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Artículo de revisión

Scientific production: a relationship of the PIB of Ecuador and Latin america

Producción científica: una relación del PIB del Ecuador y Latinoamérica

Produção científica: uma relação entre o PIB do Equador e da América Latina

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Abstract

When studying and analyzing Research and Development in Ecuador compared to Latin America, it allows us to perceive the real scientific situation that these regions have had and their relationship with PIB (GDP; in English gross domestic price. In Spanish precio interno bruto) in investment; The main objective is to position and understand one of the main determinants of development and performance of its productive sector in public health in relation to the percentage that represents spending on PIB for Research and Innovation.

To perform the present analysis, we used data published in journal articles indexed in the main databases of Science, many of the studies were carried out through quantitative analysis of scientific production in Ecuador and Latin America through Bibliometrics, in which the production index stands out and was related to the PIB of the countries that produce more in counterpart with those of Latin America and Ecuador.

In Ecuador, in relation to other countries worldwide, it is at a lower level with respect to scientific production, reality that is palpated in the bibliometric indexes of the different authors, lower levels of PIB expenditure were determined in scientific research in relation to the average of Latin America.

Keywords: Latin America, Ecuador, PIB

Resumen

Al estudiar y analizar la Investigación y Desarrollo en Ecuador comparando con América Latina permite percibir la real situación científica que han tenido estas regiones y su relación con el PIB en inversión; el principal objetivo es posicionar y entender uno de los principales determinantes de desarrollo y desempeño de su sector productivo en la salud pública con relación al porcentaje que representa gasto en el PIB para Investigación e Innovación.

Para efectuar el presente análisis se utilizaron datos publicados artículos de revistas indexados en las principales bases de datos de Ciencia, muchos de los estudios se realizaron mediante análisis cuantitativo de la producción científica el Ecuador y Latinoamérica mediante la Bibliometría en la que se destaca el índice de producción y se relacionó con el PIB de los países que más producen en contraparte con los de Latinoamérica y el Ecuador

En el Ecuador con relación a los otros países a nivel mundial se encuentra en un nivel inferior con respecto a la producción científica, realidad que se palpa en los índices bibliométricos de los diferentes autores, se determinó niveles inferiores de gasto del PIB en investigación científica con relación al promedio de América Latina.

Palabras Claves: Latinoamérica, Ecuador, PIB

Resumo

Ao estudar e analisar a Pesquisa e Desenvolvimento no Equador, comparando-o com a América Latina, permite-nos perceber a real situação científica que essas regiões têm tido e sua relação com o PIB em investimento; O objetivo principal é posicionar e compreender um dos principais determinantes do desenvolvimento e desempenho do seu setor produtivo em saúde pública em relação ao percentual que representa o gasto do PIB em Pesquisa e Inovação.

Para realizar a presente análise, foram utilizados dados publicados em artigos de periódicos indexados nas principais bases de dados da Science, muitos dos estudos foram realizados por meio de análises quantitativas da produção científica do Equador e da América Latina por meio da Bibliometria em que o índice de produção e estava relacionado ao PIB dos países que mais produzem em contrapartida aos da América Latina e Equador

No Equador, em relação a outros países do mundo, encontra-se em um patamar inferior no que diz respeito à produção científica, realidade que se evidencia nos índices bibliométricos dos diversos autores, foram apurados níveis mais baixos de gastos do PIB em pesquisa científica com em relação à média latino-americana.

Palavras-chave: América Latina, Equador, PIB

Introduction

According to research priorities in health services of the National Health System, research is a systematic search for information, together with research of new knowledge. Provides two essential and powerful weapons for accelerated advances within health systems, basic or traditional research, necessary to generate new knowledge, technologies, and achieve better interventions according to health problems; and the applied research, necessary for the process of identifying and prioritizing problems as well as for designing and evaluating policies and programs. (Bernal-

Delgado, Peiró, & Sotoca, 2006). Thus, determined to the scientific production like the result of the process of creative character that tries to find answer to transcendental problems and thereby achieve significant findings that increase the human knowledge applicable to the solution of the problems raised.

This process consists of different moments that are vital for it to develop fully. These include the accumulation of information, facts, empirical data; the development of the theory, interpretation, description, explanation of the facts, accumulated data and forecast or prediction of other new and unknown of the same nature; and the validation, application, verification in practice of the thought.(Salomón & Rodríguez, 2007).

Clinical research is currently of great importance, growing, and is currently a necessity for the progress and development of any country, for the progress of Health Sciences, it is a necessity for the advancement of the scientific profession

Research is so important in order to provide better care to patients, and that it has become a moral obligation for health professionals, since it is not ethical to leave the research without the importance that deserves, because it would be limiting the professional improvement and, above all, the improvement of patients.(Redondo-Figuero C G, Santamaría-Pablos A, 2015).

Multiculturalism in the Ecuadorian territory needs to know about the different behaviors that are adopted by patients, so it is necessary to potentiate scientific production in hospitals and their teaching and research departments. Universities in Ecuador are the entities that promote scientific production, so much so that figures determine the ranking of educational institutions that promote research. The great majority of the effort of the scientific and technological development of a country is mediated, directly or indirectly, by the university and the academic and research activity that it generates. (Salomón & Rodríguez, 2007).

Investigation Process

The scientific and technological advances that day by day bring the knowledge of modern procedures and advances in medicine, on one side, entail a countless number of benefits for healthy or sick people.(Redondo-Figuero C G, Santamaría-Pablos A, 2015). Scientific research part of a process accepted and validated to solve questions, aimed at knowing the principles and laws that

sustain man and the world; has its own systems based on the hypothesis deduction/induction complemented with statistical and probability calculations.(Ramírez, 2009).

The basic elements of scientific research, which characterizes factual records (numerical results, texts, images and sounds) they begin by proposing a hypothesis to adjust with mathematical models of verification and finally establishing valid and reproducible conclusions.(Padilla Navarro Osvaldo José. Cancino Salas, Ronald Domingo. Gatica Álvarez, Mario Hernán., 2013)

The good management of the theory of knowledge in scientific research allows correct answers and techniques and a hypothesis, reason why the scientific researcher should know his theory and evolution (Ramírez, 2009), being the indicated and expressive reflection of the reality that is formalized in a linguistic way (González Suárez, 2006) that are commonly accepted in the scientific community for allowing the validation of results. A set of research data constitutes a partial systematic representation of the object that is being investigated. Scientific information refers to the conclusion obtained from the analysis of data and the results of an investigation.(Padilla Navarro Osvaldo José. Cancino Salas, Ronald Domingo. Gatica Álvarez, Mario Hernán., 2013).

The scientific process is not finished when the research concludes or when it is presented in a congress or seminar, but until it has been published in a scientific journal.(Alfaro-Tolosa, 2013). As Wolf 2011 relates “sharing knowledge is what led our species to the dominant role that nowadays occupies” (Wolf, 2011). Science is characterized as being of public knowledge (Urbizagástegui Alvarado & Suárez, n.d.), repositories and scientific journals being another possibility for authors to disseminate their knowledge (Viciedo, Guardiola Fernández, & Rodríguez González, 2012).

What is Bibliometrics, Scientometrics and Informetrics (or Bibliometrics, Scientometrics and Informetrics)

The characteristics that express science in science must comply with certain characteristics, that are public, objective, reproducible, predictive, cumulative, systematic and all these depend on written disclosure. The publication is the final stage in the investigation, if this is not carried out in a scientific field, the investigation never existed. (Lang, 2010.). The importance currently given to scientific production, and consequently to journals that publish works as instruments for disseminating knowledge that contributes to the advancement of science, assumes that bibliometric

studies are of paramount importance in the evaluation framework of scientific contents.(Agudelo, Bretan-Lopez, & Buela-Casal, 2004). In recent years evaluative bibliometrics have been firmly established as a tool in the management of research and decision making in the field of scientific policy.(Torres-Salinas & Jiménez-Contreras, 2012).

One of the methods to evaluate the accredited activity of professionals who have completed higher education, is in relation to observe their scientific activity through their publications in different media as a journal indexed in scientific databases.(Larrarte et al., 2016). Bibliometrics, scientometrics and infometry are the sciences that measure the scientific production in a given entity or region, being an indicator of the scientific works that are developed in this field and evaluate the activity within a specific country or area.(Valdez Martinez et al., 2000).

The mechanisms of scientific production in health and the disclosure of them range from incarnation in physical and digital support, being communication channels with the ability to make public the results of research such as articles in scientific journals, book chapters, papers in congresses and posters.

“The bibliometric production indicators are useful quantitative indexes to measure, among others, the scientific production levels of a country, an institution, an author or a publication”. “They are used to compare the scientific productions between similar groups, but not to evaluate the quality of the production of a country, an institution or a publication”.(Álvarez, Lorenzo, Andrés, & Rodríguez, 2007) thus evaluating scientific production can distinguish jobs that focus on emerging trends.(Vega Almeida, Fernández Molina, & de Moya Anegón, n.d.).

At it says Sisa, Espinel, Fornasini and Mantilla (2011) “Bibliometrics is a tool” linked to the generation of concrete profiles of the knowledge of “a particular country or discipline”, and it supports in the “formulations of policies, filling emptiness of knowledge, and adequate distribution of financial resource in the health services administration”.(Sisa, Espinel, Fornasini, & Mantilla, n.d.). For this, it is important that health institutions together with the universities research these levels of production and dissemination in order to improve their health systems based on their local reality, thus being an effective way for the provision of health services.

This studies type does not consider qualitative aspects, such as the methodological or argumentative quality of the scientific journal articles. The analysis must be done in an integral way, the bibliometric indicators have no value for judgments about the activity of the researchers

because they do not evaluate the objectives or the results, and the comparison of the productivity is relative according to the topics and publication habits.(Oswaldo Suárez, 2012).

Ecuadorian legal framework related to scientific production

Ecuador as a sovereign state is democratic, pluricultural and multiethnic, which is located in the northwest of South America, with a territorial extension of 256.370 km² whose geography is divided into four geographical regions: Costa, Sierra, Amazonía or Oriente and Insular Region or Galápagos; it is organized in 24 provinces, 269 cantons, and 1149 parishes (361 urban and 788 rural) and the indigenous and afro-ecuadorian territorial circumscriptions. His government is republican, presidential, elective, representative, responsive, alterative, participatory and decentralized administrations. (República del Ecuador, 2008)

In Ecuador, the policies of scientific development are framed in the plan of good living and together with the change in the productive matrix, it is inclined towards scientific innovation, so much so that the Constitution of the Republic of Ecuador and the Organic Law of Health protect and develop a legal framework to establish the investigation.

The Constitution of Ecuador art. 262.- paragraph 6. Determines the research and knowledge innovation, development and transfer of technologies policies, necessary for regional development, within the framework of national planning. Art. 298.- Are established budgetary pre-allocations for decentralized autonomous governments, to the health sector, to the education sector, to higher education; and to research, science, technology and innovation in the terms provided by law. Transfers corresponding to pre-assignments will be predictable and automatic. It is prohibited to create another budgetary pre-allocation. (República del Ecuador, 2008).

And the Organic Health Law, article 2 clause 26. It establishes policies to develop, promote, and enhance the practice of traditional, ancestral and alternative medicine; as well as research, for its good practice.

Art. 69, subsection 2.- Understand the investigation of its causes, magnitude and impact on health, epidemiological surveillance, promotion of habits and healthy lifestyles, prevention, recovery, rehabilitation, social reintegration of affected people and palliative care. (“Ley organica de salud 1,” 2006).

Integrate Research, training and training of human talent the "MAIS" (in English model of integral attention in health, in Spanish modelo de atención integral en salud) It aims to strengthen the

processes of research, formation and training of human talent and that the production of knowledge becomes a tool to contribute to the improvement of the health and life conditions of the population. (Ministry of Public Health, 2012). The human talent constitutes the fundamental pillar of the change in the model of attention, the training process, qualification and the investigation are oriented to achieve technical excellence, integrity and commitment. Strategies for the development and management of human talent will be implemented through continuous training processes, health careers and training in services. The first and second level includes specialists in Family and Community Medicine and Primary Health Care Technicians, the second and third level will train specialists in the areas that are relevant and in the fourth level will constitute the space for the great specialties and the scientific investigation.

Expenditure and investment per capita in relation to PBI in previous years and the dispersed efforts between the academy and the health centers whose training and investigative characteristics, which are carried out by the authorities, lead to poor communication and dissemination of the results of research carried out, disclosure of the results of research conducted, thus being a failure in this important area that positions health entities with the degree of teaching which includes the teaching and research processes.

Medical scientific reality in Ecuador in relation to Latin America.

Scientific production in Ecuador is currently limited, due to multiple factors ranging from the administrative to the training of health professionals, whose result is evidenced with lower levels in the Latin American and world bibliographic databases, being below the average for Latin America in terms of spending on Science and Technology as a percentage of PBI and this is done by the government in its largest proportion. Another result is that the key factor for the generation of publications is determined by the spending on research and development that countries perform as well as the size of the workforce. (Econ. & Econ., 2015).

The importance of research in the development of new technologies such as innovative medicines and their influence on health and clinical management is the generation of knowledge and this must be the fundamental objective of research as an element of encouragement for professionals and prestige for the centers. (Cañarte Alcívar, J, 2019). Health care in conjunction with clinical and biomedical research constitute social interests of priority origins. (Dora Inés Molina De salazar, 2010).

Worldwide in 2009: 65.2 billion dollars were invested in contracted research, IPS research centers benefit from the incorporation of knowledge available in more advanced countries and acquisition of latest generation technologies, processes and equipment (Asociación de laboratorios farmacéuticos de investigación y desarrollo., 2002) and in Latin America and the Caribbean it is still far behind in comparison with other regions of the world in terms of research and development. While the United States, Japan and the Republic of Korea invest between 2.5 and 3 points of their gross domestic product (GDP - PIB) and the European Union in this area, close to 2 points, our continent as a whole spends only 0.5 points of the PIB.

Within the ranking in investment in research in relation to PIB, China is the first power in the world, The United States invests 2.7% of PIB, Japan allocates 3.4% of its PIB, Germany 2.6%, France 2.1% and United Kingdom 1.8%, other countries such as Israel, which is the country that invests in the world, 4.6% of PIB, Sweden invests 2.7%, Finland 3.5%, South Korea 3.5% Taiwan 2.7% and Singapore 2.6%, In Latin America, Brazil is the which invests the most, 1% of its PIB, Chile with 0.7%, and Peru only invests 0.15% of its PIB, one of the lowest indicators of America and the world. (Maguiña C, n.d.).

On the other side, according to the journalist (Andrés Oppenheimer, 2015) refers that Latin America is the one that invests least in Innovation and Research in relation to PIB, the referents in the world as Israel with 4.2% of its PIB in development followed by South Korea with 4.1%, Japan jointly with Finland the 3.5%, Germany invests 3%, while most countries invest an average of 0.5% according to UNESCO.(UNESCOPRESS, 2010).

According to the World Intellectual Property Organization in 2015, the innovation ranking in the 141, is led by Switzerland, Great Britain and Sweden, Chile is ranked 42, Costa Rica 51, Mexico 57, Colombia 67, Brazil 70, Peru 71, Argentina 72, Guatemala 101, Bolivia 104, Ecuador 119, Nicaragua 130 and Venezuela 132. Brazil, Chile, Argentina, Venezuela and Ecuador have fallen several places compared to those who had the same listing three years ago.(Andrés Oppenheimer, 2015).

Within the region, Latin America and the Caribbean is a region whose innovation potential is increasing but is still practically untapped. Brazil (70th), Argentina (72nd), and Mexico (57th) stand out as economies with results above the average obtained in the region in the Global Innovation Index. The excellent results obtained regularly by Chile (42nd), Costa Rica (51st) and

Colombia (67th), at a regional level and in comparison with countries that have a similar degree of economic development, are worth mentioning, as is the new degree of Peru (71st) and Uruguay (68th).(OMPI. Universidad Cornell. INSEAD, 2015).

Ecuador invests around 0.05% of PIB, obtaining an average of 341 publications, while countries that maintain a much higher percentage of 0.28% for Chile, 0.23% Cuba and 8% Colombia, have annual publications of 4,882, 1,113 and 1,940 respectively.(Econ. & Econ., 2015).

Brazil, Argentina, Mexico and Chile lead the medical scientific production in the regional ambit and present important growths of their production in the last fifteen years. This growth could be associated with the regional economic situation and the observed increase in investment in research and development.(Borracci, Doval, Manente, & Tajer, n.d.).

Estando íntimamente relacionada la inversión importante dentro del PIB con el posicionamiento de la producción científica en la región. This growth could be associated with the regional economic situation and the observed increase in investment in research and development.(Garcia Suarez, De Leon Rosales, Fuentes Garcia, & Ferreiro Garcia, 2010)(Loughlin & Rodríguez-granillo, 2013).

In the Directory of Open Access Journals (DOAJ), 19 countries were selected with a total of 851 journals registered in that Directory. Accordingly, it was possible to consider five large groups of countries that are larger, a smaller number of journals: a) Colombia b) Chile, Argentina c) Cuba, Venezuela d) Costa Rica, Mexico, Peru e) The rest of the countries in Latin America.(Alonso & González, 2015).

The expanding economies of South America have led to a significant increase in scientific production in the last two decades, research and spending has increased in most countries. But considering part of the world population and the gross domestic product (PIB) of the region, publication rates are still far from what one would expect quality of research has not kept pace with the increase in production, and the continent's research works continue to struggle to attract citations from the rest of the world. There are huge inequalities in the region, too: Brazil dominates the history of publications, for example, while Chile leads in the patent environment and surpasses Argentina highly in terms of the proportion of its population working in science.(Van Noorden, 2014).

In Ecuador in 2011, total spending on science, technology and innovation activities was 1210.53 million dollars, representing 1.58% of PIB.(Ecuador en cifras, 2013). It was found that during 1999-2009, where the percentage in relation to the GDP was 0.38%, 625 articles were published, with a predominance of clinical-surgical areas (60%) followed by epidemiology (17.4%), basic sciences (14.1%) and health systems (8.5%). Of all the produced during that period, only 4.3% and 7.2% were related to the main causes of morbidity and mortality, respectively. It was found that private institutions generated more health research than public ones.(Sisa et al., n.d.).

Conclusion

When carrying out an analysis on scientific production in Ecuador in relation to Latin America, it is concluded that Ecuador, in relation to the others, is at a level below the average of Latin America in terms of spending on science and technology as a percentage of PIB and this is carried out by the government in its greater proportion what places it at low levels in terms of scientific production and consequently failure in the applicability of health policies according to the population.

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