

## Corporate governance and performance: evidence from the Klabin case (2002-2020)

### Governança corporativa e desempenho: evidências do caso Klabin (2002-2020)

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#### ABSTRACT

This article analyzed the relationship between the corporate governance developed by Klabin S/A and the economic, operational and value performances revealed in the period from 2002 to 2020. First, we identified that corporate governance in Brazil is an incipient topic and that, therefore, it brings difficulties in the task of precisely correlating the development of a company's corporate governance system with the performance levels in question, even though a certain reasonableness was achieved in the  $R^2$  values obtained through the econometric models selected to describe the aforementioned relationships. Specifically, the econometric models explained, on average, 55% of the variation in ROE, 74% of the variation in EBITDA, and 26% of the variation in Tobin's Q, providing a concise quantitative gauge of explanatory power. It is also observed that, although the company adopted good corporate governance practices with the aim of ensuring investor confidence in its future, these initiatives remained, to a large extent, subordinated to the decisions of the controlling family. This context allowed Klabin S/A to present clear signs of both entrenchment and alignment, reflecting the characteristic challenges of companies under family control.

**Keywords:** business groups; family business; paper and cellulose; corporate management

**JEL Code:** G3; L25; L73; M21

#### RESUMO

Este artigo analisou a relação entre a governança corporativa desenvolvida pela Klabin S/A e os desempenhos econômico, operacional e de valor revelados no período de 2002 a 2020. Primeiramente, identificou-se que a governança corporativa no Brasil é um tema incipiente e que, portanto, traz dificuldades na tarefa de correlacionar precisamente o desenvolvimento do sistema de governança corporativa de uma empresa com os níveis de desempenho em ques-

tão, ainda que tenha sido alcançada certa razoabilidade nos valores de  $R^2$  obtidos por meio dos modelos econométricos selecionados para descrever as relações supracitadas. Especificamente, os modelos econométricos explicaram, em média, 55% da variação do ROE, 74% da variação do EBITDA e 26% da variação do Q de Tobin, fornecendo uma medida quantitativa concisa de poder explicativo. Observa-se também que, embora a empresa tenha adotado boas práticas de governança corporativa com o objetivo de assegurar a confiança dos investidores em seu futuro, essas iniciativas permaneceram, em grande medida, subordinadas às decisões da família controladora. Esse contexto permitiu que a Klabin S/A apresentasse sinais claros de entrenchamento e alinhamento, refletindo os desafios característicos de empresas sob controle familiar.

**Palavras-chave:** grupos econômicos; empresa familiar; papel e celulose; gestão corporativa.

**Código JEL:** G3; L25; L73; M2

## 1. INTRODUCTION

The main objective of this paper is to analyze the relationship between corporate governance practices and the economic, operational and value creation performance of Klabin S/A, from 2002 to 2020.

The choice of Klabin as a case study is based on the importance attributed to the relationship between the corporate governance index (IGOV) and financial performance — especially measured by indicators such as ROE (Return on Equity), Tobin's Q and EBITDA — in light of some strategic, structural and historical reasons that will be mentioned throughout this text. Klabin is a family-controlled company, but it adheres to more modern governance practices and is listed on the B3 Novo Mercado, therefore requiring a high standard of corporate governance. Thus, the company ends up placing itself in a position of transition and tension between traditional practices and more open and transparent governance models. In addition, its trajectory has the potential to reveal how family businesses can or cannot generate value through the adoption of good governance practices.

It is worth mentioning that Klabin, 100 Anos (1999), Marcovitch (2005), Cony and Lamarão (2015) and Margalho (2017) developed research on Klabin, emphasizing the role played by members of the Klabin-Lafer family during the company's growth phases, the specificities involving family and professional management methods, in addition to the projects that allowed Klabin to consolidate itself as a global company. The relationship between corporate governance and business performance, on the other hand, was part of numerous studies that sought to establish results, mainly at the sectoral level. Among the most important we can highlight: Klapper and Love (2004), Silveira and Barros (2008), Ferreira et al. (2013), Catapan and Colauto (2014), De Almeida et al. (2018) and Dutra et al. (2018), among other nationally and internationally recognized authors. However, it is important to emphasize that the methodologies used in these studies are distinct from each other, which leads to divergent results.

It is believed that this study contributes to studies of corporate history, since it seeks to examine, based on the methodology used, the relationship between governance and corporate financial performance of one of the most important economic groups in Brazil.

In general terms, it is worth noting that Klabin began its history in Brazil more than 130 years ago, when Maurício Freeman Klabin created his own company, M. F. Klabin and Brother, in 1890. The company was governed directly by family management until the end of the 1970s. At the beginning of the following decade, the company established a new corporate control dynamic, implementing professional management that, in accordance with sustainability criteria, sought strategies to diversify products and activities, implement new technologies, expand throughout the country and enter the international market without generating risks to its own organizational integrity. This process was associated with the development of the company's governance system, the best results of which were obtaining "level 1" of corporate governance by the Commodities and Futures Exchange (BM&FBOVESPA) in 2002 and "level 2" in 2014. In 2021, the company currently produced 2.1 million tons of paper and 1.6 million tons of market pulp per year (Klabin Annual Report 2021).

## 2. DISCUSSION AND METHOD

Klabin started its activities in 1890 and was run by the first generation of the Klabin-Lafer family until 1923. During this first managerial stage, the founder of the company, Maurício Klabin, was responsible for most of the administrative decisions, until gradually, his sons and nephews began to take control of the family business between the second half of the

1920s and the end of the 1970s, thus consolidating two more generations at the head of the company. During the development of the family succession process at Klabin, Wolff Klabin, Horácio Lafer, Samuel Klabin, Horácio Klabin, Jacob Klabin and Abraão Jacob Lafer stood out. The administrative competence and influence of these administrators in the Brazilian political and business environment allowed the realization of important projects between 1899 and 1979, among them: the formation of Klabin Irmãos e Cia. in 1899, the creation of Companhia de Produção de Papel (CFP) in 1909, whose expansion model was adopted until 1930, the foundation of Companhia Notroquímica (CNB) between 1935 and 1937, the formation of Klabin do Paraná IKPC, considered until then the largest paper manufacturer in Latin America and the inauguration of the Corrugated Cardboard in the Northeast (Ponsa) (KLABIN, 1999). Since 1980, however, during the transition phase between the third and fourth family generations, Klabin would undergo an administrative restructuring based on the implementation of professional management, in which Daniel Miguel Klabin, Armando Klabin, the sisters Sylvia Lafer and Graziela Lafer, in addition to Vera Lafer, Lilia Klabin, Celso Lafer and Horácio Lafer would become members of the Board of Directors and participate in the hiring process of external directors, responsible, from then on, for supporting expansion projects, managing resources and general operations, and consolidating a better communication between the Board of Directors and the operational sector.

It is important to emphasize, however, that the process of professionalization at Klabin was not only developed by virtue of hiring external managers to execute activities previously undertaken exclusively by family members, but also by the formation of control systems over the hiring and training of human resources and by financial control capable of promoting a positive effect on the main performance indicators of the companies analyzed. For Dekker et al. (2015), implemented simultaneously, these factors contribute to the good performance of organizations.

Between the early 1980s and the beginning of the 2000s, Klabin sought to maintain a continuous growth. The company's large share of the market for disposable products, corrugated boxes, packaging paper, pulp, newsprint and printing paper, bags and envelopes, involved a new dynamic of corporate control established by professional management in the face of strategies directed at diversifying products and activities, implementing new technologies, territorial expansion and international insertion, where other projects were consolidated until 2004, including: the launch of kraft paper stretch kraft paper on the market for the manufacture of multilayer bags (1980), through Celucat, a subsidiary of PCC, Klabin began producing multiwall sacks for packaging cement, chemical products and feed in general (1981), the subscription, by Klabin Packaging, of a capital increase of Cr\$ 428 million, which was directed to the construction of a new corrugated cardboard factory in Piracicaba-SP (1980-1983), start of production at Klabin's new pulp mill in Paraná, producing pulp for the manufacture of kraftliner paper (1988), formation of a joint venture with the companies Lenzing AG and the International Finance Corporation (IFC), constituting Bacell, in Camaçari (BA) for the production of soluble cellulose (1992-1994).

Between 2002 and 2003, Klabin adhered to level 1 of corporate governance of BOVESPA. Klabin's volume of foreign currency debt went from 74% in 2001 to 34% of total indebtedness in 2002, after a debenture issue in the amount of R\$ 1,036 million. In 2004, the financial control and metrics used for wealth generation started to take into considerations: Net Debt/EBITDA less than 1.5; Net Debt/Total Capitalization maximum of 35% and return on investments above the company's cost of capital (WACC) (Klabin Annual Reports, 1980 to 2003).

Among the mentioned projects, an important element related to the implementation of professional management at Klabin stands out, and which refers to the development of the corporate governance system adopted by the company, the focus of this study. Although

gradually and without reaching, between 2002 and 2020, what Dekker et al. (2015) understand as solid governance practices, Klabin's management sought to strengthen the organization through the formation of institutions such as assemblies, committees and councils, whose main objectives are to reconcile family and business interests and maintain a healthy and promising relationship between the board of directors, investors and all other interested agents (stakeholders).

The improvement in Klabin's results, based on its gradual process of developing corporate governance, allowed the company to reach "level 1" of corporate governance on the BM&FBOVESPA in 2002 and "level 2" in 2014. Klabin reached "Level I" of corporate governance of the Brazilian Stock Exchange because it has committed to improvements in terms of reporting and shareholding dispersion. In this sense, the company adopted governance practices such as the circulation of shares corresponding to 25% of the capital (Free Float of 25%) and the public offering of shares to promote the dispersion of capital, as well as seeking to improve the disclosure of quarterly information. Certainly, Klabin reached level 1 of corporate governance by collaborating with the information made available through the communication instruments with the market. However, this does not mean that all important information was easily viewed or disclosed, such as information on related party agreements (RTPs) or the existence of shareholder agreements and stock option programs.

As for the achievement of level 2 of corporate governance of BM&FBOVESPA in 2014, Klabin complied with other requirements such as the availability of the annual balance sheet following international accounting standards, the approval of Units' issue, which refers to a package of classes of assets made up of common and preferred shares, subscription warrants, among other assets, traded in lots or units. In the case of Klabin, the Units were composed of 1 common share and 4 preferred shares, listed at level 2 of BM&FBovespa (Info-Money, 2013), in addition to the approval of the replacement of advantages, which is attributed to the preferred shares, aiming for a "Tag Along" of 100%<sup>1</sup> (Klabin Annual Report, 2014). In this context, it should be noted that although the company may claim that its choices in terms of governance practices complied with the requirements of the Brazilian Stock Exchange in terms of "optional," "no specific rules," "in accordance with legislation," and "mandatory," it must be admitted that, when it comes to governance, going beyond the rules required by BM&FBOVESPA represented - and still represents - a differential that has certainly come to be observed by investors. Given these specificities, we highlight some of the main projects consolidated by Klabin before and after reaching "Level 2" of governance on the Brazilian stock exchange in 2014, they are: increase in production capacity at its plant located in Telemaco Borba-PR, which have gone from 700 thousand tons/year to 1.1 million tons/year in 2005, inauguration the Expansion Project MA - 1100, in the Monte Alegre Plant-PR, Klabin's shares are now traded in BM&FBOVESPA's "Level 2 of Corporate Governance" in 2014. Inauguration of the Puma Unit, in Paraná, with a production capacity of 1.5 million tons of pulp in 2016, Inauguration of the first Technical School of Forestry Operation in Brazil, in a total area of 37 thousand m<sup>2</sup> located in Ortigueira-PR in 2020 (Klabin Annual Reports, 2008 to 2020).

We consider that building an integrated relationship between corporate governance and business performance does not go through ready-made recipes and formulas. Klapper and Love (2004); Silveira and Barros (2008), Brazilian Institute of Corporate Governance (IBGC) (2009) and Almeida et al. (2018) mention that efficient corporate management can be achieved by the implementation of good corporate governance practices that allow reducing conflicts and promoting greater interaction and satisfaction among stakeholders, considering

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<sup>1</sup>Tag Along guarantees that the buyer of the controlling shareholders' shares makes a public offer to the minority shareholders for the full amount paid for the shares for the *Novo Mercado* type governance level.

an internal management control system formed by bodies such as the board of directors, the external auditing and the supervisory board, thus supporting the managers charged with achieving goals and better results in terms of business performance.

Merchant and Stede (2007) understand that the relationship between good governance and efficient corporate management depends on mechanisms that operate to create value for company owners, in addition to meeting stakeholder expectations.

Therefore, it is considered that there is no established definition of the meaning and scope of the term corporate governance, perhaps due to the multiplicity of issues involved and the relatively recent interest in the subject. And still, the achievement of good corporate governance depends on the control exercised by senior management, which becomes responsible for actions aimed at maximizing the company's value. Merchant and Stede (2007) considers that the control exercised by corporate management to achieve good governance is, in general, developed by regulatory agencies, boards of directors and external auditors. The Organization for Economic Cooperation and Development (OECD), interested in spreading the adoption of good corporate governance practices as an important tool for achieving efficient business management, defines corporate governance as a mechanism capable of promoting sustainable growth through a set of existing relationships among executives, boards of directors, shareholders, and other agents, so that all can jointly enjoy the benefits achieved through improved business performance (OECD, 2004).

The Brazilian Institute of Corporate Governance (IBGC) (2009) describes corporate governance as a system by which organizations are directed, monitored and encouraged, involving relationships among owners, board of directors, management and control bodies in order to preserve and optimize the organization's value, in addition to facilitating its access to resources, which contributes to its longevity. And, for the Securities and Exchange Commission (SEC), corporate governance "is the set of practices that aims to optimize the performance of a company by protecting all stakeholders, such as investors, employees, and creditors, facilitating access to capital" (Securities and Exchange Commission (SEC), 2002, 1). Thus, we observe that all explanations about the relationship between corporate governance and corporate performance have one point in common, that is, they consider that the adoption of good governance practices by corporate management will affect the interests and, therefore, the decisions made by stakeholders who value the involvement and commitment of regulators, boards of directors, external and internal auditors to the enforcement of the respective practices.

Within this perspective, Catapan and Colauto (2014) and De Almeida et al. (2018) investigated the relationship between corporate governance and business performance, assuming that the adoption of good corporate governance practices reduces the possibility of expropriation of the firm's resources by internal agents (managers or controlling shareholders), given that resources may finally be applied more efficiently, improving financial performance and increasing the firm's cash flow. On the other hand, Ferreira et al. (2013), De Almeida et al. (2018) and Dutra et al. (2018) sought to investigate the same relationship from the investments made, by using metrics of economic, operational and value character from the calculations on the indicators ROE, Return on Assets (ROA), Tobin's Q, Capital Expenditure (CAPEX) and EBITDA<sup>2</sup>.

In terms of results, Ferreira et al. (2013) analyzed the relationship between governance and performance for 104 Brazilian companies for the biennium 2007 and 2009 and concluded that these companies presented lower levels of performance from the ROE, when compared from the indicators of value known as Tobin's Q and ROA. Catapan and Colauto (2014), on

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<sup>2</sup>The concepts and methods of analysis assigned to the indicators ROE, EBITDA, Tobin's Q and CAPEX may be found in Ross, Westerfield and Bradford (2013).

the other hand, sought to observe the degree of correlation between governance and economic-financial performance of 111 Brazilian companies listed on BOVESPA in the three-year period 2010-2012. 2. Based on a governance checklist proposed by Leal et al. (2005) and related to the ROA, ROE, Tobin's Q and EBITDA indicators, it is observed that there is a high degree of correlation between what was defined as the governance index (GOVINDEX) and the business performance of the companies analyzed, measured only by the Tobin's Q and ROA indicators.

Almeida et al. (2018), using a sample of 30 companies from the construction and engineering subsector for the year 2013, concluded that, in general, the levels of adherence to governance practices related to the dimensions "board of directors", "conflicts of interest" and "shareholder rights and "moderate transparency", were able to directly influence the business performance of the analyzed subsector, according to the results analyzed in relation to ROE, ROA and Tobin's Q indicators.

Dutra et al. (2018) studied the relationship between governance and corporate performance by analyzing investments in Brazilian companies through Tobin's Q for the period between March 2010 and December 2015. A point to be highlighted regarding the methodology used, concerns the relationship observed between Tobin's Q metrics and CAPEX. The use of panel data analysis with threshold led the authors to conclude that the behavior of Tobin's Q in relation to CAPEX is positive, indicating that an increase in Tobin's Q, as a proxy for new investments, causes an increase in CAPEX, as well as a reduction in Tobin's Q results in a reduction in this indicator. That is, according to the authors, these two metrics are directly related, and it is then possible to identify different impacts of Tobin's Q on investments, measured by the CAPEX proxy.

In sum, Dutra et al. (2018) adopted an alternative proposal to determine the relationship between corporate governance, represented by the Igov index, and corporate performance measured by Tobin's Q or CAPEX value. Finally, the results presented by Dutra et al. (2018, 1) evidenced that the model with four distinct regimes is more "suitable than the linear model, and the Tobin's Q coefficients in the first three regimes are significant and positive, however, in the fourth regime, the coefficient is not significant." It is worth mentioning that this methodological choice is not consensual in the specialized literature, which criticizes this proposal of identification between governance and value performance, mainly due to the inconsistencies in terms of results that the chosen method may present. In this case, one should take into account, for example, the fact that accounting rules may cause distortions in the recording of CAPEX, since, in some cases, investments are accounted for as costing expenses. In addition, it may also be that some models used to explain the approximation between CAPEX and Tobin's Q may be failing to consider some capital expenditures that should be incorporated into CAPEX.

Based on table 1., let us now look at a summary table that highlights the consensus, gaps and controversies that result from the relationships between corporate governance and family business performance based on the Tobin's Q, EBTIDA and ROE indicators, referring, of course, to the period delimited for this research:

**Table 1. Critical synthesis highlighting consensus, gaps and controversies on the relationship between performance and corporate governance in family businesses**

Aspect	Consensus	Controversies	Researchs
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Governance and Tobin's Q	Adoption of good governance practices tends to have a positive impact on market valuation (Tobin's Q).	Some studies indicate that Tobin's Q may be influenced more by market expectations than by internal governance in family businesses.	Villalonga and Amit (2006); Anderson and Reeb (2003).
Governance and ROE (Return on Equity)	More structured governance tends to improve resource allocation and reduce agency conflicts, favoring an increase in ROE.	ROE can be elevated by short-term decisions that sacrifice long-term value, even in formal governance contexts.	Chrisman et al. (2005); Miller and Le Breton-Miller (2006).
Governance and EBITDA	The implementation of active and independent boards is associated with greater operational efficiency and better EBITDA.	Some studies do not identify a direct relationship between EBITDA and the presence of boards, suggesting that family culture may have greater weight in certain contexts.	Gallo (2004); García-Ramos and García-Olalla (2011).
<b>Complementarities</b>	<b>Consensus</b>	<b>Controversies</b>	<b>Researchs</b>
Family Participation	It contributes positively when balanced with professional governance.	Excessive centralization can limit innovation and generate conflicts.	Astrachan et. al (2002); Corbetta and Salvato (2004).
Succession	Succession planning improves performance and stakeholder confidence.	Unprepared family succession can cause significant losses in performance.	Cabrera-Suárez, M. K., De Saá-Pérez, P. and García-Almeida, D. (2001); Sharma, P., Chrisman, J. J. and Chua, J. H. (2003).
Formalization of Governance	Adoption of councils, audits and statutes strengthens performance.	Formalization without a culture of governance can be ineffective.	Monks; Mino and Nell. (2011) and Tricker (2015).
Professionalization of Management	Companies with external managers and independence on the board have better indicators.	Resistance to professionalization can affect financial indicators, even with a formal structure.	Bhagat and Bolton (2008); Bertrand and Schoar (2003).

**Fonte:** own elaboration based on the aforementioned authors.

Based on a case study, this research was considered quantitative since it uses a methodology based on numbers, metrics and statistical calculations to describe the relationship between the corporate governance developed by Klabin S/A, defined as from the construction of the corporate governance index (Igov), and the corporate performance indicators ROE, Tobin's Q and EBITDA, for the period from 2002 to 2020. It should also be considered a as descriptive research as it promotes a theoretical review about its object of study, besides proposing an analysis of the information extracted from the primary data contained in the company's annual reports and bylaws.

It is important to highlight that the database used to construct the variables, especially those related to corporate governance indices, was manually collected from 2002 onward. This adds value to the study, as it evaluates the company over an extended period. However, if we were to go further back (before 2002), the lack of informational disclosure and accounting reporting standards could introduce sample biases. Additionally, if we were to collect data

on a quarterly basis, there would be insufficient information for calculating corporate governance variables.

The 19-year period coincides with the time interval in which Klabin achieved levels 1 and 2 of governance of BM&FBOVESPA. The model chosen to describe the relationships established in this period was:

$$Performance_t = \beta_0 + \beta_1 GOVINDEX_t + Controls_t + \varepsilon_t$$

The explanatory variable defined by the Igov index was established based on the use of four dimensions associated with the quality of governance, namely: access to information, informational content, structure of the company's board of directors and ownership and control structure. It is worth noting that, in this case, the good governance practices suggested in the manuals and codes made available by the (IBGC) and the (SEC) were taken into consideration. So, based on the four aforementioned dimensions, answers were sought to the 20 dichotomous questions provided in table (2), in order to understand the quality of corporate governance adopted by Klabin between 2002 and 2020, thus defining the Igov index. Each question revealed a "yes" or "no" answer. When "yes", the assigned value was equal to "1". When "no", the value assigned to the answer was equal to 0. The Igov index (GOVINDEX) was then represented by the sum of the points for each question, the maximum value of which could not, of course, exceed 20 points. The dimensions of the Igov index (GOVINDEX) were established simply for presentation purposes, and there was no weighting among questions.

Table (3), meanwhile, presents the dependent variables which should be considered here as measures of corporate performance during the period of time established for this research. The primary data, needed to complete this stage of the work, had among its main sources the consolidated profit and loss statements (P&L) and balance sheets extracted from Klabin's Annual Reports (ARs) at the end of each fiscal year during the period from 2002 to 2020. To collect this data, support was provided by the Klabin Memorial Center, located at Av. Augusta Zorzi Baradel, 700 Tijuco Preto, Jundiaí-SP. The DIVEXT-SEC External Disclosure System and the websites [institutoassaf.com.br](http://institutoassaf.com.br), [fundamentus.com](http://fundamentus.com), [portal.fgv.com](http://portal.fgv.com), [ipeadata.gov.br](http://ipeadata.gov.br) and [seriesestatisticas.ibge.gov.br](http://seriesestatisticas.ibge.gov.br), helped in obtaining complementary data that were also important for this research.

**Table 2. Corporate governance quality under four dimensions and the twenty questions that contributed to the Index (Igov)**

Corporate Governance Dimensions	Questions (GOVINDEX)	Selection Criteria
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<p><b>Information Access</b></p>	<ol style="list-style-type: none"> <li>1. Is it possible to obtain the company's Annual Report via the Internet?</li> <li>2. Does the website have documents related to corporate governance?</li> <li>3. Does the website have presentations for analysts or data to enable the company's operational and financial projections?</li> <li>4. Is the website bilingual and does it have an investor relations section?</li> <li>5. Was there no need to contact the company directly to obtain information about the company?</li> </ol>	<ol style="list-style-type: none"> <li>1. Allows investors to analyze the Company more easily.</li> <li>2. Reveals whether the investor can understand the company's corporate governance model without having direct contact with representatives from the company.</li> <li>3. It presents information about operational and financial strategies, in addition to information about Profit and Loss Statements (P&amp;L) and Annual Reports (ARs).</li> <li>4. This is an important factor in attracting foreign funds.</li> <li>5. The need for direct contact with the company's representative is considered a negative aspect due to the greater time spent and financial costs assumed by investors.</li> </ol>
<p><b>Content of the Public Information</b></p>	<ol style="list-style-type: none"> <li>6. Do Annual Reports (ARs) include a specific section dedicated to the implementation of corporate governance principles?</li> <li>7. Do Annual Reports (ARs) or some other document explain global executive compensation?</li> <li>8. Are the statements presented in conformity with internationally accepted accounting principles?</li> <li>9. Do Annual Reports (ARs), the Website or other corporate document include earnings estimates or projections of financial returns, such as ROA, ROE?</li> <li>10. Do Annual Reports (ARs), the Website or other corporate document include the value added or destroyed by the business in relation to the analyzed periods and based on economic profit measures?</li> </ol>	<ol style="list-style-type: none"> <li>6. The corporate governance information contained in the Annual Reports (ARs) contributes to the investors' decision-making process.</li> <li>7. Executive compensation, indicated by the overall amount paid in the report (IAN), is considered one of the main corporate governance mechanisms.</li> <li>8. Financial statements in accordance with internationally accepted accounting principles are considered good corporate governance practice.</li> <li>9. It is important that the investor has a perspective on the company's performance for decision making.</li> <li>10. Presenting in the Annual Reports (ARs) the information about the value added or destroyed by the business is considered as a good corporate governance practice.</li> </ol>
<p><b>Board of Directors Structure</b></p>	<ol style="list-style-type: none"> <li>11. Are the positions of CEO and chairman of the board of directors held by different people?</li> <li>12. Does the company have a board of directors composed of 5 to 9 members?</li> <li>13. Is the percentage of outside directors on the board of directors higher than the</li> </ol>	<ol style="list-style-type: none"> <li>11. According to the codes of good corporate governance practices recommended by the IBGC and SEC, it is recommended that different people occupy the positions of executive management and of chairman of the board of directors of the company.</li> </ol>

	<p>sample median?</p> <p><b>14.</b> Does the board of directors have a unified one-year term?</p> <p><b>15.</b> Does the company have a shareholders' agreement?</p>	<p><b>12.</b> The new version of the IBGC code (2009) recommends that the board of directors have a minimum of 5 and a maximum of 11 members.</p> <p><b>13.</b> The governance codes of the IBGC and SEC recommend that the board of directors be composed of a majority of external members.</p> <p><b>14.</b> This is what the codes of good corporate governance practices of the IBGC and SEC recommend.</p> <p><b>15.</b> The presence of the shareholders' agreement may increase the potential for expropriation of minority shareholders.</p>
<p><b>Ownership and Control Structure</b></p>	<p><b>16.</b> Does the company issue only nominal common shares?</p> <p><b>17.</b> Do the preferred shares correspond to less than 50% of the total issued shares?</p> <p><b>18.</b> Is the percentage of nominal common shares held by the controlling shareholders lower than 70%?</p> <p><b>19.</b> Is there no difference between the control rights and the rights over the cash flows of the controllers?</p> <p><b>20.</b> Does the company grant "Tag Along" to the holders of preferred shares?</p>	<p><b>16.</b> The issuance of voting shares is recommended by the IBGC and SEC corporate governance codes.</p> <p><b>17.</b> This proportion was established by law 10.303/01.</p> <p><b>18.</b> It is assumed that 70% represents a strong concentration of voting shares and a fundamental characteristic to observe the level of corporate governance of Brazilian public companies.</p> <p><b>19.</b> The greater the difference between control rights and rights over cash flows held by controlling shareholders, the greater the expropriation of minority shareholders.</p> <p><b>20.</b> The Tag Along concession is seen as a good corporate governance practice by the IBGC and SEC codes.</p>

Source: Authors' elaboration based on IBGC (2009) and De Almeida et al. (2018).

**Table 3 - dependent variables**

<p>ROE - Performance Indicator (economic)</p>	<p>Net profit / Average Net Equity</p>
<p>* Tobin's Q (Performance Indicator (value))</p>	<p><math>(\text{Market value of equity} + \text{Book value of assets} - \text{Book value of equity}) / \text{Book value of assets}</math></p>
<p>(EBITDA) Performance Indicator (operational)</p>	<p>Earnings before Interest, Taxes, Depreciation, Amortization / Total Assets</p>

**Source:** Authors' elaboration (2021)

\*Note: Note: it is considered that the calculation of Tobin's Q, as originally proposed, is difficult because the market value of debts and the replacement value of assets are not directly observed. Thus, to calculate Tobin's Q, this research considered the possible approximations used to calculate this performance indicator, thus following the methodology adopted by Fauver and Naranjo (2010).

Besides the corporate governance index (GOVINDEX) as an explanatory variable, and the dependent variables, other variables (control variables) were considered, which we believe may also influence the relationship between corporate governance and business performance in the context of Klabin S/A. Among these variables are those suggested by Bastos, Nakamura and Basso (2009, 76), since, according to them: "macroeconomic and institutional factors can no longer be disregarded to explain the behavior of companies". Thus, we chose to incorporate into the econometric models established here the annual inflation measured by IGPM and the values associated with the Gross Domestic Product Real ( $GDP_{(Real)}$ ) for the period from 2002 to 2020. The other variables used were company size (COMPOSITE), indebtedness (NETDEBT) and current liquidity (CURRLIQ), the latter being defined as one of the company's liquidity control variables for the period concerned.

When choosing the variable (COMPOSITE), it was taken into consideration the interpretations released by De Moura et al. (2020). According to these authors, this variable may influence the performance of large companies, since they have greater ability to generate cash and exploit economies of scale, and thus, they may be more effective in protecting their shares than smaller companies. On the other hand, the variable (NETDEBT) was established because it is believed that it implies a disciplining effect, capable of contributing to the improvement of the company's performance. De Moura et al. (2020) also mention that higher levels of indebtedness may be related to higher corporate performance. The choice of current liquidity (CURRLIQ) as a control variable, on the other hand, is in line with the opinion of Arrighetti et al. (2014) and De Moura et al. (2020), that this type of variable should influence the firm's performance from obtaining new assets linked to ventures that may generate higher revenues. Table (4) contains the descriptions of the control variables used to improve the statistical quality of the models used:

**Table 4. Control Variables**

Size	(COMPOSITE) - Measured by Total Assets (TA)
Net Debt	(NETDEBT) - Measured by Gross Debt minus Cash
Liquidity Assets	(CURRLIQ) - Measured by Current Liquidity: Current Assets (CA) over Current Liabilities (CL).
Annual Inflation	(IGP-M)
Gross Domestic Product <sub>(real)</sub>	( $GDP_{(Real)}$ )

**Source:** Original research data.

The "ordinary least squares" (OLS) estimation method, frequently used in multiple linear regression, was introduced here to explain the relationship between corporate governance and performance (economic, operational and value) at Klabin S/A during the period from 2002 to 2020. In order to reduce the possible problems with heteroscedasticity and with the amplitude of the data, thus making the estimates less sensitive to extreme observations, three econometric models described below were used as:

$$(ROE)_t = \beta_0 + \beta_1(GOVINDEX)_t + \beta_2LN(COMPOSITE)_t + \beta_3LN(NETDEBT)_t + \beta_4LN(CURRLIQ)_t + \beta_5(IGPM)_t + \beta_6Ln(GPD)_t + \varepsilon_t$$

$$(Tobin's Q)_t = \beta_0 + \beta_1(GOVINDEX)_t + \beta_2LN(COMPOSITE)_t + \beta_3LN(NETDEBT)_t + \beta_4LN(CURRLIQ)_t + \beta_5(IGPM)_t + \beta_6Ln(GPD)_t + \varepsilon_t$$

$$(EBITDA)_t = \beta_0 + \beta_1(GOVINDEX)_t + \beta_2LN(COMPOSITE)_t + \beta_3LN(NETDEBT)_t + \beta_4LN(CURRLIQ)_t + \beta_5(IGPM)_t + \beta_6Ln(GPD)_t + \varepsilon_t$$

Where:

**The subscript (t):** refers to the time period;

**ROE<sub>t</sub>:** represents the economic performance indicator;

**TOBIN'S Q:** represents the proxy indicator for firm value;

**EBITDA<sub>t</sub>:** represents the proxy indicator of operational performance;

**GOVINDEXT:** represents the corporate governance index Igov achieved by Klabin S/A between 2002 and 2020;

**LN(COMPOSITE)<sub>t</sub>:** represents the size of the company;

**LN(NETDEBT)<sub>t</sub>:** represents the total debt of the company;

**LN(CURRLIQ)<sub>t</sub>:** represents a liquidity asset (current liquidity);

**IGPM<sub>t</sub>:** Annual inflation measured by the general price index;

**LN(GDP<sub>(Real)</sub><sub>t</sub>):** gross domestic product (base year = 2002);

**ε<sub>t</sub>:** error term.

It is worth emphasizing the usefulness of directional hypotheses in many empirical designs. However, in this single, longitudinal case study, we deliberately opted for an exploratory approach guided by a research question rather than formal hypothetical deductions. This decision follows the methodological tradition of explanatory case studies (Yin, 2018; Eisenhardt, 1989), in which the analytical logic rests on the iterative confrontation between evidence and theoretical framework. Therefore, we preferred to maintain the focus on the central question—"What is the relationship between corporate governance and Klabin's economic and financial performance?"—and to explore this relationship through three complementary performance proxies (ROE, EBITDA, and Tobin's Q). This strategy allows us to: (i) capture accounting, operational, and market value dimensions; (ii) verify the consistency of the  $\beta_1$ (GOVINDEXT) coefficient without inflating the number of tests; and (iii) deepen the qualitative discussion of the underlying mechanisms. Finally, by highlighting the theoretical and econometric reasons presented, the article maintained methodological coherence while clarifying to the reader the rationale behind the absence of formal hypotheses.

### 3. ANALYSIS OF RESULTS

Table (5) presents the descriptive statistics of Klabin's corporate governance index (GOVINDEX) for the period analyzed. The results were established based on the measures of central tendency and the dispersion associated with the respective index:

**Table 5. Descriptive statistics**

<b>Klabin Index (Igov) (2002-2020)</b>	
<b>Average</b>	0,5305556
<b>Median</b>	0,5500000
<b>Mode</b>	0,5500000
<b>Standard Deviation</b>	0,0546079
<b>No. Observations</b>	19
<b>Reliability level (95.0%)</b>	0,0271559

Source: Authors' elaboration.

The average of Klabin's (GOVINDEX) index between 2002 and 2020 was 0.53 with a standard deviation of 0.054. This average was obtained by dividing the number of questions with "yes" answers in relation to the 20 dichotomous questions presented in the table (see table 4). Bearing this in mind, it was possible to infer that, on average, Klabin obtained 10.6 (53 percent) "yes" answers and 9.4 (47 percent) "no" answers, with 95 percent confidence that the averages found were those that, in fact, should have been established.

Table (6) presents a statistical summary in which the quality of the governance index (GOVINDEX) may be verified based on the four dimensions considered: the access to information, the content of public information, the board of directors' structure and the ownership and control structure. It can be demonstrated that the dimensions regarding the access to information and the structure of the board of directors were those which contributed most to explaining the quality of corporate governance adopted by Klabin between 2002 and 2020.

**Table 6. Descriptive statistics by dimension of the index (Igov) Klabin (2002-2020)**

<b>Statistical Summary</b>	<b>Information Access</b>	<b>Content of the Public Information</b>	<b>Board of Directors Structure</b>	<b>Ownership and Control Structure</b>
<b>Average</b>	0,877778	0,322222	0,800000	0,1333333
<b>Median</b>	0,800000	0,400000	0,800000	0,2000000
<b>Mode</b>	0,800000	0,400000	0,800000	0,2000000
<b>Standard Deviation</b>	0,100326	0,100326	2,28E-16	0,0970143
<b>Sample</b>	19	19	19	19
<b>Reliability Level (95.0%)</b>	0,049891	0,049891	1,136E-16	0,0482441

Source: Authors' elaboration.

Concerning the access to information, the average of 0.87 referring to the "yes" answers explained that of the 5 questions formulated for this dimension, 4.35 of them were answered "yes". In this case, it can be stated that Klabin facilitated access to the available information concerning the operational and financial projections, without the need for direct contact with the company, even though we may consider that the company failed to present,

in a more extensive manner, the content of information considered crucial for investors' decision-making.

About the dimension associated with the board of directors' structure, the average reached was 0.80, i.e., among the 5 questions asked within this dimension, 4.0 obtained "yes" answers. These results may be explained by the company's attempt to follow the codes of good governance practices suggested by the IBGC and SEC, by allowing external managers to occupy management positions or by establishing the one-year term for the members of the board of directors, which also included the participation of external members.

Within the four dimensions that define Klabin's governance quality between 2002 and 2020, two of them, the content of available public information and the ownership and control structure, were the ones that least collaborated to the Igov index score. Regarding the content of public information, this dimension presented as average the value of 0.32, that is, 1.6 "yes" answers among the 5 questions formulated through this dimension.

These results lead us to believe that the content of information made available by Klabin from 2002 on, did not promote a better understanding of, for example, the estimates of profits and projections of financial returns such as ROE and ROA, or of the values added or destroyed by the business over a given period of time. A more detailed approach to these contents would provide a better basis for investors' decision-making, even if one takes into account the fact that the content of some of the key information on business performance might only have been presented from 2014 on, when the company had already been prepared to achieve BM&FBOVESPA's level 2 corporate governance.

The average achieved to explain the level of governance based on the dimension related to the ownership and control structure was the lowest among 4 established dimensions, that is, 0.13. In this case, among the 5 questions asked, 0.65 presented a "yes" answer. These values reveal, for example, that Klabin did not issue only shares (ON), and the issues of shares (PN), without voting rights, corresponded to more than 50% of the total shares issued, thus inhibiting the adoption of the codes of good corporate governance practices suggested by the IBGC and SEC. Furthermore, the information contained in the annual reports does not clarify, definitively, whether there were differences between the rights of control and the rights over the cash flows of the controlling shareholders. Finally, even though Klabin offered "Tag Along" in relation to (ON) and (PN) shares, thus trying to make all investors aware of significant changes in the companies due to the adoption of good governance practices - since this seems to be an aspect which tends to increase the investor confidence and the alignment between majority and minority shareholders. However, Klabin only did so with a 100% guarantee after 2013, according to information extracted from the Annual Reports (2002 to 2013).

Table 7. shows the results of the multiple regression analyses used to verify the relationship between Klabin's corporate governance measured by the Igov corporate governance index and economic, operational and value performance, measured by the Return on Equity (ROE), Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) and Tobin's Q indicators between 2002 and 2020. The choice of N=19 (therefore: N<30) is conditioned on three points: a) awareness: the theme "corporate governance" has gained strength in Brazil since 1998. In 1999, the Brazilian Institute of Corporate Governance (IBGC) published the first Brazilian Code of Best Corporate Governance Practices, and the discussions on corporate governance based on this publication. In 2000, the World Bank and McKinsey consultancy indicated that investors would be willing to pay a substantial premium for shares in companies with greater transparency and accountability (Silveira and Barros, 2008); b) the first most significant results from the development of governance practices by Klabin in 2002 are translated by the achievement of level 1 governance of the Brazilian Stock Exchange; c) the continuity of the process of developing governance practices at Klabin prepared the com-

pany to achieve level 2 governance of BM&FBOVESPA in 2014. Currently, the company has been working to reach the level defined as "Novo Mercado".

**Table 7. Klabin and the regression results for ROE, EBITDA and Q-Tobin as dependent variables (2002-2020)**

Variables	ROE				EBITDA				Q-Tobin			
	<b>GOVINDEX</b>	-15,18 [0,10]	-18,44 [0,03]	-23,01 [0,06]	-20,11 [0,07]	-85,3 [0,81]	37,9 [0,90]	425,6 [0,34]	335,1 [0,42]	-0,16 [0,13]	-0,15 [0,17]	-0,19 [0,17]
<b>COMPSIZE</b>	54,10 [0,05]	43,08 [0,07]	13,19 [0,78]	34,08 [0,44]	1.146 [0,27]	1.564 [0,11]	3.817 [0,04]	3.166 [0,08]	0,42 [0,16]	0,44 [0,16]	0,22 [0,68]	0,13 [0,8]
<b>NETDEBT</b>	-31,09 [0,01]	-19,55 [0,09]	-27,84 [0,03]	-19,32 [0,11]	151,4 [0,74]	-286,2 [0,53]	-61,4 [0,89]	-326,9 [0,47]	-0,14 [0,30]	-0,17 [0,27]	-0,12 [0,39]	-0,16 [0,31]
<b>CURRLIQ</b>	0,86 [0,91]	-3,15 [0,65]	-0,60 [0,94]	-3,31 [0,65]	127,4 [0,69]	279,4 [0,34]	222,9 [0,46]	307,2 [0,30]	0,10 [0,26]	0,11 [0,24]	0,10 [0,31]	0,11 [0,28]
<b>IGPM</b>		-188,29 [0,02]		-179,67 [0,06]		7.139 [0,04]		5.603 [0,12]		0,48 [0,65]		0,78 [0,51]
<b>GPD<sub>(Real)</sub></b>			71,28 [0,31]	16,56 [0,80]			-4.654 [0,09]	-2.948 [0,28]			0,34 [0,67]	0,57 [0,53]
<b>Constant</b>	-466,12 [0,10]	-319,33 [0,20]	-813,37 [0,07]	-406,71 [0,36]	-17.660 [0,12]	-23.226 [0,03]	5.015 [0,75]	-7.668 [0,65]	-2,93 [0,35]	-3,31 [0,32]	-4,58 [0,37]	-6,33 [0,29]
<b>N</b>	19,00	19,00	19,00	19,00	19	19	19	19	19,00	19,00	19,00	19,00
<b>r<sup>2</sup></b>	0,46	0,63	0,50	0,63	0,67	0,76	0,74	0,79	0,24	0,26	0,25	0,28
<b>F</b>	2,97	4,43	2,61	3,43	7,17	8,40	7,35	7,36	1,12	0,89	0,88	0,78
<b>Breusch-Pagan/Cook-Weisberg test for heteroscedasticity</b>												
Chi <sup>2</sup>	0,55	1,48	1,32	0,94	2,56	0,87	0,96	0,37	0,15	0,03	0,14	0,00
Prob > Chi <sup>2</sup>	0,46	0,22	0,25	0,33	0,11	0,35	0,33	0,54	0,70	0,86	0,70	0,96
<b>VIF Statistics</b>												
Mean VIF	7,99	7,31	26,60	25,10	7,99	7,31	26,60	25,10	7,99	7,31	26,60	25,10
<b>Durbin-Watson</b>												
d-statistic	2,320	2,619	2,349	2,614	0,293	1,016	0,804	1,308	2,469	2,585	2,371	2,492

Source: Authors' elaboration based on the identical results generated by the software used.

Table (7) presents the results for the Adjusted R<sup>2</sup>, the F-test statistics, and the p-value relative to the regressions made from the established econometric models. Aiming to provide robustness and consistency in the estimations performed, the proposed models were estimated with four different forms: the first without inflation and GDP, the second and third, alternating with inflation and GDP, and the fourth form with the complete model, considering all variables proposed by the study. Based on the sample used, it is observed that ROE showed a negative and statistically significant relationship at 10 percent, while EBITDA and Tobin's Q showed no statistically significant relationships at 10 percent, 5 percent or 1 percent. The F-tests determine a statistically significant relationship for ROE and EBITDA, since the values associated with p-values of the F-tests were less than their significance levels. In this case, the values assigned to the R<sup>2</sup> of these two business performance indicators were significantly different from zero. On the other hand, it is noted that the results presented in relation to Tobin's Q are not, in this sense, satisfactory.

It is considered that, in general, the models present moderate explanatory power, with a total average of 55.5 percent related to the economic performance measure and the value of 74 percent related to the average EBITDA operating performance, thus justifying the choice of explanatory variables.

The negative and statistically negative relationship between the GOVINDEIX and ROE presented in this study diverges from the results found in some papers that have sought to investigate this same relationship. In this case, one must take into account the specificities involving the methodological aspects established for each research conducted. Brown and Caylor (2004), for example, verified a positive relationship between the corporate governance index and the ROE performance indicator. However, it should be understood that unlike our proposal, the methodology established by Brown and Caylor (2004) relied on the analysis of 2,327 companies belonging to several sectors of the US economy and 51 variables to demonstrate the positive and statistically significant relationship between governance and ROE. Furthermore, we admit that companies belonging to the North American market had, and still have, a more advanced governance process. Inclusively, both Brown and Caylor (2004) and Dekker (2015) consider that companies that have a developing governance process and allow the formation of costs arising from the delay in decision-making and other costs from a larger management structure, are less profitable, thus presenting a lower return on equity (ROE).

In this perspective, we explain the negative and statistically significant relationship between GOVINDEIX and ROE found in this study and that is in line with the results found by Catapan and Colauto (2014) who also presented results on this same relationship regarding several Brazilian companies with shares traded in BM&FBovespa between the years 2001 and 2012. To some extent, our result regarding the relationship between the (GOVINDEIX) index and ROE is also close to the result presented by Dami (2006), since the author accepts the fact that there is no positive relationship and with statistical significance between corporate governance mechanisms, control and ownership structure variables, and ROE.

The absence of statistical significance we found when estimating the relationship between the GOVINDEIX index and the EBITDA indicator, followed a trend previously established in the studies of Brown and Caylor (2004), Ferreira et al. (2013) and Catapan and Colauto (2014). It is important to consider that the decision to comply with the corporate governance standards considered by the IBGC and SEC involves expenses, such as the unprecedented adoption of internal auditing practices that, consequently, will depend on hiring specialized labor capable of defining the best work methodology. Costs which the management sometimes intends not to bear. It is also worth noting that, in certain cases, the costs of participating in corporate governance segments may be greater than the benefits of the ability to generate greater operating cash flow by the manager involved in the planning and execution of projects.

The absence of statistical significance between GOVINDEIX and Tobin's Q presented in this study is in line with the result established in the study of Ferreira et al. (2013), although the authors have not used control variables to verify how this relationship occurred within the companies listed in BM&FBovespa. In fact, the authors verified a lower market value regarding companies listed in BM&FBovespa compared to those not listed. On the other hand, the result we present, based on this relationship, diverges from the results found in Black, Carvalho and Sampaio (2014) and Dutra et al. (2018). In this case, we draw attention once again to the methodological aspects of each research. To present the positive relationship between governance and Tobin's Q, Black, Carvalho and Sampaio (2014) considered some governance attributes that differ from those we used in this research. For example, while we focus our analysis on a case study in which the analyzed company strives to implement governance practices that would allow it to reach corporate governance levels 1 and 2 of BM&FBovespa, between the years of 2002 and 2020, Black, Carvalho and Sampaio (2014)

seek to construct a corporate governance index and relate it to the company's value Tobin's Q based on a comparison of the following factors: (a) growth of companies that achieved *Novo Mercado* certification and Level 2 certification; (b) improvements on governance practices to achieve *Novo Mercado* company certification and Level 2 corporate governance certification.

The divergence from the result attributed in the study of Dutra et al. (2018) refers to the fact that we did not consider, in the case of Klabin, CAPEX as an adequate proxy to define its relationship with the GOVINDEIX corporate governance index.

#### 4. CONCLUDING REMARKS

This article analyzed the relationship between the corporate governance developed by Klabin S/A and the economic, operational, and value performances revealed by the company from 2002 to 2020. First, we identified that corporate governance in Brazil is an incipient topic and, therefore, brings difficulties in the task of precisely correlating the development of a company's corporate governance system with the performance levels in question. Even so, some methodological efforts established here through the econometric approach allowed a satisfactory approximation of the results achieved between the aforementioned relationships. This interpretation is supported by the  $R^2$  values observed, which indicate a reasonable level of adjustment of the model. The good corporate governance practices adopted by this business group, seeking to ensure investor confidence in the company's future, remained, to a large extent, subject to the positions of the controlling family. This evidence dialogues with the international literature (table 1), which explores the dichotomy between entrenchment and alignment in the context of the ownership structure. It is therefore important to take into account that family control may favor practices of expropriation of minority shareholders, especially in institutional environments with low legal protection. On the other hand, family businesses may perform better when there is alignment of interests between controlling shareholders and other shareholders — although the real effect depends on the degree of concentration of control and the level of family involvement in management. However, different forms of family involvement show that not all family presence generates value — depending on the degree of control, there may be entrenchment effects, where family controlling shareholders tend to maintain decision-making power even when they do not add value to the company, refusing to adopt innovations or changes in management. This reduces the company's ability to adapt to the market and weakens governance.

Although Klabin S/A sought new administrative directions, initiating a professional management process in the late 1970s, the controlling family still maintained hegemony over the corporate management decision-making system. In this context, the company showed clear signs of both entrenchment and alignment, reflecting the typical challenges in family-controlled companies. Over the period analyzed, only 2 of 12 board members were not related to the Klabin and Lafer families — the board appointed by the controlling shareholder reduced the participation of independent directors, compromising the effectiveness of good governance practices. In this sense, the family composition of the board made it difficult to adopt practices recommended by agencies such as the IBGC or Novo Mercado, since it characterizes resistance to external changes and limited accountability.

However, it is also important to emphasize that Klabin S/A has been evolving slowly, in the sense of promoting good performance guided by a corporate culture predisposed, mainly, to minimize the uncertainties that affect investors' decisions. Given that the Alignment and ongoing good practices have already resulted in Klabin S/A receiving praise for its focus on deleveraging and cash generation, with institutional investors (BTG, XP, Goldman Sachs) pointing to constant financial performance and maximization of shareholder value.



These findings should be interpreted with caution, since the construction of the corporate governance index (GOVINDEX) through the unweighted aggregation of dichotomous variables entails methodological constraints, as it does not capture potential heterogeneities in the relative relevance of the evaluated dimensions. The literature indicates that different governance attributes may exert asymmetric effects on corporate performance, meaning that uniform aggregation can introduce measurement biases. Future research may employ alternative methodologies that consider differentiated weightings or sensitivity analyses of the index composition in order to assess the stability and robustness of the empirical results.

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