

Statistical Analysis of the Innovation, Science and Technology Processes in Colombia According to Colciencias

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Abstract

The following research aims to introduce what are the most important contributions made by the Colombian government executed from Colciencias (Administrative Department of Science, Technology and Innovation), thus providing valuable contributions in the improvement of science, technology and innovation in different approaches seeking internal improvements not only in the areas of research but also in the productive areas of the country, since these are what create an economic sustainability that can help improve future processes in any application branch. The statistical analysis shows what has been the internal management of the benefits granted to different groups or institutions that were taken into account by the entity due to their good practices. On the other hand, the division of aid at the regional level will also be analyzed in order to determine where there is more application of new processes in the country and which ones are the sectors where the expansion of coverage should be improved. Finally, the most important challenges of the Presidency of the Republic in terms of science, technology and innovation will be named in order to welcome the entire interested community and make more assertive the processes applied by the institution in charge of this significant task for the technological development of the country.

Keywords: Science, Technology, Innovation, Process, Business Sector and Development..

INTRODUCTION

Since 1968, the national government has sought the development of technology and innovation processes for Colombia to be an advantage in the industrial sector, with the main purpose of seeking opportunities to increase and promote the development of productivity in the business sector; Thanks to these intentions Colciencias is created, an entity that depends directly on the efforts made from the presidency of the national republic and which aims to lead processes of science, technology and innovation in some specific work areas, where the change of mind from the common areas to scientific culture is the success sought since its conception [1].

Thanks to the work carried out during these last years, Colciencias has created a series of international agreements that help to improve the educational and productive processes. One of the main conventions, the Fulbright commission (United States), is worth mentioning, in order to catalog Colombia as a scientific destination and where the improvement of their capacities can be performed; Additionally, Harvard University offers the opportunity to people who want to participate in doctoral programs, and these are only two (2) of the 13 agreements with the USA [1]. The Asian continent has also worked to find direct improvements in environments such as industrial, academic and political. And finally, the work done with the Latin American area cannot be ignored since it is here where the country performs the best. Thanks to programs such as the Ibero-American meeting on science and technology for development, Colombia has been able to improve its future projects by showing a more competitive face in the region [1]. The work areas are too important in this type of numerical analysis, since they allow quickly detailing where the incursion of current technological processes is being carried out on a larger scale and where more work has to be done to achieve overall stability in all business organizations, educational, governmental and scientific. In the future, entities like this won't only seek local recognition but will also find an external ally that help to potentiate internal processes, so in this way the productive branch of the country is more competitive and manages to improve the working environment of the majority of the population [7-10].

MATERIALS AND METHODS

This research is mainly focused on a statistical analysis that illustrates the investment management used by Colciencias at the national level in the educational and productive fields. Analytical studies will be carried out on the ACTI (Scientific, Technological and Innovation Activities in Spanish) or R & D, which will allow deepening the current requirements of the productive branches of the country in order to determine which lines of action or projection should be worked in the future, aiming to find valid alternatives that allow improvement the productive processes of the organizations and with this, look for a better competitive level in both the national and international environment [3].

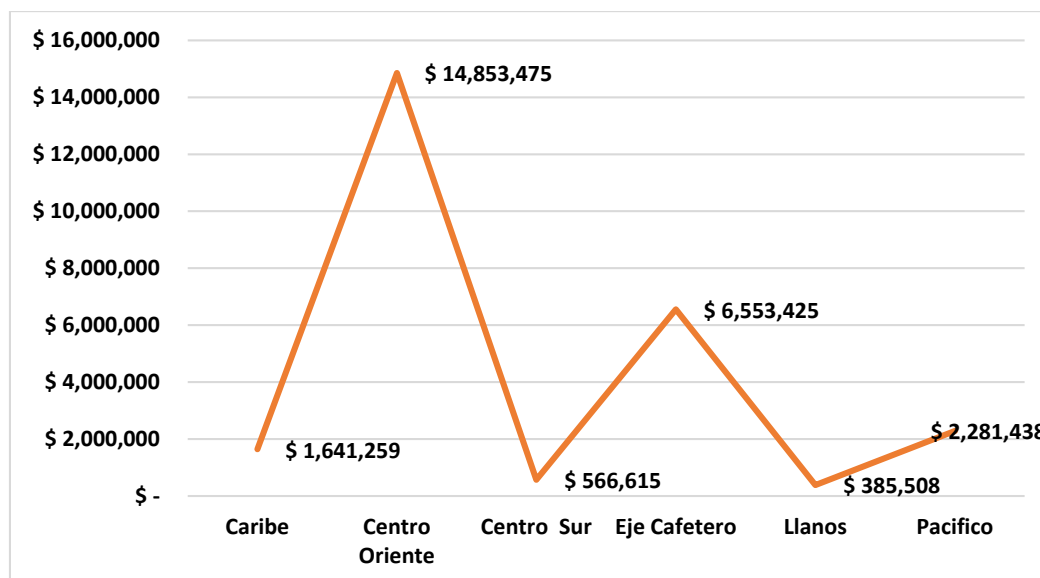


Figure 1: National Investment in ACTI, total by region 2016 [3].

The statistical bulletin of the year 2017 presented by Colciencias would allow to better support the ideas that arise from the engineering branch, so after illustrating a series of graphs explained in their order, the future plans of the entity will be described being able to increase the use of new practices in all types of organizations. With this, a reference is made to the three pillars of the research that are: science, technology and finally innovation.

DEVELOPMENT AND DISCUSSION

In Colombia there are different indicators that allow to measure how investment is made in technology and innovation science projects, but the most relevant for organizations such as Colciencias are ACTI (Scientific, Technological and Innovation Activities) whose function is to measure what the effort is of a specific country or region in terms of scientific and technological activity and, on the other hand, R & D, whose main goal is to illustrate what research in basic and applied sciences is for the technological development at the local level. The organization in charge at the national level of carrying out this type of statistical analysis is the OCyT (for its abbreviations in Spanish Observatory of Science and Technology) that not only is the one in charge of making them but also it is in charge of the opportune publication for the sight of the interested.

National investment in ACTI

At regional level

For the year 2016, in the management report presented by Colciencias, the investment of the budget was illustrated, depending on the region and, of course, on the number of advances in the subject of innovation. In Fig. 1 it can be analyzed how national investment was divided into scientific,

technological and innovation activities throughout the national territory, this is where it can be seen that the majority of this investment is in the central east region where departments as Boyacá, Santander and Cundinamarca obtains about 56.5% of the national investment and on the other hand it can be identified that the region that receives less investment is the region of the plains with 1.5%; This reflects that in the future it is needed to work in a more direct way with the regions that have less investment in order to increase and generate a scientific culture in the less contributing regions.

By type of economic activity 2012 – 2016

For Colombia the type of economic activity practiced by many business organizations is important, since it is one of the best ways to know how to make a good investment in support issues in order to improve science, technology and innovation activities within the national territory. This has a common purpose which is to integrate all the sectors that are part of the working, academic and technological environment of the territory. Fig. 2 shows how the ACTI investment is made according to the type of economic activity performed by organizations in general, determining in this way that the labor departments that receive the most are those that work with innovation and development.

National investment in R & D

With percentage GDP 2014 – 2016

Since 2014 the investment made in R & D in percentage terms has been constant, this refers to the consideration given to the gross domestic product in different economic sectors such as the public, private and international sectors. It is here where it can be seen that in recent years the private sector has had more reception in this type of process and in the future tends to

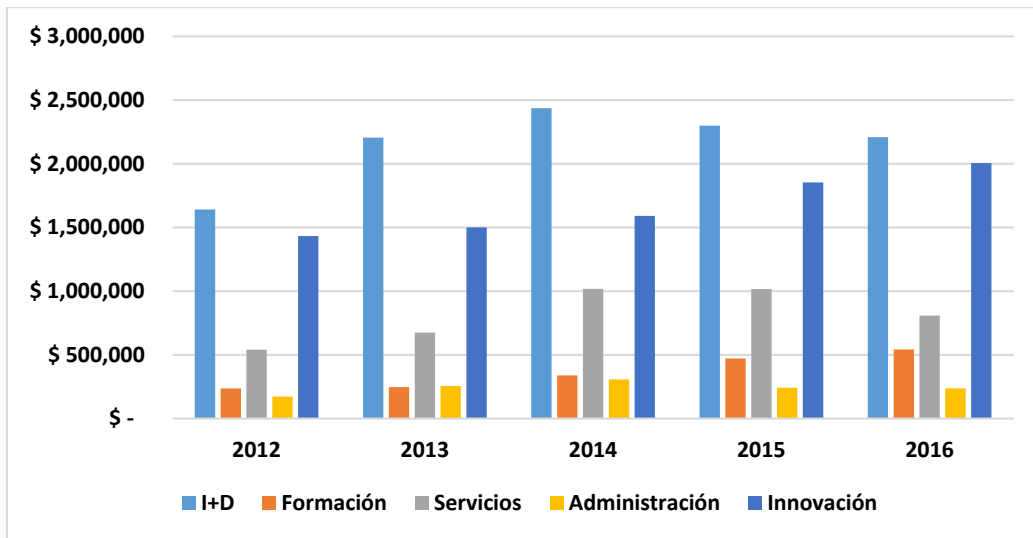


Fig. 2: National Investment in ACTI by type of activity. Total of the country. 2012 - 2016 [3].

continue increasing considerably, but on the other hand there is a crisis with the financing of international resources since its percentage is stable but it does not tend to improve and it is here where the contingency plans have to be activated in order to increase these percentages seeking to benefit more the entities that belong to this group.

At regional level

It is worrisome that in several departments of the national territory the investment in terms of research and development

does not reach even 1% and it is a problem evidenced in all regions of the country. Table 1 shows the distribution of this investment since 2012; This only leads to think that the processes in Colombia should be more inclusive throughout the territory in general, so that the opportunities to advance in terms of efficient processes can be applied throughout the region and not the little inclusion that has been so far.

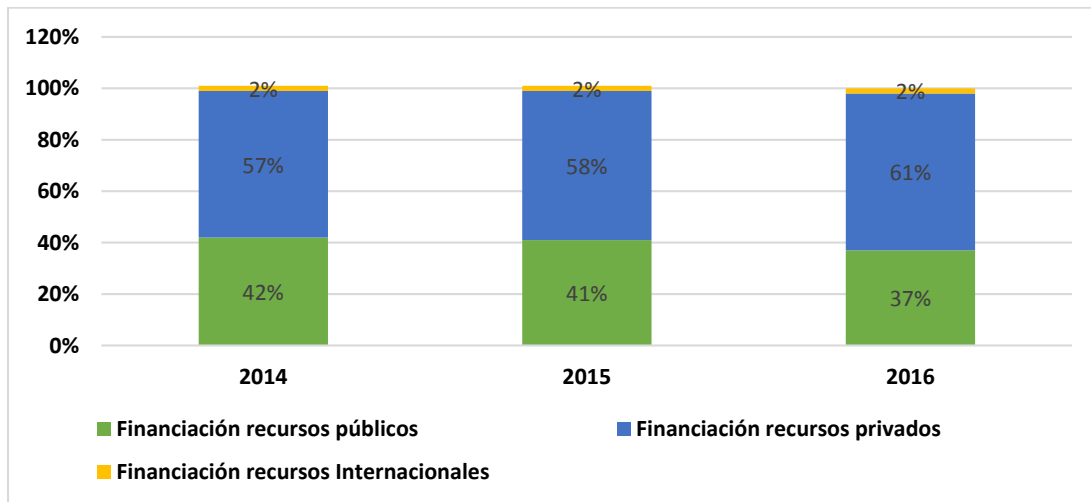


Fig. 3: National investment in R & D as a percentage of GDP, by type of resource, 2014 - 2016

Table 1: National investment in R & D by region and department, 2012 - 2016. [3].

Region / Department	2012	2013	2014	2015	2016	Total	%
Caribe	48.684	66.116	174.610	180.897	149.377	619.684	6%
Atlántico	10.602	15.623	63.446	62.079	50.782	202.532	2%
Bolívar	24.467	27.645	32.793	30.542	26.482	141.930	1%
Cesar	1.456	2.071	8.425	9.855	8.885	30.692	0%
Córdoba	1.711	3.157	27.508	47.392	29.104	108.872	1%
La Guajira	1.261	2.313	6.906	3.042	13.829	27.350	0%
Magdalena	5.866	12.192	26.213	20.130	16.462	80.863	1%
San Andrés	3.307	3.105	3.324	1.482	1.412	12.630	0%
Sucre	13	11	5.995	6.374	2.422	14.815	0%
Centro Oriente	972.980	1.556.365	1.148.293	1.092.609	1.116.414	5.886.661	55%
Bogotá D.C.	740.430	1.151.571	751.181	699.272	722.614	4.065.069	38%
Boyacá	9.469	11.147	22.293	23.145	20.046	86.099	1%
Cundinamarca	188.953	215.962	147.821	156.541	147.205	856.483	8%
Norte de Santander	4.147	5.535	4.696	3.114	3.335	20.828	0%
Santander	29.980	172.150	222.301	210.536	210.536	858.181	8%
Centro Sur	17.083	18.766	43.171	50.691	35.681	165.391	2%
Amazonas	7.453	7.934	10.627	8.690	6.896	41.600	1%
Caquetá	1.477	1.556	3.640	5.813	6.094	18.580	0%
Huila	4.833	5.043	3.495	7.471	7.498	28.440	0%
Putumayo	493	789	1.809	1.755	1.765	6.611	0%
Tolima	2.726	3.445	23.599	26.961	13.429	70.160	1%
Eje Cafetero	479.031	444.911	885.486	759.582	699.535	3.268.546	30%
Antioquia	409.881	388.999	821.254	699.922	643.269	2.963.325	27%
Caldas	60.661	47.118	53.829	42.641	37.338	241.587	2%
Quindío	1.552	2.611	2.951	4.558	3.842	15.513	0%
Risaralda	6.937	6.183	7.452	12.462	15.087	48.120	0%
Llanos	5.974	11.878	44.350	43.370	44.694	150.266	1%
Arauca	1.582	1.815	640	687	692	5.416	0%
Casanare	-	34	366	419	1.538	2.357	0%
Guainía	483	1.374	548	883	834	4.121	0%
Guaviare	1.944	1.183	5.675	4.548	4.342	17.692	0%
Meta	594	5.265	30.396	32.563	32.460	101.279	1%
Vaupés	1.371	2.207	4.963	3.561	4.001	16.102	0%
Vichada	-	-	1.762	709	827	3.299	0%
Pacífico	117.675	107.277	141.004	171.873	162.864	700.693	6%
Cauca	11.655	8.668	9.236	18.868	14.245	62.672	1%
Chocó	1.863	3.007	5.600	11.277	7.751	29.497	0%
Nariño	2.187	4.316	13.127	29.595	21.772	70.997	1%
Valle del Cauca	101.970	91.286	113.041	112.134	119.097	537.527	5%
Total General	1.641.427	2.205.314	2.436.913	2.299.021	2.208.566	10.791.241	100%

Future challenges

Innovation

One of the most important internal challenges that the country has is to improve all its innovation processes, which is why it is necessary to change the current processes existing in the different public and private institutions, in order to look for new alternatives that help improve the incursion of new implementations to facilitate the execution of tasks in a more efficient manner, so internal competitiveness increases and is reflected in international environments [4]. The following is a list of some recommendations that should be taken into account when looking for improvement in innovation processes [2][7]:

- Simplify processes to help obtain benefits in future investments.
- Create a single science and competitiveness commission as the leading body of the System.
- Support the entrepreneurial processes to establish an environment of continuous improvement.
- Increase economic support in professional careers that include research.
- New financing of proposals at the local level in innovation processes.
- Form a solid environment in all organizations in an efficient manner and focused on a common vision.
- Reorganize the destination of benefits to increase the operability of national innovation.
- Design and implement surveillance schemes to control activities in future innovation processes.
- Increase the participation of the academic programs of higher education entities.
- Promote the creation of new headquarters of the innovation department to reach the most vulnerable regions of the country.

Science and Technology

To be able to potentiate the internal processes of the productive sectors of the country, it is good to make a series of recommendations that must be taken into account in order to seek better continuities within the projects that are desired to be carried out in the future in terms of science and technology [6]; the simple fact of creating action plans to help develop these processes will help the country to respond assertively to the global requirements. Below are some of these recommendations to be taken into account [5]:

- Strengthen all the processes of the productive sectors of the country in order to generate a moderate use of the natural resources of the region.
- To search for optimal economic growth, increasing the generation of jobs that provide welfare to the entire society.
- To generate a scientific culture that helps the growth of innovation processes and new technologies.

- To guarantee benefits for the population based on advances in scientific and technological processes.
- To increase investment in innovation and development processes in all productive sectors of the country.
- To improve the educational quality in its superior level, with the purpose of encouraging the population to generate new technological systems that help the competitive development of the country.
- To engage in new technology markets to provide quick solutions to processes that do not help improve the efficiency of internal processes at the organizational level.
- To increase coverage in the provision of scientific and technological services throughout the national territory.

CONCLUSIONS

In order for the country to become more competitive, it must be more inclusive in all its science and technology innovation processes, bringing together all the productive sectors and obtaining the best of them, thanks to this, it will be possible to obtain facilities throughout the national territory, in physical and economic way that allow to promote a scientific culture and with this can be obtained better results at local and international level in subjects of social inclusion and change of methodologies.

The previously written shows a statistical relationship of the investment process of the fundamental pillars of the adopted theme, defining where the use and appropriation of these processes is most centralized and their behavior during the last years. On the other hand, the recommendations set out in the paper are contributions that will allow, in the future, the inclusion of all regions of the national territory and the improvement in terms of scientific culture, seeking implementation and mass appropriation of projects. All this is supported by a centralized entity such as Colciencias, since it is the entity in charge of optimally managing all the projects proposed from different productive sectors, but apart from this, it is also in charge of seeking continuous improvements that aim to consolidate the country as a leading region in innovation, science and technology processes.

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