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ECONOMIC INEQUALITY AND THE PURCHASING POWER OF A COUNTRY AS PREDICTORS OF THE LEVEL OF BUSINESS INNOVATION

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Lina María Palomino Ruiz: Conceptualization, Methodology, Software,Validation, Formal analysis, Investigation, Resources, Data curation, Original, Revision and editing, Viewing, Project management. **Natália Munari Pagan**: Conceptualization, Methodology, Validation, Formal analysis, Resources, Original, Revision and editing, Viewing, Supervision, Project management. **Karina Munari Pagan**: Methodology, Validation, Resources, Revision and editing, Viewing.

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Abstract

Objective of the study: The general objective of this study is to establish the relationship between the economic inequality of a country, the purchasing power of its inhabitants and the level of innovation in companies
Methodology/approach: A factorial analysis was carried out with the countries that had the three indices simultaneously. Likely, a structural equation model was used.
Originality/Relevance: There is no consensus in the literature on the role of economic inequality in relation to innovation. Some studies present results that show that economic inequality can drive or even hamper innovation, while other studies explain the difficulties of development when there are economic gaps among citizens and low purchasing power. This study helps to understand this role and how innovation presents a model of structural equations that relates economic inequality, innovation and purchasing power of a country.
Main results: People's purchasing power positively predicts a country's level of innovation and a nation's economic inequality negatively impacts the degree of innovation.
Theoretical/methodological contributions: proposal for a model that relates economic inequality, business innovation and purchasing power of a country
Social /management contributions: the study of macroeconomic factors and their relationship with innovation allow marketing to have a vision that leads to the construction of penetration strategies and respond to specific needs in order to increase the sales success of a given product**.**

Keywords: economic inequality, purchasing power, business innovation.

La desigualdad económica y el poder adquisitivo de un país como predictores del nivel de innovación empresarial

Abstracto

Objetivo del estudio: El objetivo general de este estudio es establecer la relación entre la desigualdad económica de un país, el poder adquisitivo de sus habitantes y el nivel de innovación en las empresas.
Metodología/enfoque: Se realizó un análisis factorial con los países que tenían los tres índices simultáneamente. También, se utilizó un modelo de ecuación estructural.
Originalidad/Relevancia: No existe consenso en la literatura sobre el papel de la desigualdad económica en relación con la innovación. Algunos estudios presentan resultados que muestran que la desigualdad económica puede impulsar o incluso obstaculizar la innovación, mientras que otros estudios explican las dificultades del desarrollo cuando existen brechas económicas entre los ciudadanos y un bajo poder adquisitivo. Este estudio ayuda a comprender este papel y cómo la innovación presenta un modelo de ecuaciones estructurales que relaciona la desigualdad económica, la innovación y el poder adquisitivo de un país.
Resultados principales: El poder adquisitivo de las personas predice positivamente el nivel de innovación de un país y la desigualdad económica de una nación impacta negativamente el grado de innovación.

Palabras clave: desigualdad económica, poder adquisitivo, innovación empresarial.

A desigualdade econômica e o poder aquisitivo de um país como preditores do nível de inovação empresarial

Resumo

Objetivo do estudo: O objetivo principal deste estudo é estabelecer a relação entre a desigualdade econômica de um país, o poder aquisitivo de seus habitantes e o nível de inovação empresarial.
Metodologia/ênfoque: Foi realizada uma análise fatorial com os países que obtiveram os três índices simultaneamente. Também foi utilizado um modelo de equação estrutural.
Originalidade/Relevância: Não existe consenso na literatura sobre o papel da desigualdade econômica em relação à inovação. Alguns estudos apresentam resultados que mostram que a desigualdade econômica pode impulsionar ou até mesmo barrar a inovação, enquanto outros estudos explicam as dificuldades do desenvolvimento quando existem brechas econômicas entre os cidadãos e um baixo poder aquisitivo. Este estudo ajuda a compreender este papel e como a inovação se apresenta e para isto foi proposto um modelo de equação estrutural que relaciona a desigualdade econômica, a inovação e o poder aquisitivo de um país.
Resultados principais: O poder aquisitivo das pessoas prevê positivamente o nível de inovação de um país e a desigualdade econômica de uma nação, impactando o grau de inovação.

Palavras-chave: desigualdade econômica, poder de compra, inovação empresarial.

1 Introduction

Consumer is immersed in a changing environment that generates the need for constant transformation to adapt (Koschate-Fischer *et al*., 2018, Aggarwal, Baker, and Joshi,2024, Pagan *et al*., 2024b). In this way, customers are increasingly rigorous and demanding solutions innovative (Pagan *et al*., 2024a, Pagan *et al*., 2022). So then, the innovation process allows the creation of different and original ideas that respond to the dynamism with which the current consumer moves (Cloughton, 2020, Aggarwal, Baker, and Joshi,2024, Cina *et al*., 2024, Glaeser and Lang, 2024).

Innovation is a concept named by the economist Joseph Schumpeter in 1911, who initially conceived it as a continuous and gradual change, but later he explained that innovation can be an interrupted process and carried out in intervals (Ziemnowicz, 1942, Aggarwal, Baker, and Joshi,2024, Cinar *et al*., 2024, Glaeser and Lang, 2024). Although theoretically innovation has been defined as a concept since the 20th century, change and transformation have arisen since prehistory. Now, it is important to distinguish between creation and innovation, since the former is subjective while the latter is quantifiable (Arboniés and Ortíz, 2008, Cinar *et al*., 2024, Glaeser and Lang, 2024). Innovation is creation applied to a business and commercial purpose, which is

why many processes begin with the creation phase and obtain as a result the innovation stage that is finally monetized (Pratt, 2008, Cinar *et al*., 2024, Glaeser and Lang, 2024).

To be measurable, a scale is used to compare how innovative a country is with another (Dutta *et al*., 2020, Aggarwal, Baker, and Joshi, 2024). In this way, to measure innovation, the World Intellectual Property Organization (WIPO) carries out an annual ranking, the Global Innovation Index (GII), taking into account the following characteristics: Institutions, human capital, infrastructure, market sophistication, business knowledge, knowledge and technological results, creative results (Cornell University, INSEAD, and WIPO, 2013). This ranking has shown that in the global economy, the most innovative nations are at the same time more developed and industrialized. Oppositely, it is possible to note that the countries of Central America and Africa are the countries with the lowest degree of innovation and also with the greatest inequality in the world (Lustig, 2015, Aggarwal, Baker, and Joshi,2024, Owen and Pryce, 2024).

Inequality in a critical state can mean poverty, which in turn becomes one of the obstacles to innovation, because if the basic needs of a society are not covered, it is difficult to develop new products and services for commercialization (Thorbecke and Charumilind, 2002, Caiani *et al*., 2019, Liu, Dalton and Mukhopadhyay, 2024, Owen and Pryce, 2024, Zhao *et al*., 2024). So, it is possible to state that there is a negative relationship between inequality and innovation. In this way, the higher the inequality index of a country, the lower its innovation index (Hiltunen, 2017, Dalton and Mukhopadhyay, 2024, Zhao *et al*., 2024). Some studies indicate that, in more egalitarian societies, people would be more willing to acquire new products and services (Hatipoglu, 2012, Dalton and Mukhopadhyay, 2024, Owen and Pryce, 2024, Zhao *et al*., 2024). This relationship could be explained in part because purchasing power would be greater in countries with less inequality (Majumder, 2015, Dalton and Mukhopadhyay, 2024, Zhao *et al*., 2024).

Additionally, it has been found in the literature that a country with a low purchasing power would result in a low rate of innovation, so less good could be obtained (Cozzens and Kaplinsky, 2009, Fernández, 2020, Constant & Johnsen, 2024, Sudirjo, Bunyamin and Pahrijal, 2024). The purchasing power measures how many dollars and/or services can be purchased with the same amount of money in different countries (O'Brien and Vargas, 2017, Constant & Johnsen, 2024). In 1986, the Big Mac price index was established as a measure to understand the differences in purchasing power in different countries, since the same hamburger could have variations in prices

from country to country (Clements, 2012, Constant & Johnsen, 2024, Sudirjo, Bunyamin and Pahrijal, 2024).

If inequality and low purchasing power have a negative impact on innovation development, there are cases that contradict this premise. Such is the case of Kazajistán, a country with a low inequality index, but equally with a low innovation index (Maydirova *et al*., 2020, Eyisi, 2024, Nawaz, 2024). The case of Kazajistán contrasts with Brazil, one of the countries with the greatest inequality in the world, but at the same time one of the most innovative countries at a regional and global level (De Brito Cruz, 2010, Cortés, 2019, Nawaz, 2024).

Recent studies show that there is a positive relationship between inequality and innovation, that is to say, that a country with inequality can have a high rate of innovation (Aghion *et al*., 2019, Eyisi, 2024, Jäggi, Schetter & Schneider, 2024, Nawaz, 2024). Saint (2008) and Caiani *et al*., (2019) explain that, in unequal societies, rich people can access those new products or services, while poor people are part of the workforce. Jäggi, Schetter and Schneider (2024) showed that inequality can be influenced by innovation in the context of international competition. In addition, innovation brings with it the "spillover" effect of knowledge, which translates to the spread of knowledge, and means that more people can update their knowledge and thus receive higher salaries (Breau, 2014).

On the other hand, Bertola (2002), Farhana, and Swietlicki (2020) and Jäggi, Schetter and Schneider (2024) have studied how economic inequality makes access to innovative products massively difficult and converts them into a niche market. This happens because only people with high incomes could buy these goodies and services. In addition, it has been noted that the most egalitarian societies manage to invest in technology and Research and Development (IyD), which is finally the ingredient that allows for innovation to take place (Osório and Pinto, 2020, Nawaz, 2024).

As noted earlier, there is no consensus in the literature on the subject, which is why the present study has as its main objective to establish the relationship between the economic inequality of a country, the level of innovation in companies, and the purchasing power of its inhabitants. The problem of this study is: Can economic inequality and the purchasing power of a country be predictors of the level of business innovation?

To date, after searching scientific databases such as Google Scholar, Web of Science, Scielo and Scopus, no studies have been found that have proposed investigating economic inequality and

the purchasing power of a country as predictors of the level of business innovation in the form of a structural equation model. Some of the literature has investigated these variables in isolation. Furthermore, no studies have been found that have conducted this study using measures of the Big Mac and Gini indexes in all countries that calculate these metrics. Therefore, this study can bring important contributions to the field of study.

Thus, this study is relevant in creating a model that incorporates economic inequality, a country's purchasing power and the level of business innovation, considering the relationships between these variables.

In this way, a contribution to the market is generated by understanding how the economic and social aspects of a country can positively or negatively affect the offer of innovative products and services, which in turn allows understanding the different markets and their needs to adjust the strategies of penetration of products in different countries. Additionally, by understanding the factors that predict innovation, it is possible to generate marketing plans that facilitate or strengthen existing opportunities to overcome social and economic barriers. In this way, when studying innovation, there is the possibility of generating value and experience for consumers and, as a result, improving their quality of life.

2 Theoretical Reference Framework

Considering the objective of the present study, it is important to understand the relationship between each of its variables. In the first place, it is proposed that economic inequality be an indicator of low purchasing power, as demonstrated by Gharehgozli and Atal (2019), Dalton and Mukhopadhyay (2024), Owen and Pryce (2024), Zhao *et al*., (2024). These authors found that even though the price of a good - in this case, the hamburger Big Mac - was more expensive, egalitarian countries could acquire more items of this product than the economies with greater inequality (Atal, 2014, Dalton and Mukhopadhyay, 2024, Owen and Pryce, 2024, Zhao *et al*., 2024).

Additionally, evidence was found that purchasing power, measured by the Big Mac price index, is sensitive to changes in economic inequality indices in a country (Gelb and Diofasi, 2016). So, the logic followed by the study carried out by Almås (2012) explains how among the poorest is a country, lower are the per capita income, which eventually affects the number of benefits and

services that can be obtained. In this way, the price of the products is affected in this equation, which will have relevance later.

On the other hand, Bertola (2000) e Zhao *et al*. (2024) explain that the effect does not always occur so in some poor economies the services and products tend to be more economical, which would make them affordable and would not affect the power to acquire them. However, there is evidence that this phenomenon does not occur at all because all products and/or services of a country are not always produced in the same, indicating the need to import good (Strauss, 1995). This means that the final consumer of an unequal country must pay the same price (or sometimes more) that a person in another country would pay with more equal conditions (Picatoste, 2017, Zhao *et al*., 2024).

Table 1

Comparison of prices USA vs. Colombia

	Minimum monthly salary (COP)	Minimum monthly salary (USD)	Price per gallon of gasoline (COP)	Price per gallon of gasoline (USD)	Percentage of salary used if you buy 10 gallons of gasoline per month (%)
USA	14.400.000	3.6000	14.596	3,72	1,01
Colombia	1.000.000	254	9.372	2,39	9,37

Source: Made by the authors according to the Berry 2021 article

To illustrate the above, the case of homemade lunch and oil in Colombia will be pointed out. Currently the minimum wage is 1,000,000 pesos (254 USD) and a homemade lunch or corrientazo, as it is colloquially called, costs around 8,000 pesos (2 USD) (Leal Reyes, *et al*., 2021). The low cost of this product is mainly due to the fact that food is produced in the country and labor is cheap. However, if the case of oil is analyzed, the situation changes radically. Colombia is an oil-producing country and you would think that gasoline would be a cheap product. However, the country lacks refineries, so it sends its raw material to the United States for this process and then Colombia pays a high price to receive gasoline (Rodríguez Pinzón, 2011). Table 1 allows us to understand the difference in prices comparing by currency and it is concluded that a Colombian pays nine times more than an American proportionally, losing purchasing power

(Berry, 2021, Dalton and Mukhopadhyay, 2024, Owen and Pryce, 2024, Zhao *et al*., 2024). This is why the first hypothesis is proposed.

Hypothesis 1 - The economic inequality of a country negatively affects the purchasing power of its inhabitants

The foregoing makes sense when it is related to the study by Farhana and Swietlicki (2020) where it is explained that innovation in its most incipient period results in producing niche goods or products, as occurs in 'startups' (Felin, *et al*., 2019). This is explained because at the beginning the product and service have a price that cannot be paid by the majority of buyers and that is why these products are initially marketed as a luxury for high socioeconomic levels, especially in unequal economies.

According to the innovation curve (Grier, 2006), consumers who first consume or buy a new product or service in the market are called innovators. These consumers are classified as risky, adventurous, and explorers (Kaminski, 2011, Fernández, 2020, Constant & Johnsen, 2024, Sudirjo, Bunyamin and Pahrijal, 2024), which in turn allows us to say that innovation brings with it risk. The novelty of the product is linked to the little predictability of its behavior and its functional results, so there is uncertainty in this regard (Merton, 2013). That is why Cheng *et al*., (2008) studied how purchasing power was related to the concept of risk and its implications for innovation. This would mean that the more purchasing power a person has, the more risks they can take.

However, Acemoglu *et al*., (2012) e Sudirjo, Bunyamin and Pahrijal (2024) explain that in economies with higher poverty rates there are unmet needs, which in turn become an opportunity to promote innovation, development and the resourcefulness of entrepreneurs. However, innovation considered as a process would mean solving a problem in a constant, dynamic and not punctual and static way (Chandler *et al*., 2019, Constant & Johnsen, 2024). This means that the product or service offered by such a solution can be refined and acquire a higher value or even diversify its portfolio, offering more expensive ways to satisfy the consumer (Lakdawalla *et al*., 2015, Constant & Johnsen, 2024). The implications of this practice result in fewer people being able to purchase the product or customers purchasing the product less frequently. Thus, the second hypothesis is proposed.

Hypothesis 2 - The purchasing power of people positively predicts the level of innovation in a country

There is no consensus in the literature on the effects of inequality on innovation (Caiani *et al*., 2019, Liu, Dalton and Mukhopadhyay, 2024, Owen and Pryce, 2024, Zhao *et al*., 2024). Some authors explain that inequality can be the engine for innovation since there are social and/or functional problems that the government has not solved and motivate entrepreneurs to build different and creative solutions (Hopkin, 2014). However, foreign investment in unequal countries is considerably lower than in homogeneous economies (Sylwester, 2005). In this way, many entrepreneurs fail since they cannot find a way to finance their ideas and be able to carry them out (Lippmann *et al*., 2005).

In addition, Jacobs (2016) explains that inequality generates unemployment, which in turn becomes an opportunity, since there is labor available to undertake initiatives related to innovation. However, it is important to understand that many of the people who are available to work do not have technical education to carry out tasks or tasks related to the required processes (Parker *et al*., 2020). In this way, the innovation process is truncated or can take a longer time since it needs to train unskilled labor (Ogurtsova *et al*., 2019, Owen and Pryce, 2024).

On the other hand, the Global Innovation Index (GII) defines that there are 'inputs' which are the motor to produce innovation, such as institutions, infrastructure, business sophistication, and human and economic capital to obtain an 'output' or result that in turn, it can be measured by creativity, knowledge, and technology (Cornell University, INSEAD, and WIPO, 2013). Based on the above, the nations that invest the most in the inputs may have a greater probability of successfully generating innovation.

However, some countries do not cover the basic needs of all citizens in terms of health, housing and education (Easterly, 2007, Liu, Dalton and Mukhopadhyay, 2024, Zhao *et al*., 2024). Larrea and Kawachi (2005) studied the cases of some Latin American countries where it was seen how economic inequality was significantly related to the precarious health system and malnutrition. On the other hand, Brown (2018) explained that affordability in education could be explained by economic equity. In conclusion, if the citizens of a country have difficulty accessing basic services, it would be unthinkable to obtain more developed products. From here comes the third hypothesis.

Hypothesis 3: The economic inequality of a nation negatively impacts the degree of innovation

3 Method

This investigation is of a correlational nature and therefore quantitative, in order to understand the relationship that exists between the three concepts mentioned above. Hernandez, Fernandez and Baptista (2003) define that the purpose of correlational research is to find relationships between the variables and to be able to predict the behavior of a variable through the other in a quantitative way. Unlike experimental research, correlational research does not manipulate variables, it simply studies their relationships, but cannot control them (Aron, 2001).

In this way, a model of structural equations (SEM) was created that aims to make the regressions more flexible, so that within this same model there may be an independent variable that is also dependent (Escobedo *et al*., 2016). For example, the purchasing power can depend on the economic inequality of a country, but it can behave as an independent variable compared to the degree of innovation.

Additionally, there are two main advantages of working with the SEM. The first one is that it allows working with latent variables, it is declaring variables that are not observable, although they can be measured (Manzano, 2018). In this study, we have as a case the inequality that is not visible, but this is quantified according to the income indicators of the population and its difference between population groups. The second advantage is that the model allows defining the type and direction of the relationship through the Bootstrapping technique, which allows us to confirm whether the proposed model behaves in that direction and whether the relationship between variables is direct or indirect (Ruiz, Pardo and San Martín, 2010).

Another reason why the present study is adjusted to the use of SEM is that its application can be carried out in longitudinal studies or in time series (Díaz, 2000). This fulfills the purpose of analyzing not only the information available from last year, but also allows comparing the behavior of the variables throughout other periods of time that have sufficient information to carry out the analysis.

The data used in the regressions came from government and private company databases, which is considered secondary information. The GII database is the most recent measure of global innovation measurement. Additionally, it takes into account their input resources (inputs to

generate innovation) and output (results of the innovation process) (Cornell University, INSEAD, and WIPO, 2013). The Gini coefficient was selected as the indicator of inequality since it does not need stratification nor does it take into account the size of the distribution (Costa and Pérez, 2019). Additionally, this measure allows us to understand income inequality among the population, which may be related to purchasing power. For the latter, we choose to work with the Big Mac Index, used in The Economist magazine, because it equalizes the prices of the products and allows us to understand through the price of this hamburger how many products can be purchased in the different countries with a certain sum (Fernández, 2020).

Inequality was measured through the Gini coefficient, generating a number between zero and one, where zero is absolute equity and one represents absolute inequality (Costa and Pérez, 2019). Innovation was measured with the Global Innovation Index (GII) according to the annual ranking carried out by WIPO. Finally, purchasing power was quantified by the Big Mac index. For the last two, high indices represent a higher degree of innovation and higher purchasing power, while low indices mean low innovation and low purchasing power. When there are differences between the measurements, it is necessary to normalize the study variables. It was studied the relationship between inequality and innovation during the last 5 years in the global economy.

4 Results and Discussion

4.1 Initial data analysis and description of the sample

Of the 195 countries defined by the United Nations (2018), a total of 39 countries had defined the Gini coefficient, the innovation coefficient (GII) of the last 4 years and the Big Mac index of the last 4 years. The other countries did not have complete information.

The data of the 39 countries was standardized in order to work statistically with it. In this way, it is possible to make comparisons and relationships between different variables, since a common scale is created for the data (Chen, *et al*., 2016). In this way, the normalization formula in Excel (Eck and Waltman, 2009) is followed:

$$\frac{(x-\bar{x})}{ds} \qquad (1)$$

x = data value

$\bar{x}$ = average of the data set

ds = standard deviation of the data

Subsequently, the analysis of the outliers was carried out. It is identified that Africa and Switzerland have values that are further from the average in terms of the Gini Coefficient and Big Mac index respectively (Figure 3). These data were not removed from the analysis despite their statistical salience, since they do not affect the significance of the correlations or the normality tests (Rousseeuw & Hubert, 2010; Boyd, Docken & Ruggiero, 2016). Nor are they considered errors related to data collection, but rather cases where there is a very extreme level of inequality (Africa) and very high purchasing power (Switzerland). Thus, these outliers are worth studying and were included in the analysis performed.

Figura 3 - Outliers de variables

Source: Graph made by the author

Thus, the normality analysis was completed where George & Mallery (2010) state that the skewness and kurtosis must be in a range between -2 and 2 to prove a univariate normal distribution. As can be seen in Table 2, the values of kurtosis and asymmetry are in the range mentioned above, which indicates normality in the data.

Table 2

Kurtosis and skewness

Variable	Kurtosis	Skewness
Gini	0,68427	0,84751
GII 2021	-0,5986	0,65869
BMI 2021	0,79636	0,9648
GII 2020	-0,5368	0,64102
BMI 2020	0,71656	0,93305
GII 2019	-0,5847	0,73584
BMI 2019	0,81014	0,82517
GII 2018	-0,0617	0,66258
BMI 2018	0,04414	0,6449

Source: Analysis made by the author

However, the Jarque Bera normality test that takes kurtosis and asymmetry into account (Thadewald and Büning, 2007) was completed to corroborate the aforementioned. In this way, the test is carried out in Excel, taking into account that the program calculates the excess kurtosis, so it does not use the original formula where 3 units are subtracted from the kurtosis (Mantalos, 2011).

$$JB = \frac{n}{6}\left(S^2 + \frac{K^2}{4}\right) \qquad (2)$$

n = Number of observations or degrees of freedom

S = Skewness

K = Kurtosis

According to Table 3, it is possible to test normality by obtaining the P value, which is the result of the chi-square distribution of the result of the Jarque Bera test with 2 degrees of normality

(Mbah and Paothong, 2015). Thus, when the value of P is greater than 0.05, it can be accepted that the data are normal (Mantalos, 2010).

Table 3

Jarque Bera value and P value

Variable	JB test	P value
Gini	4,901645	0,086223
GII 2021	3,739644	0,154151
BMI 2021	4,530896	0,103784
GII 2020	3,766307	0,15211
BMI 2020	4,080344	0,130006
GII 2019	4,274254	0,117993
BMI 2019	3,404611	0,182263
GII 2018	3,279642	0,194015
BMI 2018	2,671973	0,262899

Source: Analysis made by the author

4.2 Measurement model

First, the factor loadings in the second order factor analysis were examined to understand if the observable variables are related to the latent variable. Vinzi *et al*. (2010) explain that charges above 0.70 are considered acceptable, therefore, it is possible to affirm that inequality is measured by the Gini coefficient with a correlation of 1. When purchasing power is analyzed, it is evident that the indices of the Big Mac of the years 2018 (load = 0.91), 2019 (load = 0.92), 2020 (load = 0.96) and 2021 (load = 0.96) are highly related. Similarly, the innovation presented through the Global Innovation Indices (GII) for the years 2018 (load = 0.97), 2019 (load = 0.97), 2020 (load = 0.99) and 2021 (load = 0.96) thus achieving a high correlation (Table 4).

Table 4

Factor loadings

	Inequality	Purchasing power	Innovation
Gini	1		
BMI 2018		0,96	
BMI 2019		0,96	
BMI 2020		0,92	
BMI 2021		0,91	
GII 2018			0,96
GII 2019			0,99
GII 2020			0,97
GII 2021			0,97

Source: Analysis made by the author

To determine the reliability and validity of the model, tests are carried out for compound reliability, convergent validity, and discriminant validity.

In this way, the composite or construct reliability test was executed with Cronbach's Alpha. Aron (2001) and Jöreskog (1971) explain that a Cronbach's Alpha with values greater than 0.80 is considered quite high. As evidenced in Table 5, both constructs turn out to be high (Inequality with Cronbach's Alpha = 1.00, Innovation with Cronbach's Alpha = 0.98, and Purchasing power with Cronbach's Alpha = 0.96). However, according to Reidl (2013) internal reliability means that the measurements of the variables are consistent. For this research, reliability is explained because each one uses the same scale year after year to measure the respective construct.

Table 5

Construct Reliability

Construct	Cronbach's Alpha	Convergent validity	Compound reliability
Inequality	1,00	1,00	1,00
Innovation	0,98	0,95	0,98
Purchasing power	0,95	0,88	0,96

Source: Analysis made by the author

To demonstrate construct validity, it is important to talk about convergent and discriminant validity. In this way, it must be shown that the constructs are convergent, which means that they are correlated; and in turn must be discriminant, that is, they do not overlap (Savickas *et al*., 2002).

Regarding the first, Convergent validity, Hair *et al*. (2006) state that values greater than 0.50 show that the constructs are related to each other. The results of this research show a high convergence validity (Inequality = 1.00, Innovation = 0.95 and Purchasing Power = 0.88).

On the other hand, in terms of discriminant validity, the process recommended by Fornell and Larcker (1981) is followed, where the Pearson correlation matrix is taken and the highest correlation value is replaced by the square root of convergent validity. Subsequently, it is validated that the lower correlations are lower than the roots (Ringle *et al*., 2014), as happens in Table 6, thus resulting in the existence of discriminant validity in the data of the present study.

Table 6

Discriminant validity

	Gini	Innovation	Purchasing power
Gini	1		
Innovation	-0,38	0,97	
Purchasing power	-0,16	0,66	0,94

Source: Analysis made by the author

Therefore, the measurement model has validity and reliability.

4.3 Structural model

The model is reflective and contains latent variables (inequality, innovation and purchasing power) and observable variables (measurements made from 2018 to 2021 for each index). Table 7 presents the measures of the structural model in relation to the variables analyzed. It is possible to verify that hypotheses 2 and 3 were confirmed while hypothesis 1 was not. Table 8 presents the beta of the model variables' links.

Table 7

Student's t test

	Average (M)	Standard deviation (SD)	T value	P value
Hypothesis 1	-0,150	0,153	1,058	0,291
Hypothesis 2	0,599	0,108	5,714	0,000
Hypothesis 3	-0,295	0,096	2,963	0,003

Source: Analysis made by the author

Table 8

Structural model relationships

	Gini	Innovation	Purchasing power
Gini		-0,38	
Innovation			0,66
Purchasing power	-0,16		

Source: Analysis made by the author

To find out how accurate the model is, we proceeded to analyze the value of R2, understanding that values close to 1 mean that the variables explain the model well and values close to 0 show a model that is hardly explained by the proposed variables (Miles, 2005). Hair *et al*. (2013) considers that a model with an R2 value higher than 0.70 is considered strong, values close to 0.50 as moderate and values lower than 0.25 are considered weak. The R2 values found were R2 = 0.02 for purchasing power and R2 = 0.51 for innovation, indicating good measures in social sciences.

In search of a model that improves its "fit", adjusted R2 is evaluated, which seeks to increase the precision of the correlations. In this way, purchasing power reported an adjusted r2 = 0.00 and innovation reported an adjusted R 2 = 0.48. According to Karch and van Ravenzwaaij (2020) it is normal for the adjusted R2 to be less than the R2.

On the other hand, the predictive validity was studied with the Stone-Geisser or Q2 indicator. In this way, the "Bindfolding" technique was applied in SmartPLS, which reuses the samples and makes a forecast with the original values, with a distance of 7 given by default, understanding that this distance must be between 5 and 12 (Hair *et al*., 2017). Ringle (2014) explains that Q2 must be greater than zero for the latent variable to predict the relationship with the indicators, while Chin (2010) explains that values less than 0.02 will have low predictive

relevance, 0.15 will have a medium relevance and 0.3 a high relevance. According to the above, the predictive relevance of the innovation variable was high Q2 = 0.46 and low predictive relevance of purchasing power with Q2 = 0.02.

Finally, the value of F2 was analyzed to identify the size of the effect in the understanding that values less than 0.02 are low, 0.15 medium and 0.35 high (Cohen, 1988). Hence, the results obtained show a low effect between inequality and purchasing power (0.02), a medium effect between inequality and innovation (0.16) and a high effect between purchasing power and innovation (0 .75).

Table 8 shows the statistics that allow us to measure the fit of the model. The first measurement is the Standardized Root Mean Square Residual (SRMR), which measures the difference between the empirical correlation matrix (Table 10) and the model's implicit estimated correlation matrix (Table 11) (Martinez and Ferro, 2018). For the SRMR, it is recommended that its value be less than 0.10 and the closer it is to zero, the closer it is to having a perfect fit (Ringle and Becker, 2015; Hair *et al*., 2017). For the present investigation, the result showed an optimal value, since Byrne (2008) explains that values close to 0.05 are acceptable for a model. Additionally, the RMSEA is not especially effective in samples of less than 200, as is the case with this sample, and it is recommended to use the SRMR to understand the covariance (Jordan, 2021).

Regarding the 'Normed Fixed index' or better known as NFI, Fábregas, *et al*. (2018) explain how this index compares the model in question against a null model in order to calculate the fit of the model. Thus, the NFI values must be greater than 0.90 (Bentle and Bonnett, 1980; Ringle and Becker, 2015). In the present study, the NFI value did not reach 0.90, but it is close (Table 9).

Table 9

Model fit analysis

	Saturated model	Estimated model
SRMR	0,05	0,05
NFI	0,86	0,86

Source: Analysis made by the author

Table 10

Empirical correlation matrix

	BMI 2020	BMI 2021	GII 2020	BMI 2018	BMI 2019	GII 2018	GII 2021	GII 2019	Gini
BMI 2020	1,000	0,727	0,579	0,850	0,903	0,566	0,491	0,593	-0,290
BMI 2021	0,727	1,000	0,637	0,868	0,821	0,623	0,664	0,647	-0,111
GII 2020	0,579	0,637	1,000	0,674	0,580	0,904	0,931	0,983	-0,355
BMI 2018	0,850	0,868	0,674	1,000	0,909	0,622	0,626	0,671	-0,077
BMI 2019	0,903	0,821	0,580	0,909	1,000	0,552	0,550	0,581	-0,135
GII 2018	0,566	0,623	0,904	0,622	0,552	1,000	0,917	0,926	-0,393
GII 2021	0,491	0,664	0,931	0,626	0,550	0,917	1,000	0,952	-0,370
GII 2019	0,593	0,647	0,983	0,671	0,581	0,926	0,952	1,000	-0,376
Gini	-0,290	-0,111	-0,355	-0,077	-0,135	-0,393	-0,370	-0,376	1,000

Source: Done by the author

Tabla 11

Model Implicit Estimated Correlation Matrix

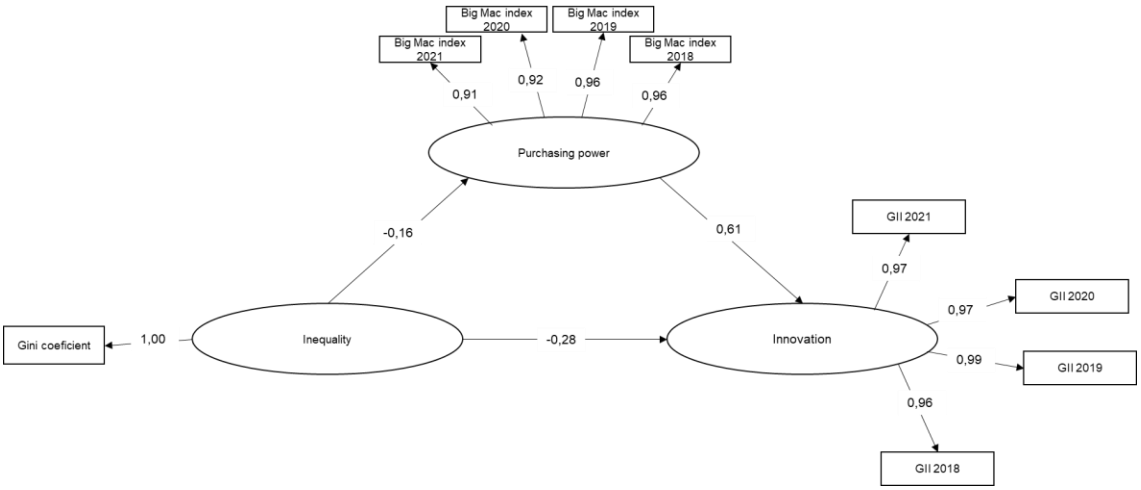
	BMI 2020	BMI 2021	GII 2020	BMI 2018	BMI 2019	GII 2018	GII 2021	GII 2019	Gini
BMI 2020	1	0,8405	0,5961	0,8902	0,8884	0,5845	0,5927	0,6026	-0,148
BMI 2021	0,8405	1	0,5891	0,8798	0,8779	0,5776	0,5857	0,5955	-0,147
GII 2020	0,5961	0,5891	1	0,6239	0,6226	0,9397	0,9529	0,9688	-0,374
BMI 2018	0,8902	0,8798	0,623	1	0,9298	0,6118	0,6203	0,6307	-0,1557
BMI 2019	0,8884	0,8779	0,6226	0,9298	1	0,6105	0,6191	0,6294	-0,1554
GII 2018	0,5845	0,5776	0,9397	0,6118	0,6105	1	0,9343	0,9499	-0,3672
GII 2021	0,5927	0,5857	0,9529	0,6203	0,6191	0,9343	1	0,9633	-0,3724
GII 2019	0,602662	0,595587	0,968883	0,630777	0,62948	0,949976	0,963321	1	-0,37865
Gini	-0,1488	-0,1470	-0,3745	-0,1557	-0,1554	-0,3672	-0,3724	-0,3786	1

Source: Done by the author

Finally, the model (Figure 4) is obtained with its relationships, which allows us to understand the relationship between the different variables.

Figure 4

Analysis SEM



Source: Done by the author

5 Discussion

Hypothesis 1 (A country's economic inequality negatively affects its inhabitants' purchasing power) was not confirmed (p-value = 0.291, t = 1.058). This result contradicts part of the literature where this effect was verified (Berry, 2021, Dalton and Mukhopadhyay, 2024, Owen and Pryce, 2024, Zhao *et al*., 2024). Although these studies show that a country's economic inequality negatively affects its inhabitants' purchasing power, it is important to highlight the context analyzed. A country's economic inequality may not have a negative effect on its inhabitants' purchasing power in the case of specific economic segments, where there may be a salary increase in the sector, which leads to an increase in the purchasing power of that sector.

Hypothesis 2 (People's purchasing power positively predicts a country's level of innovation) was confirmed (p-value = 0.000, T = 5.714). This result corroborates the literature (Kaminski, 2011, Fernández, 2020, Constant & Johnsen, 2024, Sudirjo, Bunyamin and Pahrijal, 2024). Therefore, the higher the purchasing power of people, the more likely a country is to innovate. This can motivate companies to develop new products to differentiate themselves from the competition, therefore, increasing the level of business innovation.

Although many economies with low purchasing power promote an innovative attitude, the development cycle is very short, since without investment it is difficult for companies or initiatives to sustain themselves in the long term (Zayas-Márquez and López, 2022). Additionally, there are

authors who affirm that innovation is executed in an ecosystem where different actors intervene (for example, universities, industry, government, among others) and add their efforts to achieve successful innovation (Jiang, 2022).

Hypothesis 3 (A nation's economic inequality negatively impacts the degree of innovation) was confirmed (p-value = 0.003, T = 2.963) indicating that a nation's economic inequality negatively impacts the degree of innovation of a country. This result is in line with the studies by Caiani *et al*., (2019), Liu, Dalton and Mukhopadhyay, (2024), Owen and Pryce (2024), Zhao *et al*., (2024) who observed the same finding. In fact, the more economic inequality a country has, the less innovation the country develops. This can be explained by the lack of financial resources for the development of innovation, which can be allocated to social issues.

Crime, the educational deficit, the precariousness of the health system and political problems are other consequences of social inequality that also become obstacles to innovation because if the basic needs of a society are not covered it is difficult to develop new products and services for commercialization (Thorbecke and Charumilind, 2002; Caiani *et al*., 2019, Zhao *et al*., 2024).

Conclusions

The objective of this study was to understand the relationship between inequality and purchasing power in innovation. This objective was met and hypotheses 2 and 3 of the research were confirmed, however, it was not possible to confirm hypothesis 1. Thus, it was seen that people's purchasing power positively predicts a country's level of innovation and A nation's economic inequality negatively impacts the degree of innovation. It was not seen that a country's economic inequality negatively affects its inhabitants' purchasing power. These results bring important practical, theoretical and social implications; while purchasing power directly influences the level of business innovation, economic inequality negatively impacts the degree of innovation. Based on this knowledge, public policies, government incentives and central bank actions could be developed in the country to combat economic inequality and improve purchasing power.

In relation to theory, this study is important, as it integrated a model based on the relationship of these three variables, a subject that has not yet been found in the main scientific databases (Google Scholar, Web of Science, Scielo, Scopus, among others). About society, it is

shown how macroeconomic measures such as purchasing power and economic inequality influence business innovation

6.1 Limitations

By exposing the limitations of this study, it is intended to point out the opportunities that future researchers can take in order to compare and adjust the data and enrich the literature on innovation and inequality.

Thus, the results of this study show that a large part of the countries with high levels of inequality are in Southeast Asia and Latin America. However, these two areas base their economy mainly on informality (Benito, 2021), which complicates the measurement of income according to the Gini coefficient, since it only includes formal income (Manero, 2017).

Additionally, the Gini coefficient has a bias in the size of the sample, since when there are small nations the Gini coefficient tends to be low, but it does not necessarily mean that they are egalitarian countries (Deltas, 2003). Another limitation with this measurement explains that the income measured by Gini is relative and not absolute (Van de Ven, 2001), which means that two countries can have the same coefficient, even though their income is distributed unequally, as explained by Chitiga *et al*. (2014). Thus, this study can function as a starting point for it to be replicated with other indices that measure inequality, such as the Atkinson coefficient, and thus achieve a comparison that allows evidence of the model that best fits the reality of the economy of the nations.

Another limitation of the study is related to the availability of data. This refers to the fact that not all the countries had the data for the three indices studied, and finally when the information of the countries that had the three variables was crossed, only 39 of them had the complete data. In other words, only 19.8% of the economies have the indices of inequality, innovation and purchasing power simultaneously. Thus, a call is made to the different institutions that carry out these measurements and to the governments to expand their horizons in terms of measurement, which probably allows a more detailed follow-up, which in turn allows understanding the impact of the different economic policies on the population.

However, compared to the purchasing power indicator in this research, the Big Mac Index was used, which has had some criticism that is important to expose in this section. Although

McDonald's is a well-known restaurant chain, not all countries have branches (Bates, 2013; Jošić *et al*., 2018). This means that this index does not allow a measurement of purchasing power in 100% of nations. Another of the limitations of this indicator refers to its price variability in the same country; In other words, the price of Big Mc may be higher in Amsterdam compared to other cities in the Netherlands, because some cities are highly touristic (Loveridge, & Paredes, 2018). In their sharing, Jošić *et al* (2018) expose how other factors such as taxes, the production price, the importation of products and even transport prices have an impact on the final price of the hamburger, which generates disparity across the board. when defining it as a global purchasing power index.

In conclusion, it is possible to show that the purchasing power of a nation is related to its innovation initiatives. In other words, the more income a population has, the easier it is to develop new products and services, since its inhabitants have the capital to be able to access them. Thus, it is possible to show how marketing must understand both the microenvironment and the macro forces before entering any market.

6.2 Suggestions for future studies

Future studies could carry out this study including other variables that may influence innovation such as investment in research and development, government policies to support innovation, technological infrastructure, education and qualification, among others.

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