BAR - Brazilian Administration Review
ISSN: 1807-7692
ANPAD - Associação Nacional de Pós-Graduação e Pesquisa em Administração

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BAR - Brazilian Administration Review, vol. 20, no. 2, e220103, 2023
ANPAD - Associação Nacional de Pós-Graduação e Pesquisa em Administração

DOI: https://doi.org/10.1590/1807-7692bar2023220103

Available in: https://www.redalyc.org/articulo.oa?id=84175511004

BAR Brazilian Administration Review

ANPAD

Research Article

The Interdependence Between Ease of Doing Business, Innovation, and Competitiveness of Nations

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How to cite: Morano, R. S., Jacomossi, R. R., Barrichello, A., & Feldmann, P. R. (2023). The Interdependence between ease of doing business, innovation, and competitiveness of nations. *BAR-Brazilian Administration Review, 20*(2), e220103.

DOI: https://doi.org/10.1590/1807-7692bar2023220103

Keywords:
ease of doing business; innovation; competitiveness of nations; World Bank; World Economic Forum

JEL Code:
nonadherent.

ABSTRACT

This study aims to assess whether the ease of doing business can be considered as an alternative path (indirect path) between innovation and competitiveness of nations, improving the understanding of the effect transfer between these two variables. The study used exploratory/confirmatory factor analysis and mediation techniques applied to data from 141 countries contemplated in The Global Competitiveness report 2019 by the WEF and Doing Business report 2019 by the World Bank. The results show the mediator role of ease of doing business in the relationship between innovation and global competitiveness. Innovation improves the competitiveness of nations, but rules and regulations can be a barrier to this relationship. Therefore, ease of doing business is an essential element in improving the relationship between innovation and competitiveness, helping policymakers to focus their efforts on ease of doing business aspects in such a way as to enhance the economic process and support investors to make the most appropriate decisions when choosing the countries in which to invest their resources. Complementarily, the study also contributes by pointing out that the current method of calculating the EDB index may not be the most suitable, since it can distort analysis affecting international investment feasibility studies.

Received:
July 05, 2022.
This paper was with the authors for two revisions.

Accepted:
May 15, 2023.

Publication date:
June 13, 2023.

Conflict of Interests:
The authors have stated that there is no conflict of interest.

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INTRODUCTION

The challenge of creating a favorable business environment motivates researchers, international institutions, and policymakers to seek alternatives to improve the economic exchange process. The creation of reports that rank the environment around companies and the ease of doing business is one of the initiatives in this direction. The World Bank's Doing Business score is presented in one of these reports, comparing business regulation in 190 economies (International Bank for Reconstruction and Development [IBRD], 2020). This data has supported many studies and decision-making processes (Estevão et al., 2020).

Public managers in numerous countries have implemented reforms seeking to improve processes and reduce costs and time to open new businesses to promote the public sector's development and economic growth (Klapper & Love, 2010). The literature supports this policy by offering evidence of the challenges to starting, operating, and developing businesses, including the regulatory restrictions among these difficulties (Crafts, 2006; Herrendorf & Teixeira, 2011).

According to the literature, one of the reasons for countries' economic development is how much governments promote entrepreneurship or the ease of doing business. Therefore, it is important to stress that government actions must avoid interventionism and be limited to creating laws that facilitate spontaneous transactions among the various economic agents. Thus, governments must provide a framework for a highly collaborative environment (Leal-Rodríguez & Sanchís-Pedregosa, 2019) that favors the emergence of innovative solutions.

In this aspect, innovation generates positive effects on improving companies' performance and, consequently, increases nations' productivity and competitiveness (Barrichello et al., 2020; Dutta et al., 2016; Feldmann et al., 2019; Nelson & Winter, 1982; Pavitt, 1984; Rosenberg, 1982; Schumpeter, 1934). A key element for entrepreneurship development is a good business environment in countries, indicating a close relationship with the ease of doing business (Dougherty, 2007). Thus, it is worth understanding how the ease of doing business affects innovation and competitiveness when analyzed concurrently.

The ease of doing business, according to the World Bank (IBRD, 2020), means that a country's regulatory environment is more conducive to starting and operating a local company, that is, entrepreneurship facilitated by public policies, legal system, and bureaucracy in the country, increasing its global competitiveness. In turn, for this work, innovation is linked to investment in research and development (R&D), considering mainly the private sector, the existence of high-quality research institutions that generate the necessary knowledge for the development of new technologies, collaboration in R&D between universities and industry, and protection of intellectual property (Schwab, 2019). Against this backdrop, this study is guided by the following research question: What is the role of ease in doing business in the existing relationship between innovation and competitiveness of nations? Therefore, this study aims to assess whether the ease of doing business can be considered as an alternative path (indirect path) between innovation and competitiveness of nations, improving the understanding of the effect transfer between these two variables. If this possibility is demonstrated, elements are added to a relationship already enshrined in the literature (innovation — competitiveness of nations) (Barrichello et al., 2020; Dutta et al., 2016; Feldmann et al., 2019; Jacomossi et al., 2021; Nelson & Winter, 1982; Pavitt, 1984; Rosenberg, 1982; Schumpeter, 1934), but always open to adding new possibilities that allow understanding the development of each country, contributing to the prosperity of its populations.

This work's contribution rests in helping governments and their regulatory strategies to improve the business environment and governance to support local and international trade. In practical terms, the work intends to present to companies and investors the importance of the ease of doing business for the application of their resources in different countries, as well as to emphasize the need to be concerned with the methodology for calculating the index so that their decisions do not be biased by this factor. In addition, the study allows the joint assessment of the three variables (innovation, ease of doing business, and competitiveness), together, in a single structural model, better representing the reality experienced by the global business environment.

RELATIONSHIP BETWEEN INNOVATION AND COMPETITIVENESS OF NATIONS

Innovation and its effects on improving companies' performance have been the object of organizational and economic studies developed to support the competitiveness and productivity of nations. Usually, the role of innovation is highlighted in the classic literature on the subject (Nelson & Winter, 1982; Pavitt, 1984; Rosenberg, 1982; Schumpeter, 1934), thus enhancing the explanation for the growth of companies and nations' competitiveness and the effects of such growth on the production of wealth. This importance is corroborated by Dutta et al. (2016), who point out that innovation has been an important element to boost economic progress and competitiveness.

Porter (1990) postulated that it is not nations that are powerful, but rather the companies that operate within their territories. Therefore, countries depend on their productive sectors to create business environments capable of innovating faster than their foreign competitors. Furthermore, several authors highlight the importance of innovation as an essential factor in productivity gains and consequent countries' competitiveness (Barrichello et al., 2020; Feldmann et al., 2019; Schreiber et al., 2016). In this direction, Gordon (2016) proved that the growth of a country is not directly related only to innovation but also to increased productivity. In part, this explains why many governments are putting innovation at the center of their growth strategies through industrial, and research and development (R&D) policies.

In addition, other approaches have gotten emphasis like those associated with organizational capabilities development that turns companies more innovative. For instance, the role dynamic capabilities guide companies to move more consistently in turbulent markets (Crossan & Apaydin, 2010; Ichijo & Nonaka, 2007; Panayides, 2006).

When it comes to the relationship between innovation and productivity, there are several models. One of them suggests that companies incorporate external knowledge and use it in their internal processes, achieving innovative products (Armstrong & Lengnick-Hall, 2013; Brettel et al., 2011; Cohen & Levinthal, 1990; Jacomossi & Feldmann, 2020; Najafi-Tavani, et al., 2014; Ritala & Hurmelinna-Laukkanen, 2013; Zahra & George, 2002).

Osuna-Alarcón and Rodríguez-Hernández (2020) show the education role and entrepreneurial attitude to reach for successful business development. For the authors, innovation should be seen as a base to improve companies' competitiveness. Regarding the culture of innovation, it is important to show the role of R&D as a precedent element of the diffusion process of innovation, relating this investment with better performance (Bae, 2016; Barrichello et al., 2020; Bertrand & Mol, 2013; Spezamiglio et al., 2016).

It is worth mentioning that several studies emphasize the role of foreign investments by multinationals in subsidiaries, enabling knowledge to spill over into the country that receives the new technologies, increasing productivity and competitiveness (Blomström, 1986; Blomström & Kokko, 1998; Fleury, et al., 2018; Liu, 2008; Morano et al., (in press); Suyanto & Salim, 2012; 2013).

Finally, the relationship between innovation and competitiveness is enshrined in the literature (Feldmann et al., 2019; Ichijo & Nonaka, 2007; Nelson & Winter, 1982 Schumpeter, 1934). However, for companies to develop their innovative capabilities, the existence of a business environment that favors this type of practice is necessary (Melo et al., 2017; Porter, 1990; Santos et al. (updated to 2023).

RELATIONSHIP BETWEEN INNOVATION AND EASE OF DOING BUSINESS

The Ease of Doing Business ranking, developed and published by the World Bank, supports public and private decision-makers to assess the level of regulatory performance of countries over time. It captures the difference between each economy from the best regulatory performance observed in each of the indicators that make up the index. One can also assess the performance gap between countries by assessing changes in their regulatory environments over time (IBRD, 2020). Innovation and the ease of doing business have a strong impact on countries' economies. Together, they impact information sharing, the development of information and communication technology (ICT), and citizens' per capita income (Alderete, 2020). Jerbashian and Kochanova (2016) analyzed how regulations for doing business in countries affect investments in ICT. Such investments decrease as the costs of starting and operating a business and registering property increase. Investments increase when legal rights are secured. Dougherty (2007) concluded that there is a relationship between the ease of doing business and innovation development so governments should act, above all, to improve the business environment of countries, to strengthen this relationship.

Chaotic management systems do not favor creativity and innovation as low group cohesion leads to disorganization. The established rules and standards end up prevailing, so doing business is difficult. At the same time, the group's high cohesion creates an organizational structure that supports the generation of creative results, facilitating decision-making and doing business (Jacomossi & Feldmann, 2020; Tognazzo & Mazzurana, 2017).

According to Amankwah-Amoah et al. (2018), nations and companies can capitalize on their resources and capabilities to meet the 21st-century challenges of doing business. They argue that the main requirements are human capital formation, technology transfer, innovation, and learning. Thus, technology can be used to meet some of the 21st-century challenges. A multifaceted approach involving governments, individuals, and companies is suggested to facilitate the dissemination of new technologies to face the nations' future challenges and national economies.

The generation of innovation in a country has a strong connection with the encouragement of entrepreneurship,

which relies on the ease of doing business (Acemoglu & Robinson, 2012).

The logic of the influence of ease of doing business on innovation begins to be seen differently with technological advances and the beginning of the Fourth Industrial Revolution. Digital business models have changed commerce and created many opportunities for small and medium-sized entrepreneurs in developing countries, fundamentally with the emergence of so-called intangible products (Rensburg, 2021). This concept is presented in the work of Hofacker and Goldsmith (2020), who propose that between tangible products and intangible services, there would be a third category, the information products. Such products would exist on their own, being mutable, scalable, and public, but would also form part of both, products and services, that contain information as a participating element. Thus, the product concept should be revised to contain, more explicitly, this informational component (Hofacker & Goldsmith, 2020).

Considering this perspective, the physical limitations, often imposed by regulations and legislation that make it difficult to do business in a country, gradually lose their strength, as technology lowers the barriers to connecting and communicating with companies and people internationally (Rensburg, 2021). Thus, an information product can be created in one country, sold, and paid for in other countries, without the government of the country of origin having any participation in collecting taxes, generating jobs, and increasing the population's quality of life. The opposite movement is also true, as an international company does not need to install itself in a country to sell to its inhabitants, it can do so over the internet, with the cost of what was supplied being limited to import tax or similar fees. Thus, digital innovation can bypass a country's rules and regulations, no matter how strict they may be. The conclusion is that innovation, local or international, ends up affecting rules and regulations for doing business in a country, harming its competitiveness unless they are reviewed. This can be a slow process, depending on the development stage of each country, but technological pressure is something that will happen. South Africa went through this kind of process when it developed its international competitiveness strategy, having identified several policies for doing business that needed to be revised (Govender, 2015).

Shuaib (2020) follows this same path by showing in the work how the digital economy can affect international business and the needs of countries to adapt to these innovations by changing their legislation and the way they do business. According to the author, a striking example of this relationship between innovation and the search for easier doing business is Nigeria, which changed its foreign trade policies, even creating a ministry for the digital economy due to the potential contributions of this area to the country's GDP. The study concludes that countries must be proactive in responding to changes in the business environment around the world, brought about by technological innovations, by formulating domestic policies that correspond to changes in global trade policies.

Previously, López-González and Jouanjean (2017) and López-Gonzalez and Ferencz (2018) have already warned that digitization is changing what and how one negotiates: from digital delivery to greater commerce physical environment made possible by digital connectivity. Online platforms mean more small packages crossing borders, while new technologies are changing the way services are produced and delivered. For trade policy, the increased bundling of goods and services raises questions about which trade rules (GATT or GATS) apply; trade facilitation is increasingly critical for just-in-time deliveries and global value chains; and the role of data flows in enabling digital commerce may require more attention, as well as how to ensure that the gains from digital commerce are inclusive, within and across countries.

Thus, from a perspective where the ease of doing business influences innovation, in an increasingly virtual world, digital innovations impose regulatory challenges in the context of digitization and the continuous change in the structure of cross-border digital commerce. Technological innovations will increasingly require improvements in international trade regimes concerning the cross-border exchange of data as well as harmonization of national standards for data exchange between countries, regimes for the export of digital goods and services, as well as privacy and security of data (Smirnov & Karelina, 2020).

The relationship between innovation and ease of doing business shows the importance of these two components in the context of competitiveness, which is explored in the next section.

RELATIONSHIP BETWEEN EASE OF DOING BUSINESS AND COMPETITIVENESS

In some countries, there is a gap in terms of awareness of the importance of competitiveness and excessive regulation. For example, Dougherty (2007) compared productivity between China and India, finding that despite the differences in human capital development and education in favor of China, there was a greater regulation of the labor market in India, very harmful to the country's productivity and growth. The regulation

practiced by a country also influences its international trade and governance (Khan, 2020).

Canare et al. (2019) studied the relationship between the ease of doing business and the cost of setting it up using data from the Philippines. The result showed that the ease of starting a business has a positive relationship with business creation. This result was clearer when observing, separately, the costs of starting and maintaining a business.

Ease of doing business influences the attraction of foreign direct investment (FDI). Items part of the business environment, such as starting a business, registering property, getting electricity, and resolving insolvency, are key to attracting investors. Issues such as dealing with construction permits, getting credit, paying taxes, and protecting minority investors showed a negative impact on attracting FDI (Corcoran & Gillanders, 2014; Haliti et al., 2020).

Estevão et al. (2020) evaluated the business environment and the production of wealth considering the impacts of these variables on countries. The authors examined whether the factors that make up the Doing Business score are equally important, regardless of the economic development in each country. They found that the ranking and the public policies it supports should consider regional specificities, thus refuting the idea that the design of public policies to improve the environment where businesses operate should follow a single intervention model for all regions.

For example, the Landscape for Impact Investing in West Africa — part of a series of regional markets landscape reports published by the Global Impact Investing Network (GIIN, 2015) — shows the impact Doing Business has on a country's investments. The GIIN defines impact investing as "investments made into companies, organizations, and funds to generate social and environmental impact alongside a financial return."

In this landscape report prepared for investors, the example of Nigeria stands out. Despite the country having a high investment potential, it was among the most difficult countries to operate in the world. Problems such as congested and poorly maintained infrastructure, inefficient public service and bureaucracy, and high levels of corruption hampered its growth. The country ranked 170th out of 189 countries in the World Bank's 2014 Ease of Doing Business ranking. Despite having improved from the position obtained in the year before (175th), its ranking remained poor compared to the West African average. This lackluster performance was largely driven by delays in getting electricity (an average wait of 260 days for a connection) and problems dealing with construction permits, property registration, and paying taxes.

Overall, the costs of doing business in Nigeria — both financially and in the time and effort required to operate effectively — were very high. Despite Nigeria being the largest economy in Africa, it was difficult for new investors to enter the market (GIIN, 2015).

This situation changed considerably, as observed in the Doing Business report 2019 (Mudaliar et al., 2019). The country was ranked 146th of 190 countries, with several positive aspects such as the simplification of formalities when pre-registering and registering a new business, introduction or improvement of online procedures, simplified approval process to get electricity, introduction or improvement of electronic processes to send documents for export, and reinforced border infrastructure for imports, among other regulatory changes.

DEVELOPMENT OF THE HYPOTHESIS

The revised literature suggests that the three variables, innovation, ease of doing business, and global competitiveness, deserve attention and should be analyzed together.

Some research on ease of doing business, measured by the World Bank's Ease of Doing Business score in different contexts, revealed its mediating action in the relationships between relevant variables for studies on the development of nations.

One example of this situation is the work by Kofarbai and Bambale (2016). The authors assessed the mediating role of indicators related to ease of doing business in the relationship between investment climate and foreign direct investment (FDI) as possible determinants of change in the direction of FDI from developed countries to developing countries. The study showed that ease of doing business is one of the important factors driving higher FDI inflows, just as a bad business environment raises investment constraints and substantially increases the cost of doing business. The authors recommend improvements in energy supply, vigorous fighting against corruption, tax simplification, and a good investment policy for more significant economic growth.

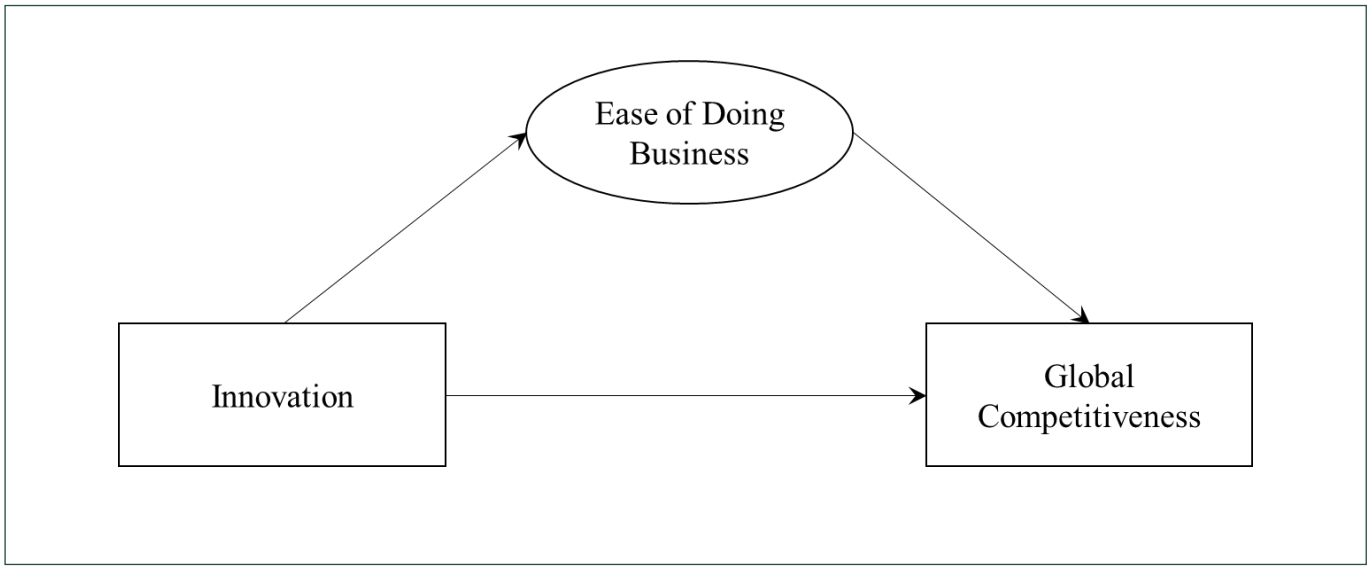
Another example is the work of Khan (2020), who investigated the mediating role of business regulations in the relationship between governance and international trade. The author found that the business regulations present in a country significantly influence its international trade, but the country's control instruments indirectly influence its international trade performance. The results showed a full mediation, in which the indirect effect of governance on international trade was observed to be mediated by trade regulations.

Considering the relationship between innovation and ease of doing business, Rensburg (2021) argues that technological innovations present challenges to legislators as they face rules and regulations that impose barriers that are sustained only for the physical environment. Technological advances make governments lose their control power provided by current legislation, forcing them to review concepts and rules to adapt them to the virtual world so that their countries continue to benefit in international business scenarios (López-Gonzalez & Ferencz, 2018; López-González & Jouanjean, 2017; Shuaib, 2020; Smirnov & Karelina, 2020).

Thus, to assess whether the ease of doing business could be an alternative path (indirect path) between innovation and competitiveness of nations, improving the understanding of the effect transfer between these two variables, the following hypothesis was developed:

H1: The Ease of Doing Business score plays a mediating effect in the relationship between innovation and global competitiveness.

The constructed hypothesis H1 is schematically represented in Figure 1.



Note. Developed by the authors

Figure 1. Theoretical model.

This model seeks to understand whether the ease of doing business works as a mediating variable in the relationship between innovation and competitiveness, affecting the way one variable influences the other. Analysis of mediation is a method applied to evidence how a factor 'A' transfers its effect to a factor 'B,' directly or through a third factor ('C') (Hayes, 2018). One of the most general formulations for a mediation hypothesis is the stimuli-organism-response (S-O-R) model of behavioral psychology. Such a formulation recognizes if an organism intervenes between stimulus and response (Baron & Kenny, 1986; Woodworth, 1926).

METHODOLOGY

This study used secondary data extracted from indicators of 141 countries inside the Global Competitiveness report (GCR) 2019, published by the World Economic Forum (WEF) (Schwab, 2019), and in the Doing Business report 2019, published by the World Bank (IBRD, 2019). From the GCR, indicators of innovation and global competitiveness of the analyzed countries were used. These indicators result from a combination of data from international organizations, academic institutions, and non-governmental organizations and information gathered by the WEF-sponsored The Executive Opinion survey. The survey is a unique global study that each year collects the opinion of approximately 15,000 business executives with the help of 150 partner institutions (Schwab, 2019).

The indicator related to the ease of doing business in each country was obtained from the Doing Business report 2019, the 16th of a series of annual reports that investigate the regulations that improve or restrict business activities, presenting quantitative indicators on business regulation and the protection

of property rights that can be compared across different economies and over time (IBRD, 2019). This report was chosen because the GCR does not offer a specific indicator related to the ease of doing business in each country. Only the countries included in the two reports were considered in the analysis.

The Doing Business report presents the Ease of Doing Business score, which is the result of a simple arithmetic mean of ten indicators related to areas that are affected by regulations, namely: starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, and resolving insolvency (IBRD, 2019). The arithmetic mean ($\bar{x}$) is perhaps the most important measure of position, but it is a measure of the data's central position, which gives all variables used in its calculation the same weight (Anderson et. al., 2013). The mean has little value if it is not accompanied by a measure of variability, such as standard deviation (SD) or variance, measures that are not present in the report. The calculation of standard deviation and coefficient of variation (CV = ratio between standard deviation and mean) for the Ease of Doing Business score existing in the report showed variability above what could be considered acceptable, for example, for countries such as Eritrea ($\bar{x}$ = 21.5; SD = 25.4; CV = 118.3%), Libya ($\bar{x}$ = 32.7; SD = 31.8; CV = 97.1%), Somalia ($\bar{x}$ = 20.0; SD = 26.0; CV = 129.6%), Timor-Leste ($\bar{x}$ = 39.7; SD = 32.7; CV = 82.4%) and Yemen ($\bar{x}$ = 30.7; SD = 30.8; CV = 100.3%), among others.

Another point to be considered is that the Kolmogorov-Smirnov test for each of the component variables of the Ease of Doing Business score showed results of normal distribution only for registering+ property, enforcing contracts, and resolving insolvency, with the others presenting a series of outliers. This fact supports the idea that using a simple arithmetic mean is not the best way to determine the Ease of Doing Business score.

While the World Bank's Ease of Doing Business score is well known and widely used to quantify and monitor the ease of doing business in a country, it has drawn much criticism for being too reliant on a one-size-fits-all approach (equal weighting) among the variables that compose it in the stage of its construction (Rogge & Archer, 2021).

Thus, it was considered more appropriate to calculate the Ease of Doing Business score using factor analysis to reduce the dimensions of the ten indicators used for a single factor. The variables definitions used in the study are shown in Table 1.

The quantitative method applied was regression analysis with the use of an IBM SPSS Statistics® 20.0 macro (PROCESS model 4) (Hayes, 2018), and confirmatory factor analysis using the IBM SPSS AMOS® 22.0.

Table 1. Variables used — Conceptual definitions.

Variable	Item	Description
Global competitiveness	-	Set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the country can achieve.
Innovation	-	Sufficient investment in research and development (R&D), especially by the private sector; the presence of high-quality scientific research institutions that can generate the basic knowledge needed to build new technologies; extensive collaboration in research and technological developments between universities and industry; and the protection of intellectual property.
Ease of doing business	Starting a business	Procedures, time, cost, and paid-in minimum capital to start a limited liability company for men and women.
	Dealing with construction permits	Procedures, time, and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system.
	Getting electricity	Procedures, time, and cost to get connected to the electrical grid, the reliability of the electricity supply, and the transparency of tariffs.
	Registering property	Procedures, time, and cost to transfer a property and the quality of the land administration system for men and women.
	Getting credit	Movable collateral laws and credit information systems.
	Protecting minority investors	Minority shareholders' rights in related-party transactions and corporate governance.
	Paying taxes	Payments, time, and total tax and contribution rate for a firm to comply with all tax regulations as well as post-filing processes.
	Trading across borders	Time and cost to export the product of comparative advantage and import auto parts.
	Enforcing contracts	Time and cost to resolve a commercial dispute and the quality of judicial processes for men and women.
	Resolving insolvency	Time, cost, outcome, and recovery rate for commercial insolvency and the strength of the legal framework for insolvency.

Note. Adapted from Schwab, K. (2019). The Global Competitiveness Report 2019. World Economic Forum. World Economic, Forum, Geneva, Switzerland. https://www.weforum.org/reports/global-competitiveness-report-2019 and International Bank for Reconstruction and Development. (2019). Doing Business 2019: Training for reform (Vol. 2). The World Bank Publication. http://documents.worldbank.org/curated/en/975621541012231575/Doing-Business-2019-Training-for-Reform

ANALYSIS AND DISCUSSION OF RESULTS

Initially, an exploratory factor analysis (EFA) of the ease of doing business component items was carried out to verify the possibility of obtaining a single factor (EDB) that represented the ten components of the index (Hair et al., 2009). Despite the premise of the existence of this factor, a premise used by the World Bank in the calculation of the index, and which would allow an immediate confirmatory factor analysis (CFA), the EFA was chosen due to the questions made concerning how the index EDB is currently calculated. The results were satisfactory (KMO = 0.908, Bartlett's sphericity test = $712.791_{(45)}$, $p < 0.001$), with factor loadings ranging from 0.580 (getting credit) to 0.798 (getting electricity) and Cronbach's alpha of 0.899.

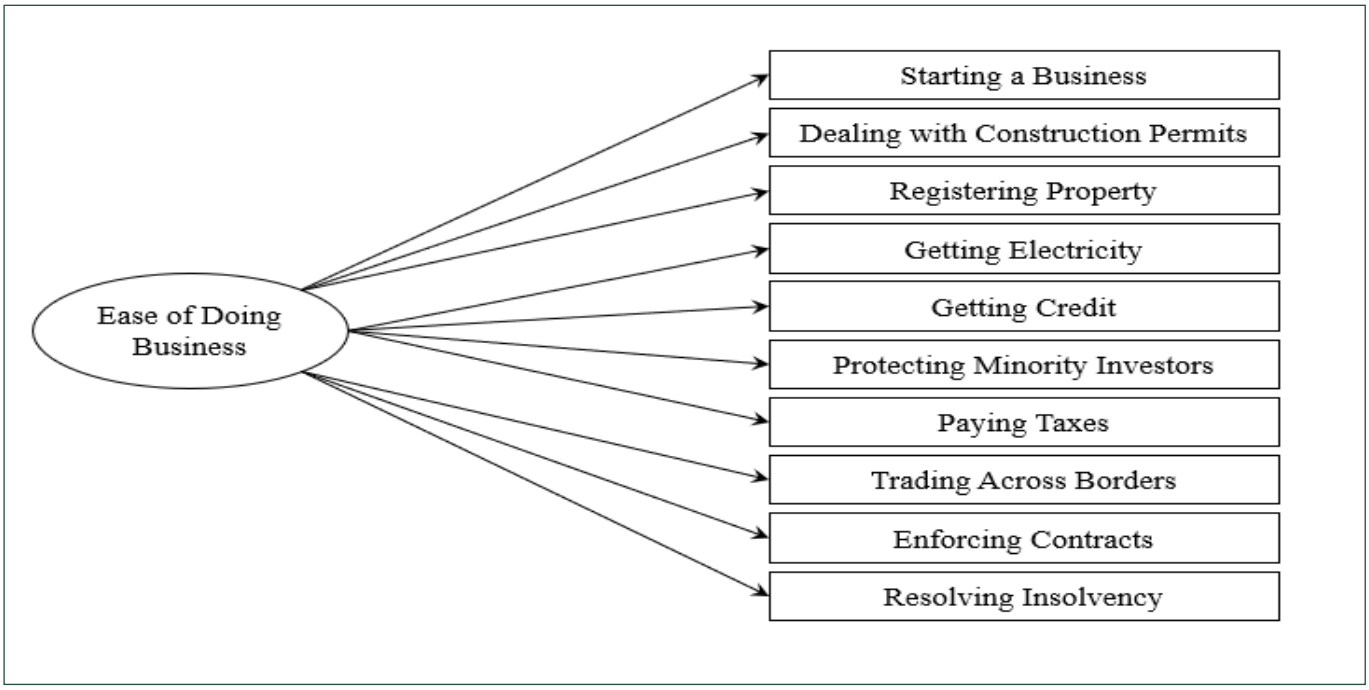
Posteriorly, confirmatory factor analysis was performed to estimate the measurement model of the ease of doing business variable using the maximum likelihood method (Byrne, 2010; Marôco, 2014).

For this variable, concerning normality, studies show that even data without a normal distribution can be acceptable as long as the univariate kurtosis (Ku) and asymmetry (Sk) measures of each item approach zero and are not superior in modules 2 and 7, respectively (Marôco, 2014). The results of the univariate normality tests, measured by the asymmetry ([-2.162 : -0.165]) and kurtosis ([-0.151 : 7.198]) parameters, indicated that only starting a business presented |Sk| > 2 and |Ku| > 7, but at levels considered acceptable, when compared to the imprecision offered by the simple arithmetic mean calculation in the Doing Business report, thus assuming that there was no extreme violation of normality (Marôco, 2014).

Corcoran and Gillanders (2014) examined the effect of a country's regulatory business environment on the amount of foreign direct investment it attracts. The authors use the World Bank's Ease of Doing Business ranking to estimate companies' costs when operating in a country. Two results stand out. First, the Doing Business ranking is highly significant when included in a standard empirical foreign direct investment (FDI) model, estimated based on the 2004-2009 data average. Second, the importance of Doing Business is driven by the ease of trading across borders, showing that the overall Doing Business score has more contributory components than others.

Therefore, Corcoran and Gillanders (2014) present what can be considered a development of studies in which a richer measure of the regulatory environment is used and the effect of the ease of international trade is separated from the general ease of doing business.

The measurement model, after evaluating the assumptions of normality, showed good goodness-of-fit indices (Byrne, 2010; Marôco, 2014), namely: $X^2 = 31.831_{(28)}$, $X^2/gl = 1.137$, GFI = 0.955, NFI= 0.957, RFI = 0.930, IFI = 0.995, TLI = 0.991, CFI = 0.994, PNFI = 0.595, RMSEA = 0.031 ([0.000 : 0.075]). The correlations found between the items of the variable were incorporated into the model, improving its fit, and not compromising the analyses performed (Byrne, 2010). Figure 2 shows the measurement model obtained.



Note. Developed by the authors.

Figure 2. Measurement model.

Table 2. Confirmatory factor analysis.

Variable	Item	Factor loadings	AVE	CR
Ease of doing business	Starting a business	0.669	0.500	0.908
	Dealing with construction permits	0.735		
	Registering property	0.721		
	Getting electricity	0.802		
	Getting credit	0.499		
	Protecting minority investors	0.687		
	Paying taxes	0.762		
	Trading across borders	0.739		
	Enforcing contracts	0.697		
	Resolving insolvency	0.715		

Note. Developed by the authors.

Table 2 presents the factor loadings of each item in the final measurement model (factorial validity). In addition, it presents the composite reliability (CR) and the average variance extracted (AVE — convergent validity).

The factor loadings of each item considered in the dimension reduction presented adequate values for the number of countries in the sample (Hair et al., 2009). The use of factor analysis allows us to assess the contribution of each component to the construction of the ease of doing business variable, unlike what is observed in the World Bank reports. It was possible to see that getting electricity, for example, is more relevant than starting a business, while getting credit is the least important item in terms of its influence on the overall Ease of Doing Business score.

These results corroborate Corcoran and Gillanders (2014), who claim that the importance of doing business is driven by the ease of trading across borders, showing that the overall Doing Business score has more contributory components than others.

The composite reliability (CR) results showed values above the recommendation (0.7), and the average variance extracted (AVE) values were also above the suggested limit (0.5) (Byrne, 2010; Marôco, 2014). Thus, the items that make up the ease of doing business variable obtained by factor analysis met the requirements of factorial validity, composite reliability, and convergent validity (Byrne, 2010; Marôco, 2014), making it valid for this study.

After the procedure described above, the factorial scores of the ease of doing business variable were extracted for use in the mediation tests.

The proposed hypothesis (H1) was tested by adopting Hayes' (2018) method: the simple mediation with bootstrapping resampling. According to the author, bootstrap resampling does not require assumptions about the sampling distribution of indirect effects and, therefore, is considered a suitable method to be used. Additionally, he argues that unstandardized coefficients are the indicated metric when referring to causal modeling results. Thus, PROCESS model 4, SPSS syntax built up by Hayes (2018), using 5,000 bootstrapping resamplings, was estimated to obtain the proposed theoretical model's total, direct, and indirect effects, and non-standardized path coefficients were used to test the hypothesis.

The innovation variable increased the ease of doing business variable (B=0.3126, SE=0.0245, t= 12.7349, $\mathbf{p}$<0.0001, R^2= 0.5385), which in turn had a positive effect on global competitiveness (B= 0.7679, SE= 0.0564, t= 13.6063, p<0.001, R^2= 0.9306) when controlling innovation. Furthermore, the indirect effect of innovation on global competitiveness, when mediated by ease of doing business, was positive (0.2401) with an interval of confidence that did not contain zero value ([0.1942 : 0.2892], bootstrapping method, 5,000 resamplings), supporting the hypothesis of mediation.

The results suggest that the relationship between innovation and global competitiveness is mediated by the ease of doing business. Despite the results showing a so-called partial mediation (Baron & Kenny, 1986), the use of the wording 'partial mediation' was rejected, following the recommendation of Preacher and Kelley (2011) and Rucker et al. (2011). Thus, this research adopted the suggestion of relative magnitude involving the total effect (direct effect + indirect effect) and the indirect effect (mediation indicator) between innovation and global competitiveness. These findings corroborate Rensburg (2021) that innovations influence the ease of doing business.

Table 3 shows the relationships using the mediating variable, following the recommendations of Pieters (2017).

Thus, the ratio involving indirect effect and total effect represents that 36.02% of the innovation

effect on global competitiveness happens through ease of doing business, showing how this variable is important in the relationship between innovation and global competitiveness. Additionally, the kappa-squared method was used to verify the indirect effect size by the magnitude of the indirect effect obtained concerning the maximum indirect effect possible (Preacher & Kelley, 2011). For this study, kappa-squared presented a value of 0.5573 (SE= 0.0309 [0.4948 : 0.6176]).

Therefore, the presence of high-quality scientific research institutions, innovation-related items such as R&D investment, and extensive collaboration in R&D between universities and businesses remain important elements in determining the level of productivity of an economy. In addition, reasonable regulations on procedures, time, and cost to connect to the electricity system, reliability of electricity supply, and transparency of fees, payments, time, total tax, and other financial obligations a company must comply with and the time and cost to export and import products and parts with comparative advantage, are fundamental for an increased effect of innovation on a country's competitiveness. The combination of all these variables influences the prosperity a nation can achieve.

Table 3. Innovation for global competitiveness — total, direct, and indirect effect.

Description	Value	Standard Error	Confidence Interval*	
			LL	UL
Total Effect (TE)	0.6664	0.0249	0.6171	0.7156
Direct Effect (DE)	0.4263	0.0240	0.3788	0.4739
Indirect Effect (IE)	0.2401	0.0238	0.1942	0.2892
IE/TE	0.3602	0.0298	0.3024	0.4192
IE/DE	0.5631	0.0742	0.4336	0.7218

Note. Developed by the authors. * Interval calculated with 95% confidence.

The statistical robustness of the mediation test was verified using the G*Power® 3.1.9.2 software, obtaining a result > 0.99 (*post hoc test*) (Faul et al., 2009; Faul et al., 2007). The presence of a mediator in the model significantly increased the coefficient of determination (R^2) from 0.8374 (without the mediator) to 0.9306 (with the mediator), indicating that ease of doing business increases the explanatory power of the relationship between innovation and global competitiveness (Hayes, 2018).

Theoretical models simulate reality in relationship studies regarding any specific phenomenon, seeking to comprehend nature's behavior (Chwif & Medina, 2014; Ford, 2010). Simple mediation models can estimate complex dynamics like the one between innovation and global competitiveness (Hayes, 2018). Therefore, results such as those found in this research stimulate discussion about the importance of reducing bureaucracy and about measuring the relationship between innovation and global competitiveness.

The results corroborate the work of López-Gonzalez and Ferencz (2018), López-González and Jouanjean (2017), Shuaib (2020), and Smirnov and Karelina (2020), which indicate the influence of innovation on the ease of doing business, a counterintuitive relationship, since less regulated environments are expected to offer more opportunities for the development of new ideas and are more conducive to innovation. Although this is true, the literature mentioned indicates that technological innovations outweigh bureaucratic barriers, being, to a certain extent, immune to them. Thus, rules and regulations for doing business can and are affected by digital technology, often needing to be changed, reversing the logic of the traditional analog relationship.

The findings indicate that ease of doing business influences the relationship between innovation and global competitiveness, with each of its components having a different effect on the variable. As shown in the factor analysis, it is legitimate to claim that the Doing Business report considers this alternative form of measurement when constructing the Ease of Doing Business score. The results revealed that depending on how this variable is constructed, the image of each country could be considered differently. For example, Table 4 shows the top ten countries with the highest score of ease of doing business, considering the existing regulations. The table displays the scores using the Doing Business methodology (simple arithmetic mean) and the methodology proposed in this work (factor analysis).

There are considerable differences between the two rankings, especially in the positions of the United States and Georgia. Thus, it should be of interest to those dealing with the Ease of Doing Business to evaluate the procedures currently adopted and search for a more reliable methodology than the simple arithmetic mean (Rogge & Archer, 2021).

Table 4. Ranking of the first ten countries — Ease of doing business vs. Factor analysis.

Ranking	Country	Ease of Doing Business*	Country	Factor Analysis*
1	New Zealand	87.00	Hong Kong SAR	54.64
2	Singapore	85.80	Singapore	54.03
3	Denmark	85.20	Denmark	53.73
4	Hong Kong SAR	85.10	Korea, Rep.	53.62
5	Korea, Rep.	84.00	New Zealand	53.57
6	United Kingdom	83.60	United Arab Emirates	52.83
7	United States	83.60	Taiwan, China	52.68
8	Georgia	83.50	Norway	52.68
9	Norway	82.90	United Kingdom	52.65
10	Sweden	82.00	Sweden	52.47

Note. Developed by the authors. * The difference between the values presented is a result of the methodology used. The important point is the ranking of countries, considering both methodologies.

The discrepancy is repeated when considering the last ten countries in the Ease of Doing Business ranking (Table 5).

As observed with the ten first countries in the ranking, some discrepancies and countries escape the list when the methodology for obtaining the Ease of Doing Business score is changed. This is important as the EDB is often used for investments made into companies, organizations, and funds to generate social and environmental impact alongside a financial return. Thus, the more accurate the calculation method, the better the decision to be taken when applying the resources.

CONCLUSIONS

The search for more favorable business environments for the development of companies has been the target of policymakers to improve the economic process. Despite difficulties related to measurement, the World Bank has used the Ease of Doing Business score (IBRD, 2020), which has guided investment in several countries.

Regarding the importance of the topic, few studies use this indicator as a competitiveness measure. This work sought to assess whether the ease of doing business can be considered as an alternative path (indirect path) between innovation and competitiveness of nations, improving the understanding of the effect transfer between these two variables.

Table 5. Ranking of the last ten countries — Ease of doing business vs. Factor analysis.

Ranking	Country	Ease of Doing Business*	Country	Factor Analysis*
132	Burundi	46.50	Cameroon	31.86
133	Cameroon	46.00	Zimbabwe	31.78
134	Gabon	44.50	Gabon	31.35
135	Bangladesh	42.50	Madagascar	30.88
136	Angola	41.20	Bangladesh	29.48
137	Haiti	37.90	Congo, Dem. Rep.	27.04
138	Chad	36.70	Haiti	26.32
139	Congo, Dem. Rep.	35.20	Chad	23.99
140	Venezuela	32.10	Yemen	20.23
141	Yemen	30.70	Venezuela	20.11

Note. Developed by the authors. * The difference in values between one methodology and another is irrelevant. The important point is the ranking of countries, considering both methodologies.

Therefore, a quantitative approach was used in this paper, making it clear that among the components of the ease of doing business variable, there are different weights, i.e., each component has different participation in the construction of this variable. The ranking proposed here reveals changes in the countries' position compared to the World Bank's ranking (which uses a simple arithmetic mean). The difference in positions can lead to a distorted analysis, affecting international investment feasibility studies. Thus, it is legitimate to suggest that the Doing Business report consider this alternative form of measurement when building the Ease of Doing Business score.

In September 2021, the World Bank released a note that corroborates the findings of this research. The World Bank recognized inconsistencies in the development of the score in its reports and revealed its concern about improving by re-evaluating methodologies and structures (The World Bank, 2021).

Given the results obtained, the Ease of Doing Business score influences the relationship between innovation and global competitiveness, playing a mediating role between these two elements. Therefore, innovation-related items remain important elements in determining a country's level of productivity. On the other hand, ease of doing business is fundamental for the increased effect of innovation on a country's competitiveness. The combination of these variables is relevant to the prosperity a nation can achieve.

In addition, the study allows the joint assessment of the three variables (innovation, ease of doing business, and competitiveness), together, in a single structural model, better representing the reality experienced by the global business environment. Thus, the results of this research encourage debate about the importance of ease in doing business — and how this variable should be measured — in the relationship between innovation and global competitiveness.

An incremental theoretical contribution is that the work subverts the common sense that defends the idea that it is always the ease of doing business that influences innovation, and the opposite effect cannot occur. In a world dominated by technological innovations, legislation and bureaucracy need to be reviewed and adapted to continue to make sense, avoiding the risk of being run over and left aside as they constitute obstacles to the competitiveness of countries.

In addition to demonstrating the importance of the Ease of Doing Business score and how it could be used more accurately by the World Bank, it is also worth noting that such an instrument can serve as a guide for governments and regulatory bodies to improve governance and the environment, facilitating the flow of local and international trade.

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