



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

# IJDR

*International Journal of Development Research*

Vol. 12, Issue, 01, pp. 53670-53677, January, 2022

<https://doi.org/10.37118/ijdr.23850.01.2022>



RESEARCH ARTICLE

OPEN ACCESS

## SYSTEMATIC MAPPING OF LITERATURE ON INTELLECTUAL PROPERTY AND ECONOMIC-FINANCIAL PERFORMANCE

<sup>1</sup>Marina Bezerra da Silva, <sup>2</sup>Maria Emília Camargo and <sup>3</sup>José Ricardo de Santana

<sup>1</sup>Postgraduate Program in Intellectual Property Science, Federal University of Sergipe (UFS) / Business and Management Department, Federal Institute of Piauí (IFPI); <sup>2</sup>Postgraduate Program in Intellectual Property Science, Federal University of Sergipe (UFS) / Postgraduate Program in Administration, Federal University of Santa Maria (UFSM); <sup>3</sup>Postgraduate Program in Intellectual Property Science and Postgraduate Academic Program in Economics, Federal University of Sergipe (UFS)

### ARTICLE INFO

#### Article History:

Received 12<sup>th</sup> October, 2021  
Received in revised form  
29<sup>th</sup> November, 2021  
Accepted 17<sup>th</sup> December, 2021  
Published online 30<sup>th</sup> January, 2022

#### Key Words:

Patents; Brands; Performance;  
Performance; Intellectual property  
Strategy; Innovation policy.

#### \*Corresponding author:

Marina Bezerra da Silva

### ABSTRACT

Innovation in companies is directly related to investment in Research and Development and to the formalization of their Intellectual Property. At the same time, it also tends to be related to organizational performance and value in the market. In view of this, this work consists of a systematic review of the international literature regarding the relationship between intellectual property (patents, brands, software, among others), an important indicator of innovation, and its effects on organizational performance. Scopus and Web of Science databases were consulted. Based on the inclusion criteria, 21 articles were analyzed, with publications between 2015 and 2020. Among these studies, 12 indicated a positive effect of intellectual property on the performance of companies, 6 presented inconclusive results and only 3 indicated a negative impact. Therefore, most research has suggested the positive effect of protective strategies on organizational performance.

Copyright © 2022, Marina Bezerra da Silva et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Marina Bezerra da Silva, Maria Emília Camargo and José Ricardo de Santana. "Epidemiology of covid-19 in the resident and prison populations of the city of Recife-pe", *International Journal of Development Research*, 12, (01), 53670-53677.

## INTRODUCTION

Innovation in companies is directly related to investment in Research and Development (R&D) and intellectual property. At the same time, it also tends to be related to the performance of operations and organizational value in the market (Yang & Okada, 2019). In view of this, the patenting strategy followed by companies, a reflection of legal practice in the area of intellectual property, tends to be an important factor analyzed by the financial markets (Ren & Duprez, 2019) and by the stakeholders in the organization or in the innovation system in which it is inserted. Intellectual property rights are related to the formalization and ownership of intangibles, such as patents, brands, copyrights, cultivars, among others, and have a correlation with the production, possession and distribution of knowledge (Kiškis et al., 2016). Although part of the literature does not consider these assets adequate proxies for innovative capacity (Rodríguez-Pose & Wilkie, 2016), they have been one of the most used indicators to estimate innovation (Ambrammal & Sharma, 2016; Lee et al., 2015), since they represent an indication of the inventive activity of the company.

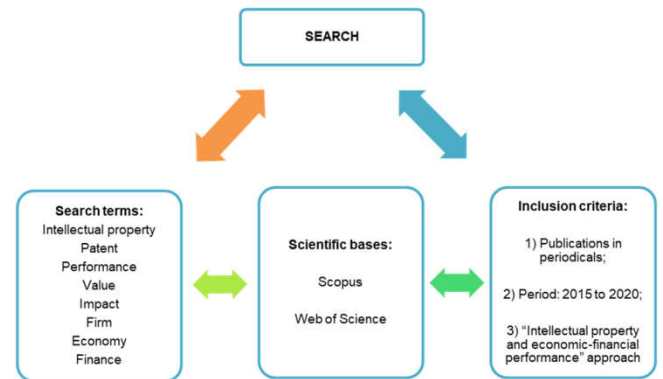
Thus, through patent analysis it is possible to understand important technological changes and innovative business performance (Tahmoosnejad & Beaudry, 2019). The exclusivity of production rights and the sale of an invention asset, provided by patent protection, encourages creditors and potential investors to finance R&D projects. In addition, legal protection of intellectual property and patents increases the possibility of appropriating the results of R&D activities (Maskus et al., 2019). This indicates that a stronger intellectual property system can directly collaborate with economic development and financial performance, through more confident stakeholders in the return of their applications. Guo-Fitoussi et al. (2019) also indicate the importance of protecting assets, since knowledge, a necessary resource for the development of technological innovation, is semi-public and not exclusive. In this case, from the protection, the return generated by the innovation is amplified. It is important to highlight that, even if some patents have no perceived value, involvement with a patenting (protection) process can indicate a positive and important perspective for the market and for potential investors (Singh, 2018), which can have a good impact on the market. In fact, through the parallel relationship between patents and

innovation, it is understood that companies that invest in patenting processes are more innovative, being able to generate, at least, a reserve of value in the market, which can generate future returns for an organization. The literature indicates that, in case of litigation related to patents, there is a loss of value for companies that lose the lawsuits (Kim, D., Kim, N., Kim, W., 2018). Therefore, relations in the legal sphere of intellectual property also affect business performance, given that they interfere with trust and the market's perception of the organization. Guo and Ding (2017) show that when a company performs better than expected, it tends to get involved with invention patents. Conversely, when the company underperforms, it tends to focus on incremental improvements, with utility model patents. Thus, the patenting strategy depends on the path followed by the company, through its R&D capacity and according to the knowledge base accumulated over the years, which is reflected in the innovative projects developed. With this scenario, investigating the relevance of intellectual property to organizational performance proves to be an important issue. It is noteworthy that, if a positive impact of protection strategies for the performance of companies is found, this can also represent a decisive path for the sustainable economic development of the business and innovation ecosystem in which the organization is inserted. Therefore, considering the importance of this topic for understanding the effects of intellectual property on organizational performance, the present study systematically investigated the international literature on the relationship between intellectual property (patents, brands, software, among others), an important indicator innovation, and its effects on the performance of companies. From this investigation, it is possible to identify the tendency of studies focused on the relationship between intellectual property and organizational performance. The topic is relevant because it can help guide public policies on intellectual property and Science, Technology and Innovation (CTI). Likewise, it is an important reflection for the strategic management of companies, since it presents the differential of protection for organizational performance. Additionally, the research also allows for a reflection on the importance of intellectual property for society. In addition to this introduction, the work consists of three other sections. In the second, the methodological design of the study is presented. In the third, the research identified in the systematic review is presented. In the fourth, the results found are discussed and the considerations of the study are presented.

## RESEARCH METHODOLOGY

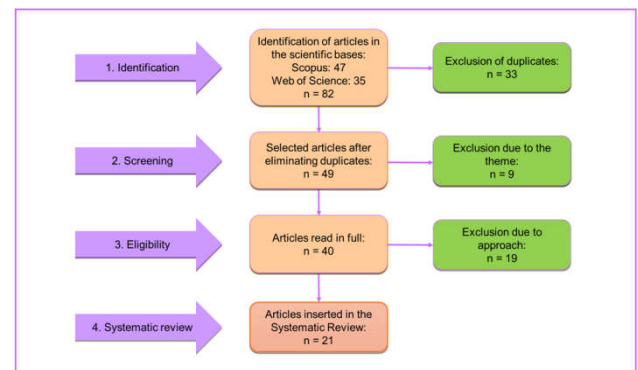
This research has a qualitative approach and a descriptive nature, using a systematic literature review as a procedure. It aimed to identify scientific publications related to intellectual property and its effects on organizational economic and financial performance. To conduct the study, two international databases were consulted: Scopus and Web of Science, accessed through the Capes Journals Portal. The search and selection of articles were carried out in June and July 2020. The methodological procedures, the definition of inclusion and exclusion criteria for papers, as well as the reading of documents for analysis, were carried out by two researchers, aiming to reinforce the quality of the selection and review processes of articles included in the research. Disagreements were resolved by consensus. For the systematization and choice of publications, the following criteria were defined. Combinations of the terms "intellectual property," "patent," "performance," "value," "impact," "firm," "economy" and "finance" were used. These words were considered because of their importance to the line of investigation. For the elaboration of the search expressions, we resorted to the truncation of terms and the use of Boolean operators. The research was carried out through the fields "titles of publications," present in the bases. Figure 1 presents the design of the search strategy, based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology by Liberati et al. (2009). Initially, 262 works were identified. When the search was restricted to articles published in "scientific journals," 186 documents remained. The procedure aimed to guarantee the quality of the publications included in the study, since journals, in general, perform blind peer review. Then, the articles published

between the years 2015 and 2020 were selected, to identify the recent literature on the subject. Therefore, 82 papers remained, 47 from Scopus and 35 from Web of Science. Subsequently, duplicate works (33 documents) were eliminated, leaving 49 articles that were read in full.



Source: authors (2020).

Figure 1. Design of the paper search strategy for systematic review



Source: authors, adapted from the PRISMA methodology (Liberati et al., 2009).

Figure 2. Flowchart of the systematic review

Among these, articles that did not discuss the specific topic of this study (9 documents) and those that developed parallel approaches (19 documents), which dealt with innovation or value, but not specifically with intellectual property and value or business performance, were eliminated. Thus, 21 articles remained for systematic analysis. Figure 2 presents the job selection flowchart. Studies that met the search criteria were included and analyzed regardless of the results presented. During the review, the research objectives, techniques, context, results presented and discussions were observed. For the systematization proposed in this study, articles that evaluated the context of underdeveloped and/or emerging countries, those that analyzed developed countries and those that analyzed the global context were analyzed, verifying the possible relationships between intellectual property and economic and financial performance in these realities. Finally, the main practical implications presented by each article included in the review were verified, compiling a framework with guidelines for innovation and intellectual property policies in emerging economy countries. In the next item, the systematic analysis of the articles is presented.

**Systematic analysis of articles:** Investigations on the relationship between intellectual property and the economic and financial performance of companies present important considerations for the intellectual property and innovation policies of a given territory, as well as for the business organizations present in it. The scientific literature, in general, presents contradictory results on the subject, however, there are several approaches that indicate the relevance of the theme, especially considering the impact on the economy and society. Next, the research on intellectual property and performance in underdeveloped and/or emerging countries, in developed countries and in approaches that refer to the global context is presented.

**Intellectual property and performance in underdeveloped and/or emerging economy countries:** Ten (10) articles were found that investigated the effect of intellectual property on economic-financial performance in underdeveloped countries. Singh (2018) analyzed the association between the market value of companies and patenting activity in the Indian industrial sector. Using a panel, simple linear regressions and quantile regressions<sup>1</sup>, he studied 380 companies distributed in 22 industry subgroups. Companies that use patents to protect their innovations have a significantly higher market value than those that do not. The increase in the number of patents granted to a company is associated with a higher market value for those companies that are at the lower end of the market value distribution. It is concluded that patents serve as a sign of company quality. A study with Autoregressive Vector Models (VAR) on the relationship between R&D, patent agreements and financial performance in Taiwanese electronics companies listed on the Taiwan, China and United States stock exchanges identified that R&D expenses can influence different financial performances, positively or negatively, due to the diversified characteristics of the industry. Patent arrangements are significant for companies' financial performance (Chang et al., 2015). Huang et al. (2016) analyzed the relationships between R&D expenses, the number of patents, performance and the hysteresis effect<sup>2</sup> in the six main industries of the Hsinchu Science Park, in Taiwan, from 1988 to 2011, using a VAR model. R&D expenses and patents have a stable, long-term relationship with performance, also causing a hysteresis effect on performance that lasts for about two years. Another study estimated the impact of R&D spending and patenting on the performance of Indian manufacturing companies, using productivity, profitability and Tobin's Q-index as performance indicators. Through a panel and semi-parametric techniques, it was concluded that patent protection results in improved productivity, profitability and Tobin's Q of companies, while R&D expenses<sup>3</sup> generate positive and significant effects on profitability and the Tobin's Q. The positive impact of patenting on financial performance presents differences for foreign and domestic companies (Ambrammal & Sharma, 2016). Kim, D., Kim, N. and Kim, W. (2018) analyzed how patent protection affects the market value of companies in the renewable energy sector in South Korea. Using a panel model, 197 companies in the sector were observed, distributed in 11 subsectors. It was identified that the simple patent count is not a strong measure to explain the financial success of a company. Indices such as back citations<sup>4</sup> and patent families<sup>5</sup>, which measure patent protection capacity, affect a company's market value.

One study analyzed the influence of in-house R&D and patent applications on the performance of Latin American companies. A total of 751 companies with revenue equal to or greater than US\$ 100,000.00 were analyzed using logistic regression and linear regression (two-stage model). Innovations developed from R&D investments, especially non-patented innovations, have a positive

<sup>1</sup>Type of regression used to estimate the percentiles of the dependent variable, conditional on the values of the explanatory variables. A straight line is estimated for each quantile of the distribution and the estimators are found through the minimization of absolute errors, not taking into account the mean. It is suitable for cases where the mean is greatly affected by outliers (Fávero & Belfiore, 2017; Goncalves & Montalvo, 2021).

<sup>2</sup>Hysteresis effect refers to the situation where changes in certain economic factors take some time to affect other elements of the economy (Huang et al., 2016).

<sup>3</sup>Regarding the productivity variable, Research and Development expenses had positive and non-significant effects. Based on the results, Ambrammal & Sharma (2016) explain that, in India, investment in R&D is more oriented towards product innovation, while patenting is more directed towards product and process innovation.

<sup>4</sup>Back citations refer to prior knowledge citation. Patents that do not cite prior knowledge are more subject to invalidation proceedings. Thus, the citation above is an indication of patent protection against this type of process (Kim, D., Kim, N., Kim, W., 2018).

<sup>5</sup>In relation to patent families, it refers to the strategy of filing patents in different countries, aiming at the protection of inventions. In the study in question, the number of patent families per company is considered a proxy for the company's ability to protect the patents it owns (Kim, D., Kim, N., Kim, W., 2018).

influence on corporate financial performance. However, when R&D investments are made by companies more focused on patenting, the relationship with performance is negative (Paula & Rocha, 2020). China's growing micro and small companies were analyzed through a panel. The intensity of patent co-ownership was negatively related to the market value of these companies. Supplier financing mitigated this negative relationship while government subsidies strengthened the negative relationship between the intensity of joint ownership and the market value of these companies (Diwei Lv et al., 2018). Cho et al. (2015) developed a new conceptual model of the causal relationship between intellectual property rights (IPR), innovation and growth. They analyzed the Korean pharmaceutical, semiconductor and shipbuilding industries and used a panel technique. Stronger intellectual property rights are beneficial for R&D-intensive industries, where large domestic companies have strong R&D and IPR resources but have no impact on globalized industries. On the other hand, stronger IPRs hurt industries and small and medium-sized enterprises (SMEs), which generally have limited resources. Wang (2015) assessed the effect of patent examination duration on the market value of Taiwanese companies. The study was carried out through a panel, approaching companies in the electronics and components, computing and peripheral equipment and communication and internet industries. There is an inverse U-shaped moderating effect of examination duration on the relationship between patent assets and the market value of companies.

Nour (2015) studied the importance of intellectual property rights and examined factors that hamper and/or contribute to increasing intellectual property rights in Sudan. Inadequate protection of IPRs in Sudan leads to a weak national innovation system, making foreign direct investment (FDI) and technology transfer difficult. In relation to underdeveloped and/or emerging countries, most works indicate a positive effect of intellectual property on business performance (5) (Ambrammal & Sharma, 2016; Chang et al., 2015; Huang et al., 2016; Kim, D., Kim, N., Kim, W., 2018; Singh, 2018). Articles were also found that indicate that the impact of IP on performance is negative (2) (Diwei Lv et al., 2018; Paula & Rocha, 2020). Some researches present inconclusive results (3) (Cho et al., 2015; Nour, 2015; Wang, 2015). Several of these studies were carried out in Asian countries (India, Taiwan, South Korea and China), and the positive result of most studies may be related to the rise of countries on the continent in terms of innovative capacity and intense patenting in recent years. Thus, there are results that suggest a positive effect of patenting actions on the financial results of companies and, consequently, on the ecosystems in which they are inserted. On the other hand, the small participation of other emerging countries in the studies, such as Latin Americans or Africans, also stands out. Unfortunately, these are regions that need a better structuring of their innovation systems, aiming at the adequate organization of efforts or for the development of science and technology, as discussed by (Chiarini et al., 2019), in an analysis of the Brazilian case. Next, a schematic table with the systematization of these results is presented (Table 1).

**Intellectual property and performance in developed economy countries:** Eight (8) articles were found that analyze the effect of intellectual property on performance in developed countries. A panel analysis of the US food and beverage industry considered patent data to identify the effect of product, process and marketing innovation on companies. It was identified that the increase in the quality of patented innovations in food and beverage products facilitates the increase in the value of the company (Grashuis & Dary, 2019). Chung et al. (2019) studied 602 companies holding software patents<sup>6</sup> in the North American context. Through a panel analysis, they identified that these patents positively influence business value.

<sup>6</sup>Software patents protect logic or algorithms for processing data. Until the mid-1990s, software was not patentable in the United States. With some U.S. Federal Circuit Court decisions in the 1990s, and guidelines from the U.S. Patent and Trademark Office (USPTO) in 1996, restrictions on software patentability were eliminated (Chung et al., 2019).

**Table 1. Systematization of studies on intellectual property and performance in underdeveloped and/or emerging economy countries**

Authors (year)	Countries	Sector (Sample)	IP involved	Method	Result (positive or negative)
Singh (2018)	India	Industry with distribution in 22 industrial subgroups. (380 companies)	Patents	Panel, simple linear regressions and quantile regressions	(+) Positive
Chang et al. (2015)	Taiwan (companies listed in Taiwan, China and the United States)	Semiconductor industries, computers and peripheral equipment, optoelectronics, communications and Internet, parts and other electronics. (73 companies)	Patents	Autoregressive Vector Models (VAR)	(+) Positive
Huang, Wu and Tsai (2016)	Taiwan	Hsinchu Science Park high-tech companies from 1988 to 2011. (485 companies)	Patents	Autoregressive Vector Model (VAR)	(+) Positive
Ambrammand Sharma (2016)	India	Manufacturing companies, high and medium technology. (489 companies)	Patents	Panel and semiparametric techniques	(+) Positive
Kim, Kim and Kim (2018)	South Korea	Renewable energy sector, distributed in 11 subsectors, between 1980 to 2014 (197 companies)	Patents	Panel	(+) Positive
Paula and Rocha (2020)	06 Latin American countries - Brazil, Mexico, Argentina, Colombia, Chile and Peru	Companies with declared revenue equal to or greater than US\$100,000.00 in at least one of the last 10 years (751 companies)	Patents	Logistic regression and linear regression (two-stage model)	(-) Negative
Diwei Lv, Zeng and Lan (2018)	China	SMEs and high-tech growth companies from 2013 to 2016. (54 SMEs, 70 large companies and 272 observations)	Patents	Panel	(-) Negative
Cho, Kim and Shin (2015)	Korea	Pharmaceutical, semiconductor and shipbuilding industries (132 large companies and 2,578 SMEs in the three industries)	Patents	Panel (company level)	Inconclusive
Wang (2015)	Taiwan	Industry (electronics and components, computing and peripheral equipment and communication and internet). (88 companies)	Patents	Panel	Inconclusive
Nour (2015)	Sudan	-	-	Descriptive statistics (simple frequencies) and expert interview	Inconclusive

Source: authors (2020).

**Table 2. Systematization of studies on intellectual property and performance in developed economy countries**

Authors (year)	Countries	Sector (Sample)	IP involved	Method	Result (positive or negative)
Grashuis and Dary (2019)	United States	Food and beverage industry, 1994–2005 (194 companies, with 1,440 observations)	Patents	Panel	(+) Positive
Chung et al. (2019)	United States	Computer and peripheral equipment manufacturing, software and computer system design and related services sectors, from 1998 to 2006. (602 companies, with 2,321 observations)	Software Patents	Panel	(+) Positive
Kim et al. (2020)	Patenting data in the United States (USPTO)	Software and hardware industry (153 observations)	Blockchain Patents	Panel	(+) Positive
Boasson and Boasson (2015)	United States	Pharmaceuticals (115 companies)	Patents	Spatial analysis	(+) Positive
Lin and Chang (2015)	United States	Industry (142 companies)	Patents	Panel	(+) Positive
Colombo and Shafi (2016)	Seven European countries - Belgium, Finland, France, Germany, Italy, Spain and the United Kingdom.	High-tech manufacturing and service industries (369 companies: 62 operate in biotechnology, 71 in information and communication technology and other high-tech manufacturing, and 236 in software, Internet, telecommunications and other high-tech services).	Patents	Fixed Effect Panel (with robust standard errors)	(-) Negative
Agostini et al. (2016)	Italy	Mechanical industry (203 small companies) and fashion industry (170 small companies). Note: the data bank was constituted especially by small companies.	Patents and trademarks	Panel	Inconclusive
Kiškis et al. (2016).	Lithuania and United States (Arizona)	biotechnology industries (12 companies from Lithuania and 12 from Arizona)	Patents	Case analysis, with simple linear regression and non-parametric tests	Inconclusive

Source: authors (2020).



**Table 3. Systematization of studies on intellectual property and performance in the global context**

Authors (year)	Countries	Sector (Sample)	IP involved	Method	Result (Positive ou Negative)
Guo-Fitoussi et al. (2019)	The study involved 16 countries in 2004 and 14 countries in 2006	104,717 companies in 16 countries in 2004 and 94,347 companies in 14 countries in 2006	Patents, trademarks, designs and copyrights.	Logit model and factor analysis	(+) Positive
Tsakalerou (2018)	More than 34 countries (world)	8222 companies from services to manufacturing	Intellectual property (patents, copyrights, trademarks, etc.).	GE/McKinsey matrices	(+) Positive
Lee et al. (2015).	Global	28 global Information Technology companies from the 2013 'Forbes Global 2000' list.	Patents	Multiple regression	Inconclusive

Source: authors (2020).

Software patent portfolios with an exploration<sup>7</sup> orientation are associated with higher business value in low-dynamism and high-competitive environments. On the other hand, software patent portfolios with an exploitation<sup>8</sup> orientation are associated with greater value in markets with high dynamism and low competitiveness. Kim et al. (2020) explored the specific relationship between blockchain patents<sup>9</sup> and the value of companies. The software and hardware industry was analyzed, using data from the United States Patent and Trademark Office (USPTO) and panel modeling. Blockchain patents for originality<sup>10</sup> are associated with a higher company value. Blockchain generality<sup>11</sup> patents are not associated with company value, however, when considering a model with delayed effects (t-1), the blockchain generality patent is positively associated with company value. Thus, blockchain patent is just as sustainable to increase business value as conventional patents. Boasson and Boasson (2015) examined the role of geographic location of research-intensive companies on the ability to generate new research and products, which, consequently, according to the authors, would affect organizational value.

The North American context was investigated through spatial analysis. Companies more often cite the patents of other companies geographically closer to them. Thus, the quality of a patent is a function of the company's proximity to other knowledge-intensive institutions and activities, and the quality of the patent is a function of the company's geographic location. Location affects company value. Lin and Chang (2015) investigated the performance effects of ambidextrous innovation<sup>12</sup> (exploration and exploitation) and identified possible antecedent and moderating factors. The survey observed 142 companies in the North American industry, and a panel was developed. It was identified that a higher level of ambidextrous innovation (AI) leads to better performances. A study investigated how public policies regarding product market regulation (PMR) influence the growth capacity of young European companies supported by venture capital (VC) compared to a sample of companies not supported by VC. From the analysis of 369 companies in the service industries and high-tech manufacturing present in Belgium, Finland, France, Germany, Italy, Spain and the United

Kingdom, and through a fixed effects panel (with robust standard errors), VC-backed and non-VC-backed high-tech young companies were found to suffer due to a regulatory environment that makes competition difficult. There is a decrease in the sensitivity of sales and total assets in the stock of patents with the increase in regulatory burdens in the product market. This negative effect is stronger for VC-backed companies (Colombo & Shafi, 2016). Agostini et al. (2016) investigated 203 small companies in the mechanical industry and 170 belonging to the fashion industry in Italy. Panel analysis suggested that ownership or not of patents or trademarks does not directly affect the average value of sales growth and return on assets (ROA) in the mechanical industry. However, small and micro enterprises (SMEs) with at least one registered trademark in the investigated period show higher average values of sales growth than SMEs without any registered trademarks in the fashion industry. Finally, an empirical analysis of the Lithuanian and Arizona biotechnology business cases (industries) in the United States (USA) revealed that the commercial value of intellectual property differs between countries. The US has high standards of intellectual property protection, with a strong focus on the commercialization of IP assets. Some European countries have a technocratic legal approach to intellectual property, not focusing on the commercial value of intellectual property. Lithuania, in this case, has less innovative intellectual property rights (Kiškis et al., 2016). In developed countries, most research suggests the positive effect of protection through intellectual property on business performance (5) (Boasson & Boasson, 2015; Chung et al., 2019; Grashuis & Dary, 2019; Kim et al., 2020; Lin & Chang, 2015). One study signals a negative relationship between intellectual property and performance (Colombo & Shafi, 2016). Two articles present inconclusive results for the present analysis (Agostini et al., 2016; Kiškis et al., 2016). The United States is one of the most observed realities in these surveys, which may be related to its prominence as one of the greatest economic powers in the world, being also one of the strongest nations in terms of intellectual property protection and innovation on the planet. It is noteworthy that, as expected, most studies show positive results regarding the effects of intellectual property on performance, which is related to the organization for innovation in developed countries.

#### **Intellectual property and performance in the global context:**

Three (3) analyses were identified that addressed the topic in a global context. Guo-Fitoussi et al. (2019) investigated the impact of combinations of intellectual property rights on company productivity, aiming to understand the relationship of complementarity or substitution between these rights. We analyzed 104,717 companies in 16 countries in 2004 and 94,347 companies in 14 countries in 2006 using a logit model<sup>13</sup> and a factor analysis model. It was identified that intellectual property strategies must be combined with other complementary intangible assets for the optimal appropriation of innovation profits. Tsakalerou (2018) examined the extent to which a system of intellectual property rights protection promotes an environment in which intellectual capital can be important to a

<sup>7</sup>Exploration refers to the knowledge creation strategy (Lichtenthaler & Lichtenthaler, 2009).

<sup>8</sup>Exploitation refers to the knowledge application strategy (Lichtenthaler & Lichtenthaler, 2009).

<sup>9</sup>Blockchain technology provides a decentralized database record and assists companies in building secure transaction systems, reducing intermediary costs. It can be applied in various fields, such as healthcare, smart contracts, banking, among others (Kim et al., 2020).

<sup>10</sup>The originality of the blockchain patent increases as it is cited by technologies developed by other companies. Thus, the concept is related to the usefulness of the patent in question in the development of new technologies (Kim et al., 2020).

<sup>11</sup>Blockchain patent generality increases as it uses or combines different technologies. In this case, generality is observed as the patent cites other patents, which expands its applicability in various situations or sectors, in addition to expanding its convergence with other technologies (Kim et al., 2020).

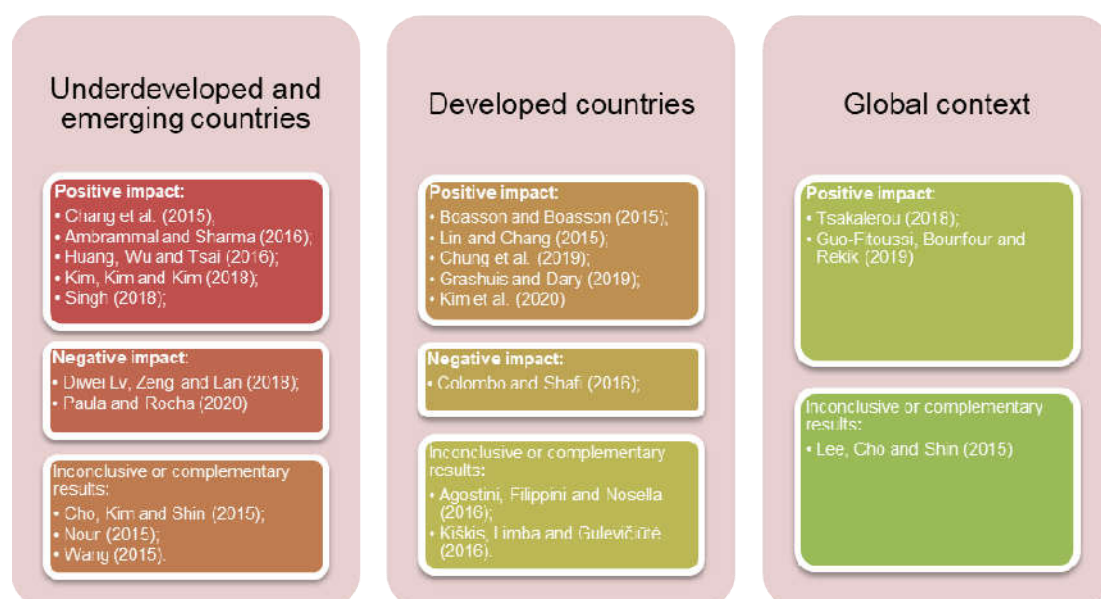
<sup>12</sup>Lichtenthaler and Lichtenthaler (2009) present ambidexterity as a strategy in which companies seek to balance the development and use of knowledge capabilities (exploration and exploitation).

<sup>13</sup>Logit models, also called logistic regressions, are used when the phenomenon studied has a qualitative form, being represented by one or more dummy variables, depending on the number of possible responses or categories of this dependent variable (FÁVERO; BELFIORE, 2017).

**Table 4. Implications of the works analyzed in the systematic review for innovation and intellectual property policies in emerging economy countries**

Authors	Theme	Implications for emerging economy countries
Paula and Rocha (2020)	Investment in R&D, patenting and performance	Articulate innovation and intellectual property policy focused on the specific needs of companies.
Kim et al. (2020)	Blockchain patents	Identify modern technological trends and align them with innovation and industrial policies.
Guo-Fitoussi et al. (2019)	Complementarity of intellectual property rights	Encouraging the protection of intellectual property combined with the management of intangibles.
Grashuis and Dary (2019)	Patented innovations	Strengthen national intellectual property policy.
Chung et al. (2019)	Software patents	Understand market characteristics to develop innovation and patenting strategy.
DiweiLv et al. (2018)	Co-patent and value	Identify the effect of partnerships and financing for innovation on national companies.
Tsakalerou (2018)	Intellectual capital	Strengthen the national intellectual property system.
Singh (2018)	Patents and value	Strengthen the national intellectual property system.
Kim, D., Kim, N. and Kim, W. (2018)	Patent protection and market value	Strengthen the national intellectual property system and measure other patent information, in addition to the simple counting of deposits and concessions.
Colombo and Shafī (2016)	Venture capital and product market regulation (PMR)	Understand the influence of the regulatory environment on young and innovative companies, to structure an environment that encourages innovation.
Agostini et al. (2016)	Trademarks and patents in SMEs	Understand the performance and importance of intellectual property in each sectoral group, to develop an intellectual property policy that is appropriate to sectoral specificities.
Ambrammal and Sharma (2016)	Patenting	Plan policies that promote investment in R&D, especially aimed at the development of the economy through patenting in companies.
Huang et al. (2016)	Innovation and results of technology parks	Encourage innovation through technology parks, by financing innovation and encouraging patenting.
Kiškis et al. (2016)	Intellectual property and business revenues	Understand the profile of intellectual property protection, in the country, and its economic effects, to strengthen the IP strategy.
Lee et al. (2015)	Open innovation and business performance	Identify the effects of investment in R&D, patent purchases and university-company partnerships on the results of national companies, aiming at planning intellectual property and innovation policies.
Chang et al. (2015)	Research and development and patenting	Understand how the Brazilian industrial network behaves in the face of investments in innovation and intellectual property, aiming to plan an adequate IP policy.
Nour (2015)	Intellectual property rights	Understand each structural element of the intellectual property and innovation system to align them with a policy to strengthen intellectual property and innovation.
Cho et al. (2015)	Intellectual property rights	Customize intellectual property policies for both industries and small and micro companies.
Boasson and Boasson (2015)	Spatial relationships between companies and innovation	Understand the regional innovation clusters to articulate programs to stimulate innovation and intellectual property, aiming to add value to the regional and national economy.
Wang (2015)	Patent examination duration	Improve the quality of patent examination and, along with that, manage the analysis time, aiming at optimization.
Lin and Chang (2015)	Ambidextrous innovation	Stimulate ambidextrous innovation (exploration and exploitation) in the national industry.

Source: authors (2020).

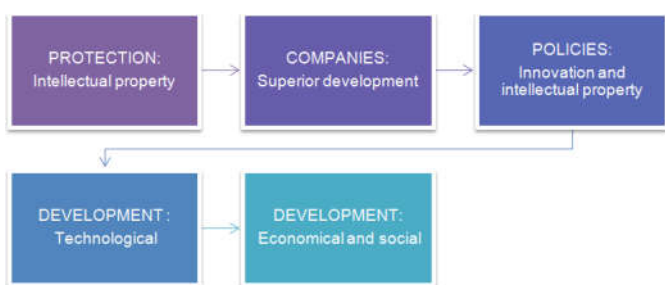


Note – In the group with “inconclusive or complementary results,” studies that did not investigate the direct relationship between “intellectual property and performance” and studies in which part of the results indicate a positive influence, while another part indicate a negative influence or even inexistence of effects were included.

Source: authors (2020).

**Figure 3. Evidence from the literature on the relationship between intellectual property and performance**

company's performance. 8222 companies were considered, in more than 34 countries, in diverse sectors, from services to manufacturing, and GE/McKinsey matrices were used. It was identified that the minimum structure of an intellectual property system in the country is important for there to be a positive impact of intellectual capital on the performance of companies in the industrial sector. On the other hand, the importance of intellectual capital is reduced when the company operates in an environment with a weak protection system. Another study analyzed the effects of patents originating from in-house R&D and university-industry collaboration on corporate sales, profits and market value at 28 global Information Technology companies on the Forbes Global list, using multiple regression. Patents from internal R&D investments increase sales, profits and corporate value. Purchased patents have small, immediate positive effects on market value and profit, but do not increase sales. Patents resulting from university-industry collaboration boost sales after more than two years, but negatively impact market value (Lee et al., 2015). Most global investigations also point to the relevance of intellectual property to organizational performance (2) (Guo-Fitoussi et al., 2019; Tsakalerou, 2018). However, it is observed that there are studies with results that are still inconclusive on the subject (1) (Lee et al., 2015). A summary of the findings identified in these studies is presented in Figure 3. The literature presents several indications that intellectual property produces positive effects on business performance: the ownership of IP assets, the opening of protection processes and the granting of patents or trademarks, for example, are aspects that signal technological innovation in the company. In general, it should be considered that intellectual property rights provide greater protection to leaders in technology development than to those who are followers (Kiškis et al., 2016). Thus, protection seems to increase competitiveness (Agostini et al., 2016) and contribute to the strategic positioning before the market and stakeholders. It is important, in this case, a strategic planning of the IP system for the proper exploration of the effects of the area. A considerable part of the studies also indicates a negative effect of intellectual property on performance, which is often caused by the implementation of protection systems or policies that are not aligned with the demands of the country, its organizations and society. Finally, these researches also bring discussions or analyses that can direct or generate important bases for the elaboration of innovation and intellectual property strategies in countries that need to dynamize their innovation environments, especially in those with an emerging economy. Table 4, below, presents the main implications of each work analyzed in this systematic review.



Source: authors (2020).

**Figure 4 - Flow generated from the protection of intellectual property in organizations**

Based on this framework, one can see the need to structure the countries' innovation and intellectual property systems. In addition, it demonstrates the need to understand the real effects of the intellectual property strategy on economic and financial performance, for a better strategic orientation.

Thus, from this study, the following Hypothesis 1 can be formulated:

H1: Investment in intellectual property protection leads to superior economic and financial performance in companies.

In addition to the findings of most of the studies analyzed in this research study, hypothesis H1 also considers as a guiding premise that, from the protection of assets, business organizations position themselves in a more strategic way in the market and achieve superior performance. Considering such relationships, policies to encourage innovation and the protection of intellectual property become opportune, which must be planned and duly implemented; from there, technological development is promoted and, consequently, economic and social developments. This path is shown in Figure 4.

## FINAL CONSIDERATIONS

Understanding the relevance of intellectual property to the economic, industrial and innovation systems of countries, both developed and underdeveloped, directly contributes to the strategic positioning of these nations in the face of the global economy. Therefore, this work systematically investigated the position of research on the relationship between intellectual property and the economic-financial performance of companies. Among the studies, 12 indicated a positive effect of intellectual property on the performance of companies, 6 presented inconclusive results and only 3 indicated a negative impact. Thus, most of the works analyzed in this review signaled a positive effect of intellectual property protection strategies on organizational performance. Among the assets analyzed are mainly patents, which are directly related to the development of new technologies, however, there are also approaches related to the effects of brands and other intellectual properties. In general, the economies of underdeveloped countries need a long-term strategic direction, aiming at both the development and the improvement of society's quality of life. Thus, it is understood that technological development and its due exploitation, through intellectual property, optimize the entire system, being an important basis for the strengthening of the industry, for the entrepreneurial activity, for the generation of employment and income and for the delivery of better solutions for society. There are patent documents that also analyze the relationship between intellectual property and business performance, especially with a view to identifying whether investment in this type of asset is viable for certain companies. Thus, a limitation of this study was the focus essentially on articles, without the insertion of patents in the area. Future studies may survey and analyze patents related to this thematic line, aiming to understand how these technologies are structured. Additionally, as a research agenda, it is recommended that new approaches analyze and test Hypothesis 1, formulated and presented in this study.

## ACKNOWLEDGMENTS

This research was supported by the Federal Institute of Piauí (IFPI) and the Postgraduate Program in Intellectual Property Science of the Federal University of Sergipe (UFS).

## REFERENCES

- Agostini, L., Filippini, R., & Nosella, A. (2016). Protecting intellectual property to enhance firm performance: Does it work for SMEs. *Knowledge Management Research and Practice*, 14(1), 96–105.
- Ambrammal, S. K., & Sharma, R. (2016). Impact of patenting on firms' performance: an empirical investigation based on manufacturing firms in India. *Economics of Innovation and New Technology*, 25(1), 14–32.
- Boasson, V., & Boasson, E. (2015). Firm value, spatial knowledge flow, and innovation: evidence from patent citations. *China Finance Review International*, 5(2), 132–160.
- Chang, M. C., Wang, Y.-H., Hung, J.-C., & Sun, C. (2015). R&D, Patent Arrangements, and Financial Performances: Evidence from Taiwan. *Periodica Polytechnica Social and Management Sciences*, 23(1), 25–40.

- Chiarini, T., Caliarì, T., Rapini, M. S., & Ribeiro, L. C. (2019). A evolução do patenteamento no Brasil: análise dos domínios tecnológicos “química” e “engenharia elétrica.” In T. Chiarini & T. Caliarì (Eds.), *A economia política na América Latina: Tecnologia e Inovação a favor do desenvolvimento/Organização* (pp. 241–272.). Paco.
- Cho, K., Kim, C., & Shin, J. (2015). Differential effects of intellectual property rights on innovation and economic performance: A cross-industry investigation. *Science & Public Policy*, 42(6), 827–840.
- Chung, S., Animesh, A., Han, K., & Pinsonneault, A. (2019). Software Patents and Firm Value: A Real Options Perspective on the Role of Innovation Orientation and Environmental Uncertainty. *Information Systems Research*, 30(3), 1073–1097.
- Colombo, M. G., & Shafi, K. (2016). The impact of patenting on the size of high-tech firms: the role of venture capital and product market regulation. *Economia e Politica Industriale*, 43(1), 85–103.
- Diwei Lv, D., Zeng, P., & Lan, H. (2018). Co-patent, financing constraints, and innovation in SMEs: An empirical analysis using market value panel data of listed firms. *Journal of Engineering and Technology Management*, 48, 15–27.
- Fávero, L. P., & Belfiore, P. (2017). *Manual de Análise de Dados: Estatística e Modelagem Multivariada com Excel®, SPSS® e Stata®*. Elsevier Brasil.
- Goncalves, Y. B., & Montalvo, G. S. A. (2021). Uma introdução à regressão quantílica. *Encontros Universitários Da UFC*, 5, 2983–2983.
- Grashuis, J., & Dary, S. (2019). Patented Innovation and Firm Value in the U.S. Food and Drink Industry: The Economic Importance of High-Quality Product Innovation. *Journal of Agricultural & Food Industrial Organization*, 17(2). <https://doi.org/10.1515/jafio-2017-0002>
- Guo, B., & Ding, P. (2017). Invention or incremental improvement? Simulation modeling and empirical testing of firm patenting behavior under performance aspiration. *Decision Support Systems*, 102, 32–41.
- Guo-Fitoussi, L., Bounfour, A., & Rekik, S. (2019). Intellectual property rights, complementarity and the firm’s economic performance. *International Journal of Intellectual Property Management*, 9(2), 136–165.
- Huang, S.-Z., Wu, T.-J., & Tsai, H.-T. (2016). Hysteresis effects of R&D expenditures and patents on firm performance: An empirical study of Hsinchu Science Park in Taiwan. *Univerzitet U Nisu. Prirodno-Matematički Fakultet. Filomat*, 30(15), 4265–4278.
- Kim, D., Kim, N., Kim, W. (2018). The effect of patent protection on firms’ market value: The case of the renewable energy sector. *Renewable and Sustainable Energy Reviews*, 82, 4309–4319.
- Kim, H., Kim, J., Jang, K., & Han, J. (2020). Are the Blockchain-Based Patents Sustainable for Increasing Firm Value? *Sustainability: Science Practice and Policy*, 12(5), 1739.
- Kiškis, M., Limba, T., & Gulevičiūtė, G. (2016). Business value of Intellectual Property in Biotech SMEs: case studies of Lithuanian and Arizona’s (US) firms. *Entrepreneurship And Sustainability Issues*, 4(2), 221–234.
- Lee, B., Cho, H. H., & Shin, J. (2015). The relationship between inbound open innovation patents and financial performance: evidence from global information technology companies. *Asian Journal of Technology Innovation*, 23(3), 289–303.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*, 339, b2700.
- Lichtenthaler, U., & Lichtenthaler, E. (2009). A capability-based framework for open innovation: Complementing absorptive capacity. *The Journal of Management Studies*, 46(8), 1315–1338.
- Lin, C., & Chang, C.-C. (2015). A patent-based study of the relationships among technological portfolio, ambidextrous innovation, and firm performance. *Technology Analysis and Strategic Management*, 27(10), 1193–1211.
- Maskus, K. E., Milani, S., & Neumann, R. (2019). The impact of patent protection and financial development on industrial R&D. *Research Policy*, 48(1), 355–370.
- Nour, S. S. O. M. (2015). The economic importance and impacts of intellectual property rights (IPRs) in Sudan. *African Journal of Science, Technology, Innovation and Development*, 7(2), 126–143.
- Paula, F. de O., & Rocha, R. J. S. (2020). The Effect of R&D Investments and Patents on the Financial Performance of Latin American Firms. *Latin American Business Review*, 27, 1–20.
- Ren, X., & Duprez, R. (2019). Financial impact of legal practice on software patent subject matter eligibility: Effectiveness of a workable standard. *The Journal of High Technology Management Research*, 30(1), 50–58.
- Rodríguez-Pose, A., & Wilkie, C. (2016). Putting China in perspective: a comparative exploration of the ascent of the Chinese knowledge economy. *Cambridge Journal of Regions, Economy and Society*, 9(3), 479–497.
- Singh, S. (2018). Patenting Matters, Not Patents: Firm Market Value in Indian Manufacturing. *Margin: The Journal of Applied Economic Research*, 12(1), 67–87.
- Tahmoosnejad, L., & Beaudry, C. (2019). Capturing the economic value of triadic patents. *Scientometrics*, 118(1), 127–157.
- Tsakalerou, M. (2018). Intellectual property as a key driver of business performance: The case of Singapore and its implications for innovation in a knowledge-based economy. *International Journal of Learning and Intellectual Capital*, 15(1), 83–92.
- Wang, M.-Y. (2015). Moderating effect of duration of patent examination on market value of firms: Evidence from Taiwanese publicly traded firms. *International Journal of Technology, Policy and Management*, 15(2), 197–212.
- Yang, A. S., & Okada, H. (2019). Corporate innovations as institutional anomie: Patent activities and financial performance of the international aerospace industry. *Finance Research Letters*, 28, 328–336.

\*\*\*\*\*