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ASSESSING THE IMPACT OF THE INFORMATICS LAW (13.969/2019) ON INNOVATION AND FIRM PERFORMANCE: A PATENT-BASED AND FINANCIAL INDICATOR ANALYSIS IN BRAZILIAN ICT COMPANIES

AVALIANDO O IMPACTO DA LEI DE INFORMÁTICA (13.969/2019) NA INOVAÇÃO E NO DESEMPENHO DAS EMPRESAS: UMA ANÁLISE DE INDICADORES FINANCEIROS E BASEADA EM PATENTES EM EMPRESAS BRASILEIRAS DE TIC

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Abstract: This study investigates the behavior of firms benefiting from the Informatics Law (13.969/2019), focusing on Multilaser, Intelbras, Positivo, and Padtec during the period 2016–2022. The analysis combines financial indicators and patent data to assess firm performance and innovation outcomes. The results show that, although the companies exhibit some degree of innovative activity and variations in financial performance, they have not yet developed the more radical innovation profile required in Brazil's ICT sector.
Keywords*:* Law; Companies; Brazil; Information and Communication Technology.

Resumo: O trabalho investiga o comportamento de empresas beneficiadas pela Lei da Informática (13.969/2019), tomando como referência Multilaser, Intelbras, Positivo e Padtec, no período de 2016 a 2022. A análise combina indicadores financeiros e de inovação, a partir do registro de patentes, para avaliar o desempenho das firmas. Os resultados revelam que, embora as empresas apresentem algum grau de atividade inovadora e variações em seu desempenho financeiro, ainda não alcançam um perfil de inovação mais radical, considerado necessário para o setor de TIC no Brasil.

Palavras-chave: Lei da Informática; Empresas; Brasil; Tecnologia da Informação e Comunicação.

1. INTRODUCTION

One of the factors responsible for the profound transformations observed worldwide, including the major technological shifts between the 1970s and 1990s, was the development of information and communication technologies (ICTs) (Farhadi, Ismail, and Fooladi, 2012). ICTs promoted changes in social habits, fostered new forms of interaction, and contributed to the emergence of a new society. With the accelerated pace of innovation since the 1960s, ICTs have become indispensable for the dynamics of the global economy.Their role goes beyond technological infrastructure, encompassing direct contributions to local development, particularly by enabling economic growth through investments in technology, fostering competitiveness, creating new business opportunities, generating employment, and providing improvements in quality of life, especially in education and healthcare.

Technological advances in this sector triggered significant changes that reverberated across the daily lives of individuals, businesses, and institutions. The scale of these innovations was so pronounced that they became determining elements of the economic cycle in the second half of the twentieth century. By reducing costs and enhancing the quality and scope of communication systems, innovations such as automation, operational efficiency, data integration, supply chain management, and Big Data reshaped the organization of production chains, allowing them to operate in increasingly interconnected local and international networks (Gunasekaran and Ngai, 2014).

The rise of investments in the ICT sector, particularly through Research and Development (R&D), has led to notable advances in production, employment, and export revenues. At the same time, the strategic use of ICT resources has enhanced productivity, competitiveness, and economic growth. On the governmental level, ICTs can contribute to more efficient, transparent, and accountable management, including improved integration between rural and urban areas through technological connectivity (United Nations, 2004). At the international level, empirical analyses, such as Farhadi, Ismail, and Fooladi (2012) demonstrated that ICT usage had a significant impact on economic growth in 159 countries between 2000 and 2009, with particularly pronounced effects in high-income economies. These findings reinforce the idea that the adoption of ICTs has a differentiated impact across regions, widening the productivity gap between developed and developing nations.

This background highlights the relevance of examining the Brazilian case. Although the Informatics Law dates back to 1991, we understand that its applicability remains current, especially because it still guides practices that are relevant to the business reality.

Furthermore, the focus of this study lies in the empirical analysis of the most recent accounting and financial information from the four selected companies, which ensures the pertinence and contemporaneity of the research. Thus, the historical normative reference is articulated with current data, allowing us to discuss not only the legal foundations but also the effects and implications in the present scenario.

The motivation for this research lies in deepening the understanding of the relationship between the incentives generated by the Informatics Law and the performance of four Brazilian ICT companies, particularly in terms of their innovative activities and financial dynamics. To achieve this objective, the study combines financial indicators with innovation proxies (patent data), thereby offering a dual analytical perspective. It is important to emphasize that the analysis is not strictly grounded in conventional profitability metrics such as Return on Assets (ROA) and Return on Equity (ROE). These indicators are considered complementary variables, used alongside a broader set of financial ratios (liquidity, profitability, capital structure, and leverage) to enrich the understanding of firms' economic-financial behavior.

To sum up, the contribution of the article is centered on identifying patterns of financial and innovative behavior of companies within the context of the Law's incentives, allowing for the observation of how these instruments may influence, albeit indirectly, the consolidation of technological capabilities and sector competitiveness. Thus, the study provides a concrete application of knowledge by offering insights to understand the dynamics between legal incentives, R&D investments, and business performance, contributing to the reflection on policies that promote innovation in the ICT sector.

The originality of this research lies in its specific scope and methodological design. First, the empirical analysis is restricted to a selected group of four companies in the Brazilian ICT sector, which allows for a more detailed assessment of sectoral dynamics. Second, the study uniquely combines two dimensions of analysis, financial performance and innovative output, through the integration of accounting indicators and patent data. Third, the methodological approach includes the construction of financial ratios and a systematic patent mapping based on the Derwent Innovations Index, enabling an evaluation of firms' innovative efforts in a measurable and comparable way. Finally, the time frame adopted, covering the years from 2016 to 2022, allows for a longitudinal analysis capable of capturing recent transformations and trends in the sector.

In addition to this introductory section, the article is structured into six sections. Sections 2 and 3 present the main discussions related to the ICT sector, its determining factors, and the role of government, with particular attention to the impact of the Informatics Law. Section 4 describes the methodological framework, including the database and the construction of financial and innovation indicators. Section 5 presents and discusses the empirical results. Section 6 concludes the study, highlighting the contributions, main findings, and potential avenues for future research.

2. ICT COMPANIES AND THEIR RELEVANCE WITH EMPHASIS ON COMPETITIVENESS AND INNOVATION

ICT companies are linked to the factors driving significant transformations in the world, and with the dynamics of innovation, they have become indispensable for the development of the global economy. It is therefore evident that organizations are undergoing a context in which organizational efficiency is highly valued. As a result, companies are realigning their management strategies to achieve performance goals and increase their competitive advantage. Businesses are undergoing a constant restructuring process in their operations to improve speed and efficiency. In recent years, the theme of innovation in ICTs has enabled organizations to reach new possibilities and operational limits, consolidating their capacity for technological development and

linking management to incremental forms of improvement aimed at achieving high performance.

The increasing presence of information technology in businesses is driven by fundamental strategic reasons: growing competitiveness requires a deeper understanding of the parameters at play, greater flexibility to adapt to new market conditions, and the strengthening of technical capabilities through the absorption of new techniques and technologies. The productivity of digital businesses is shaped by continuous innovation and technological advancements. In this context, ICTs become the driving force behind economic development. In agreement with this view, technological development (innovation) is understood to induce the economic growth of companies, promoting not only competitiveness but also the consolidation of knowledge and technological capacities essential for long-term development.

During strategic planning, companies consider the most important market agents: customers, suppliers, competitors, or new entrants. The analysis of competitive forces allows ICTs to be evaluated based on their contribution to enhancing a company's power by neutralizing or weakening market forces (Graeml, 2000). Given the inevitable changes in the new global context, it is crucial to pay particular attention to substitute products, which typically do not need to face entry barriers or, at least, encounter weakened barriers, and are only perceived when they are strong enough to withstand retaliation attempts from established competitors (Graeml, 2000).

The use of ICTs impacts competition in the market in three distinct ways: I) ICT can alter the structure of an industry by creating barriers to entry, changing the balance of power between suppliers and customers, or introducing new substitute products; II) ICT can create a competitive advantage for a company that may be relatively sustainable, given the cost and time required to develop a strategic information system; and III) ICT can enable new business or markets.

According to OECD data (Organization for Economic Cooperation and Development) regarding the 250 largest ICT companies between 2000 and 2010, employment grew primarily in internet companies, followed by IT equipment manufacturers and the software industry (OECD, 2010). Thus, it is clear that the emergence and consolidation of ICT companies play a vital role in a country's competitiveness and development, contributing with numerous innovations across a wide range of economic sectors, including healthcare, education, technology, and agriculture.

With the increased adoption of technologies such as artificial intelligence, big data, and the internet, ICT companies in Brazil have stood out by offering innovative and competitive solutions to meet market needs. Salerno, Arbix and Toledo (2015) points out that, on the global stage, industrial competitiveness is based on product and process differentiation, with technological innovation being the key element. Regarding competitiveness, its importance stands out in providing impactful elements for the economy, fostering the country's development. Innovation, diversity, efficiency, productivity, and price reduction not only drive competition but also reinforce the need for continuous investment in R&D, encouraging companies to innovate in order to remain competitive in the market. Similarly, all the aforementioned factors lead to the development of new technologies, services, and products that benefit consumers, thereby increasing innovation in the market and providing a broader diversity of products and services (Salerno, Arbix and Toledo, 2015).

In this context, innovations allow ICT companies to automate processes and optimize time to perform tasks, reducing costs and improving efficiency. Efficiency, in this case, is an element that seeks to meet customer needs, thereby increasing competitiveness. Therefore, the positive effects of innovations in the sector contribute to a more competitive price for the consumer, as well as promoting economic development and improving the quality of life for the population (Salerno, Arbix and Toledo, 2015). To understand the innovation process, the neo-Schumpeterian theory highlights three

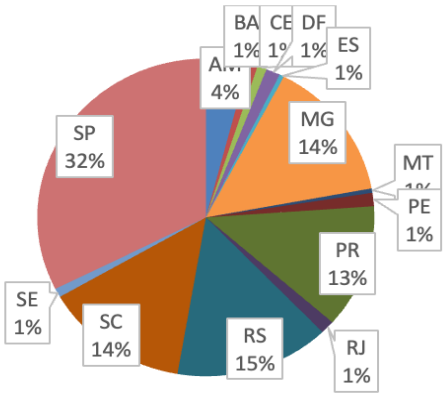
basic phases (Freeman; Soete, 2008). The first phase consists of the discovery of new ideas. The second phase represents development, where ideas are transformed into projects. Finally, the third phase is characterized by business/commercialization, where projects are turned into new products, processes, or businesses. It is important to note that each phase requires distinct management tasks. Notably, neo-Schumpeterian theory takes an evolutionary approach, defining the innovative process based on the means of searching for and selecting innovations. This search process occurs through R&D investment programs, carried out by companies, universities, and research centers, either jointly or independently. As a result, investments in innovation and R&D foster a virtuous cycle for the country's economy, consolidating technological capacities, generating economic and social gains, and ensuring competitiveness in the long term.

3. INFORMATICS LAW AND ITS EFFECTS ON THE DEVELOPMENT OF COMPANIES IN BRAZIL

The Informatics Law (Law No. 8,248/91), which established a set of rules to encourage the development of the Brazilian information technology industry, has been one of the most significant instruments for stimulating technological innovation and competitiveness in the Brazilian ICT sector (Brasil, 2021). While it provides fiscal incentives, its scope is broader, since these incentives are linked to obligations for investment in research and development (R&D). In this way, the Law not only reduces costs but also functions as a direct instrument for fostering innovation and consolidating technological capacities in the country.The Brazilian government sought to stimulate the industry by creating an environment conducive to investment in innovation, with the aim of increasing the country's competitiveness in the global market. Through its various measures, the Informatics Law has contributed to the growth of national technology companies and the expansion of innovation in Brazil. However, there are ongoing debates about its long-term effectiveness, particularly in a rapidly changing technological environment.

The Informatics Law should be understood not merely as a fiscal mechanism, but primarily as an industrial policy instrument designed to stimulate competitiveness and strengthen the technical capabilities of the Brazilian ICT sector. Its provisions are aimed at fostering research and development, promoting innovation, and enhancing the country's technological autonomy in strategic areas such as informatics, automation, and telecommunications. By requiring that firms benefiting from fiscal incentives invest in R&D activities, the Law seeks to establish a virtuous cycle in which tax benefits translate into tangible technological advances, capacity building, and increased competitiveness in both domestic and international markets. In this sense, the Law operates as a structural policy for innovation, aligning private sector incentives with broader industrial development goals and consolidating the ICT industry as a key driver of economic modernization in Brazil.

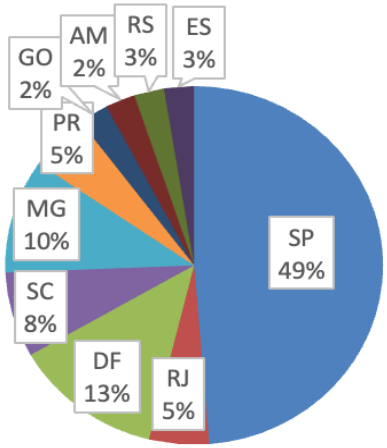
Figure 1 – Distribution of Companies Benefited by the Informatics Law by State



Source: Author's own elaboration.

The regions analyzed have a more developed infrastructure in terms of electricity, telecommunications, and internet access, crucial factors for the sector—thus creating an environment conducive to the development and operation of these companies (Figure 1). After all, these regions host large urban centers, concentrating a significant portion of the companies and qualified professionals (Taveira, Gonçalves and Freguglia, 2011), as shown in Figure 2. In it, over 82% of the largest companies, i.e., 32 out of the 39 largest Brazilian companies in the ICT sector selected, are located in the South and Southeast regions. Notably, the state of São Paulo hosts 49% of these companies.

Figure 2 – Largest ICT Companies by State



Source: Author's own elaboration.

In the context of the Informatics Law and its government oversight, it is observed that the state has not been fulfilling the monitoring duties after granting the fiscal incentives. According to the Federal Court of Accounts (TCU, 2018), since 2018, the fiscal incentives of the Informatics Law have continued to be extended without any evaluation of their impact on the benefiting industrial segment. These results, which have already accounted for more than R$ 25 billion in tax waivers between 2013 and 2017, solely regarding the Tax on Industrialized Products (IPI) not collected during this period, along with delays in the proper assessment of the application of research and development by the benefiting companies, estimated to be at least R$ 9 billion between 2006 and 2015, were identified and monitored. The implementation and recommendations were made by the TCU in 2014. Among the 26 recommendations issued by the Court at the time, only four were fully implemented, and another four are still in progress. It is important to note that the fiscal incentives of the Informatics Law have been extended without the necessary evaluation of their impacts on the supposedly benefited industrial segment (TCU, 2018).

Finally, the Informatics Law is one of the most relevant instruments within the institutional framework in which the Brazilian electronics companies operate. Its importance is highlighted not only by the substantial amount of resources involved (in the form of tax waivers and their counterparts), but also by its key role in the creation and maintenance of departments, laboratories, and research institutes (Diegues and Roselino, 2006). Ultimately, the perception of the social and economic benefits of ICTs appears to be consolidating across various decision-making spheres, whether from research institutions, universities, government agencies, or the private sector. Its relevance arises from two main sources: the significant volume of investments dedicated to R&D and the transversal effects on the productivity of other economic activities. Therefore, the following sections will analyze the efforts of selected Brazilian companies in the ICT sector to assess their performance (both financial and technological) in relation to the benefits provided by the Informatics Law to the companies in

the sample.

4. METHODOLOGY AND DATABASE

This study analyzes the financial and innovative performance of four Brazilian ICT companies benefiting from the Informatics Law, covering the period from 2016 to 2022. The selected timeframe allows for the observation of recent trends and the assessment of medium-term impacts of the incentives provided by the Law, ensuring the contemporaneity and relevance of the results.

The methodological approach combines financial indicators and patent analysis as complementary tools to evaluate company performance. Financial indicators, including liquidity ratios, profitability ratios, capital structure ratios, and financial leverage ratios, were chosen to provide a comprehensive view of the companies' financial health, without limiting the analysis to ROA and ROE, which serve only as complementary measures. This combination enables a multi-dimensional assessment of each company's capacity to invest, manage resources efficiently, and support innovation initiatives.

First, for the selection of the companies, a search was conducted for the 200 largest companies in the ICT sector in 2020, with the purpose of analyzing large companies before the pandemic period. The choice was made to focus on these companies due to their greater availability of data, both financial and regarding the impact of a benefit received, or even the impact of these companies on the Brazilian economy. In the search for the 200 largest companies, those that were founded in Brazil and had publicly disclosed financial results, such as net profit or net revenue, were selected, which resulted in 39 Brazilian companies.

After this initial selection, a second selection was made based on data from the Ministry of Science, Technology, and Innovation (MCTI, 1998), identifying companies that had received fiscal benefits under the Informatics Law, a government program that provides fiscal incentives to companies investing in research and development (R&D) in information technology and producing goods related to computer, automation, and telecommunications. In this second selection, more than 220 companies were identified.

With the support of these two company databases, an interaction was made between them. Both databases were compared, and the companies selected were those that had compatible information, i.e., companies that are among the 200 largest ICT companies, are founded in Brazil, have publicly available data, and have been benefited by the Informatics Law. The resulting companies from this interaction were the following four (represented by their commercial brand names): Multilaser, Intelbras, Positivo, and Padtec.

In the second part of the selection process, focused on the technological efforts of the companies, a search was carried out for patents registered by the four selected companies. Patent analysis was adopted as a proxy for innovative activity, allowing the identification of trends and patterns in technological development. By tracking registered patents over the selected period, it is possible to measure the output of R&D efforts, link them to financial performance, and evaluate the practical implications of the incentives provided by the Law. This search was conducted using data from the Derwent Innovations Index database, where all patents developed by the companies since their inception were selected. In the third part, which analyzed the financial efforts, various data from the selected companies were compiled. These data were divided into four main indices: Liquidity Ratios, Profitability Ratios, Capital Structure Ratios, and Financial Leverage Ratio. The data were extracted from each company's Investor Relations section, where all the accounting and financial information needed for the calculation of each index was available.

For the measurement of Liquidity of the companies, the following indices were used: Current Liquidity, Immediate Liquidity, General Liquidity, and Quick Liquidity. Current Liquidity is the ratio between current assets (short-term rights) and current liabilities (short-term debts). It indicates the company's ability to meet its

short-term financial obligations and maintain its daily operations. Its formula is: Current Assets / Current Liabilities (Eljelly, 2004) Immediate Liquidity is a performance indicator that shows whether a company has the ability to fulfill its obligations and debts immediately. Its formula is: Cash / Current Liabilities (Eljelly, 2004).

General Liquidity is a financial indicator that measures the company's ability to meet both its short- and long-term obligations. In other words, it shows if the company has the capacity to cover its debts. Its formula is: Current Assets + Long-Term Receivables / Current Liabilities + Long-Term Liabilities (Eljelly, 2004). Quick Liquidity measures if a company can pay its short-term obligations without considering inventory. Its formula is: (Current Assets - Inventory) / Current Liabilities. For the measurement of Profitability, the following indices were used: Asset Turnover, Return on Assets (ROA), and Return on Equity (ROE).

Asset Turnover (GA) is the comparison of how much the company sells relative to its total assets, calculated by the ratio of net revenue to total assets. It evaluates how well the company is utilizing its assets (which constitute the company's capital). Net revenue is based on what the company has sold in the past 12 months after deductions such as returns, taxes on sales, and discounts. Total assets are simply the company's total assets. Its formula is: Net Revenue / Total Assets (Eljelly, 2004).

ROA (Return on Assets) is a profitability indicator that calculates the company's ability to generate profit from its assets, and indirectly indicates the efficiency of its managers. It is calculated by the ratio of net profit to total assets. Its formula is: Net Profit / Total Assets (Bächtold, 2011). ROE (Return on Equity) is an indicator that measures the company's ability to generate value for the business and its investors based on the resources the company owns. It is measured as the net profit accumulated over the past 12 months divided by the company's equity.

For the construction of the Capital Structure indicator, the following indices were used: Third-Party Capital Participation and Debt Composition. Third-Party Capital Participation represents the percentage of resources from external sources used by a company to continue, maintain, and expand its activities. Its formula is: Current Liabilities + Long-Term Liabilities / Equity (Rauh and Stern, 2010). Debt Composition considers the current liabilities in relation to third-party capital. The goal is to identify what percentage of the company's total obligations corresponds to short-term debts. Its formula is: Current Liabilities / (Long-Term Liabilities + Current Liabilities) (Eljelly, 2004). For the measurement of Financial Leverage, only the Financial Leverage Ratio is used.The Financial Leverage Ratio refers to the company's effort to boost its sales by creating new products using third-party financial resources in its capital structure. Its formula is: EBIT (Earnings Before Interest and Taxes) / EBT (Earnings Before Taxes) (Eljelly, 2004). Data were systematically collected from each company's Investor Relations website and from patent databases, ensuring accuracy, consistency, and replicability of the analysis. The methodological design enables a structured comparison across companies and over time, allowing for objective evaluation of the relationship between financial performance and innovative output.

Overall, the methodology integrates multiple dimensions of company activity, financial and innovative, providing a rigorous, transparent, and replicable framework for analyzing the effects of the Informatics Law on the development of ICT companies in Brazil. The chosen indicators, combined with the defined period of analysis, support robust conclusions and allow the study to generate actionable insights regarding the interaction between legal incentives, corporate investment in innovation, and sector competitiveness.

The indicators presented above are summarized in Table 1 (next page).

Table 1 - Summary of the Financial Indicators of the Companies to be Evaluated

Evaluation Indices of Companies	Indicators	Methodology	Definition
Liquidity Index	General Liquidity	(AC + RLP)/(PC + PNC)	Measures the company's ability to meet its short-term and long-term obligations. If greater than or equal to 1, the company is capable of covering all its debts.
Profitability Index	Return on Assets (ROA)	(LL / Ativo Total)*100	Measures a company's ability to generate profit from its assets. The higher the ROA, the more efficient the company is at generating profits.
Capital Structure Index	Debt Composition (CE)	PC / (PC + PNC)*100	Shows the relationship between short-term debt and the total debt of a company. The lower the CE, the less the company will need to spend capital in the short term to repay its debts.
Financial Leverage Index	Degree of Financial Leverage (GAF)	LAJIR / LAIR	Shows a company's exposure to third-party capital. The higher the GAF, the greater the debt and financial risk. If greater than 1, the leverage effect is positive, with third-party capital contributing to generate additional returns for the shareholder.

Source: Author's own elaboration.

5. RESULTS

Based on the financial indicators presented, it is possible to evaluate the performance of the four selected companies. Figures 3 to 7 presents a comparative summary of the companies' General Liquidity, which helps to assess their ability to meet financial obligations, both in the short and long term, demonstrating the companies' financial health. The General Liquidity, according to Figure 3, Multilaser stands out with the highest general liquidity in almost all years. In 2021 and 2022, the company had values above 2, meaning it has enough capital to cover its debts twice. Positivo, Intelbras, and Multilaser maintained ratios above 1 throughout the analyzed period (2016-2022), indicating they were able to meet their obligations. On the other hand, Padtec had a liquidity ratio close to 1 in the first two years, but after 2018, it maintained a ratio above 1, ensuring its financial health.

The Figure 4 presents the Profitability (ROA - Return on Assets), which indicates the companies' ability to generate profit from their assets. Multilaser and Intelbras were the standout performers, maintaining an ROA above 10% in most years, showing excellent efficiency in profit generation. In contrast, Positivo and Padtec had lower performance, with Padtec reporting a return below 8% during most of the period, particularly in 2016 and 2022, where it fell below 2%. Positivo showed improvement in the last three years, achieving an ROA above 5%, indicating a recovery in the company's profit generation efficiency.

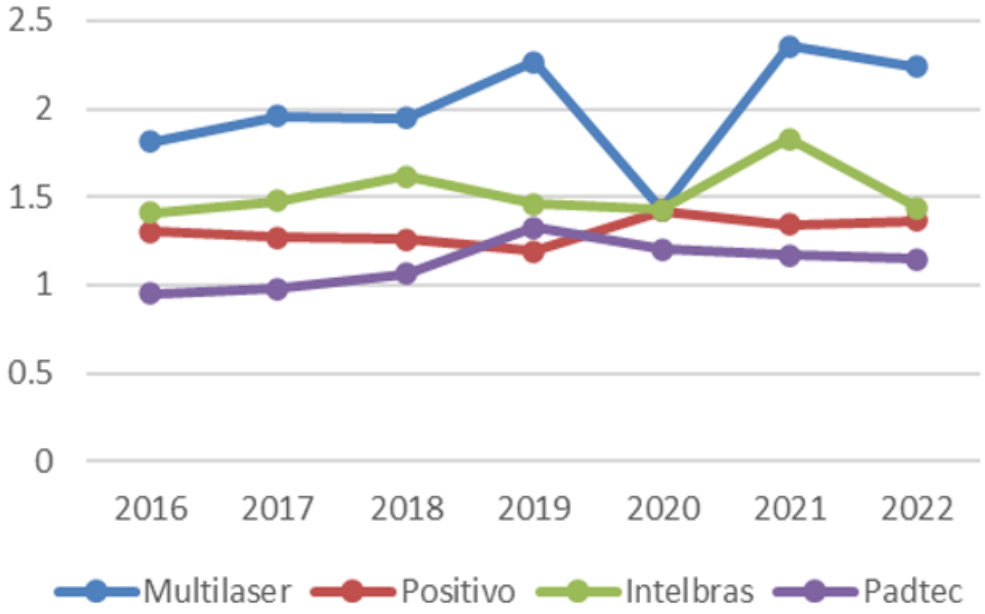
The Figure 5 reveals the debt composition (CE) of the companies, showing the proportion of debt concentrated in the short term. The reduction of this ratio over the years, except for Padtec, indicates a lower risk of liquidity issues. However, the values remain high, suggesting that most of the companies' debts are short-term, which could lead to cash flow difficulties, increasing the risk of insolvency. Padtec had a higher debt composition index, indicating greater dependence on short-term funding.

Financial leverage (Figure 6) measures the company's sensitivity to changes in pre-tax profits. Multilaser exhibited the most consistent leverage ratio, maintaining a result close to 1 in the first years, indicating that its pre-tax profits were either equal to or exceeded its financial expenses

(interest), meaning it had enough financial resources to cover its debt-related costs. A financial leverage ratio above 100% indicates that the company has more third-party capital than its own, which can be beneficial if managed properly but can also introduce risks.

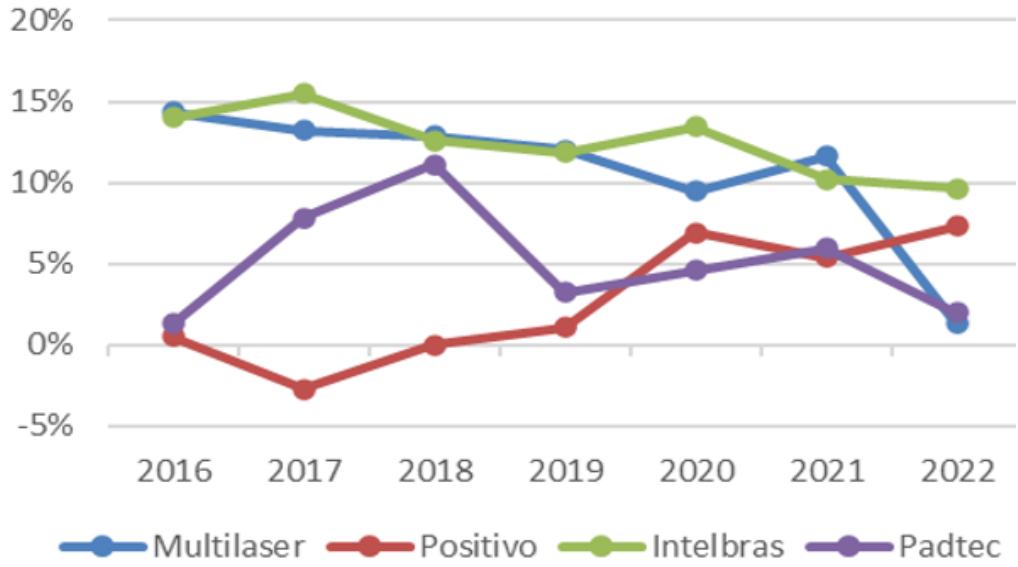
In summary, the four companies analyzed demonstrated solid financial health, reflecting both their capacity to generate wealth and their ability to contribute to employment creation in the ICT sector, whether or not they receive fiscal incentives. Their financial stability enables investment in production, operations, and human capital, reinforcing the sector's broader economic impact.

Figure 3 – General Liquidity Index



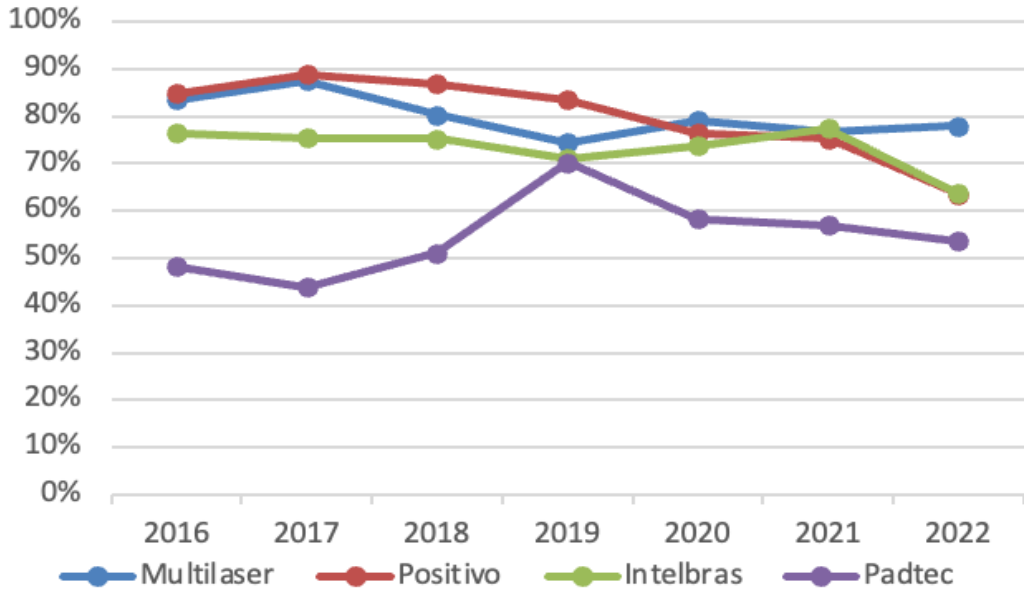
Source: Author's own elaboration.

Figure 4 – Return on Assets (ROA) Index



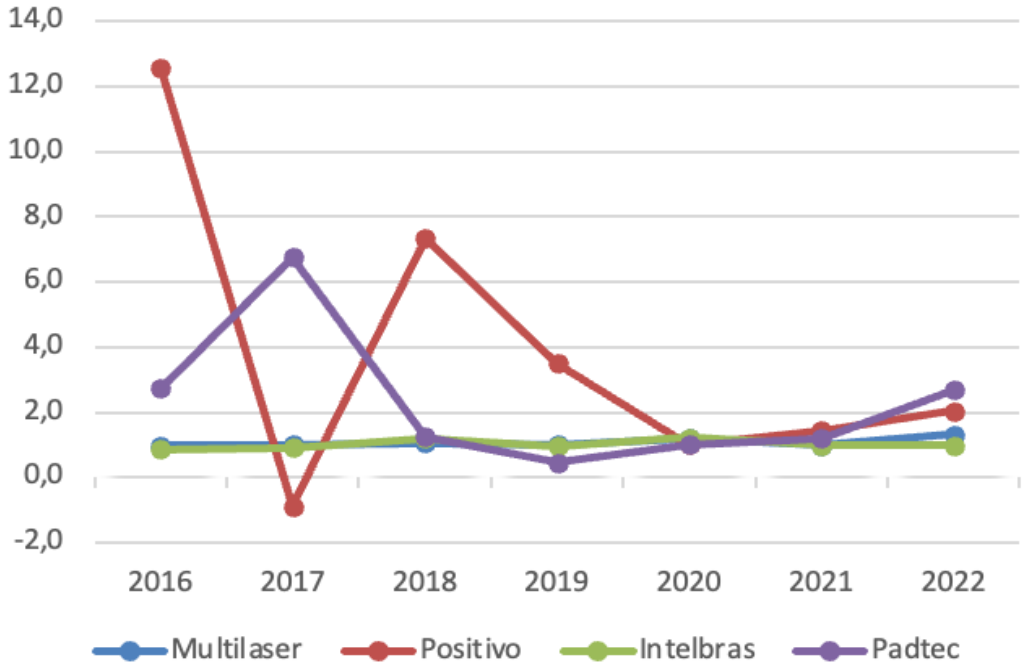
Source: Author's own elaboration.

Figure 5 – Debt of Companies



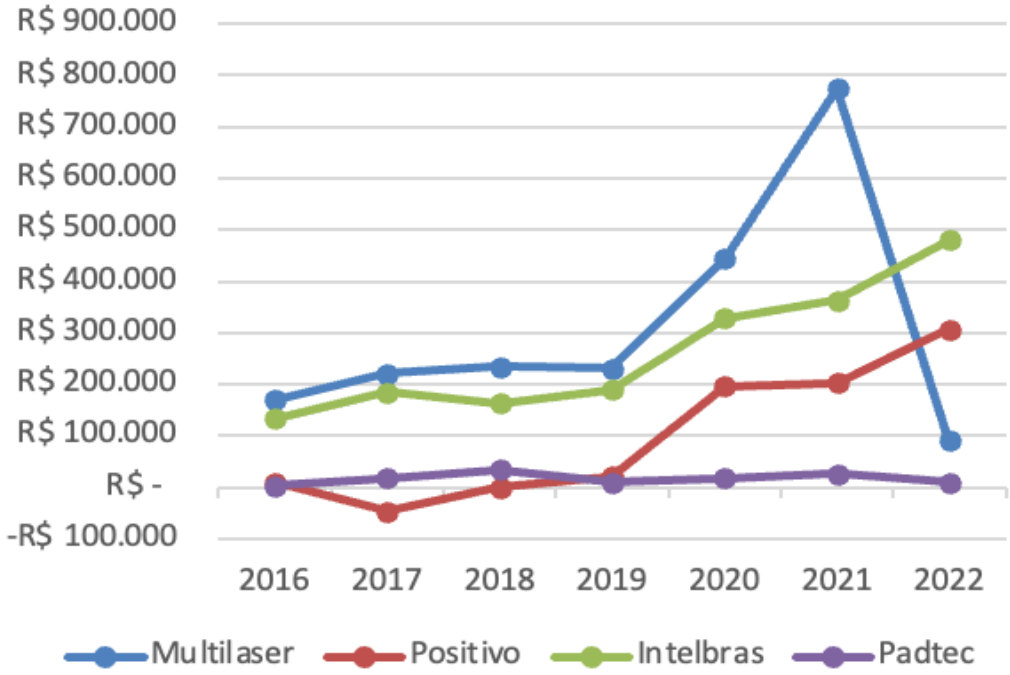
Source: Author's own elaboration.

Figure 6 – Financial Leverage of Companies



Source: Author's own elaboration.

Figure 7 – Net Profit of Analyzed Companies



Source: Author's own elaboration.

Beyond financial performance, it is essential to analyze the technological efforts of the companies, especially regarding patents, as they reflect the companies' commitment to innovation and the development of new products or systems. Table 2 shows the number of patents registered by the companies between 1998 and 2022. It is notable that the companies benefiting from the Lei da Informática, while demonstrating financial stability, also show differing levels of technological investment, highlighting how subsidies can encourage or enhance innovation capacity, though even companies without significant patent activity contribute to employment and economic output. Multilaser, despite strong financial performance, did not register patents during this period, indicating limited focus on technological innovation compared to competitors.

Table 2 – Number of Patents Registered by Companies (1998 – 2022)

Company	Total patents
Positivo Tecnologia S/A	19
Intelbras S.A.	11
Padtec S/A.	21
Multilaser Industrial S/A	0

Source: Author's own elaboration based on Derwent´s database.

Thus, on the next page, Table 3 highlights the patents created by the companies, with the search covering the period between 2016 and 2022, showing a low number of patents registered by the companies.

Table 3 – Analysis of Patents Registered by Sample Companies (2016 – 2022)

Company	Year	Patent
Positivo	2019	Communication system for the location and tracking of people and objects, consisting of subdevices that send commands to traceable devices, filter signals received from main devices with registered identification in the receiver, and measure the power of the received signal.
Intelbras	2019	Post insulator for electric fence, composed of multiple cylindrical segments, from which fins are projected, and a head that has a groove for the passage of the electric wire.
Intelbras	2020	Wall mount for optical network unit (ONU), It features oblong openings with a ribbed guide protruding at the bottom, located at the start of the ONU's mounting area, and a structure formed by discontinuous parallel curved walls equipped with protruding retention teeth.
Intelbras	2020	Pass-through box arrangement, It has a lid with a free area and adequate strength to secure the camera, and a housing with a hook on the internal surface, a series of guides on the peripheral walls, and internal handles.
Intelbras	2020	Electric lock suitable for indoor or outdoor use, it has a solenoid coil associated with a piston at the end of the casing, where the piston is pressed against the trigger, which consists of a flat plate.
Intelbras	2020	Method for manufacturing a core for a lock and electromagnet core, It involves the formation of clips, followed by cutting and crimping of E-shaped stamped sheets, joining clips, forming crimped cores, and providing clips in recesses on the stamped plates.
Intelbras	2021	Wireless fidelity router based on coupling for data packet forwarding between networks. It has a coupling base housing electronic circuits with technology to be added to the router body and is provided with an external communication interface.
Padtec	2016	Method for characterizing electro-optic modulators. It involves generating synchronized electrical signals in phase and out of phase, where the amplitude modulation of a continuous wave optical signal is characterized.
Padtec	2017	Method to measure nonlinear effects applied to electro-optic components. It involves characterizing the distortion of amplitude, phase, and frequency produced by dynamic complex electrical and optical carriers in electro-optic components.
Padtec	2017	Electro-optic space switch. Or a semiconductor optical amplifier, for optical carrier amplification to transmit information in telecommunications systems, it has a gold plate for signal transmission to the anode of the optical amplifier.
Padtec	2017	Method for probabilistic characterization of phase slip occurrence in coherent optical systems. It involves obtaining phase slip characteristics and determining the average time between occurrences and the probability distribution of phase slip.
Padtec	2021	Method for fault localization in optical networks using machine learning algorithm. It involves performing real-time operations, generating probabilistic output, and monitoring available optical network telemetry parameters.
Multilaser	-	Without Patents

Source: Author's own elaboration based on Derwent´s database.

Based on the descriptions of the patents shown in Table 3, it is evident that the companies developed incremental products/services, meaning they did not achieve notable innovations in creating a completely new product or process. The developments presented are trivial and do not represent substantial advances, failing to demonstrate real progress by Brazilian companies in the sector. Many granted patents are simply variations of existing technologies or apply well-known methods in a simplistic manner. For example, the 2019 patent by Positivo did not introduce any relevant or distinct features compared to systems already available in the market. The use of sub-devices to send commands, filter received signals, and measure signal strength does not constitute a significant innovation but rather a common application of well-known technologies such as wireless communication devices and signal strength sensors. The elements described in the patent, such as sending commands and measuring signal strength, are basic and expected functionalities in location and tracking systems, without any detailed description of specific technologies or innovative methods

that would significantly differentiate this system from other solutions on the market.

Another example is Intelbras' 2021 patent, which describes a wireless router based on coupling for forwarding data packets between networks. However, this does not represent a significant innovation in the field of network routers. The concept of wireless routers is already widely known and used in the networking industry. Therefore, the mere addition of a coupling base with electronic circuits does not offer a meaningful contribution to advancing technology. Finally, the inclusion of an external communication interface is not a substantial innovation, as external communication interfaces are common in electronic devices and are used to enable connectivity with other devices or networks.

Based on the financial performance and patent analysis, companies receiving tax incentives under the Information Technology Law (Lei da Informática) have shown both financial stability and, in most cases, technological effort, illustrating the combined effect of fiscal support on wealth creation and innovation. The patent analysis (Table 3) for 2016–2022 further confirms that most innovations are incremental. While the developments contribute to process and product refinement, they do not represent breakthrough innovations, suggesting that, although the sector is financially robust, the generation of high-impact technological advances remains limited. Nonetheless, the ICT sector continues to play a key role in wealth and employment generation, independently of patent output, due to its labor intensity and capacity to foster economic activities throughout Brazil. In this way, the ICT sector demonstrates the ability to contribute significantly to wealth creation and employment, regardless of the level of subsidies received, highlighting the role of these companies in consolidating strategic technological capabilities in the country.

Thus, the analyses developed in this study are not limited to a descriptive examination of financial and innovative indicators, but rather seek to understand the extent to which the incentives established by the Informatics Law have been effective in shaping the behavior of the selected companies. By combining financial ratios with patent-based innovation metrics, the research aims to capture both the economic and technological dimensions of corporate performance, thereby providing empirical evidence on the Law's effectiveness. In this way, the study contributes to the broader debate on the impacts of public policies in the ICT sector, reinforcing the pertinence of the legal framework while simultaneously highlighting its practical results in the most recent period analyzed.

6. CONCLUSION

This article aimed to evaluate and monitor the performance of four companies benefited by the Lei da Informática (Information Technology Law) through the analysis of their financial indicators and their innovation processes. Based on the results, it was possible to conclude that the companies demonstrated good performance in their financial indicators, possessing strong debt repayment capacity, good management performance, and profit generation. In other words, all of them are efficient in their accounting and financial processes. However, there was a lack of commitment from the companies after adopting the Lei da Informática, meaning they did not make significant efforts to expand their innovation processes, which are crucial for their sustainability and competitiveness in the ICT sector. Therefore, it was observed that this lack of effort limits and hinders Brazilian companies from achieving a prominent position in international competitiveness. Additionally, through the analysis of patents, it was evident that the companies' innovations were not significant, as the patents registered can be considered incremental innovations.

However, despite these strengths, the companies showed limited commitment to expanding their innovation processes after adopting the Lei da Informática. The analysis of patents indicated that the innovations were primarily incremental, suggesting that the full potential of the Law to foster transformative

technological development and strategic capabilities has not been fully realized. This limitation constrains the long-term sustainability and competitiveness of Brazilian ICT companies, limiting their positioning in international markets.

The geographical concentration of benefiting companies in the South and Southeast regions, with 49% in the Southeast and 41% in the South, highlights existing regional inequalities in economic opportunities. This uneven distribution underscores the importance of policies that encourage ICT development across other regions of Brazil, stimulate entrepreneurship, and strengthen companies outside the main hubs. Improved monitoring and evaluation of companies could enhance resource allocation, incentivize innovation in less-benefited regions, and increase the overall effectiveness of the Lei da Informática.

Regarding technological capacity, strategic investment in R&D remains essential for the advancement of both large and smaller firms. Smaller companies could benefit from initiatives focused on industrial design and innovation support, which would leverage existing production structures and generate additional value. Long-term investments in cutting-edge technologies and research could provide a key differentiator, enhancing competitiveness and contributing to the sustainable development of the sector at both national and international levels.

Limitations of the study include its focus on a small sample of four companies, which, although selected for methodological rigor, may limit the generalizability of the findings to the broader ICT sector. Additionally, the study did not directly measure the overall effectiveness of the Lei da Informática as a national policy instrument, focusing instead on the observed financial and innovative behavior of the selected companies.

Future research could expand the analysis to a larger and more diverse sample of ICT companies, including firms of varying sizes and from different regions of Brazil, to better capture the sector's dynamics. Further studies could also explore additional dimensions of innovation, such as the qualitative impact of patents, collaboration networks, and the translation of R&D into marketable products, providing a more comprehensive understanding of how legal incentives shape technological and competitive outcomes.

Overall, the study demonstrates that financial performance alone does not guarantee the full realization of innovation potential. The findings emphasize the need to align fiscal incentives with sustained investment in R&D and strategic innovation management, reinforcing the relevance of the Lei da Informática and providing actionable insights for policymakers and companies seeking to enhance competitiveness and technological capacity in Brazil's ICT sector.

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