Mercados y Negocios
1665-7039 printed
2594-0163 on line
Year 27, n. 58, May-August (2026)

Financial Resources, The National Science and Technology System, and Innovation Performance: Colombian Manufacturing Firms

Recursos financieros, Sistema Nacional de Ciencia y Tecnología y desempeño innovador: evidencia en la manufactura colombiana

https://doi.org/10.32870/myn.vi58.8047

Camilo Arciniegas Pradilla
Universidad del Tolima (Colombia)
caarciniegasp@ut.edu.co
https://orcid.org/0000-0001-7382-5263
Oscar Hernán López Montoya
Universidad del Tolima (Colombia)
ohlopezm@ut.edu.co
http://orcid.org/0000-0002-7033-3009
Octavio Hernández Castorena
Universidad Autónoma de Aguascalientes (México)
octavio.hernandezc@edu.uaa.mx
http://orcid.org/0000-0002-2609-6616

Received: December 3, 2025
Accepted: March 6, 2026

ABSTRACT

This study presents a theoretical model that analyses the relationship between financial resources, the National Science and Technology System, and innovation performance in Colombian manufacturing companies. Four hypotheses were formulated and approved, demonstrating a positive relationship between these factors. The research was based on an empirical, cross-sectional sample of 1,572 units, whose data were analysed using the PLS-SEM statistical package. The results confirm that the proposed theoretical model is acceptable and significant, suggesting that financial resources and the support of the science and technology system have a crucial impact on the innovation capacity of Colombian companies. Furthermore, the proposed theoretical model, derived from an integrated design of three factors informed by the theoretical consultation, aims to serve as a reference for future studies across different sectors and regions where manufacturing companies operate.

Keywords: Financial Resources, National Science and Technology System, Innovation Performance, Manufacturing.

Jel Code: O31, O32, O38.

RESUMEN

En este estudio se presenta un modelo teórico que analiza la relación entre los recursos financieros, el Sistema Nacional de Ciencia y Tecnología y el desempeño de la innovación en las empresas manufactureras de Colombia. Para ello, se formularon cuatro hipótesis que se validaron, lo que evidenció una relación positiva entre dichos factores. La investigación se basó en una muestra empírica y transversal de 1572 unidades, cuyos datos se analizaron con el paquete estadístico PLS-SMART. Los resultados confirman que el modelo teórico propuesto es aceptable y significativo, lo que sugiere que los recursos financieros y el apoyo del sistema de ciencia y tecnología tienen un alto impacto en la capacidad de innovación de las empresas colombianas. Además, el modelo teórico propuesto, derivado de un diseño integrado de tres factores a partir de la búsqueda de literatura especializada, pretende ser de referencia para futuros estudios en diferentes sectores y regiones donde operen las empresas manufactureras.

Palabras clave: recursos financieros, sistema nacional de ciencia y tecnologías, desempeño en la innovación, manufactura.

Código JEL: O31, O32, O38.

INTRODUCTION

Companies face growing consumer demands, forcing them to meet increasingly high expectations. To remain competitive, they must continually propose innovative products, services, business models, and marketing strategies that deliver real added value (Chatzinikolaou & Vlados, 2026). This process of continuous improvement requires organisations to constantly adapt, aligning their internal capabilities with the needs and expectations of their customers. In addition, business innovation is strengthened when companies collaborate closely with actors in the National Science and Technology System, which allows them to access key knowledge, infrastructure, and technical support to drive their innovations. However, to respond effectively to these market demands and develop creative solutions, companies also need the necessary financial resources to sustain their innovation and technological development processes (Kim, 2024; Chervinska et al., 2025; Yogantara et al., 2025).

The current business environment is increasingly pressurised by clients who demand that companies meet their needs optimally. It also raises questions about how organisations make financing decisions, especially since innovation involves investing resources with the expectation of a good return. A foundational framework for understanding these decisions is the Pecking Order Theory (Myers & Majluf, 1984; Konstantinos & Werner, 2025), based on the asymmetry of information between managers and external investors. This theory holds that companies follow a hierarchy of preferences when choosing their sources of financing: they initially resort to retained earnings, then to debt, and, as a last resort, to issuing shares. This theory posits that companies prefer internal sources because of lower costs arising from information asymmetry. However, for manufacturing SMEs, the subject of this study, this scenario does not fully reflect their reality. These companies are affected by transaction costs, information asymmetries, high interest rates, a decline in profits due to the Covid-19 crisis, and obstacles to obtaining external financing. Hence, these factors compel them to seek financing sources that do not necessarily follow the order proposed by the Pecking Order Theory.

Since the Pecking Order Theory struggles to adequately account for financing choices in manufacturing SMEs, it is more appropriate to turn to the Theory of Credit Rationing, as demonstrated by Jin and others (2024). This theory explains that financial constraints in micro and small enterprises arise mainly because of information asymmetry in the credit market. Lenders, unable to accurately assess the credit risk of these companies, impose restrictions on access to credit, limiting their ability to finance themselves, even when they are willing to pay higher interest rates or provide additional collateral. In addition, the Credit Rationing Theory (Rebel et al., 2024; Stiglitz & Weiss, 1981) complements the arguments

by highlighting the difficulties SMEs face in accessing external financing due to information asymmetry between lenders and borrowers. Here, banks and other financial institutions restrict access to credit, even for solvent companies, due to perceived risks and a lack of accurate information about their financial condition. Therefore, SMEs face high interest rates or a contraction in profits due to inflationary phenomena artificially created by lenders.

Additionally, some studies have explored the elements that drive innovative performance, recognising both internal and external factors. Among the external factors, recent studies have described the importance of aligning different actors' capacities and expectations as an essential element for ensuring its effective functioning (Broekel & Bednarz, 2018; Capone & Lazzeretti, 2018; Wang, Feng, & Liu, 2024; Mingting et al., 2020; Guo et al., 2022). In Colombia, the National Science and Technology System (NSTS) operates as an integrated framework of laws, policies, strategies, and methodologies that coordinates human, material, and financial resources across the public and private sectors. This system, led by Minciencias, aims to promote the development of science, technology, and innovation, thereby contributing to the country's competitiveness and productivity (Heredia & Mesa, 2018). Within the NSTS, participating actors create a diverse set of links and flows, aiming to shape an innovation ecosystem. Among the internal factors, aspects such as organisational culture, knowledge management, dynamic capabilities, and the availability of financial and human resources stand out (Pincheira & Araujo, 2023).

Therefore, investment in R&D plays a central role, as it articulates both types of factors, allowing companies to leverage their innovative capacity. Here, effective management of financial and human resources is key to facilitating research and development processes, thereby increasing the potential for business innovation (Shi et al., 2019; Xiao & Wang, 2025). According to Demirkan (2018), SMEs with greater financial resources tend to take better advantage of external opportunities and invest more in innovation than those with limitations. In addition, idle resources beyond those required for core operations also positively impact innovation.

Hence, the objective of this study is to analyse the relationship between Financial Resources (FR) and the National Science and Technology System with Innovative Performance (IP) in manufacturing SMEs (Figure 1). To explore this relationship, the study seeks to answer: are managers or owners of these types of companies aware of the importance of constantly investing in innovation? And do they have a good understanding of their customers' needs? The paper is structured in six sections. The first section introduces the topic and develops the research problem. The second section presents the literature review and the theoretical frameworks which explain the core concepts. The third section details the methodology, showing the process used for data collection and analysis. The fourth section presents the

principal results and hypothesis testing. The fifth section elaborates in the discussion, and the last section provides conclusions, implications and further research.

LITERATURE REVIEW

As introduced in the previous section, the Pecking Order theory (Konstantinos & Werner, 2025) posits that companies follow a hierarchical order when prioritising their sources of financing. According to this theory, companies first resort to retained earnings, then to debt, and finally to issuing shares. Although this approach is useful for explaining companies' financial decisions, it does not always fit the reality of manufacturing SMEs due to market imperfections and the difficulties these companies often face in accessing credit. In this context, the theory of Credit Rationing (Rebel et al., 2024) is particularly relevant for SMEs. This theory addresses how information asymmetries between lenders and borrowers limit access to credit, even for potentially solvent companies. In the case of manufacturing SMEs, these constraints may explain the difficulties they encounter in financing their innovation processes and their impact on innovative performance.

Although previous theories explain financial issues, innovation in organisations should also be explained in light of the Theory of Resource-Based View (RBV) (Grant & Yeo, 2024), which posits that variations in organisational performance can be attributed to resources and capabilities. These resources and capabilities should be valuable, rare, difficult to imitate, and non-substitutable (VRIN). Hence, the RBV helps us understand how organisations gain a sustainable competitive advantage over their rivals, which is essential for analysing the innovative behaviour of manufacturing SMEs (Grant & Yeo, 2024; Wang et al., 2025).

In this sense, the RBV enriches the explanation of the process of resource acquisition as an evolutionary and cumulative one, fundamental to innovation (Yogantara et al., 2025). In the context of manufacturing SMEs, the ability of these companies to innovate not only depends on internal resources but also on the availability of external resources dedicated to Science, Technology, and Innovation (STI), which are closely related to the production, promotion, and dissemination of new technologies and ideas. The availability of resources is closely linked to the generation, promotion, dissemination, and use of scientific and technical knowledge (Cheng & Wang, 2019; Grant & Yeo, 2024; Wang et al., 2025).

To summarise, the Pecking Order and Credit Rationing theories together explain why manufacturing SMEs face structural barriers in financing their innovation, as information asymmetries limit their access to external capital. Thus, it constrains their ability to invest in R&D. However, the RBV shifts the focus inward, explaining how firms that do secure financial resources can convert them into rare, inimitable capabilities that drive innovative

performance. The original contribution of our model lies in its explicit recognition that this conversion is not direct, but it is mediated by the National Science and Technology System (NSTS). The NSTS provides the external institutional infrastructure, technology centres, universities, patent databases, and R&D networks that allow firms to translate financial inputs into innovation outputs. By situating the NSTS as a mediator, this study moves beyond treating financial resources as sufficient for innovation and highlights the systemic conditions required for their effective use. The following paragraphs define the variables used in this study.

Innovative Performance (IP)

Innovative performance (IP) can be defined as a resulting variable that reflects the outputs of the innovation process and measures an organisation's ability to transform its resources into tangible results. According to Dalimunthe et al. (2025) and Argothy et al. (2024), IP is directly associated with the outputs of innovative efforts, whereas Rehman et al. (2019) link it to firms' results. For manufacturing SMEs, this implies the ability to convert their resources into innovative products, processes, or business models.

In the context of Latin America and the Caribbean, innovative performance is analysed by considering both the inputs and outputs of innovation, highlighting the importance of investment in R&D and the interaction of internal factors, such as human capital and knowledge management, with external factors, such as innovation policies and regional ecosystems (Pincheira & Araujo, 2023). This approach highlights the importance of efficient resource use to maximise innovative outcomes, which is crucial in emerging economies where innovation gaps persist compared to more developed countries.

Financial resources (FR)

The financing sources available to any company to carry out innovation processes are varied (Zuzek, 2019; Mariane et al., 2024; Chen et al., 2024; Adegboye et al., 2018). These resources can come from internal and external sources. For example, organisations can finance operations using shareholders' wealth, banks and financial institutions, venture capital funds, angel investors, stock and bond issues, government support, and funding from non-profit organisations or universities. According to Kramer and Wrightson (2016), financing sources should enable organisations to develop key capabilities for creating new products and services. Along these lines, Mingting et al. (2020) posit that companies typically prefer external sources due to various barriers, including market failures, intense competition, a lack of corporate capital, and ineffective management, which hinder the development of innovative activities. However, each potential source presents specific challenges that must be considered before undertaking any actions.

For this study, both internal and external sources are considered without discrimination, as both play a crucial role in financing Research and Development (R&D) activities, which are essential for carrying out the entire innovation process (Mingting et al., 2020; Guo et al., 2022). For the context of this research, Shi et al. (2019) analysed and found that financing has a positive impact on the innovative performance of manufacturing companies. They found that these resources enable organisations to navigate the competitive environment and promote the development of new products and services. This reinforces the importance of proper management of both internal and external financial resources to ensure the success of innovation processes. Similarly, Mingting et al. (2020) and Guo et al. (2022) highlight that greater investment in innovation-related activities creates incentives for companies to accelerate their innovation processes.

National Science and Technology System (NSTS)

The National Science and Technology System (NSTS) is an open and inclusive system comprising programs, strategies, activities, organisations, and mechanisms directly related to science, technology, and innovation. This group of actors aims to produce and disseminate science and technology in a specific territory. The actors in the system interact at various levels, such as technical, commercial, legal, social, and political, establishing multiple links and flows.

According to Erzurumlu et al. (2022), these actors are organised into four main levels. The first level comprises public, private, and governmental organisations, as well as educational institutions, that function as an integrated social, technological, and economic system. The second level comprises government institutions responsible for regulating interactions between organisations and actors within the system. The third level comprises knowledge infrastructure, including research and educational institutions that provide essential resources and skills to advance science and technology. Finally, the fourth level encompasses the relationships and interactions among all actors, which are key sources of cooperation and system strengthening.

Thus, financing activities are crucial to innovation processes, as they contribute to the development of innovation capabilities. However, the literature widely recognises various barriers to achieving optimal innovative performance, one of the most relevant being the lack of financial resources (Gardocka-Jałowiec & Wierzbicka, 2019; Corchuelo & Carvalho, 2020; Wipulanusat et al., 2019). Based on the postulates, H1 is proposed as follows:
H_1: Financial resources (FR) allocated to the innovation process have a positive relationship with innovative performance (IP).

The convergence of all actors distributed across the levels proposed by Erzurumlu et al. (2022) provides fertile ground for innovation. The system thus operates efficiently when

some of these actors interact to generate new knowledge and new ideas that enable the creation of new products, services, and business models. In this process, the system plays a mediating role by creating links and relationships among the actors of the National Science and Technology System. These links, together with each actor's capabilities, play a pivotal role in the entire innovation process. Hence, H2 is proposed as:

H_2: Financial resources (FR) allocated to the innovation process have a positive relationship with innovative performance (IP).

Organisations require investment in equipment, infrastructure, training, and product development to perform adequately in the market by generating designs that satisfy customers (Dalimunthe et al., 2025; Argothy et al., 2024). In this sense, the connection between financial resources and understanding the functioning of the National Science and Technology System raises H3:

H_3: Financial resources (FR) allocated to the innovation process have a positive relationship with innovative performance (IP).

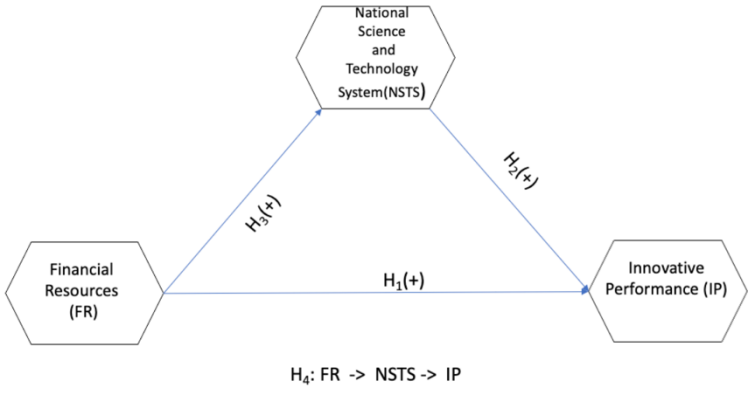
Regions undoubtedly require support in terms of external financing, which is generated by private initiatives, associations, and the government. Its impact is significant for the realisation of business projects, leading to substantial improvements in innovation performance aligned with the set objectives (Zuzek, 2019; Mariane et al., 2024; Chen et al., 2024; Adegboye et al., 2018). Hence, H4 proposes:

H_4: Financial resources (FR) allocated to the innovation process have a positive relationship with innovative performance (IP).

Finally, the hypotheses are integrated into the following theoretical model (Figure 1).

Figure 1

Proposed Theoretical Model



Source: Own elaboration.

METHODOLOGY

The objective of this study is to analyse the relationship between Financial Resources (FR), the National Science and Technology System (NSTS), and Innovative Performance (IP) in manufacturing SMEs. The following methodology outlines the processes used to collect, analyse, and interpret relevant data on these variables. Initially, a review of the literature was conducted to construct the theoretical framework underpinning the study, followed by the definition of the research variables, data collection instruments, and analysis approach. Then decided that the methodological approach should follow a quantitative, cross-sectional logic, using a representative sample of manufacturing SMEs. Using statistical techniques, evaluated the relationships among the variables and validated the proposed hypotheses. In addition, we carried out comparative analyses to identify differences in access to financial resources and their impact on innovation.

Design

This empirical study builds on the work of Hair et al. (2019, 2020, 2022) and adopts an explanatory research design to analyse the determinants of innovation in Colombia's manufacturing sector. Specifically, it examines how independent variables, such as financial resources and participation in the National Science and Technology System (NSTS), affect companies' innovative performance. To test these relationships, the study uses structural equation modelling (SEM) with latent variables, enabling the representation of associations among unobservable constructs within a unified system of equations. The methodological framework adopts a quantitative orientation, using partial least squares (PLS), which aims to maximise the explained variance of dependent constructs through a sequence of partial regressions (Hair et al., 2022). The PLS-SEM method is particularly appropriate for moderate sample sizes or data that deviate from the conventional assumptions of multivariate normality and homoscedasticity, offering greater robustness and flexibility relative to covariance-based SEM.

The unit of analysis in this study comprises Colombian manufacturing companies with at least 10 employees. The data were sourced from the Survey on Technological Development and Innovation in the Manufacturing Industry (EDIT) conducted by DANE (2019). The sample included 8,062 companies, of which complete information was available for 7,529. However, minor variations in response rates were observed across specific items in the EDIT IX questionnaire (2017–2018). This dataset offers a robust representation of the Colombian manufacturing sector, facilitating a detailed examination of the influence of financial resources and participation in the National Science and Technology System (NSTS) on

innovative performance, as well as the identification of key constraints and barriers to innovation faced by companies.

Data source

To carry out this study, the EDIT IX (DANE, 2019, period 2017-2018) survey on Technological Development and Innovation in the Manufacturing Industry was used as the main data collection tool. This survey has been established as the main source of statistical information on technical and organisational transformation and change processes in the Colombian manufacturing industry. Thus, it provides specific data on innovation practices and strategies, presenting a comprehensive overview of the context in which companies operate. A defining feature of this survey is its focus on the articulation of economic activity and knowledge, which are fundamental elements in the production process. This implies that companies are not only implementing technologies but also integrating specialised knowledge to optimise operations and enhance competitiveness in a dynamic environment.

Selected indicators are presented in Table 1, which serve as critical metrics for measuring and evaluating the study's variables. These indicators enable the quantification of innovative performance among manufacturing companies and the assessment of how financial resources contribute to it. Defining a comprehensive set of indicators supports systematic comparison and evaluation of results, thereby advancing understanding of the drivers and constraints influencing innovation in the manufacturing industry. To summarise, choosing the EDIT IX survey as a data collection tool provides a solid basis for analysing innovative performance in the sector, allowing us to capture both current trends and the challenges faced by manufacturing companies in their technological transformation process.

Table 1
Indicators from the EDIT IX questionnaire

Construct	*Indicator*
Financial Resources	
rfri01	Total invested in scientific, technological, and innovation activities, according to the original source of the resources used to finance these investments in 2017 and 2018
NSTS	
rsnt01	R&D Department
rsnt02	Specific interdisciplinary groups for innovation
rsnt03	Scientific and technological databases
rsnt04	Technical standards and regulations
rsnt05	Universities
rsnt06	Seminars and conferences
rsnt07	Books, journals and brochures
rsnt08	Industrial property information system (patent database)
rsnt09	Technology based business incubators
rsnt10	Technology centers
rsnt11	Training centers and technology platforms
rsnt12	Technology development centers
Innovative performance	
dein01	Total innovations in new goods and services in 2017 and 2018.
dein02	New or significantly improved processes, production methods, distribution, delivery, or logistics systems introduced in your company in 2017 and 2018.

Source: Own elaboration.

Sample

It should be noted that the sample adopted is part of a study conducted by the National Administrative Department of Statistics of Colombia (DANE), which measures innovation through the Technological Development Survey in the Manufacturing Industry (EDIT) for the 2017–2018 period. This survey is designed to conduct a census of the sector. Accordingly, the universe of companies surveyed through the DANE questionnaire totalled 8,062 firms, of which complete data were obtained for 7,529.

It should be clarified that the unit of analysis for this study comprises Colombian industrial manufacturing companies with at least 10 employees. The exclusion criteria used to finalise the sample selection required that the company must have had, at a minimum, the intention to innovate, meaning that such intention had to have materialised into at least one concrete project. Therefore, after excluding potentially innovative firms, the final sample comprised 1,572 companies. This sample selection enabled a robust representation of the Colombian manufacturing sector, allowing analysis of the impact of financial resources and the National Science and Technology System (NSTS) on innovation, as well as the constraints and barriers that companies face in their innovative performance.

Data analysis

The statistical analysis in this study was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM), implemented with SmartPLS 4.1.1.4 software (Ringle et al., 2024). PLS-SEM is particularly appropriate for modelling complex relationships among latent constructs and enables a rigorous assessment of the proposed hypotheses. The analytical procedure encompassed two core stages: the evaluation of the measurement model and the assessment of the structural model, which together provide a comprehensive examination of the model’s reliability, validity, and causal relationships. The measurement model focused on establishing the relationship between observable indicators and latent constructs defined in the literature review.

The Innovative Performance construct was treated as reflective, given that its indicators are mutually interchangeable and represent manifestations of an underlying phenomenon (Hair et al., 2020; Hair et al., 2022). In contrast, the other constructs were treated as formative, allowing the indicators to contribute distinct aspects to the construct's definition. The quality of the model was assessed by examining indicator collinearity using the variance inflation factor (VIF), ensuring that all values remained below 3 to avoid multicollinearity issues (Hair et al., 2022). In addition, the bootstrapping method was used to evaluate the statistical significance of the indicators' external weights and to determine their relative contribution to the construct. The following procedure allows identification of statistically significant indicators essential for the analysis.

On the other hand, the structural model explored the relationships between latent variables, evaluating predictive relevance using the coefficient of determination R2. This index indicates the proportion of variance in the dependent variable that is explained by the independent variables. Other fit coefficients were also considered to evaluate the overall quality of the model and its ability to adequately reflect the postulated theoretical relationships (Hair et al., 2022). In summary, the statistical analysis performed using PLS-SEM offers a robust and flexible approach, allowing researchers to better understand the dynamics between financial resources, the National Science and Technology System, and Innovative Performance in the context of manufacturing SMEs. This methodological approach not only ensures the validity of the results but also contributes to a deeper understanding of the factors that influence innovation within the sector.

RESULTS

This section presents the results of the analysis of the collected data, which allow evaluation of the hypotheses proposed in the study. It presents the relevant findings on the influence of financial resources, the National Science and Technology System (NSTS), and other variables on the innovative performance of Colombian manufacturing SMEs.

Measurement Model Evaluation

The dimensions related to the interactions with the National Science and Technology System (NSTS) were conceptualised as reflective measurement constructs. The weights for each indicator are reported in Table 2, where all indicators associated with the proposed constructs are statistically significant. The evaluation of the measurement model followed the guidelines established by Hair et al. (2022). Accordingly, several criteria were examined, including internal consistency, assessed through Cronbach's alpha and composite reliability. Convergent validity was assessed using the average variance extracted (AVE), while discriminant validity was evaluated using the HTMT ratio, which compares the average correlations of indicators across constructs with the average correlations of indicators within the same construct. Each criterion is discussed in detail in the following sections.

Table 2
Measurement Model with Significant Indicators

Construct	Indicator	External Weight	Loading	*t*-value	Significance
NSTS	rsnt01	0.193	0.630	29.878	$p < 0.001$
	rsnt02	0.207	0.666	26.584	$p < 0.001$
	rsnt03	0.131	0.638	25.970	$p < 0.001$
	rsnt04	0.148	0.639	30.543	$p < 0.001$
	rsnt05	0.268	0.660	24.803	$p < 0.001$
	rsnt06	0.173	0.704	32.293	$p < 0.001$
	rsnt07	0.163	0.670	36.376	$p < 0.001$
	rsnt08	0.239	0.648	26.357	$p < 0.001$
Innovative Performance (IP)	dein01	0.845	0.891	14.974	$p < 0.001$
	dein02	0.457	0.541	5.974	$p < 0.001$

Source: Own elaboration.

Cronbach's Alpha and Composite Reliability: Cronbach's Alpha (α) is a widely used parameter to evaluate the internal consistency of a construct, estimating reliability based on the inter-item correlations of observed variables. In the present analysis, the NSTS construct yielded $\alpha = 0.816$, indicating acceptable reliability. This value is reported in Table 3 alongside the Omega-a (rho_A) and Composite Reliability (CR) coefficients to allow a comprehensive assessment of measurement quality. Cronbach's Alpha was not calculated for single-item or formative constructs (Financial Resources), as it is not applicable in such cases. Regarding the Omega-a coefficient (Rho_a), this indicator is appropriate when all items are assumed to measure the same underlying construct, and there is no theoretical justification to consider them as capturing different components.

Unlike Alpha, Rho_a relies on factor loadings, providing more robust and stable estimates that reflect the true reliability of the measure without being affected by the number of items (Roco et al., 2024). For the Omega coefficient to be considered acceptable, its value should fall between 0.70 and 0.90 (Campo & Oviedo, 2008; Roco et al., 2024). Composite Reliability (CR) serves as a complementary measure and is interpreted similarly to Cronbach's Alpha. As shown in Table 3, the indicators range from 0.698 to 0.859. It is worth noting that values exceeding 0.9 are undesirable, as they may indicate that the items are essentially redundant and measure the same phenomenon, which is not suitable for assessing the construct (Hair et al., 2019).

Convergent validity: This concept assesses the extent to which a construct correlates positively with alternative measures that assess the same construct. In the context of a reflective construct, the indicators are interpreted as different ways of measuring the same phenomenon. Therefore, items representing a particular reflective construct should converge and share a high proportion of variance. A high value in the external loadings of a construct indicates that the associated indicators have much in common, which is effectively captured by the construct. To assess this validity, the Average Variance Explained (AVE) is used. The AVE results presented in Table 3 show that the construct associated with the National Science and Technology System explains 43.2% of the variance. In contrast, for Innovative Performance, the AVE rises to 54.5%. This indicates that each latent variable explains a substantial portion of the variance in the indicators, thereby reinforcing the convergent validity of the constructs analysed.

Discriminant validity: This concept refers to the extent to which a construct is distinct from others. The first approach applied was the criterion proposed by Fornell and Larcker (Hair et al., 2022; Radomir & Moisescu, 2020), which involves comparing the square root of the AVE with the correlations among the latent variables. According to this criterion, the square root of the AVE should exceed the inter-construct correlations. However, due to limitations of

this approach, the HTMT (Heterotrait-Monotrait Ratio) criterion was employed. HTMT is considered the most robust method in PLS-SEM for evaluating discriminant validity and requires values below 0.85 (Henseler et al., 2015).

Additionally, to enhance the reliability of the analysis, the Bootstrapping technique was applied. This method generates the sampling distribution of the HTMT statistic by creating multiple random subsamples from the original dataset. Each subsample is used to re-estimate the model, and the process is repeated numerous times. As a result, a 95% confidence interval for the HTMT values is obtained, indicating the range within which the true value is likely to fall. Because the resulting interval does not include the value of 1, it can be concluded that discriminant validity is present, confirming that the constructs defined in the model are conceptually distinct and appropriate for the analysis (Hair et al., 2022).

Table 3
Correlation Matrix, Reliability, Convergent and Discriminant Validity, And Heterotrait-Monotrait Ratio (HTMT)

	Alpha	rho_A	CR	AVE	*NSTS*	IP	FR	95% CI	Relation
Relations with ***NSTS***	0.816	0.859	0.859	0.432					
Innovative Performance			0.698	0.545					
Heterotrait-monotrait ratio (HTMT)									
Financial Resources						0.753		[0.179;0.389]	FR NSTS
Relation with NSTS						0.861	0.301	[0.120;0.395]	NSTS IP
Innovative Performance								[0.164;0.566]	FR IP

Source: Own elaboration.

Structural model evaluation

To evaluate this model, followed the proposal made by Hair et al. (2022). Initially, the collinearity of the structural model is evaluated, followed by an assessment of the significance and relevance of the model's relationships. Thus, R2 is evaluated repeatedly, as well as its predictive relevance.

Collinearity Assessment of the structural model: used the Variance Inflation Factor (VIF) to assess multicollinearity among the predictors. The VIF is defined as the reciprocal of the tolerance and indicates the extent to which independent variables are correlated within a regression model. When multicollinearity is present, meaning that two or more predictors share substantial variance, it can distort the estimation of regression coefficients and compromise the model's stability. The VIF quantifies how much the variance of a coefficient is inflated due to this issue. As a general criterion, VIF values should be below 5 to rule out problematic collinearity. In this analysis, both the Financial Resources and Relations with

the National Science & Technology System constructs had VIF values below this threshold, indicating no multicollinearity concerns. The results are presented in Table 4.

Relevance of model relationships: This measure shows the strength of the relationships between the independently proposed constructs and the dependent variable. In this case, Financial Resources and Relationships with the National Science & Technology System are independent variables, and Innovative Performance is the dependent variable. These standardised values range from -1 to +1. The further these values are from zero, the greater the impact on the dependent variable in the direction of the sign, i.e., affecting it positively or negatively. It should be noted that values close to zero have no impact. As shown in Table 4, the relationship weights are significant, supporting the validity of the proposed model. To assess whether these standardised coefficients are truly significant, bootstrapping was used. Based on the coefficients calculated for each subsample, the standard error and standard deviation can be estimated to obtain the corresponding values. In this way, it is feasible to calculate the t-statistic (Student's t-test) and the p-value, which are presented in Table 4.

Another indicator of the statistical significance of the coefficients associated with the relationships among the model constructs (external loads) is the confidence intervals constructed via bootstrapping. These intervals provide additional information on the stability of the estimated coefficients. Using a 95% confidence interval, the central idea is that this interval does not include zero. As can be seen in Table 4, none of the confidence intervals for the constructs contains zero, thereby complementarily validating their significance.

Coefficient of Determination (R^2): It is one of the most used measures. This coefficient measures the model's predictive power. It represents the latent exogenous variables, along with the effects of the endogenous variables. Therefore, it represents the amount of variance in the endogenous variable explained by the exogenous constructs. The value of this coefficient ranges from 0 to 1. For the present model, we have an R^2 of 0.184. According to Hair et al. (2022), this is considered satisfactory.

Predictive Relevance (Q2): It is the final indicator used to evaluate the structural model, and it was proposed to measure its relevance. When a model has predictive relevance, i.e., when the Q^2 value is greater than zero, it indicates that the independently specified constructs can predict the valundent variable. In other words, both the Financial Resources construct and the National Science and Technology System construct predict the outcome of the Innovative Performance construct because their Q^2 values are greater than zero (Danks & Ray, 2018).

Table 4
Assessment of The Measurement Model

	IP	NSTS	VIF	*t-value*	*p-value*	95% CI	Predictive Relevance Q^2
Innovative performance				FR->IP 3.582	0.000	FR->IP [0.083;0539]	0.086
Financial Resources	0.268	0.291	FR->IP 1.093	FR->NSTS 7.3770	0.000	FR-> NSTS [0.151;0.412]	
Relation with NSTS	0.266		NSTS ->IP 1.093	FR->NSTS 6.764	0.000	NSTS->IP [0.119;03.83]	0.032
Innovative performance		0.698	FR-> NSTS 0.545				

NSTS: National Science and Technology System; IP: Innovative Performance; FR: Financial Resources. VIF: variance inflation factor, CI: Confidence interval 95% Source: Own elaboration.

The model presented in Figure 1 shows how the National Science and Technology System mediates the relations between Financial Resources and Innovative Performance. To test this mediation, Bootstrap was used, which utilises sample distributions of indirect effects to avoid the difficulties presented by the Sobel Test (Murad et al., 2020). This technique does not assume any distribution of the variables. Thus, the methodology proposed by Hair et al. (2022), which assesses mediation through direct and indirect effects, is used to test this mediation. The results can be seen in Table 5, where it can be analysed that there is ultimately complementary mediation, indicating that the relationship between innovative performance and financial resources is not only explained by changes in resources but is also affected by changes associated with the National Science and Technology System. To summarise, Table 6 presents each hypothesis formulated and its results.

Table 5
Mediation Test Between Proposed Constructs

Relation	Indirect effect	95% CI	*t-value*	*p-value*
FR->NSTS->IP	0.078	[0.037:0.131]	5.509	0.000

NSTS: National Science and Technology System; IP: Innovative Performance; FR: Financial Resources. Source: Own elaboration.

Table 6
Hypotheses Results

Hypothesis	Description	Result
H_1	Financial resources (FR) allocated to the innovation process have a positive relationship with innovative performance (IP).	Confirmed
H_2	The National Science and Technology System (NSTS) has a positive relationship with innovative performance (IP).	Confirmed
H_3	Financial Resources (FR) have a positive relationship with the National Science and Technology System (NSTS).	Confirmed
H_4	The National Science and Technology System (NSTS) mediates between financial resources and innovative performance.	Confirmed

Source: Own elaboration.

DISCUSSION

Regarding the relationship between financial resources and innovative performance, Mariane et al. (2024) highlight the importance of identifying appropriate strategies that enable firms to reduce financial risks and enhance operational efficiency. This is consistent with the findings of the present study, which show that a sustained flow of financial resources positively influences innovation outcomes. Similarly, Chen et al. (2024) consider that the innovative performance of SMEs is shaped by the financial improvements they implement to maintain stability and balance. In the same vein, Guo et al. (2022) highlight the relevance of external support, particularly that provided through public policies and initiatives, to strengthen financial capabilities, which ultimately contribute to enhanced innovative performance.

On the other hand, another factor that positively impacts companies' innovative performance is support from the National Science and Technology System. As noted by Erzurumlu et al. (2022), these types of institutions aim to strengthen the strategies implemented in companies from a systemic perspective, as evidenced by the results of this study and by entrepreneurs. The NSTS brings together a group of actors that make it possible to achieve better innovative performance. The role of research groups, universities, and the intellectual property system is noteworthy. These actors are fundamental elements in building R&D capabilities for manufacturing SMEs.

Findings of this study support theories such as RBV, the Theory of Capital Cost, the Evolutionary Theory of Innovation, and the Theory of National Innovation Systems (TNIS). For instance, according to Zuo (2022), the Theory of Resource-Based View (RBV) posits that financial resources improve innovation capabilities and that, as companies secure greater resource flows, they can increase their investment in R&D. This results in a propensity to generate more innovations reflected in new products, processes, or services. Complementarily, the Evolutionary Theory of Innovation, based on principles of evolutionary biology, explains how changes driven by different determinants enable the effective materialisation of innovation processes. Within this theory, financing is a predictor of innovation in companies (Kruglov & Shaw, 2024). Similarly, the Theory of Innovation Systems (TSNI) argues that cooperation, mutual learning, and alliances between different actors in the system, such as those proposed in this research, enable the generation of knowledge and innovative solutions (Wu & Huang, 2024).

CONCLUSIONS

This study set out to analyse the relationships among financial resources, the National Science and Technology System (NSTS), and innovative performance in Colombian manufacturing SMEs. The results from the PLS-SEM analysis confirm all four hypotheses, yielding three key findings. First, financial resources exert a direct and positive influence on innovative performance (H1 confirmed, $\beta = 0.268$, $p < 0.001$), underscoring that adequate investment is a necessary, though not sufficient, condition for innovation in this sector. Second, the NSTS itself positively and significantly predicts innovative performance (H2 confirmed, $\beta = 0.266$, $p < 0.001$), indicating that institutional actors: universities, R&D centres, technology platforms, and patent systems play an independent and substantive role beyond the financial channel. Third, the NSTS functions as a complementary mediator between financial resources and innovative performance in the Colombian case (H4 confirmed, indirect effect = 0.078, 95% CI [0.037, 0.131]), meaning that the impact of financing on innovation is amplified when companies actively engage with the national science and technology ecosystem. Together, these findings advance the understanding of innovation in emerging-economy manufacturing firms and provide a robust empirical foundation for both managerial practice and public policy.

Theoretical implications

The findings contribute to the literature in three interconnected ways. First, they extend the RBV by demonstrating empirically that financial resources alone do not determine innovative performance. However, their effects are conditioned by a firm's integration into the national science and technology ecosystem. Second, the complementary mediation found provides nuanced support for the Theory of National Innovation Systems, confirming that systemic actors (universities, technology centres, incubators) serve not merely as background conditions but as active mediators that translate financial inputs into innovation outputs. Third, by situating the Credit Rationing and Pecking Order theories within an innovation context, this study adds to the nascent literature connecting financial constraints to SME innovation capacity in Latin America, a region where both access to credit and institutional development remain highly heterogeneous.

Practical implications

For managers of manufacturing SMEs, the findings point to two actionable priorities. First, investment in innovation must be deliberate and structured rather than residual: firms that allocate dedicated budgets to scientific, technological, and innovation activities consistently outperform those that do not. Critically, however, the returns on this investment are conditional on institutional engagement. Second, managers should actively cultivate

relationships with NSTS actors. The measurement model reveals that among the twelve NSTS indicators, R&D departments (rsnt01), interdisciplinary innovation groups (rsnt02), universities (rsnt05), and seminars and conferences (rsnt06) carry the highest loadings, suggesting these are the most productive channels through which SMEs can amplify the value of their financial investments. For policymakers, the mediating role of the NSTS provides a strong rationale for public investment in institutional capacity. Strengthening the articulation between Minciencias, regional technology centres, and business incubators would lower the cost of NSTS access for small firms, thereby expanding the innovation premium that comes from financial investment. Tax incentives or co-financing schemes explicitly conditioned on NSTS engagement could be particularly effective instruments.

Social implications

In a national innovation system, the government occupies a central position as the main coordinating and steering actor. It is responsible for designing and implementing policies and allocating the financial, regulatory, and institutional resources needed to strengthen the innovation ecosystem. By formulating coherent science, technology, and innovation policies, the government can enhance and expand the institutional innovation capacities of the manufacturing sector, particularly SMEs, thereby promoting firm competitiveness, social well-being, and sustainable development.

Limitations

Despite its contributions, the study has limitations that must be considered when interpreting the results. First, the cross-sectional design based on EDIT IX (2017–2018) precludes causal inference and does not capture structural changes in science, technology, and innovation policy that may have occurred since that period, including disruptions associated with the COVID-19 pandemic. Second, the model focuses on two independent constructs (FR and NSTS), while other drivers of innovative performance, such as human capital, organisational culture, and dynamic capabilities, are not incorporated. Third, the analysis is confined to the Colombian manufacturing sector, which limits direct generalisation to other industries or national contexts.

Future research agenda

These limitations define a clear agenda for future research. First, longitudinal or panel analyses using successive EDIT waves (X, XI, XII) would allow researchers to examine whether the mediating role of the NSTS has strengthened or weakened in the post-pandemic policy environment, providing a dynamic picture of how systemic innovation capacity evolves. Second, incorporating moderating variables such as firm size, technological intensity (CIIU sector), or geographic proximity to technology clusters would reveal boundary conditions for the NSTS mediation effect and enrich the theoretical model. Third, replicating the model in other Latin American countries with comparable national innovation

systems (e.g., Mexico, Chile, or Peru) would test the external validity of the findings and contribute to a comparative theory of innovation in emerging economies. Fourth, qualitative or mixed-methods studies examining the specific mechanisms through which NSTS actors translate financial resources into innovation outcomes would complement the quantitative evidence presented here and provide richer insights for practitioners and policymakers alike.

REFERENCES

Adegboye, A. C., & Iweriebor, S. (2018). Does Access to Finance Enhance SME Innovation and Productivity in Nigeria? Evidence from the World Bank Enterprise Survey. *African Development Review / Revue africaine de Développement*, 30(4), 449–461. https://doi.org/10.1111/1467-8268.12351

Argothy, A., Llamuca, J., Guerrero, C., Herrera, F., & Morales, X. (2024). Innovative efforts and export performance in Ecuador's metal mechanics industry. *Heritage & Sustainable Development,* 6(2), 709–719. https://doi.org/10.37868/hsd.v6i2.494

Broekel, T., & Bednarz, M. (2018).Disentangling Link Formation and Dissolution in Spatial Networks: An Application ofa two-Mode STERGM to a Project-Based R&D Network in the German Biotechnology Industry. *Networks and SpatialEconomics*, *18* (3), 677–704

Capone, F., & Lazzeretti, L. (2018). The Different Roles of Proximity in Multiple Informal Network Relationships: Evidence from the Cluster of High Technology Applied to Cultural Goods in Tuscany. *Industry and Innovation, 25*(9), 897–917.

Campo, A., & Oviedo, H. (2008). Propiedades psicométricas de una escala: la consistencia interna. *Rev Salud Pública, 10* (5), 831-839.

Chatzinikolaou, D., & Vlados, C. (2026). From Hyperglobalization to "New Globalization": Transnational Corporations, Geopolitical Shocks, and Resilient Global Value Chains. *Mercados y Negocios*, (57), 49–80. https://doi.org/10.32870/myn.vi57.7949

Cheng, H., & Wang, B. (2019). Multiplier Effect of Science and Technology Innovation in Regional Economic Development: Based on Panel Data of Coastal Cities. *Journal of Coastal Research*, 883–890. https://www.jstor.org/stable/26854067.

Chen, W., Arn, G., Song, H., & Xie, Y. (2024). The influences of digital finance on green technological innovation in China's manufacturing sector: The threshold effects of ESG performance. *Journal of Cleaner Production*, 467, https://doi.org/10.1016/j.jclepro.2024.142953

Chervinska, L., Kalina, I., Chervinska, T., Mylenkyi, V., Hryshchenko, A., & Khorosheniuk,

A. (2025). Technology Transfer in the System of Innovation Development: Challenges and Opportunities. *Technology Audit & Production Reserves, 2*(4), 80–87. https://doi.org/10.15587/2706-5448.2025.327378

Corchuelo, B. & Carvalho, L. (2020). Innovative activity and propensity to innovate in Extremaduran KIBS companies. *International Journal of Innovation Management*, *24*(7), 1–31. https://doi.org/10.1142/S1363919620500620

Dalimunthe, R., Siahaan, E., Lubis, A., Astuti, P., & Siregar, M. (2025). Success Strategies for Womenpreneurs to Improve Innovative Performance and Competitive Advantage. *TEM Journal, 14*(1), 266–277. https://doi.org/10.18421/TEM141-24

Danks, N., & Ray, S. (2018). Predictions from partial least squares models. In F. Ali, S. M. Rasoolimanesh, & C. Cobanoglu (Eds.), *Applying partial least squares in tourism and hospitality research,* (35–52). Emerald Publishing.

DANE. (2017). *Metodología General de Encuesta de Desarrollo e Innovación Tecnológica en la Industria Manufacturera*. EDIT.

DANE. (2019). *Encuesta de Desarrollo e Innovación Tecnológica en la Industria Manufacturera*. EDIT IX 2017-2018.

Demirkan, I. (2018). The impact of firm resources on innovation. *European Journal of Innovation Management*, *21*(4), 672-694. https://doi.org/10.1108/EJIM-12-2017-0196

Erzurumlu, S., Erzurum, Y. & Yoon, Y. (2022). National innovation systems and dynamic impact of institutional structures on national innovation capability: A configurational approach with the OKID method. *Technovation, 114*. https://doi.org/10.1016/j.technovation.2022.102552

Gardocka-Jałowiec, A., & Wierzbicka, K. (2019). Barriers to Creating Innovation in the Polish Economy in the Years 2012-2016. *Studies in Logic, Grammar and Rhetoric*, *59*(1), 211–225. https://doi.org/10.2478/slgr-2019-0038

Grant, D., & Yeo, B. (2024). Resource-based view of the Productivity Paradox. *Technology Analysis & Strategic Management, 36*(3), 533–548. https://doi.org/10.1080/09537325.2022.2042509

Guo, D., Guo, Y., Jiang, K. (2022). Government R&D support and firms' access to external financing: funding effects, certification effects, or both?. *Technovation, 115*, 102469. https://doi.org/10.1016/j.technovation.2022.102469.

Hair, J., Hult, G., Ringle, C. & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage. Thousand Oaks, CA.

Hair, J., Howard, M. & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research, 109*, 101–110

Hair, J., Risher, J., Sarstedt, M., & Ringle, C. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. *J. Acad. Mark. Sci. 43*, 115–135. https://doi.org/10.1007/s11747-014-0403-8

Heredia, M., & Mesa, D. (2018). Consideraciones de los programas de formación de alto nivel en la política nacional de ciencia y tecnología en Colombia. *Revista Educación en Ingeniería, 13*(25), 108-116. http://dx.doi.org/10.26507/rei.v13n25.863

Jin, Y., Zhang, S., Yu, R., & Huang, T. (2024). Influencing Factors of Financing Constraints of Micro and Small Enterprises (MSEs) in China: A Risk Information Conveyance Perspective. *Human Behavior and Emerging Technologies*, 3614328, https://doi.org/10.1155/2024/3614328

Kim, C. Y. (2024). Innovation Resistance of Vulnerable Workers: Focusing on Corporate Financial Performance. *SAGE Open, 14(*3), 1–15. https://doi.org/10.1177/21582440241271176

Kramer, F. D., & Wrightson, J. A. (2016). The role of finance. In *Innovation, Leadership, and National Security*. Atlantic Council. 11–13. http://www.jstor.org/stable/resrep03653.7.

Kruglov, P., & Shaw, C. (2024). *Financial Performance and Innovation: Evidence From USA, 1998–2023*. (Preprint). https://arxiv.org/abs/2403.10982

Konstantinos, V. & Werner, R. (2025). Trade-off theory vs. the pecking order hypothesis: Japanese evidence on capital structure under financial constraints. *Structural Change and Economic Dynamics. 74.* https://doi.unalproxy.elogim.com/10.1016/j.strueco.2025.06.004

Mariane, A., Kazuo, E., Lessa, B., Mendes, F., & de Miranda, M. (2024). The Effect of Innovation and Strategic Resources on Capital Structure. *RAE: Revista de Administração de Empresas, 64*(6), 1–24. https://doi.org/10.1590/S0034-759020240608

Mingting, K., Yuanqi, Y., & Kaihua, C. (2020). The impact of external R&D financing on innovation process from a supply-demand perspective. *Economic Modelling, 92*, 375-387.

Murad, M., Rakesh, G., & Ahasan, H. (2020). Testing mediation via indirect effects in PLS-

SEM. *Data Analysis Perspectives Journal, 1*(3), 1-6.

Myers, S., & Majluf, N. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187-221.

Pincheira V. & Araujo, A. (2023). Innovación en América Latina y el Caribe: Análisis desde el criterio de eficiencia. *INGENIARE - Revista Chilena de Ingeniería*, *31*, 1–18.

Radomir, L., & Moisescu, O. (2020). Discriminant validity of the customer-based corporate reputation scale: some causes for concern. *Journal of Product & Brand Management. 29*(4), 457–469. https://doi.org/10.1108/JPBM-11-2018-2115

Roco, Á., Aguilera, R., & Olguin, M. (2024). Ventajas del uso del coeficiente de omega de McDonald frente al alfa de Cronbach. *Nutrición Hospitalaria, 41(*1), 262-263. https://dx.doi.org/10.20960/nh.04879

Rebel C., Marc Cowling, M. & Liu W. (2024). The effect of collateral on small business rationing of term loans and lines of credit. *Journal of Financial Stability, 74.* https://doi.unalproxy.elogim.com/10.1016/j.jfs.2024.101320.

Rehman, S., Bhatti, A., Chaudhry, N. (2019). Mediating effect of innovative culture and organizational learning between leadership styles at third-order and organizational performance in Malaysian SMEs. *Journal of Global Entrepreneurship Research*, 9 (36). https://doi.org/10.1186/s40497-019-0159-1.

Ringle, C., Wende, S., & Becker, J. (2024). *SmartPLS. Smart PLS GmbH*. Boenningstedt.

Shi, Y., Gong, L. & Chen J. (2019). The Effect of Financing on Firm Innovation: Multiple Case Studies on Chinese Manufacturing Enterprises. *Emerging Markets Finance and Trade, 55*(4), 863-888, https:/doi.org/10.1080/1540496X.2018.1478284

Stiglitz, J., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review, 71(*3), 393-410.

Wang K., Feng, Y. & Liu, S. (2024). Analyzing the innovation ecosystem of China's major science and technology projects: From the ecological and systems science perspective. *Project Leadership and Society, 5.* https://doi.unalproxy.elogim.com/10.1016/j.plas.2024.100156

Wang, C., Wu, C., & Ou, C. (2025). Does intellectual capital matter in small- and medium-sized enterprise (SME) decisions? Roles of resource integration capability and top management team involvement. *Journal of Intellectual Capital, 26*(1), 229–252. https://doi.org/10.1108/JIC-07-2024-0222

Wipulanusat, W., Panuwatwanich, K., Stewart, R. & Sunkpho, J. (2019). Drivers and barriers

to innovation in the Australian public service: A qualitative thematic analysis. *Engineering Management in Production and Services, 11*(1), 7–22.

Wu, F., & Huang, H. (2024). Why do some countries innovate better than others? A new perspective of science, technology, and innovation policy regimes and national absorptive capacity. *Sustainability, 16*(7), 2840. https://doi.org/10.3390/su16072840

Xiao, R., & Wang, C. (2025). Founder resources and innovation investment: A configuration perspective. *Expert Systems with Applications, 262*, https://doi.org/10.1016/j.eswa.2024.125680.

Yogantara, K., Yadnyana, I., Sudana, I. P., & Sujana, I. (2025). Culture is a moderator of the interaction between financial inclusion and financial performance. *Mercados y Negocios*, (56), 3–28. https://doi.org/10.32870/myn.vi56.7880

Zuo, X. (2022). *State capital involvement, managerial sentiment and firm innovation performance: Evidence from China*. (Preprint).. https://arxiv.org/abs/2204.04860

Zuzek, D. K. (2019). Expenditure on Innovations of SMEs and Sources of Their Financing in Poland as Illustrated by the Example of Malopolskie Voivodeship. *Economic Science for Rural Development Conference Proceedings, 50*, 289–295. https://doi.org/10.22616/ESRD.2019.036