Patent Mapping in Emerging Countries

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Abstract: Perform a technological prospecting permits the Company to understand what in the future may have as economic assets to their own nation and which technologies will be available in terms of innovation. In this paper, we aimed to construct a panorama with technological indicators through patents focusing mainly in emerging countries that make up the BRIC group. It was sought as obtaining results, variables such as: profiles of patent offices, numbers of intellectual protection applications, patent applications by offices in the applicable countries of forms resident and abroad by family of patents, as well as the technological profiles of these patents, of their inventors and of their investors. With this multicase study, reflections were supported through bibliographic references in scientific articles and international reports, and the extraction of technological data in patents were results of one exploratory verification in the Patent Office of the World Intellectual Property Organization. Taking the general understanding that emerging countries are growing index in intellectual protection records in the issue of patents and there is a general effort from their offices by the motivation to innovation, as well as multinational companies stand out in this segment of intellectual assets.

Keywords: innovation; technology; prospection; development; economy.

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Introduction

To measure and know the Intellectual Property - IP - indexes, is the same as seeking to understand the technological forecast that the Society in the future may have as a resource for usufruct. And in focus on developing countries, we can observe the degree of possible patent growth, and the main areas of investment by companies.

In order to illustrate the size of these emerging countries at the world level, authors such as Neil (2001) and Brics Research Group (2012) Report that these savings represent approximately 43% of the population worldwide with a share of 25% of the global Gross Domestic Product - GDP, catching eyes to its participation in world markets.

There are gaps that are questionable in the innovation and economic relationship in these countries, for example: what are the numbers of Applications for Intellectual Protection of Brics' emerging members, the Intellectual Protection profile of the Resident and Foreign patent offices by family of patents, what are the Technological Profiles of these patents, of their inventors and of their investors.

For the variables described in this study, procedures were carried out for research by means of bibliographic analysis with verification in journals indexed on international bases, as well as exploration in the PatentScope database of the World Intellectual Property Organization - WIPO

In the portals of patent offices of the countries investigated, it was sought to understand what has recently been adopted as a way of developing solutions to improve the services provided by technological protection in patents.

The method of analysis and construction of the assertives researched resulted from hypothetical-deductive logic with the analysis of indicators extracted from spreadsheets, and generated in the form of graphs or figures to better explain the phenomena observed. Taking Microsoft Excel 2019 Student software as a tool. The research is geographically limited to the main emerging countries, known as Brics: Brazil, Russia, India, China and South Africa in the last decade, with a descriptive approach of qualitative and quantitative variables.

As a goal of this multicase study (YIN, 2001), it is hoped that research on technological indicators in patents can make these elements a means of looking at a brief overview that will allow us to generate reflections for impacting on the future of these territories, which are heading towards possibly being examples in cooperation with other developing nations.

Theoretical Reference

Intellectual Property (IP) consists of new ideas, original expressions, distinctive names and appearance that make products exclusive, valuable and often marketed or licensed (LESPERANCE, 1994; WIPO, n.d.). Just like the authors' view Quintella et al., (2013) that mention intellectual property is actually a type of property or asset as valuable (or more valuable) as physical or real property, even though it may be intangible, such as knowledge. In other words, it is a category of property that covers the intangible creations of the human intellect in such a way that it appears in the form of industrial property and copyright (WORLD INTELLECTUAL PROPERTY ORGANISATION - WIPO, 2016).

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In terms of patents for emerging countries of Brics group, it can now be understood that there is a well aligned understanding among these nations via international treaties adjusted by the World Intellectual Property Organization (DEORSOLA et al., 2017) and seek to conduct summits that discuss among other issues, technology and innovation (BRICS, 2017). And extract the statement from (BUDWAR et al., 2017) that "BRICS exhibit several profiles with trade-offs between intensity, structural change and interaction with the global economy".

Look at intellectual property - IP - in the world scenario, especially in patents, it is understandable that just in 2018, the amount of this technology reached 3.3 million applications, understanding the potential of protecting in terms of technolog

Method

Subjects or Participants

The participants are emerging nations limited to Brics, with registered patents in public patent database renowned globally answering issues as: applicants names, patents quantities, international classifications, inventors' names. Which it was possible with PatentScope® Database originated at Intellectual Property Organization – WIPO.

The subjects are patents of each country answering information about technological forecasting like numbers of Applications profile of Resident and Foreign patent offices by family of patents, technological profiles of these patents, of their inventors and of their investors. Which all these information permit to reflect and bringing the matter: in case of emerging countries, what is their landscapes about technologies and their players?

Apparatus

For this research, all technology in terms of equipment and software were generated with their own resources, as well as the analysis and generation of graphs with the help of Microsoft Excel Student and Coreldraw X7 Student, with support of map extracted from WIPO.

Design

All the statistical variables are discrete for the quantification of the patents of each country studied. This allowed to be traced the behavior of countries independently and acting together, and it was understandable that countries presented themselves as dependent variables. As for the independent variables, the profile of patent applicants, inventors, patent areas (classification) could be highlighted.

Oultcomes and Discussions

Brazil

The official office that deals with issues of intellectual property protection is the National Institute of Industrial Property (INPI) - autarchy linked to the Ministry of Economy - and that recognizes intellectual property as the fruit of inventiveness in relation to knowledge, technology and expertise INPI (201-), and comes corroborating what is internationally referenced by the World Intellectual Property Organization (WIPO, 2016).

WIPO in its report highlights in the patent area the position (26) for Brazil and pending in analyses of patents around (196,354), although a reduction of this backlog by (6.8%) was observed in relation to the previous period (WIPO, 2019a). As possible justifications, this can be found in Sobral (2017) that the process of internationalization has evolved the number of international deposits in the country, as well as the technological progress resulting from more complex inventions.

With this metric in the Brazilian backlog, the INPI expanded its staff by 1/4 of its old capacity in human resources for technological analysis, as well as improved electronic systems and internal process flows of its institute (INPI, 2018).

The Ministry of Economy recognized the world competitive scenario and the need to stimulate innovation, reacting with the goal of reducing the average analysis of each patent to 02 years, using the analysis of invention patent applications already made abroad, either for resident or foreign applications; adherence to the Madrid protocol for effectiveness in trademark protection and internationalization; briefness for priority examinations (group of elderly, micro and small businesses, green technology science institutions and participants of *Patent Prosecution Highway – PPH*)[1] (VERDÉLIO, 2019).

The INPI Business Program also stands out, broadening the list of INPI services, acting as a facilitating agent in the relations between national and foreign companies, universities, start-ups and research institutes, in order to generate new assets in intellectual protection (SILVA, 2020).

Russia

With entry into the World Intellectual Property Organization in 1970, Russia has Rospatent as the official office for intellectual protection (ROSPATENT, 2018b).

In your office, there is a continuous interest for efficiency in the evaluation of processes, optimizing a reduction in the deadlines from 2018 to 2019 by 30% in protections in general, with the processes to be optimized online (ROSPATENT, 2019a).

In the internationalization of Russian intellectual protection, Rospatent has been holding since 1997 the Rospatent Science and Practice Conference event, with the participation of regional and international organizations such as WIPO, EPO, Eurasian Patent Organization and foreign states (ROSPATENT, 2019b).

As for the profile of innovations registered in Russia internationally via WIPO, data are available in the general intellectual property panel of emerging countries (Table 1,2 and Appendix 2).

India

WIPO participant since November 1973 (WIPO, 2019b), India has a growing patent in recent years, highlighting the increase in the number of applications for patents by origin, particularly in the areas of information and communication technology (CORNELL UNIVERSITY; INSEAD; WIPO, 2019).

[1]*Patent Prosecution Highway (PPH)* – projeto entre escritórios nacionais/regionais de patentes no qual um Country aproveita o exame do parceiro para realizar sua análise.

His office, known as the Office of General control of Patents, Designs and trademarks, presents as legal framework the patent law since 1990 (THE PATENT ACT, 1970), amended in order to take account of normative developments.

Above all, we can see India with strong growth in patents since 2016 (WIPO, 2019c), being able to check more details in the results section of this work.

China

Member of the World Intellectual Property Organization since 3 June 1980, and being in force at the Paris Convention in 1985, China has the world's largest index of patent protection. (WIPO, 2018).

The answer to this growth in China can probably be found through Smith e Leydesdorff (2012), when it reveals that the increase in innovation took place after the change of state-owned enterprises (EEs) have been privatised. In addition, there has been an increase in applications for protection in Chinese cities regarding the use of Intellectual Property Rights (IPR) by private sector companies, which are more sensitive to IPR protection than state-owned companies.

Another factor that possibly justifies this growing rate of innovation is the investment in R&D, reaching the figure of 1.55 trillion, representing 2.1% of its GDP, so that part of these investments come from companies that contribute 78% of total spending on Innovation and Development. With this, China reaches 4th place in the world in citations of articles indexed to SCI, according to (BRICS, 2017).

In short, China seems to explain in large part the worldwide dissemination of scientific and technological innovation activities in the last two decades, although many other countries have contributed to this trend. But many low-income countries are systematically excluded from international innovation.

South Africa

The participation of the South African office at WIPO, took place with the agreement signed in 1967 which went into effect in 1975 (WIPO, 1975).

The office of the acronym in English, CIPC - Companies and Intellectual Property Commission, presents itself as the Commission of Companies and Intellectual Property, and comes since 2013 with the adoption of patent applications and other electronic technologies in order to optimize the service of the growing demand for intellectual protection (CIPC, 2013).

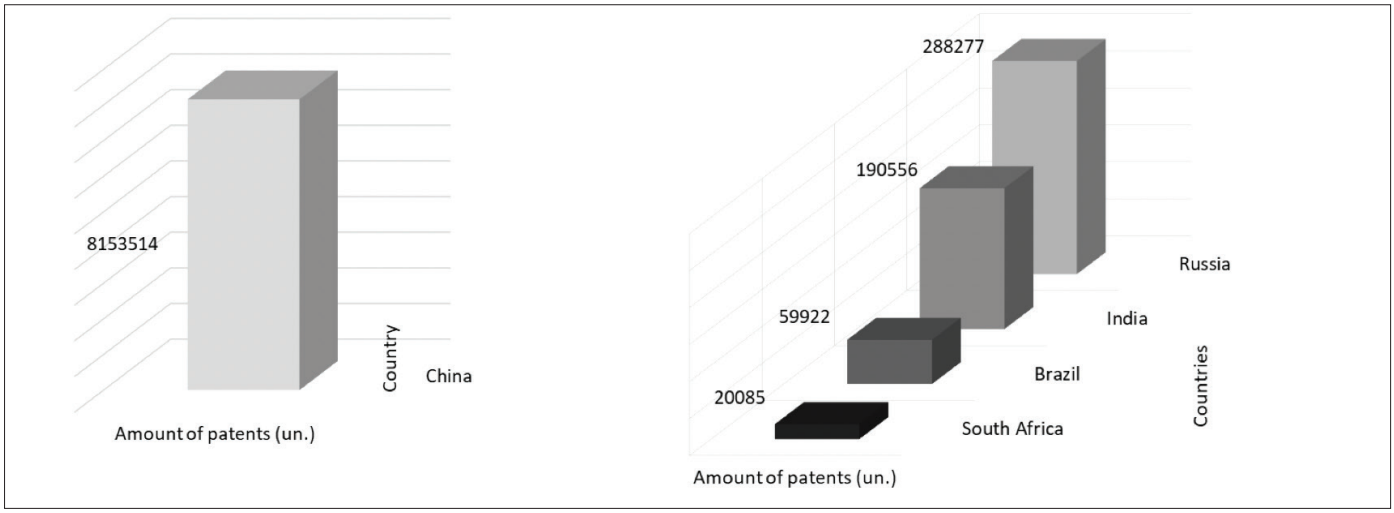
It is also found that the services for registration in intellectual protection of CIPC motivated its customers even more, adopting a strategy of reducing fees for the purpose of increasing records, thus demonstrating a greater interest in the increase of its technological indicators (Notice 36 of 2019 - Decrease of co-operative registration fee and amendment of constitution in terms of the amended co-ops act (no.6 of 2013), 2019).

It could be seen that South Africa still strives to make significant progress in the area of intellectual protection in front of the same markets on its continent. (Makhoba & Pouris, 2018), and has adopted a strategic planning with proposed market value, making it potentially available, as can be enumerated with: a) Delivery program and easy access to CIPC; b) Programme to promote innovation and creativity; c) Programme of reputation and business standardization (CIPC, 2017).

2.1. Requests for Intellectual Protection

Looking at the report of the World Intellectual Property Organisation, an increasing number of applications for intellectual protection for the emerging could be found, with the unusual point of the outlier of China potentially superior to the other countries, reaching over 8,15 million units in patents, making him world leader globally and among emerging countries, followed by Russia with (314251), India (212147), Brazil (65835) and South Africa with (20085) patents, as shown more graphically by Figure 1.

Figure 1. Accumulated patents in emerging
Residents + Foreign and Regional (2009 a 2018)



Source: Adapted from (WIPO, 2019a, 2019d, 2019c, 2019b, 2019e).

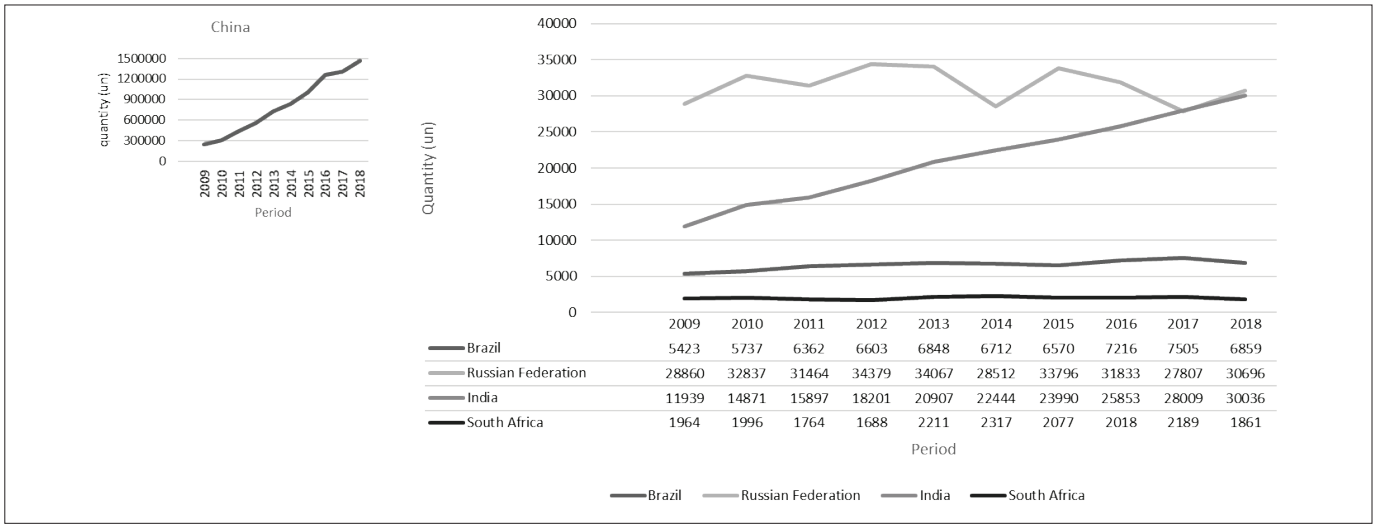
However, there is a strong characteristic related to these patents over the period when viewed in chronological detail by (Figure 2), when in the year of 2014 Russia presents strong decrease and recovery of growth in 2015 with later fall to the years after 2018. Resuming again strong growth from 2015 to 2018, appearing to be a general problem among patent offices in the matter of technological protections. While China, still being the outlier of this statistic, has not shown to have suffered shake-ups in its indices.

For India, it is worth highlighting the strong growth throughout the period for investment in intellectual protection, demonstrating a great effort of this country by its inventors, as well as an awareness of the importance of protecting its innovations. Moreover, it is worth highlighting the strong market by the population contingent that demands for various technological solutions. In order to compare its initial results with the most recent, according to the data presented, India started with 11,939 patents in 2009 and reached the mark of 30036 patents in 2018, showing in this contrast an increase of 251.57%.

In the case of Brazil, the protection of innovations remained practically constant, maintaining between 5423 and 7505 patents.

As for South Africa, it presented a quantitative index around 1964 to 2317 patents during all time.

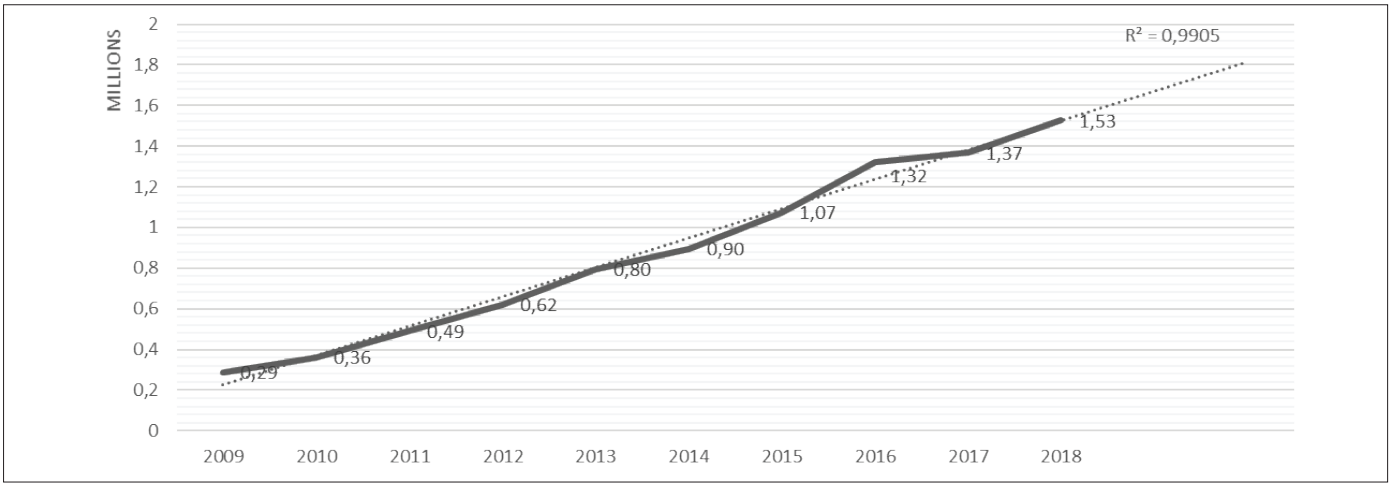
Figure 2. Number of patents per period in emerging countries (2009-2018)



Source: Adapted from (WIPO, 2019a, 2019d, 2019c, 2019b, 2019e)

In general terms, there is an increasing number of intellectual protection applications for emerging countries, observing just Brazil, Russia, India and South Africa during this period, when the amount of patents per year is analyzed (adding up your results per year), as can be seen from Figure 3, when it shows a trend line with R^2=0.99, demonstrating that together they show a strong trend of technological growth in numbers of millions patents.

Figure 3. Accumulated of emerging patents per period (2009-2018)



Source: Adapted from (WIPO, 2019a, 2019d, 2019c, 2019b, 2019e)

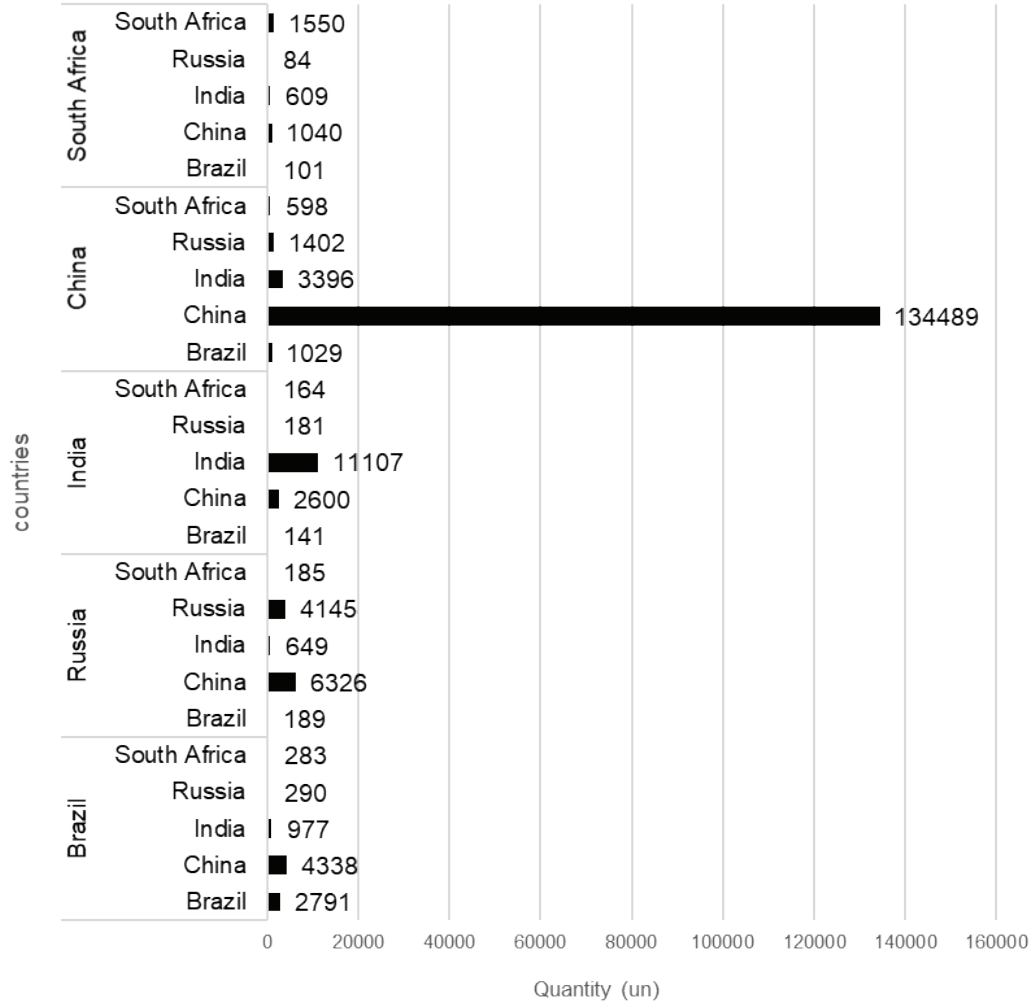
2.2. Intellectual Protection of Patent Offices Resident and Abroad by Patent Family

From this international indicator of Intellectual Property, it is worth noting that patents have been widely used as an indicator of innovation activity in recent decades, and that to measure the productivity of these activities in research and development, one must observe the absence of limitations pointed out by Pavitt (1982)and policies towards, technical change, requires better measurement of technical change. No single measure is perfect. Taken together, statistics on R&D and on patenting activities give important clues about the rate and direction of innovative activities, and also show the dangers of too hasty interpretation based on one measure. They both show a neavy concentration of innovative activities in chemicals and engineering (electrical, electronic and non-electrical and Griliches (1990), when many of the innovations are not patented, while others have several patent protections when applied in different territories, or the number of patents protecting the invention may differ between each country applied for (DECHEZLEPRÊTRE et al., 2017).

Another relevant point to understand in this indicator of patents residing and abroad by family is that each protection exercised presents its usefulness for quantifying the technological diffusion that is taking place among these countries, and also with the minimization of data duplication. It is also possible to count the relationship of international interests regarding the invention to be protected for exploitation in the respective market of that country, or simply to be applied in use mode (DE RASSENFOSSE et al., 2013). Thus, depending on the size of the family of patents in which there is representation in the territory, it is possible to observe a mensuration of size market, quantifying the appropriate technological value (HARHOFF et al., 2003).

Analysing the important points raised about these indicators, it is possible to ask: what are the indexes, at least quantitative in a protection matrix among the emerging ones, and what can be evidenced with these numbers? And according to PatentScope (2020), it was possible to condense the quantitative in the period 2009 to 2018 in agree with Figure 5, resulting of Table 4 from Appendix II.

Figure 4. Protected resident/exterior patents per family, among emerging countries.



Source: Database PatentScope(2020)

Looking at the compiled data from the sum of the period of 2009-2018, it turns out that South Africa invests in protecting its technological assets much more internally (1550) to externally, indicating that outside its territory it is much more attractive to protect its innovations in markets. As for requests for protection abroad, this African continent nation has records in Chinese office with (1040) patent units, Indians (609), Brazilians (101) and finally in Russian markets (84).

China's innovation ecosystem actors presented a superiority in this internal quantitative patent protection (134489), presenting full leadership in these indicators also in the external market. And It places their investments in protections, mainly in the Indian neighbor market (3396), followed by Russia (1402), Brazil (1029) and South Africa (598), demonstrating a hierarchy of interests in these markets.

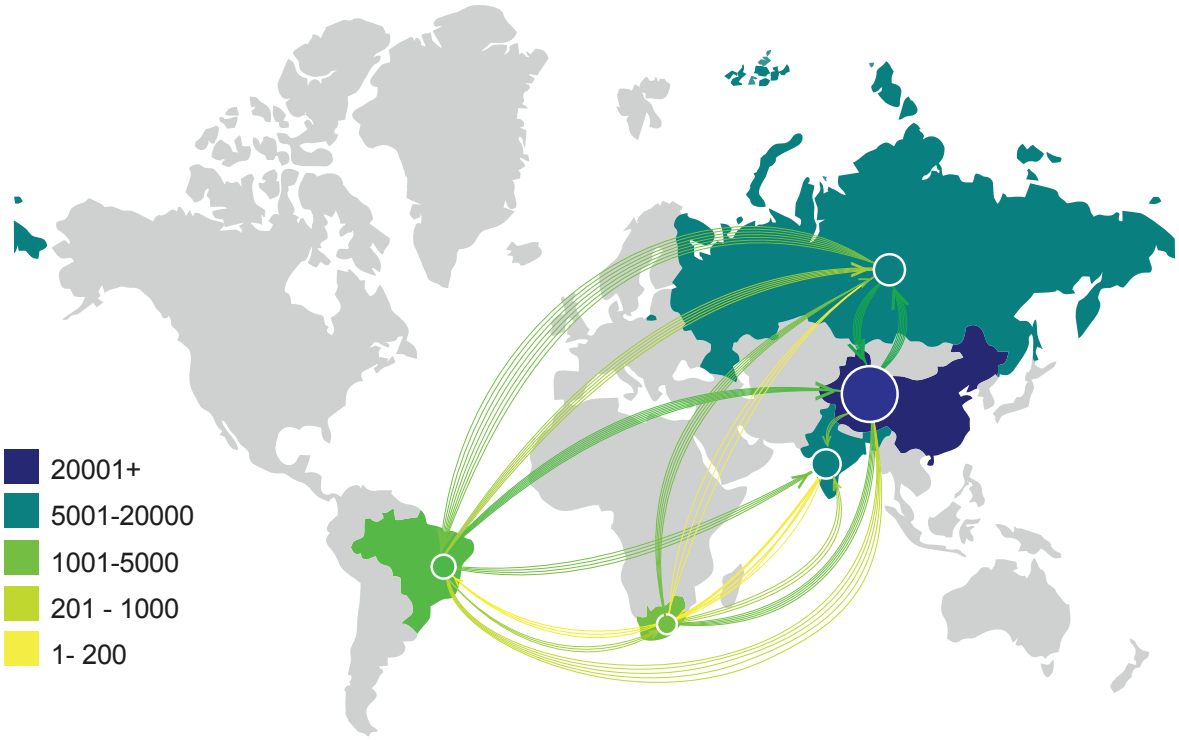
India visualizes its domestic market with great value (11107) in the protection of its innovations against the external market, but it respects the neighboring market of China (2600), and less investment in the protection of the Russian (181), African (164) and Brazilian (141) markets. It should be noted that all these external markets do not represent or want more than 2% of the quantity of resident patents protected.

Russia invests around 60% more in the protection of its patents within the China market (6436) in relation to its number of domestically protected patents (4145), while in the hierarchical order of investments in protection, it follows the Indian (649), Brazilian (189) and South African (185) markets mainly. The families of patents in Brazil present a statistic of importance in the external market mainly (4338), while internally it also presents a considerable index of this quantitative (2791), so that India is the second external market of greater interest (977), Russia (290), and South Africa (283) finally, and not less important.

Observing the general indicators of protection in this macro-environment of nations, one can possibly identify that the considerations of the factor - geographical proximity to the markets - attract more patent protection in general, except for China, since this huge Chinese market of protection attracts the interest of international patent registrations from the most distant countries, as in the case of Brazil.

From the data obtained, it is possible to illustrate this relationship of interests in Intellectual Protection resident and abroad through Figure 6, identifying the appropriate quantitative proportions.

Figure 5. Geography of Intellectual Protections in emerging countries and their resident and foreign holdings (2009 – 2018)



Source: PatentScope database (2020); illustration adapted by Tadeu Tatum.

The results achieved on the geographical factor with the vision of Blomkvist; Drogendijk, (2013) when it mentions that physical distance really is a factor explaining the path of internationalization of companies as a form of choice, as well as the flow and selection of markets in emerging countries, widely perceiving the power of patents protected by family on the axis of Russia - China - India.

In the case of China, although its market share in foreign patents is still a fraction of what is applied for in domestic patents, it is noted that there is a significant amount also in foreign countries, which has also been observed in the case of emerging countries (WUNSCH-VINCENT et al., 2015).

The same authors also point out that China's patents are concentrated on specific technologies and on small companies, being mostly in the technological sectors, corroborating what will be seen in the item below in what is presented in Table 1, in the technological profiles of Chinese patents.

It is observed that African general indices are more suppressed compared to all other countries as we have seen, however, is to be emphasized research (Makhoba; Pouris, 2018) that portrays South Africa with a different view, a look at specific areas in nanotechnology, biotechnology, climate change, energy and health, highlighting it in a more competitive environment against Brazil, Russia, India and China, even concluding that South Africa's production is the most prolific on its own continent, although the technologies investigated are not properly aligned with the priority areas of government policy.

Lubango (2020) exposes the international networks of co-inventors among South Africa, Brazil and India for the production and dissemination of green international innovations, highlighting the linear correlations in India, followed by Brazil with the largest network of co-inventors and finally identifying the non-linearity for South Africa, by presenting a smaller network. However, it argues that co-inventor networks accelerate transnational exchanges of human capital and that it is worth adopting national and transnational industrial cluster and innovation policies at global levels to support sustainable production plans.

The Russian Government highlights the bilateral technical-military cooperation with China, aiming at maintaining the agreements on mutual protection of intellectual property, and ensuring their effective implementation in relation to previous agreements (ROSPATENT, 2018a).

In the proposed study of Russia as the cooperation in the Brics relating to Science, Technology and Innovation, the authors have compiled indexes in priority areas, and realized that issues such as the advanced manufacturing and robotics, space systems and astronomical observations are fields of high importance and which require a lot of research and development - R&D, while areas of information communication technology - ICT - have a great importance and an average capacity for investments in R&D (SOKOLOV et al., 2019).

Another important topic regarding this collaboration network among the emerging focus on Russia, is present: a) the focus for cooperation in the fields of nanotechnology and new materials; b) mutual benefit for win-win cooperation in ICT and advanced robotics and industrialization; c) and the leading role in space research and robotics (SOKOLOV et al., 2019).

Patents: Technology profiles, inventors and investors (2010-2019)

Knowing the profiles of protection in patents with the highest rate of each nation, is possible to extract evidence that China holds the largest amount of intellectual protection with more than 19.8 million units, being outlier compared to other countries. And following in descending order, there is the participation of Russia with (1,197,097) patents, Brazil (788,878), India (538,465) and South Africa with (151,921) protections.

Taken from the whole period (2010-2019), the highest rate of protection for each country, was the year 2011, and a description of its results is worth noting. Note that in the general classification profile of the International Patent Code there is a clear evidence and predominance of the category (G06F) which is associated with - section G - Physics, subsection 06 - Computation; calculation; count; F - Electrical processing of digital data - dominated by the high quantitative degree of Chinese patents. Taking in general that all the productive potential in patents stands out for progress in the areas of Informational Technology and processing. While all other countries: Brazil, Russia, India and South Africa, looking for intellectual property protection in the code (A61K) which is associated with the area of - Human Needs, Health, Rescue, Recreation (A), highlighting the subclass Medical or veterinary science; Hygiene (A61) and specifically for the purpose for medical preparations, dental or hygiene (A61K) - leading to understand that companies with the profile in the health field in general, drugs or hospital have greater framework that quantitative when They present the companies Bayer AG (4497) in Brazil and Unilever PLC (3247) of South Africa.

With this, it could be seen in a general way that, in this time space of 2011 among these countries, 3/4 of patents were focused on the areas of information and processing - "cold, machine technology" - well highlighted by China, compared to 1/4 of patents for human and health issues to the rest of the countries.

Associated enterprises in the informational area are highlighted by the company's inventor Oleg Kyasenkov of Russia to (3481) patents, Qualcomm Incorporated in India (17381) and State Grid Corporation (63285) in China, in ascending order.

The countries of India, China and South Africa did not have the profile of its inventors their names, while Brazil stands out with inventions of the German Focke Heinz with 334 protections and Russian Oleg Kyasenkov with (33416) Patent units in Russia.

In the same period in 2011, stands out in ascending order of the quantitative South Africa (5108), Brazil (22,878), India (49,904), Russia (72,158) and China (839189).

Table 1. Technological Profile patents by countries for the highest rate achieved by each emerging

Country		Applicants		Inventors		Code IPC		Year of publication	
Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.
Brazil	788878	BAYER AG	4497	FOCKE HEINZ	334	A61K	64793	2011	22878
Russia	1197097	Oleg Kvasenkov (RU)	3481	Oleg Kvasenkov (RU)	33416	A61K	79637	2011	72158
India	538465	QUALCOMM INCORPORATED	17381	NA	497	A61K	74789	2011	49904
China	19888082	STATE GRID CORPORATION OF CHINA	63285	THE INVENTOR HAS WAIVED THE RIGHT TO BE MENTIONED	75662	G06F	783458	2011	839189
South Africa	151921	UNILEVER PLC	3247		22915	A61K	36202	2011	5108

Fonte: PatentScope (2020)

Evaluating the general technological profiles of the countries as the applicants, inventors and protected areas, it can be understood at a glance according to Appendix III, the following data (Table 2).

Table 2. General Profile of Inventions in Patent in Emerging (2010 – 2019)

Country	Companies	Inventors	Patents Section	
Brazil	Multinational	1 resident 9 foreign (Chinese, Americans and Russians)	A, B, C, G	SECTION A - HUMAN NECESSITIES SECTION B - PERFORMING OPERATIONS; TRANSPORT CHEMICAL SECTION C; METALLURGY SECTION D - TEXTILES; PAPER SECTION E - FIXED CONSTRUCTIONS SECTION F - MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; EXPLOSION SECTION G PHYSICS SECTION H - ELECTRICITY
Russia	Multinational	10 residents	A, B, C, E, G	
India	Multinational	1 confidential and 9 foreigns Chinese, americans)	A, C, G, H	
China	Multinational	2 under secrecy and 8 residents	A, B, C, F, G, H	
South Africa	Multinational	Foreigners	A, B, C	

The metrics of larger holdings, among the ten most, it has the following highlights: the profiles of companies that reveal, stand out by presenting profiles of multinational Productions. As for inventors, it can be extracted in a general way that Brazil for the most part is foreign; India and South Africa, all inventions are the result of external inventors, while for Russia and China the participation of inventors from their own country is observed.

For more detailed analysis and assessment is recommended to observe the Table 6 in Appendix 4.

Final Considerations

It can be seen in the survey, an increasing index in the records of intellectual property protection for patents from emerging countries and an effort to improve the quality of services of the regional offices of those countries in order to maintain a equated availability to their demands.

In patent indexes, it stands out as patent outlier, Chinese intellectual production with the highest index to the global, followed by Russia, India, Brazil and South Africa respectively. However, there is a need to verify the amplitude of India´s innovation, which in terms of patents requests, represents the second biggest rate between the countries, showing strong technological growth in the last decade. And that, the countries together accounted for an accumulation of patents with a very strong metric, recorded with a line of R^2 trend above 0.99, indicating a promising future for these countries when worked more cooperatively to innovation.

It is noteworthy that protected by patent family abroad, Russia and Brazil invest more in protection with its technological assets in China that within their own countries, while South Africa, India and China seek to protect more internally, as well as the flow of investments in intellectual property protection appears more strongly in countries that are closer geographically.

The highest patent rates in the period (2010 - 2019) represent technologically the holding of applications by multinational companies, with the profile of foreign inventors in the innovations of Brazil, India and South Africa, checking the areas of human needs (A), Processing/ Transport Operations (B), Chemistry and Metallurgy (C), Physics (G) for most emerging nations.

It is hoped that with these considerations and reflections, nations can expand cooperative efforts in technology and research, developing collaborative actions between companies and inventors, universities and researchers, intellectual property protection offices and analysts in order to effectively contribute in the economies of societies.

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APPENDIX I - Indicators of patent applications (2009-2018)

Table 3. Applications for Intellectual Property (Resident + Exterior, Including Regional)

Countries/Period	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Brazil	5423	5737	6362	6603	6848	6712	6570	7216	7505	6859
Russia	2886	32837	31464	34379	34067	28512	33796	31833	27807	30696
India	11939	14871	15897	18201	20907	22444	23990	25853	28009	30036
China	241435	308327	436168	561404	734093	837814	1010524	1257425	1306080	1460244
South Africa	1964	1996	1764	1688	2211	2317	2077	2018	2189	1861

Source:(WIPO, 2019a, 2019d, 2019c, 2019b, 2019e)

APPENDIX II - Indicators of patents resident and abroad by family of patents (2009 – 2018)

Table 5. Patent family oriented to foreigners by office of origin and destination

Countries		**Period**										
Escritório	Origem	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Brazil	Brazil	329	307	362	391	331	330	362	278	99	2	2791
Brazil	China	587	636	496	470	423	752	738	199	37		4338
Brazil	India	127	189	168	103	115	92	132	37	14		977
Brazil	Russia	34	57	45	36	28	55	27	7	1		290
Brazil	South Africa	43	48	62	34	20	31	36	9			283
China	Brazil	131	126	143	151	115	124	122	77	40		1029
China	China	9566	10419	12582	15367	16817	18667	22398	20266	7913	494	134489
China	India	439	607	631	508	300	291	311	222	85	2	3396
China	Russia	150	203	199	195	169	187	179	102	18		1402
China	South Africa	94	114	94	83	62	70	58	21	2		598
India	Brazil	63	25	11	35	7						141
India	China	1192	628	209	380	126	21	22	18	4		2600
India	India	1071	1269	1416	1310	1405	1365	1514	1248	502	7	11107
India	Russia	72	45	15	43	5	1					181
India	South Africa	73	39	18	31	1	1	1				164
Russia	Brazil	34	33	28	27	17	20	21	9			189
Russia	China	558	614	478	741	799	1062	1168	766	134	6	6326
Russia	India	89	113	114	119	61	51	47	49	6		649
Russia	Russia	422	551	578	536	460	548	486	458	106		4145
Russia	South Africa	33	34	36	19	13	19	19	12			185
South Africa	Brazil	21	15	25	24	8	6	2				101
South Africa	China	121	153	176	305	180	58	15	11	21		1040
South Africa	India	132	108	116	100	88	43	18	4			609
South Africa	Russia	22	19	9	14	15	4	1				84
South Africa	South Africa	199	221	213	239	191	200	161	110	16		1550

Source: WIPO Statistics Database. Last update: October 2019

APPENDIX III - Technology Profile in patents by emerging countries analysed separately by office (2010-2019)

Table 6. Ranking of the 10 highest patent rates per country in emerging countries.

BRAZIL

Country		Applicants		Inventors		Code IPC		Year of publication	
Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.
Brazil	788878	BAYER AG	4497	FOCKE HEINZ	334	A61K	64793	2011	22878
		PROCTER & GAMBLE	3286	WANSHI CHEN	320	A61P	36332	2012	713
		UNILEVER NV	3045	PETER GAAL	298	C07D	34563	2013	11384
		QUALCOMM INCORPORATED	2841	FREDERICK E. SHELTON IV	280	B65D	258	2014	15871
		HOECHST AG	2601	HAMMANN I	244	C07C	21991	2015	29645
		DU PONT	2511	TAO LUO	236	A01N	18823	2016	50445
		BASF AG	2446	HAO XU	219	C08L	16554	2017	74696
		GEN ELECTRIC	2221	STRATHMANN SIEGFRIED	199	C12N	15722	2018	43496
		SIEMENS AG	2165	VENEZIANO JOSE CARLOS	197	B01J	14948	2019	33516
		CIBA GEIGY AG	1934	MARTA KARCZEWICZ	196	G06F	14739		

RUSSIA

Country		Applicants		Inventors		Code IPC		Year of publication	
Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.
Russia	1197097	Oleg Kvasenkov (RU)	3481	Oleg Kvasenkov (RU)	33416	A61K	79637	2011	72158
PCT	17322	KONINKLIJKE PHILIPS N.V.	2615	Kvasenkov Oleg IvaQuant.vich (RU)	2987	A61B	43771	2012	80702
		KONINKLIJKE PHILIPS ELECTRONICS N.V.	2517	Oleg Kochetov (RU)	5873	G01N	41181	2013	81057
		Oleg Kochetov (RU)	242	Yulia Shchepochkina (RU)	5344	A23L	41154	2014	80816
		CONINKLAKE PHILIPS NW (NL)	216	Shchepochkina Julija Alekseevna (RU)	4319	A61P	39236	2015	74076
		SIEMENS AKTIENGESELLSCHAFT	2015	Magomed Akhmedov (RU)	3907	E21B	30227	2016	72122
		FORD GLOUBAL TEKQuant.LOGIS ELSY (EUA)	1976	Kvasenkov O.I.	3901	G06F	24954	2017	7761
		CONINKLAKE PHILIPS ELECTRONICS NW (NL)	1612	Kvasenkov O.I.	3843	C07D	2381	2018	63041
		SIMENS AKYMENGEELLSAFT (DE)	152	Demirova Amiat FeizudiQuant.vna (RU)	2698	B01D	19683	2019	53743
		KVELCOMM INCORPOREITED (EUA)	1308	Kvasenkov O.I. (RU)	2072	A61F	19008		

INDIA

Country		Applicants		Inventors		Code IPC		Year of publication	
Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.
India	538465	QUALCOMM INCORPORATED	17381	NA	497	A61K	74789	2011	49904
PCT	210987		12865	CHEN Wanshi	424	C07D	41187	2012	32392
		KONINKLIJKE PHILIPS ELECTRONICS N.V.	9235	GAAL Peter	407	G06F	40217	2013	28872
		SIEMENS AKTIENGESELLSCHAFT	4505	GAAL Peter	406	H04L	32312	2014	36945
		TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)	4305	LI Junyi	390	H04W	25483	2015	45293
		BASF SE	4265	LUO Tao	386	C07C	20589	2016	77638
		GENERAL ELECTRIC COMPANY	4148	CHEN Wanshi	361	A61P	18685	2017	43843
		ROBERT BOSCH GMBH	4094	MONTOJO Juan	328	C12N	16796	2018	36286
		MICROSOFT CORPORATION	3995	KARCZEWICZ Marta	324	A61B	16759	2019	40255
		SONY CORPORATION	371	JI Tingfang	266	H04N	15436		

CHINA

Country		Applicants		Inventors		Code IPC		Year of publication	
Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.
China	19888082	STATE GRID CORPORATION OF CHINA	63285	THE INVENTOR HAS WAIVED THE RIGHT TO BE MENTIONED	75662	G06F	783458	2011	839189
PCT	671477	Samsung Electronics Co. Ltd.	22538	WANG WEI	29757	A61K	601709	2012	1106830
		GREE ELECTRIC APPLIANCESINC.OF ZHUHAI	22137	ZHANG WEI	25522	G01N	519576	2013	1331729
		MIDEA GROUP CO. LTD.	21697	LI WEI	21181	A61P	44564	2014	1480077
		HUAWEI TECHQuant.LOGIES CO. LTD.	2047	WANG LEI	20098	H04L	439177	2015	1600697
		CHINA PETROLEUM & CHEMICAL CORPORATION	19559	LIU WEI	19549	B01D	404052	2016	1932340
		Huawei TechQuant.logies Co. Ltd.	18871	ZHANG LEI	19268	H01L	399703	2017	2198184
		BOE TECHQuant.LOGY GROUP CO. LTD.	17911	WANG JUN	17343	H04N	309276	2018	3038358
		ZTE Corporation	16758	INVENTOR SOB SIGILO	17318	C02F	305935	2019	3118737
		KONINKLIJKE PHILIPS ELECTRONICS N.V.	16079	LI JUN	16187	F21V	30406	2020	57764

SOUTH AFRICA

Country		Applicants		Inventors		Code IPC		Year of publication	
Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.	Name	Quant.
South Africa	151921	UNILEVER PLC	3247		22915	A61K	36202	2011	5108
PCT	3258	NOVARTIS AG	158	ADAMS & ADAMSADAMS & ADAMS	8046	C07D	21163	2012	6142
		ASTRAZENECA AB	1391	SPOOR & FISHERSPOOR & FISHER	6499	C07C	9052	2013	4765
		BASF AKTIENGESELLSCHAFT	1289	D.M. KISCH INCD.M. KISCH INC	1803	A61P	7092	2014	5065
		MERCK PATENT GMBH	772	HAHN & HAHNHAHN & HAHN	1586	A01N	5904	2015	1841
		THE PROCTER & GAMBLE COMPANY	769	VON SEIDELSVON SEIDELS	888	C07K	5817	2016	0
		BAYER AKTIENGESELLSCHAFT	687	DR GERNTHOLTZ INCDR GERN-THOLTZ INC	641	C12N	5788	2017	2
		ELI LILLY AND COMPANY	657	BOWMAN GILFILLAN (JOHN & KER-NICK)BOWMAN GILFILLAN (JOHN & KERNICK)	520	B65D	5204		
		HINDUSTAN LEVER LIMITED	651	ERASMUS TEUNSERASMUS TEUNS	412	B01J	4373		
		NOKIA CORPORATION	631	DM KISCH INCDM KISCH INC	232	B01D	3499		

Fonte: PatentScope (2020)