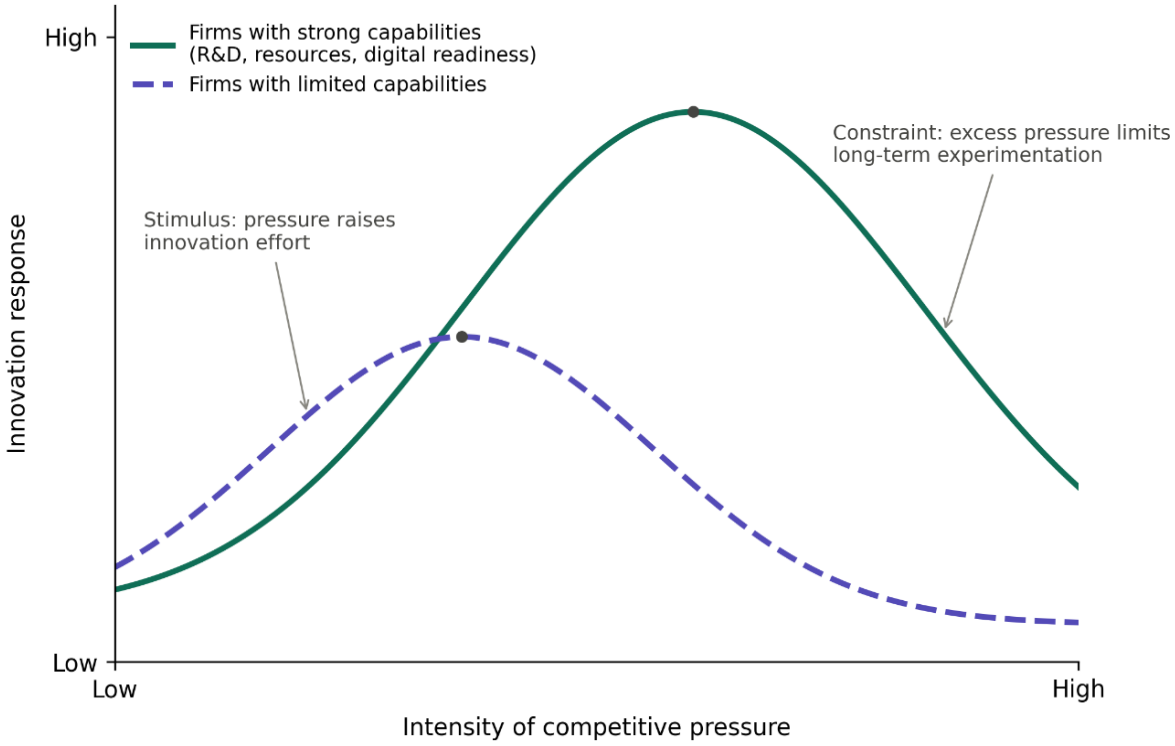


Fig. 2: Competitive Pressure and Innovation Response in Technology-Based Economies

Fig. 2 depicts the theoretical link between competitive pressure and innovation response, such that moderate pressure may promote innovation, but excessive pressure might inhibit experimentation, especially for companies with weak capacities.

Research and Development, Collaboration, and Technological Advancement

R&D became a powerful instrument that links industrial competition and technological innovation. The organization is able to engage in R&D practices to create technologies, enhance existing products, improve the production process, and design distinctive solutions. Continuous engagement in R&D can increase the technological capacities of the firm and allow it to become more effective in coping with the challenges imposed by competition. R&D thus becomes a significant internal capability that translates competitive pressures into innovation outcomes.

Another conclusion that can be drawn from the research concerns the fact that collaboration can supplement competition in terms of innovation and technological development. Organizations can collaborate with research facilities, technology providers, suppliers, and other participants of the industry to exchange technical information and knowledge and share innovation resources. This can lower technological barriers to innovation and facilitate the innovation process without preventing firms from competing.

Digital Transformation and Competitive Advantage

Digital transformation is cited as a major determinant of industrial competitiveness and innovation dynamics. The utilization of technology, through such aspects as artificial intelligence, cloud computing, big data analytics, automation, digital platforms, and interconnectivity, can change the ways in which organizations design, manufacture, and market products. Digital transformation has the ability to foster organizational flexibility, speed up decision-making processes, promote innovation through data analytics, and provide an opportunity for new innovations in terms of products and services.

The other insight from this analysis is that digital competencies have the potential to create competitive advantages by virtue of the fact that firms would be able to respond quickly to changes in the technological landscape. In effect, firms that leverage digital technologies are capable of increasing efficiency and responsiveness to market needs, fostering innovation and responding to change.

Conclusion and Future Directions

Summary of Conceptual Findings and Contributions

The study has explored the influence of industrial competition on the dynamics of innovation through the analysis of concepts from the existing literature. From the study, it was found that industrial competition has the capacity to influence innovation in terms of competitive pressure, rivalry, research and development, technological innovation, and digitalization. Competing firms can enhance their innovation capacity through improvement of products and processes, adoption of new technologies, and formulation of competitive strategies. Additionally, the study has shown that the relationship between competition and innovation is also determined by technological competencies, resources, market situations, and firms' competitive pressure management.

The study adds value through offering an integrated concept perspective that links industrial competition with R&D, collaboration, technological innovation, digital transformation, and competitive advantage. In addition, the study has emphasized that innovation is not a one-off organizational process but rather a constant reaction to changes in the competitive and technological environments.

Managerial and Policy Implications, Limitations, and Future Research Directions

From the management viewpoint, companies are able to increase competitiveness in terms of innovation, developing digital capabilities, conducting R&D activities, experimenting with technologies, and collaborating in order to promote knowledge creation. It is also important for managers to pay equal attention to both short-term competitive strategies and long-term innovations. From the policy standpoint, innovation-friendly ecosystems, incentives to conduct R&D, digital infrastructure development, availability of technologies, and competition in the market can be used to foster innovation-driven competition. In this case, policies should take into consideration technological differences among different industries and firms.

The research is purely conceptual and based on literature; thus, there are no new data presented. Further research should fill this gap through surveys, longitudinal and comparative analysis, and industry studies. Further research could consider the impact of artificial intelligence, automation, and other emerging technologies on the competition-innovation relationship. Future research could also analyze the way differences in the size of firms, technological maturity, market structure and regulatory framework affect the capacity of firms to transform competitive pressures into innovations and competitive advantages.

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