



Research paper / Artículo científico

Collaboration among disciplines and UEPs is essential to improve their teaching and research profile. Case Ecuador

La colaboración entre disciplinas y UEP es fundamental para mejorar su perfil de docencia y de investigación. Caso Ecuador

Jan Feyen 

Professor Emeritus, Catholic University of Leuven, Belgium.

Corresponding author: jan.feyen@kuleuven.be

Reception date: October 8, 2020 – Acceptance date: November 3, 2020

ABSTRACT

University development in Ecuador was relatively uncoordinated; it was not until the early 1970s that further progress was enshrined in the national education plan. Even then, hardly any attention was paid to research. Additionally, the political, social, and economic development in the following decades, along with the fairly autonomous and uncoordinated landscape of university development can be the cause of the fragmented and mediocre educational and research level of Ecuador's UEPs¹, at the beginning of the 21st century. It was not until 2008, with the creation of the new constitution, that higher education and research were increasingly being effectively directed, evaluated, and starting to bear fruit. The limited funding of university education and research, resources that are more likely to decrease than increase as a result of the Covid-19 pandemic and its aftermath, and the continuing fragmentation between institutions may delay the ongoing rise. Based on an analysis of indicators of higher education and research, and Ecuador's UEP ranking at the international level, some strategic measures are proposed that can initiate improvement of the performance and efficiency of Ecuador's higher education and research profile. Especially cooperation within and among institutions and the pursuit of interdisciplinary oriented education and research, preferentially in collaboration with various social actors, are considered the leverage for turning Ecuador's UEPs into entrepreneurial higher education institutes and will assure that the institutions provide better support to the society.

Keywords: Universities and polytechnic schools, research, fragmentation, overlap, inefficiencies, cooperation, collaboration, entrepreneurship.

RESUMEN

El desarrollo universitario en Ecuador estuvo relativamente descoordinado y no fue sino hasta principios de la década de 1970 que el plan nacional de desarrollo contempló un mayor progreso en esta área. Sin embargo, apenas se prestó atención a la investigación. Se piensa que lo anterior y la evolución política, social y económica de las décadas siguientes, y el avance bastante autónomo y descoordinado del panorama universitario son la causa del nivel educativo y de investigación fragmentado y mediocre de las UEP¹ de Ecuador a principios de Siglo 21. No es sino hasta 2008, con la creación de la nueva constitución, que la educación superior y la investigación se dirigen y se evalúan cada vez con mayor eficacia y comienzan a dar sus frutos. Pero el financiamiento limitado a la educación y la investigación universitarias, los recursos que más probablemente disminuirán como resultado de la pandemia Covid-19 y sus secuelas, y la fragmentación continua entre instituciones, pueden demorar la actual tendencia de mejora universitaria. En base de un análisis de una serie de indicadores de educación superior e investigación, y del ranking internacional de las UEP ecuatorianas, el presente trabajo propone una serie de medidas estratégicas que pueden iniciar la mejora del desempeño y la eficiencia del perfil de educación superior e investigación de Ecuador. Especialmente la cooperación al interior y entre las instituciones y la búsqueda de una educación e investigación de orientación interdisciplinaria, preferentemente en colaboración con diversos actores sociales, se consideran el punto de partida para convertir las UEP de Ecuador en institutos de educación superior emprendedores y asegurar que las instituciones brinden un mejor apoyo a la sociedad.

Palabras Clave: Universidades y escuelas politécnicas, investigación, fragmentación, superposición, ineficiencias, cooperación, colaboración, emprendimiento.

¹ UEPs: Universities and Polytechnic Schools / UEP: Universidades y Escuelas Politécnicas



1. INTRODUCTION

The Covid-19 pandemic hits hard, not only in terms of health but also economically. The pandemic outbreak started in Wuhan, China, in December 2019. Although, there are suspicions that the virus had been in the shadows out of sight for some time. Today, it is an ongoing global pandemic. From the outbreak until the 1st of October 2020, the virus claimed worldwide 1,037,528 deaths, and the countries with the highest infection rate are the US, Brazil, and India, respectively. Many countries around the world are trying to cope with this pandemic. Each in its own way based on its level of development, economic, and financial situation. Developed countries that put public health above economic recovery are more successful in this than economically emerging and developing countries, and countries like the US and Brazil that give priority to the economic revival. The money that is increasingly spent on healthcare and the stagnation of the economy during the week-long lockdowns led to a drastic deterioration of the country's economic and financial situation. Less developed countries are, of course, the hardest hit, and in those countries, the fraction of the population that struggles to make ends meet at the end of the month rapidly increases. How long it will take to get out of this crisis will depend on the development of a vaccine and how long it will take for the economy to recover. According to the World Economic Forum, the revival of the economy, depending on how hard battered, will take 2 to 5 years. The financial resurrection to the situation before the coronavirus outbreak may last up to 10 years.

It is to be expected that the mass diversion of public resources to healthcare and financial support for the population and affected economic sectors will negatively impact higher education, as well as the country's national science and research systems. The post-Covid-19 sustainability of universities will be of concern, and a lot will depend on the extent that the subsidy level of the public institutions can be curtailed. Certainly, most public universities will be confronted with a budget reduction in the coming academic years. Because of the adverse economic conditions, it is to be expected that in particular, research will be most hardly hit; initially, institutions will try to keep the multitude of teaching programs afloat. Also, according to Baker (2020), universities around the globe risk facing the loss of a generation of researchers. Because likely, many graduates will not find a job in line with their educational profile, and it will become even hard for the most brilliant graduates to obtain a Ph.D. or Postdoc grant. There is also a growing concern among Ph.D.-students and postdoctoral scholars that future posts will dry up as the universities struggle to balance their books. Subsequently, it can be expected that the number of academic staff under contract, following a downsizing of the government allowance, will be curtailed. Job cuts will be disproportionately felt by junior researchers, including recent graduates, as well as early career and mid-career researchers. The situation might even be getting worse because the current economic crisis will also hit donor organizations and the private sector, who under normal conditions co-fund research projects and offer doctoral and postdoc grants (Naidu & Deli, 2020).

Despite the immense magnitude of the health crisis and its impact on everyday life, we, unfortunately, cannot trample on the spot but have to go on. But how should this be addressed? We can wonder if the government, Ministry of Education, the senior managers, governance committees, and university administrators will be able to put the higher education institutions back on the rails, realizing that they never before have been confronted with such a recession. The recovery of the sector from the Covid-19 pandemic will require better restructuring. According to Devinney & Dowling (2020), the current crisis offers a unique opportunity to correct the strategic mistakes universities and policymakers have been made in the past. Both these authors are of the impression that most public universities are neither focused on intellectual-capital nor information-dissemination institutions that help the economy and society navigate the future. The aforementioned is noticeable in Ecuador, where the government, the public, and the private sector make little use of universities for providing sustainable social, economic, and ecological solutions. The classic organizational structure, whereby each university and faculty within behave and function as independent entities, certainly does not stimulate the cooperative organization of lectures and research between disciplines, whereas, the problems the community struggles with are increasingly interdisciplinary. Universities and faculties run their own business, leading to duplications in teaching, research, infrastructure, among others, shortly to inefficient use of public and private financial resources.

Typical for public universities is that they need as many administrative as academic staff to deliver an ever-greater array of courses and social programs, a tendency strengthened by the governmental demands for closer and closer alignment to politically motivated compliance structures. In public universities, one often wonders who is in charge, the ever-expanding administration, or the governance body. Seemingly, one has completely forgotten that the administrative weight has profound implications, and any downturn in revenues will worsen this. In summary, academic staff finds themselves increasingly engaged in activities that do not make them better teachers or researchers. For sure, it is to be expected that the recession in public funding caused by Covid-19 will increase the pressure between the academic community and the administration. Undoubtedly, this situation will enhance the competition between and within the institutions rather than collaboration.

Maybe it is true what Richard Rumelt² states. He points out that many universities of today accommodate a multitude of conflicting demands and interests, and it is the piecemeal approach that is putting so many institutions at risk in the wake of Covid-19 (Devinney & Dowling, 2020). According to Rumelt, universities urgently need to focus energy and resources on a few pivotal objectives whose accomplishment will lead to a cascade of favorable outcomes. Furthermore, he suggests changing the classical academic thinking and operation of HEIs to a truly disruptive and entrepreneurial approach (Eisenberg, Gann, & Yoon, 2019). Turning the crisis into an opportunity will not be that easy, and many universities will likely not embark on it until it is too late.

² Emeritus Professor of Business & Society at the University of California, Los Angeles

With this article, the author tries to formulate a series of inspiring ideas, some will presumably call these unrealistic ideas, that could serve as a breeding ground for the discussions, ultimately culminating in a thorough renewal of Ecuador's university system. The points of view in this manuscript are mainly based on the author's experiences with the Universidad de Cuenca and the Ecuadorian university system. The author was actively cooperating with the Universidad de Cuenca in the period 1992-2007 assisting in the formulation of research proposals and their achievement with funding from the VLIR-UOS program³ for Institutional University Cooperation. In parallel, the author gave constant guidance to Ecuadorian doctoral students in Belgium. After retiring from the Catholic University of Leuven in 2007, the University of Cuenca invited the author as a visiting professor until the end of 2019. During this period, he also gave numerous lectures at other universities in Ecuador. The author of this paper was the first foreign professor invited to join SENEYCIT's national Prometeo program, in which he served four years. Today, the author is still active as a reviewer of *Maskana*, a scientific journal of the Dirección de Investigación of the Universidad de Cuenca. The submission to this journal of scientific articles by academics and researchers from different universities allows the author to keep abreast of the scientific development of the institutions to which the authors belong and the scientific quality of the authors.

2. ECUADOR'S HIGHER EDUCATION SYSTEM

Ecuador's HEI system encompasses public and private universities, although the distinction between both was not that clear in the past as it is today since the Catholic Universities of Quito and Guayaquil received as much as 65% of their budgets from the state (CONUEP, 1992). Today, still eight on a total of 27 private universities are co-financed by the government. Three of the public institutions are the oldest, the Universidad Central de Quito⁴ founded in 1826, followed by the Universidad de Guayaquil and the Universidad de Cuenca, both founded in 1867. By 1950 Ecuador counted 8 universities, 6 (75%) public and 2 (25%) private. The number of universities increased to 29 in the period 1950-1993, an increase of 262.5% (the public universities increased from 6 to 16, an increase of 167%, and the number of private universities rose from 2 to 13, equivalent to an increase of 550%). By 2008, the number of universities increased from 29 to 68, or an increase of 134.5%, 27 public (68.8%), and 41 private (215.4%) institutions, respectively.

The exponential growth of public and private universities in the period 1993-2008 is visible in Figure 1, which depicts the evolution in the number of public and private institutions since the foundation of the first university in the country. The period with exponential growth is characterized, amidst a vacuum of central government influence and authority (Zabala Peñafiel, 2017), by budget

difficulties, politicization and privatization of the university system, and parallel to this a decline in academic standards. Similarly, for this period, the sources of comparative information on universities and their functioning are limited, hindering, even making it impossible to evaluate the higher education systems' quality and efficiency (Jameson, 1997). As an offshoot of the new constitution in 2008, President Rafael Correa in 2009 ordered CONEA⁵ to evaluate the institutional performance of all UEPs.

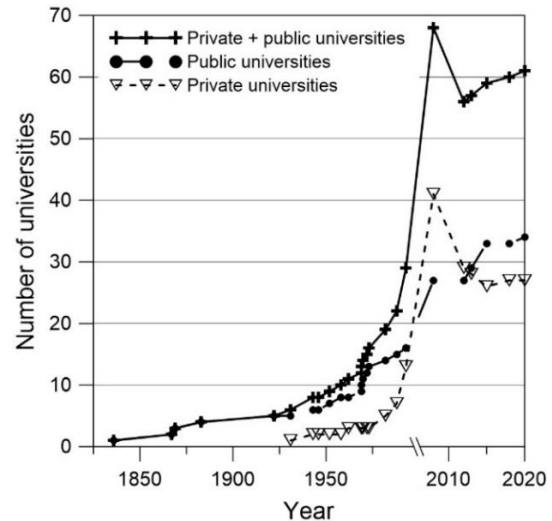


Figure 1. Evolution of the number of public and private universities since 1826 (Sources: CONEUP (1992), Jameson (1997), CONEA (2009), Ponce (2016), SENEYCIT (2018), and SNIIESE (2020)).

The UEPs initially considered CONEA's assessment as a government effort to curtail the autonomy of the HEIs. The institutions interpreted the top-down evaluation as a backlash to the HEIs' autonomy in Latin America acquired following the Córdoba reform of 1918. This reform restored the freedom of the universities, allowing them to define their curriculum and manage their budget without interference from the central government. However, Correa's government intended to call a halt to the uncontrolled growth of low-quality HEIs by subjecting them, both private and public institutions, to a critical and uniform evaluation. The screening of the HEIs resulted in the closure of 14 universities in 2012 because they were not able to implement the requested changes. The second process of evaluation and accreditation in 2014 suffered significant wear due to the frequent readjustments made in the technical instruments used in the evaluation (Zabala Peñafiel, 2017). Thereafter, the evaluation and accreditation process improved, and the institutions adopted stepwise their operation to the new evaluation criteria, which in 2020 resulted in an overall improved screening of the HEIs. In 2020, according to SNIIESE (2020), 355 higher education institutes are accredited and operative in Ecuador, of which 61 UEPs (34 public and 27 private; 6 institutes are ranked in category A, 26 in B, 16

³ VLIR-UOS: Flemish Interuniversity Council-University Development Cooperation (Belgium)

⁴ The Central University of Quito, originated from the union in 1826 of the universities San Gregorio Magno, founded in 1620 by the Jesuits, and Santo Tomás de Aquino, founded in

1688 by the Dominicans (https://es.wikipedia.org/wiki/Universidad_Central_del_Ecuador).

⁵ CONEA: National Council for Evaluation and Accreditation

in C, 4 in D, and 9 institutions were not evaluated). Among the non-evaluated institutions are the four public centers of excellence in higher education⁶ established in 2014, under the presidency of Rafael Correa. Besides the 61 accredited universities, there are 294 certified colleges⁷ active offering undergraduate programs in arts, pedagogy, business, tourism, nursing, agriculture, technology, among other fields, encompassing 146 public (49.7%), 136 autonomous private (46.3%) and 12 private, with co-funding of the government (4%).

All universities, public and private, are subordinate to CES⁸, an autonomous entity of the Ecuadorian government responsible for the planning, regulation, and coordination of the National System of Higher Education. CES' executive body is SENESCYT⁹, which is in charge of the elaboration, execution, and evaluation of policies, programs, and projects. The Secretariat is assisted by the council CEAACES¹⁰ whose main task is the evaluation of UEP's performance; the name of this council was changed to CACES¹¹ in 2019. However, the current situation has been preceded by a long and bumpy road of institutional changes. As Salazar (2013) points out, the first step towards the institutionalization of science and technology was taken in 1979, late when compared to most other Latin American countries. The law of the National System of Science and Technology (SNCT¹², 7th of August, 1979) led to the creation of CONACYT¹³ with its responsibilities: the definition, the formulation, the guidance and coordination of development policies and applications of science and technology in line with Ecuador's national development objectives. As a consequence of CONACYT failing to meet expectations, nor that of its financial resources, the government decided in 1994 to replace CONACYT with SENACYT¹⁴, a Science and Technology Advisory Council (CAST), and FUNDACYT¹⁵, the foundation fostering research and technological innovations in universities, research centers, and scientific and technological services via grants. In the absence of the desired results, CONACYT was reactivated as the governing body of science and technology, leaving the execution to SENACYT, and FUNDACYT disappeared from the scene. Starting in 2008, the law of National Science and Technology was adopted as the law of National System of Science, Technology, Innovation and Ancestral Knowledge (SNCTISA), whose objectives are: "to generate, adapt and disseminate scientific and technological knowledge, and to recover, strengthen and enhance ancestral knowledge". This led to the birth of SENESCYT in 2010, the governing body of policies that have to do with science, technology, innovation ancestral knowledge, and higher education.

Parallel with the exponential expansion of universities, private institutions in particular increased in the period 1998-2011; the student number at the undergraduate level

went from 235,000 to 591,000, an increase of 151% (Fig. 2). The increase in student enrollment before 2006 was primarily noticeable in private institutions, less than in public universities since the government, for economic reasons, withdrew its resources from the later which led to a rise in the registration fee and the organization of cost-billed degree programs. This situation resulted in a growing elitism in public institutions as well, in contradiction to the longstanding tradition of free higher education. The new constitution in 2008 proceeded in the re-establishment of the people's right to education by abolishing the registration fee for public UEPs. Not surprisingly, from then onwards, the population of university-bound students further increased. The strong increase in student numbers was however halted by the introduction of an entrance exam and by limiting the number of seats. The main objectives of the admission aptitude test were to limit the bulging enrollment, to verify if students were prepared for university, and to identify what discipline most suited the enrolling students (Van Hoof, Estrella, Eljuri, & Torres León, 2013; Edenfield, 2016). An indirect reason for the introduction of an entrance exam was to elevate the university education quality gradually. However, according to Haney and mentioned by Edenfield (2016), a drawback to the entrance exam is that it can negatively affect student's preferred field of study by forcing them to study something that the government requires. The decline in enrollment from 2011 onwards, according to Barrera (2018), is mainly the consequence of the standardization of the admission exam and more importantly the consequence of the lack of seats at public universities.

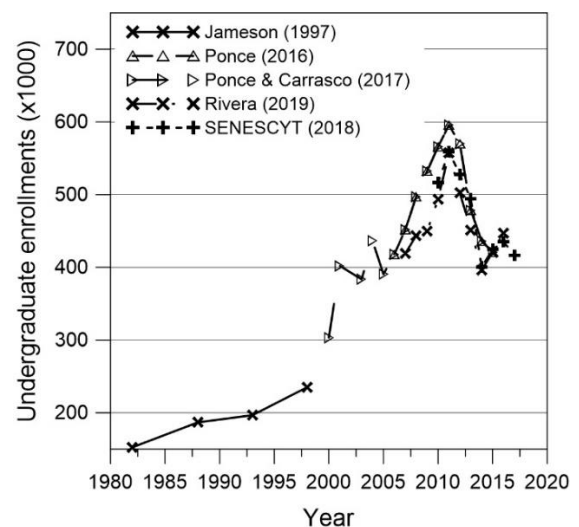


Figure 2. Evolution of undergraduate enrollments.

Following Augusto Barrera, a former head of the National Secretariat for Higher Education, Science, Technology

⁶ Universidad Yachay Tech, Universidad Regional Amazónica (KIAM), Universidad Nacional de Educación (UNAE), and the Universidad de las Artes (UArtes)

⁷ The name "colleges" stands for Higher Technical and Technological Institutes

⁸ CES: Consejo de Educación Superior

⁹ SENESCYT: Secretaría de Educación Superior, Ciencia, Tecnología e Innovación

¹⁰ CEAACES: Consejo de Evaluación, Acreditación y Aseguramiento de la Calidad de la Educación Superior

¹¹ CACES: Consejo de Aseguramiento de la Calidad de la Educación Superior

¹² SNCT: Sistema Nacional de Ciencia y Tecnología

¹³ CONACYT: Consejo Nacional de Ciencia y Tecnología

¹⁴ SENACYT: Secretaría Nacional de Ciencia y Tecnología

¹⁵ FUNDACYT: Fundación Nacional de Ciencia y la Tecnología

and Innovation (SENESCYT), the lack of spots is responsible for at least 40,000 young people being left out of university enrollment in the last decade, notwithstanding that the new version of the constitution in 2008 guaranteed free admission.

While the first universities in Ecuador primarily trained priests, as time evolved, students were trained in the law, philosophy, and arts. Still today, the majority of students entering the universities predominantly select a field of study in Social Sciences and Humanities, such as law, business, education, and social sciences. Ecuador used to have 49 law faculties, turning out over 60,000 lawyers (Correa, 2012). Not surprisingly, so many lawyers are active in the public sector. In many universities, the rector and his/her entourage, as well as the deans of almost every faculty are assisted by a lawyer. Foregoing explains to a great extent the complex functioning of Ecuador's public administrative services and public institutions, slowing down progress and clarifying that the national reality is mediocre. Following the adoption of the new Organic Law on Higher Education in October 2010, an impulse was given to the university sector to train students in other areas than Social Sciences and Humanities, to train the students in what the country needs to fulfill its social expectations of the 21st century. Training students in science and technology was correctly considered a precondition for economic and social development. The country sought from 2010 onwards to encourage careers related to hard sciences and technology. For that reason, it was decided that four new public universities and more than forty technical and technological institutes should be created (de la Vega, 2017). As verification of the change in the attitude of universities and the stimulation of new generations of students to select a study curriculum in Exact Sciences and Engineering, Natural and Environmental Sciences, and Life and Health Sciences, the title registration of graduates in the period 2013-2019 was analyzed (SENESCYT, 2020). In this period, 862,559 students of public and private higher educational institutes graduated. Figure 3 depicts the output of the analysis indicating that still, 62.95% of the graduating students possess a degree in Social Sciences and Humanities, only 2.79% in the area of Natural and Environmental Sciences,

15.72% in Exact Sciences and Engineering, and 18.34% in Life and Health Sciences. It is already a change when regarding the situation before the new constitution. René Ramírez (de la Vega, 2017) states the results are meager, especially given the fact that public universities were awarded a higher budget for each student enrolled in an engineering degree than in social sciences, business administration, or the law. The ongoing distortion in the field of study choice of the bulk of students culminates in the paradox that a country with an undeveloped productive sector follows a pattern of career choice more typical of post-industrial society (de la Vega, 2017).

The establishment of postgraduate programs in Ecuador's higher education institutes is of more recent date. The first programs established are at most 30 years old. The creation of postgraduate programs was, on one hand, considered as a way to generate funding and, on the other hand, providing graduates with higher knowledge and expertise, able to tackle the wide range of problems society faces. It is obvious that parallel to both those reasons, a postgraduate degree strengthens a person's curriculum and helps him/her stand out amongst those who did not obtain such a qualification. Besides, one is more likely to attract a job with a higher salary possessing a postgraduate degree, giving the feeling that the time and money invested in the postgraduate program was worth it. Furthermore, a postgraduate degree enables one to continue for a doctoral degree that ultimately permits one to embark on an academic career. Finally, it is also positive for the university because to be in the position of organizing a professional and/or academic postgraduate program the organizing university needs to develop the professional capacity and infrastructure. Ultimately academic postgraduate programs form the basis of the research profile of higher education institutes.

The data in Figure 4 depicts the evolution in postgraduate enrollments, according to Ponce & Carrasco (2017) and SENESCYT (2018, 2020). Both sources provide the total percent rate of the age class 25-30 years that enrolled in a postgraduate program in the period 2001-2019. The percent rates were converted to the number of postgraduate enrollments using Ecuador's population

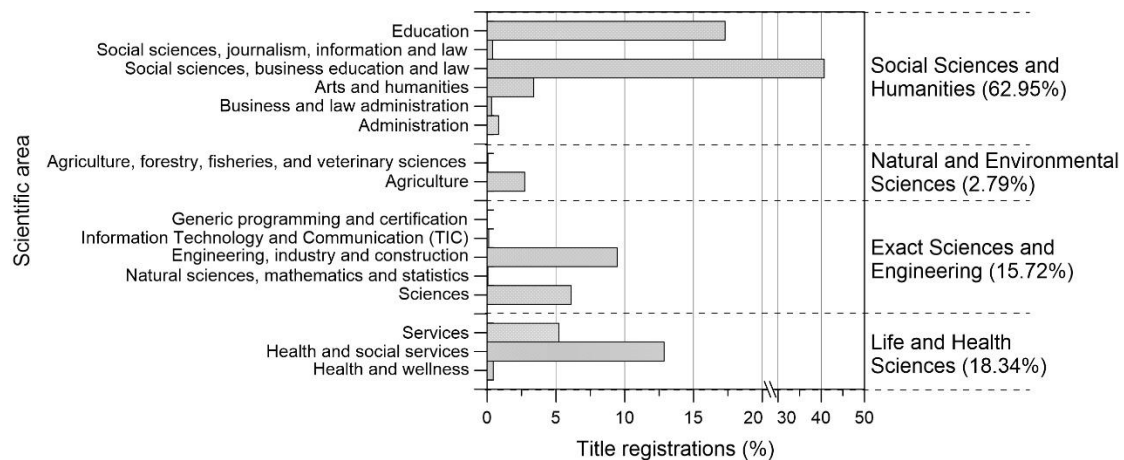


Figure 3. Title registration percentage, in the function of the scientific field in the period 2013-2019 (Source: SENESCYT, 2020).

Pyramid¹⁶. From this figure, it is clear that the postgraduate enrollment strongly fluctuates between 10,000 and 25,000, and seemingly is recently in a recession, likely due to the economic recession. This figure also illustrates the contradictions in the consulted datasets. They are present even within the datasets of the same administration and illustrates the fragmented approach within and among institutions. Also, the contradiction in the used public data might have negatively affected the conclusions of this manuscript.

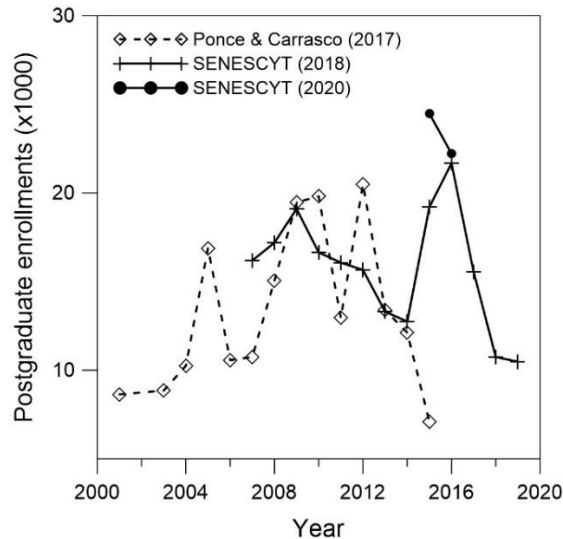


Figure 4. Evolution of postgraduate enrollments.

It is not far from the truth to say that graduate-level education is relatively immature in Ecuador because the main focus was and still is on undergraduate education. An additional reason explaining the meager focus on graduate-level education is likely due to the low training level of university teachers (de la Vega, 2017). A decade ago, not all university professors had a master's or doctoral degree, and it was an exception. Only 23% possessed a fourth level training, and only a few were active in research. The new constitution in 2008 was a wake-up call for universities to stimulate the young generation of teachers to improve their capacity by pursuing an academic grade, preferably at an institution abroad. The law even stipulated that professors without a master's degree in 2017 would be degraded in rank. Besides, for a university to be considered a teaching-research institute, CEAACES (2012) stipulated that at least 70% of the tenured faculty should possess a fourth level or doctoral degree. The objectives stated in the law were well thought and in-line with the country's intention to accelerate economic development by connecting science to economic and social development and to ensure that the universities become the engine of new ways of change. Whereas this was a correct vision of the law, what was unrealistic was the timeline set out for the universities to make it happen, considering that the main focus in the universities, particularly in public universities, remained on teaching. Even today, as stated by Van Hoof *et al.* (2013), full-time faculty members have a heavy teaching workload as compared to international standards, equal to an average of 20 credits/hours a week. The high teaching

workload is not only the consequence of the increase in student numbers but can, to a certain level, also be explained by the government's rule of limiting the number of students per class, for pedagogic reasons. As a consequence, it is not uncommon that professors have to repeat the same content of the subjects two or several times. Furthermore, the high teaching workload is most probably also the consequence of the faculty's autonomy. Faculties structure the study curriculums independently from each other; consequently, they organize similar subjects separately. Taking into consideration the preparation and follow-up time for classes, the time dedicated to administrative meetings, among other activities, it is evident that little time and motivation remains for research. Luckily, the situation is slowly improving, although the majority of academic staff (69% on average) are on a contract, while at a long-term basis in an unstable and not motivating situation, often subject to unrealistic requirements of the law and institution. Figure 5 presents a few characteristics of the teaching staff for the period 2015-2018. Whereas 64% of the academic staff possesses a master's degree, only 9.9% hold a Ph.D. Gender-wise, the rate evolves between male and female academic staff towards a more equal ratio, in line with the ratio between female and male students.

It is impossible to present, in an accurate way, the time and energy staff invest in research. It is customary internationally for the characterization of the quality of a researcher, research group, or institution, the spinoff in the number of research papers published in peer-reviewed journals as a benchmark. The research level and quality of Ecuador's UEPs was determined based on the total number of scientific documents registered in the Scopus database. Scopus is the largest abstract, research paper, and citation database, founded in 2004 by Elsevier. Figure 6 depicts the ranking of 52 Ecuadorian UEPs, grouped per evaluation category (CEAACES, 2020), in function of the total number of publications registered in the Scopus database, since the registration of the first institutional article. The number of registered articles depends on the age of the university and its research capacity. The six universities in Category A produce the most peer-reviewed articles even though there is a significant variation between the first ranked, the Universidad San Francisco de Quito (USFQ), founded in 1988, with 2610 registrations in the Scopus database, and the last ranked institution in this category the Universidad de Especialidades Espiritu Santo (UES), founded in 1993, with 679 registrations. However, both these universities are private institutions, and both have the same age, produced USFQ 3.84 times more peer-reviewed research documents than UES, indicating that the research policy and strategy of USFQ are considerably more effective. The Universidad de Cuenca (UC) and the Escuela Politécnica Nacional (EPN), both ranked in CEAACES Category A, are equally old founded in 1867 and 1869 respectively, but possess a different record in the Scopus journal database. EPN produced 1.92 more publications than UC. The difference is most likely because EPN is a polytechnic school while UC is a full-fledged university, whereby some disciplines like social and human sciences possess a different publication policy resulting in the registration of fewer peer-reviewed articles in the Scopus database.

¹⁶ <https://www.populationpyramid.net/ecuador/2019/>

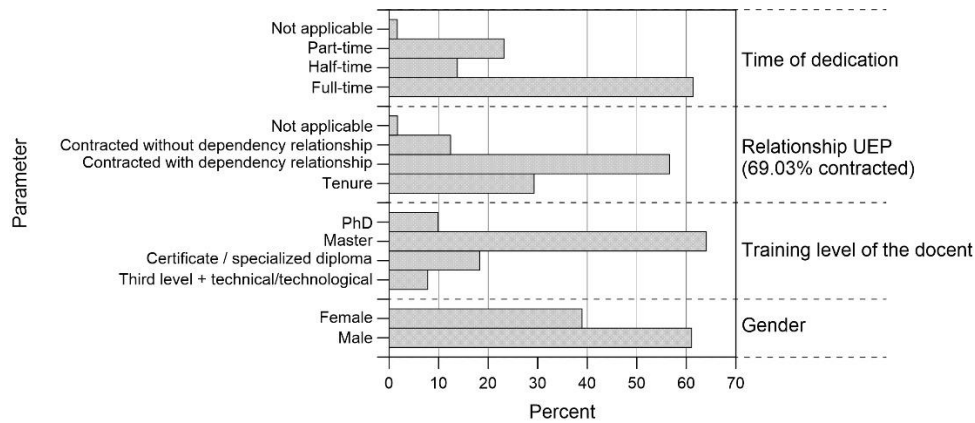


Figure 5. Main characteristics of the teaching staff (Source: SENESCYT, 2020).

Based on the Scopus database, the record of peer-reviewed articles is lower in the 26 universities in Category B, varying between 0 and 1779. The average record of registered publications for this group is 479, whereas the average publication record for the universities

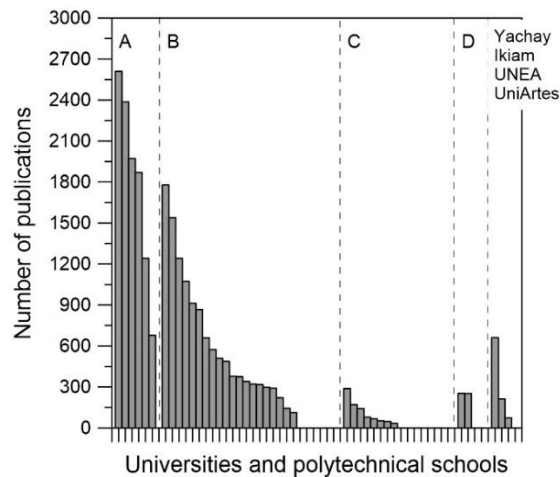


Figure 6. Ranking of the UEPs per evaluation category in function of the total number of institutional peer-reviewed documents (books, research papers, conference proceedings) registered in SCOPUS.

in Category A is 1793, 3.75 times as high. In Category B are six universities ranked with zero registered research papers, respectively, two public institutions (UPEC and UEA) and four private universities (UIA, UDH, UTEG, and UCG). The latter illustrates that universities with a low to moderate production of peer-reviewed papers, but a relatively good score on the other three evaluation criteria (academic efficiency, organization, and infrastructure) of CEAACES evaluation system, can reach a score justifying their classification in Category B. The institutions in CEAACES evaluation Categories C and D are research-wise less productive, and the 16 universities in Category C possess in Scopus database an average record of 55 peer-reviewed articles, varying between 0 and 289, and 127 registrations on average for the four universities in Category D, which vary between 0 and 254. It is evident that the record of peer-reviewed articles registered in Scopus of the 4 in 2014 created universities, Yachay Tech, IKIAM, UNEA, and UArtes, is lower. Yachay Tech achieved a registration record of 662 peer-

reviewed articles in 6 years or 110 publications on average per year, IKIAM realized a total of 213 peer-reviewed publications in Scopus or 35 registrations on average per year. UNEA and UArtes offering 3rd and 4th level training in education and arts are less successful in the development of research activities leading to research papers publishable in peer-reviewed journals. The score for UNEA is at average 12.3 registered publications annually, while UArtes so far failed to get one peer-reviewed article registered in the Scopus database.

Whereas the number of registrations of peer-reviewed documents in the Scopus database offers a good picture of the research capability of Ecuador's UEPs at the international level, it fails to measure the scientific productivity at the local and regional scale. It does not reflect the scientific productivity of the older generation of professors and the upcoming generation of junior scientists, with limited experiences in writing research papers, nor does it offer a correct image of the investigative capability of disciplines like arts, social and human sciences (Villavicencio, 2014). This group of the academic community still disseminates findings by priority in institutional, national, or regional scientific journals. Unfortunately, the fragmentation of the scientific publications of Ecuadorian UEPs in institutional and regional journals makes it impossible to compile an accurate picture of the scientific productivity of the institutions based on locally published books, monographs, and articles. Such an exercise would require the analysis of many journal databases such as DOAJ, Latindex, SciELO, SAGE, JSTOR, JURN, among many other journal databases.

Another parameter often used to characterize the investigative capacity of an institution is the number of patents generated as a spinoff of ongoing research. According to the statistics published by Knoema Corporation (2020), the Ecuadorian list of patents is far from impressive. It varies from 4 in 2010 up to 34 in 2018. Camana-Fiallos (2019) is even more critical by stating that the creation and the invention of patents by universities is far from encouraging.

A frequently heard comment in the corridors of university institutions is that the financial support from the government for higher education and research is seen as the main reason for the modest quality and research performance of the majority of universities and polytechnic schools. Despite the decision to increase the budget for higher education to 2% of GDP in the new

constitution, funding for the public institutions only increased from 0.8 to 1.62% in 2009 (Fig. 7). Given the ensuing economic recession, government allocation gradually declined to 1.3% of GDP in 2017, and given the Covid-19 pandemic, government support for higher education is expected to decline further. In reality, the public universities spent less than the assigned grant at the beginning of the calendar year because of the late transfer of the last installment. The institutions cannot spend this tranche, which equates to approximately an annual repayment of 15% of the allowance. Government investment in R&D, a budget not exclusive for UEPs, was low and remains low, ranging from 0.33% of GDP in 2012 to 0.47% in 2019 (Fig. 7). And like René Ramírez, economist and former secretary of SENESCYT expressed it: “We have nothing in science, so we asked the universities to spend at least 6% of their budget on research” (de la Vega, 2017).

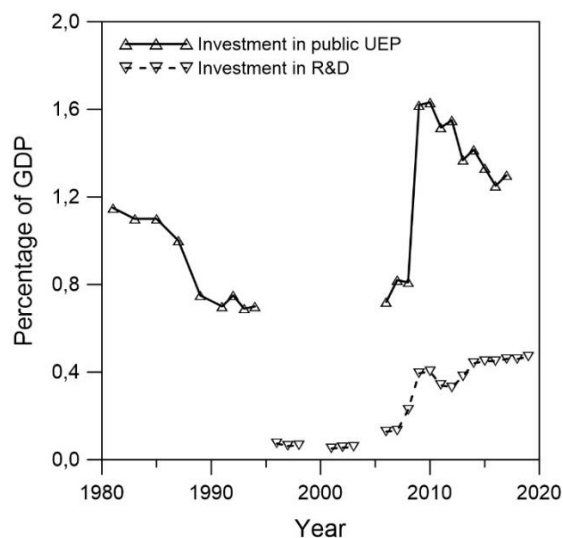


Figure 7. Government investment in public and co-financed private UEPs and R&D as a percentage of the gross domestic product (Sources: Jameson, 1997; Lara & Nuñez, 2014; SENESCYT, 2019; The World Bank, 2015).

As can be derived from this short description, the higher education policy in Ecuador underwent many changes. The shift in 2008 from being considered a good of limited access to a public good, meaning a change to free-of-charge access to higher education, can be considered as one of the major policy changes. The reform process initiated by Rafael Correa involved a complete remodeling of the government administration in charge of the regulation, coordination, planning, and accreditation of higher education. The reform process of the higher education system was complex and initially could not count on the cooperation of all actors. The new policies were regarded by the higher education institutions’ as a curtailing of the institutions’ autonomy, explaining the passive attitude of the institutions in making the recommended adjustments. Besides, the reform process suffered significant wear due to the frequent changes in

policy, executive bodies, and the readjustments made in the technical instruments that support these processes. Notwithstanding, that from 2008 onwards the public spending on higher education as a percentage of the GDP increased, it did not really lead to an improvement in the expenditure quality of the institutions. As stated by Zabala Peñafiel (2017), the money and spending by the higher education system are still primarily used in maintaining existing offices instead of improving their principles, academic and organizational paradigms, as well as their quality principles.

3. ECUADOR’S UNIVERSITY POSITION AT INTERNATIONAL AND REGIONAL SCALE

Bothwell (2020a&b), in her analysis of THE¹⁷. Latin America University Rankings 2020, concludes that in comparison with the HEIs in the US, Europe, and Asia, Latin American universities, in general, face a bleak picture, and it is expected that the ranking of Latin American universities might further decline due to the Covid-19 crisis. The ranking of Latin American universities uses the 13 performance indicators that underpin THE World University Ranking, but the weight of the indicators is calibrated to reflect the characteristics of Latin America’s universities. The performance indicators are grouped into five areas: teaching (the learning environment), research (volume, income, and reputation), citations (research influence), international outlook (staff, students, and research), and industry income (knowledge transfer). In 2020, THE ranked, at the global level, 1400 universities across 92 countries¹⁸. None of the Ecuadorian universities appear in THE World University Ranking, because of the overall low performance of Ecuador’s HEIs or because Ecuadorian universities did not produce the full set of information required for the quantification of the 13 indicators on which the ranking system is based. However, nine Ecuadorian universities appear in THE Regional University Ranking of Latin America. The Latin America Regional University Ranking comprised a total of 166 HEIs. Brazil has the largest group of universities in this ranking, namely 61, followed by 30 Chilean HEIs. There are 23 Colombian and 22 Mexican universities included in this ranking. The number of institutions retained in the Latin America University 2020 ranking is much lower for Ecuador (9), Argentina (8), Peru (6), and Venezuela (2). Finally, just one university in each of the countries: Costa Rica, Cuba, Jamaica, Puerto Rico, and Uruguay appear in the regional THE ranking. The first ranked and highest performing institution is the Pontificia Universidad Católica de Chile. The 9 Ecuadorian universities retained in this ranking are the Universidad San Francisco de Quito (ranked 56), Universidad de Las Américas (ranked 99), Escuela Politécnica Nacional, Escuela Superior Politécnica del Litoral, Pontificia Universidad Católica del Ecuador, Universidad Politécnica Salesiana, and the Universidad de Especialidades Espíritu Santo (all in the 101-125 rank), and finally the Universidad Técnica

¹⁷ Times Higher Education (<https://www.timeshighereducation.com>), is a weekly magazine based in London, reporting specifically on news and issues related to higher education

¹⁸ THE World University Ranking: <https://www.timeshighereducation.com/world-university-rankings/2020/world-ranking>

Particular de Loja and the Universidad de las Fuerzas Armadas (ranked 126+).

One could criticize that THE University Ranking system does not produce a correct picture of the university ranking at the global and regional levels. However, when using, for example, the QS-ranking, a ranking system very often used by the HEIs, more or less similar results are obtained. In comparison to THE Ranking System, the QS Ranking¹⁹ is based on six metrics, namely: academic reputation, employer reputation, faculty/student ratio, citations per faculty, ratio international faculty, and international student. In the top 200 list of the 1002 ranked universities, only 6 Latin America universities appear, respectively the Universidad de Buenos Aires (rank 74), Universidad Nacional Autónoma de México (ranked 103), Universidad de São Paulo (ranked 116), Pontificia Universidad Católica de Chile (ranked 127), Tecnológico de Monterrey (ranked 158), and Universidad de Chile (ranked 189). Only 4 Ecuadorian universities appear in the list of 1002 ranked universities at the global level, namely the Universidad de San Francisco de Quito (rank 751-800), and the Escuela Politécnica Nacional, Escuela Superior Politécnica del Litoral, and Pontificia Universidad Católica del Ecuador (rank 801-1000). The QS ranking system clearly illustrates that only a small group of Latin American Universities, primarily Argentinian, Brazilian, Chilean, Colombian, and Mexican universities appear in the top 200 QS Ranking list. Analysis of THE and QS ranking systems reveals that, although limited in number, the better Ecuadorian universities are ranked low, confirming the meager picture of the Ecuadorian university system at the international level.

4. STRATEGIC MEASURES

The worldwide corona pandemic disrupts society, with schools and universities across the globe forced to adapt activities to the new situation of social distancing, and students have been affected in their progress by the lockdowns. It is to be expected that the higher education institutions at the start of the new academic year will be confronted by a series of new challenges, just to name a few: How should the public universities respond to the expected budget cuts for at least the coming years until the country's economy recovers? Should lecturing return to the traditional face-to-face mode, or should lecturing move to a mix of online learning and classroom teaching? Should we restart the laboratory and fieldwork as before or remodel the way research was conducted? How can we catch up with the general slowdown in education, research, and intellectual progress during the corona pandemic? Should we go back to the situation before the Covid-19 crisis once a vaccine is amply available, or should we use the current situation to reimagine the university? The authorities and the academic community as a whole will be confronted by this and other questions. It is up to all of us to react creatively by reorganizing the way things were done before the crisis. Not only should we respond creatively but also move quickly, which is not a general notion of universities. As stated by Temmerman

(2020), it is a widespread custom in universities that the meetings, discussions, and the preparation of policy and procedural documents, can take months before a new policy comes into effect. However, the current crisis does not permit lengthy discussions, procedural steps, and certainly is not an excuse for the authorities to delay doing things.

Ecuador's public universities face an estimated budget cut of 10%, and since the majority of the annual budget is used for staff payment, it is to be expected that the university to making ends meet as a first step will not renew the contract of primarily junior non-tenured academic staff. The administrative staff will be in a safer position, given the dominant bureaucratic character of most public institutions. A question that arises first is how 80 to 90% of the annual budget is used for staff payment? If this is correct, little money is left for the modernization and maintenance of the infrastructure, nor the implementation of new initiatives. Could it be that the institutional policy and management over the years has resulted in the over-appointment of administrative, technical, and academic staff? Or could it be the consequence of the excess in the start-up of graduate programs? The enormous fragmentation of services at different levels within the institutions as well as the regulations of SENESCYT are likely another reason for the overpopulation of staff. As an example, the directives of SENESCYT require that for pedagogical reasons, the number of students per auditorium should be limited to a maximum of 30 to 40. The latter and the fact that the faculties mostly function autonomously means that different faculties, for example, appoint a professor of mathematics or philosophy, and that, depending on the number of students, the instructor will have to repeat one to several times his/her class, especially in the first and second year of the undergraduate program when the number of students attending the same course is large. The autonomous functioning of faculties and many services also means that there are duplications in the areas of administration, infrastructure, and equipment.

If, because of the current crisis, academic staff under contract is discarded, and the pre-crisis timetable of lectures in the different faculties remain, the consequence will be that the staff that stays on board will be confronted with an increase in teaching workload. With the previously given, should not the UEPs first reflect how they could reduce the already exuberant teaching load of the academic staff by redesigning study programs, stimulating the cooperation between faculties, and the administrative services? The collaboration between faculties should thereby not only be pursued from an economic point of view but also to stimulate the development of and strengthening interdisciplinary learning. The problems society faces daily become increasingly more complex and interdisciplinary, and solutions should not only address the technical side of the problem, but also the interaction with the multitude of social factors present in society. Another reason why the teaching load of lecturers might further increase if no appropriate measures are taken will be due to the restrictions emerging from the Covid-19 pandemic,

¹⁹ QS University Ranking:
<https://www.topuniversities.com/university-rankings/world-university-rankings/202>

namely social distancing limiting the number of students that can attend a class at the same time.

A positive aspect of Covid-19 is that online teaching modalities came to fruition. The method of online teaching is not new, and the technology of the last decades made it possible that the initial version of education at a distance whereby lecture material and assignments were exchanged by mail completely changed to an interactive online interface. This was even true for industry and business employees' online learning and training, retraining, and for updating skillset purposes, and this since the early 2000s. In university environments, the use of online teaching surfaced much slower. According to Garcia, Arias, Murri, & Serna (2010), the majority of teachers in higher education teach the way they were taught, through didactic, lecture-based teaching in a classroom setting, where the material taught is passively adsorbed by the students. The sudden rise of Covid-19 meant that many professors overnight were forced to teach online, and despite their weak capacity for online teaching, they did, of course, with varying success. A prerequisite for online teaching is that the lecturers receive training in the method and the technology of distance learning, that the study material is adapted to the new way of communication, and that interaction with the students is guaranteed (Gregory & Salmon, 2013; Andrews Graham, 2019). Educational providers of online teaching are increasingly entering the higher education marketplace. It is a must for the universities to make a quality online provider available and to organize advanced courses in how to teach online successfully. An important advantage of online teaching is that it enables the lecturer to experiment more in pedagogy and get instant feedback and the associated technology enables the lecturer to have a better idea of students' progress (Bower, 2006).

To speed up the switch from the traditional face-to-face classroom to online teaching, academic staff of different disciplines should work together to develop in different educational fields novel online courses. They should encompass online video lectures, downloadable textbooks, practice exercises, tests, and creative materials. Also, they should aim at keeping students engaged and the development of thoughtful question sessions to stimulate the student's self-reflection, revision, and social negotiation (Yang, 2008; Ahern, 2017). To do so requires the cooperation between specialists in pedagogy, the technology of online teaching, and a group of professors, eventually belonging to different faculties but teaching the same material. Having a quality online course permits the subject can be taught simultaneously to more students than the current capacity of the majority of classrooms. Courses can even be developed in collaboration with professors at other universities and made available to lecturers and students of several universities, even those not having the capacity to design and develop online course material. Online education and the availability of digital course material facilitate the regular adaptation of the course material to changing social questions and problems.

The implementation of online teaching implies that students possess a laptop and have stable WiFi access. Furthermore, it is necessary that the online teaching alternate with classroom sessions to maintain the face-to-face interaction between the lecturer and the students, and among the students. Communication and social contact are, in addition to the online learning of the study material,

important. The classroom sessions can be dedicated to the discussion of course material alternating, for example, with project work eventually in cooperation with industrial and social actors. Diversity in the form of education is and remains a necessary component, and it is important that in the classroom sessions sufficient attention is being given to the social process of learning, implying social interactions and learning of social norms. The main advantage of blended teaching, whereby digital and face-to-face teaching alternate on a fixed schedule, when well-planned and organized, can reduce the teaching load of the academic staff. Also, a reduction of the teaching load can be achieved to make, for example, for the online question sessions appeal to teaching assistants (e.g., master and/or doctoral students) as to expose the future generation of docents timely to online teaching-learning situations (Badia, García, & Meneses, 2017).

A reduction of the teaching workload of the academic staff, that urgently ought to be pursued, will permit the mid-age career and younger generation of the academic staff to engage in research. Similarly, to teaching, research is an essential component of a university or a technological school. Higher education institutes evolving from the old teaching-alone institutions should change to entrepreneurial institutions, requiring that parallel to the teaching profile, the university develops a performing research profile that culminates in the production of high-quality research output and patents. To make it happen, the university should develop policies facilitating the collaboration with the public and industrial sector. Additionally, the collaborating parties must have a common consensus based on a clear understanding of how both parties can create synergies and derive value (Eisenberg *et al.*, 2019). For the public and private sector to be interested in collaborating with universities, the university ought to give evidence of possessing high-quality performing research units. Whereas in the past, a productive research unit could be a one-person business, today due to the complexity of the problems and the high associated costs of equipment and infrastructure, strong research groups have to be in place, preferably composed of various professors and research assistants, supported by either a master's degree course or a doctoral program. Collaboration with other research groups at the national and international level is essential and will assist a research group to create research with impact. And here too, for example, to reduce the travel costs, the role of online discussions and meetings is becoming more important every day.

An additional advantage for a university possessing quality research groups is that they have the skills and capacity to generate funding through the formulation of winning research proposals at the national and international levels. Also, it will open the possibility of working with the public and private sector to formulate joint research projects. The availability of research projects will not only permit improvement and further development of the research infrastructure but also most importantly enable the hiring of more staff. If an institution today possessed this capacity, they might not have been forced by the Covid-19 induced budget cut of the government to modify staff's contract from full-time to part-time, or even to end contracts. Certainly, in today's crisis, it would be a benefit for UEPs possessing research resources which could partly be used to balance the restrictions on government allowances. Of course, the

primary objective of research remains the generation of knowledge, problem-solving, and the contribution to the generation of innovative developments.

Whereas before the coronavirus crisis, teaching, research, meetings, consultation of books and journals in the library, etc., took place in the university accommodation; today a strong shift towards online communication, teaching, learning and discussion, and working from home has surfaced and is becoming normal. It is evident that classroom teaching, laboratory, and field research within the university facilities should continue to the possible extent and that the synergies and trade-offs between teaching, research, and knowledge exchange are guaranteed, and should even come out stronger from this crisis. And why should not the universities use the crisis as an opportunity to proactively respond to the challenges and shoulder their responsibilities to demonstrate their commitment to society? As reported by Yong (2020), universities in the 21st century should be characterized by high-quality teaching, participation in learning, academic research, and innovation. Given the increasing ups and downs in the world, universities should stand up and be leading society safely ahead. Universities, although something they are not used to doing, should use the coronavirus pandemic to take up social responsibilities. For example, in May 2019, 12 universities from 9 countries founded the Global Alliance of Universities on Climate at the Tsinghua University (China), in response to the global challenges presented by climate change (Yong, 2020). Similar initiatives around specific aspects of the society can be taken at the national and regional levels, given universities at this level have the capacity and the will to collaborate. Let us hope that the coronavirus crisis will be a wake-up call for the public and private universities to work together to be capable of providing society the support it needs to make progress, not only for a few but for the entire community. Is it not a moral obligation, taking into account that both, the public and private UEPs are funded by the public, either via the government or partially via the income from registration fees and endowments given by private donors?

5. CONCLUSIONS

Will Covid-19 enhance the collaboration within and among the UEPs, as leverage for more efficient use of the limited public resources and improvement of the institutions' commitment to society? To achieve this objective, as highlighted in this manuscript, the Covid-19 associated move to online teaching must go beyond the technological change but also strive towards the inclusion of concepts of dialogic pedagogy and interdisciplinary teaching, whereby theory and languages from more than one discipline must merge to study a central theme. Both these aspects need to be considered to adapt the learning process to the changing challenges of society. Achieving this is a complex process, which requires cooperation between the lecturers of different disciplines, either belonging to one or different universities. If the implementation of online teaching is well planned, including the merging of similar courses across faculties and even institutions, the lecturers' teaching load might drop. This will enable the academic staff to invest a realistic proportion of the weekly workload into research.

To upgrade Ecuador's research profile and to assure that the research addresses the problems of society, one should realize that research is no longer a one-man activity. It requires the presence of several high-functioning research groups in an institution, either linked with other research groups at the national and/or international level and even with the public or private sector. By linking research, and why not education as well, to social actors, the institution as a whole will be able to simultaneously improve its societal commitment image.

Analysis of the publication record of the public and private UEPs revealed that overall, as compared internationally, the Ecuadorian universities possess a poor publication record. Only nine universities (15% of all institutions) possess a Scopus document record of more than 1000, and only two universities (3%) a record larger than 2000. Research is very young in the country, and most journal articles registered in the Scopus database were published after 2000. The smaller institutions only possess articles registered in Scopus published in the period 2010-2020. This type of research is visible at the international level; at the national level exists a multitude of institutional and other journals, reflecting the strong fragmentation of research, the limited appearance to the outside world, and impact on society. The current moderate funding level of the public universities, the distribution of the resources across too many institutions, the lack of collaboration within and among institutions, and the anticipated decline in funding due to the Covid-19 pandemic implies that Ecuador's scientific and innovative image will remain moderate for at least the next 10 to 20 years, and that progress of the country's economy and welfare primarily will depend on technology imports. To accelerate the progress in research and its impact on society, one could consider evolving a limited group of universities with government support into undergraduate and graduate teaching-research institutions and the mass of smaller universities with a weak research profile into undergraduate educational institutions. The latter will not only result in an improvement of the country's research output but also in a more efficient use of public funding.

ACKNOWLEDGEMENTS

I cannot express enough thanks to Dr. Edison Timbe for the assistance provided in the search for the data used in this study, in particular, taking into consideration the contradictory information in the various data sources. Thanks are also due to an anonymous reviewer for his constructive but critical comments, and for polishing the text of the manuscript.

REFERENCES

- Andrews Graham, D. (2019). Benefits of online teaching for face-to-face teaching at historically black colleges and universities. *Online Learning*, 23(1), 144-163. <https://doi.org/10.24059/olj.v23i1.1435>
- Baker, S. (2020). HE financial crisis risks 'the lost generation of researchers'. *Times Higher Education Newsletter*, July 2020. Retrieved from

- <https://www.timeshighereducation.com/news/financial-crisis-risks-lost-generation-researchers>
- Botwell, E. (2020a). THE Latin America University Rankings 2020: results announced. *Times Higher Education Newsletter*, July 2020. Retrieved from <https://www.timeshighereducation.com/news/latin-america-university-rankings-2020-results-announced>
- Botwell, E. (2020b). THE Latin America University Rankings 2020: universities prove their value in a difficult year. *Times Higher Education Newsletter*, July 2020. Retrieved from <https://www.timeshighereducation.com/world-university-rankings/latin-america-university-rankings-2020-universities-prove-their-value>
- Bower, M. (2006). *Virtual classroom pedagogy*. Proceedings of the 37th SIGCSE technical symposium on Computer science education, 148-152. <https://doi.org/10.1145/1121341.1121390>
- Brunner, J. J., & Miranda, D. A. (2016). *Educación Superior en Iberoamérica - Informe 2016*. 276 pp. Santiago de Chile, Chile: RIL® editores. Retrieved from https://www.academia.edu/30406284/Educaci%C3%B3n_Superior_en_Iberoam%C3%A9rica_Informe_2016
- Camana-Fiallos, R. (2019). En las universidades del Ecuador: La investigación y creación de patentes. *El Universo*. Retrieved from <https://www.eluniverso.com/opinion/2019/01/18/nota/143959/universidades-ecuador-investigacion-creacion-patentes>
- CEAACES. (2020). *Categoría de las Universidades de Ecuador IES CEAACES 2020*. Retrieved from <https://ecuadorec.com/categoria-de-las-universidades-de-ecuador-ies-ceaaces/>
- CONEA. (2009). *Evaluación de desempeño institucional de las Universidades y Escuelas Politécnicas del Ecuador*. Mandato Constituyente No. 14. 13 pp. Quito: Consejo Nacional de Evaluación y Acreditación de la Educación Superior del Ecuador. Retrieved from https://www.educacionsuperior.gob.ec/wp-content/uploads/downloads/2012/07/Extracto_informe_CONEA.pdf
- CONUEP. (1992). *Directorio del CONUEP y de las universidades y escuelas politécnicas*. Retrieved from <https://www.worldcat.org/title/directorio-del-conuep-y-de-las-universidades-y-escuelas-politecnicas/oclc/32661199>
- Correa, R. (2012). *Ecuador's path*. Interview. 24 pp. Retrieved from <https://newleftreview.org/issues/II77/articles/rafael-correa-ecuador-s-path.pdf>
- Devinney, T., & Dowling, G. (2020). Is this the crisis higher education needs to have? *Times Higher Education Newsletter*, May 2020. Retrieved from <https://www.timeshighereducation.com/features/crisis-higher-education-needs-have>
- Edenfield, C. (2016). Higher education in Ecuador: A reflective analysis. *Georgia Journal of College Students Affairs*, 31(1), 4 pp. <https://doi.org/10.20429/gcpa.2016.010106>
- Education Encyclopedia - StateUniversity.com (consulted August 2020). *Ecuador - Higher Education* (<https://education.stateuniversity.com/pages/403/Ecuador-HIGHER-EDUCATION.html>) and Ecuador - Administration, Finance, & Educational Research (<https://education.stateuniversity.com/pages/404/Ecuador-ADMINISTRATION-FINANCE-EDUCATIONAL-RESEARCH.html>)
- Eisenberg, J., Gann, D., & Yoon, S. (2019). *How to build an entrepreneurial university*. The World Economic Forum COVID Action Platform, September 2019. Retrieved from <https://www.weforum.org/agenda/2019/09/how-to-build-an-entrepreneurial-university/>
- Gregory, J., & Salmon, G. (2013). Professional development for online university teaching. *Distance Education*, 34(3), 256-270. <https://doi.org/10.1080/01587919.2013.835771>
- Haney, A. (2014). *Ecuador's education reforms get mixed reactions*. Retrieved from <http://pulitzercenter.org/reporting/south-america-ecuador-education-college-school>
- Jameson, K. P. (1997). Higher education in a vacuum: stress and reform in Ecuador. *Higher Education*, 33, 265-281.
- Lara, J. C., & Nuñez, W. R. (2014). La importancia del fondo permanente de desarrollo universitario y politécnico (fopedeup) en la conformación del presupuesto en las universidades Públicas del Ecuador. *Revista ECA Sinergia. Facultad de Ciencias Administrativas y Económicas. U.T.M.*, 5(5), 15 pp. Retrieved from <https://dialnet.unirioja.es/servlet/articulo?codigo=6197594>
- Ministerio Coordinador de Desarrollo Social. (2020). *Sistema integrado de Conocimiento y Estadística Social del Ecuador (SICES)*. Retrieved from <http://www.conocimientosocial.gob.ec/pages/EstadisticaSocial/herramientas.jsf>
- Naidu, E., & Deli, S. (2020). *Concern over cuts to higher education, science budgets*. University World News: African Edition, July 2020. Retrieved from <https://www.universityworldnews.com/post.php?story=202007230657559>
- Ponce, J. (2016). *Educación superior en Iberoamerica - Informe 2016: Informe nacional: Ecuador*. 23 pp. Retrieved from <https://cinda.cl/wp-content/uploads/2019/01/educacion-superior-en-iberoamerica-informe-2016-informe-nacional-ecuador.pdf>
- Ponce, J., & Carrasco, F. (2017). Acceso y equidad a la educación superior y posgrado en el Ecuador, un enfoque descriptivo. *Revista Latinoamericana de Políticas y Acción Pública*, 3(2), 9-22.
- Salazar, R. (2013). *Ciencia y tecnología en el Ecuador: Una breve introducción de su institucionalización*. 9 pp. Maestría en Ciencia, Tecnología y Sociedad, Universidad Nacional de Quilmes. Bernal, Argentina. Retrieved from https://www.academia.edu/8691241/Ciencia_y_tecnolog%C3%ADa_en_el_Ecuador_Una_breve_introducci%C3%B3n_de_su_institucionalizaci%C3%B3n_Science_and_technology_in_Ecuador_A_brief_introduction_of_Ecuadorian_science_and_technology_institutionalization
- SENESCYT. (2018). *Educación superior, ciencia, tecnología, innovación y saberes ancestrales en cifras*. 36 pp. Retrieved from <https://www.educacionsuperior.gob.ec/wp->

- content/uploads/
downloads/2019/01/00_Nacional_Educacion_Superior
_en_Cifras_Diciembre_2018.pdf
- SENESCYT. (2020). *Títulos registrados* (Versión 2.0). Quito, Ecuador: Educación Superior, Ciencia, Tecnología, Innovación.
- SNIESE. (2020). *Información actualizada sobre la educación superior del Ecuador*. Quito: Sistema Nacional de Información de Educación Superior del Ecuador. Retrieved from <https://infoeducacionsuperior.gob.ec/#/ies-acreditadas>
- Temmerman, N. (2020). HE must prepare for change, not be forced into it. *University World News*, October 2020, 3 pp. Retrieved from <https://www.universityworldnews.com/post.php?story=20200909113559143>
- The World Bank. (2015). *Research and development expenditure (% of GDP) - Ecuador*. Retrieved from <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=EC>
- UniRank. (2020). *A-Z list of World Universities: Universities in Ecuador*. Retrieved from <https://www.4icu.org/ec/universities/>
- Van Hoof, H. B., Estrella, M., Eljuri, M-I., & Torres León, L. (2013). Ecuador's higher education system in times of change. *Journal of Hispanic Higher Education*, 12(4), 345-355. <https://doi.org/10.1177/1538192713495060>
- Vega de la, C. (2017). *La transformación universitaria ecuatoriana*. 5 pp. Buenos Aires, Argentina: Tecnología Sur Sur (TSS), Universidad Nacional de San Martín. Retrieved from <http://www.unsam.edu.ar/tss/la-transformacion-universitaria-ecuatoriana/>
- Villavicencio, A. (2014). *La fiebre de las publicaciones*. 9 pp. Retrieved from <https://universidadsociedadec.files.wordpress.com/2014/04/la-fiebre-de-las-publicaciones.pdf>
- Yong, Q. (2020). Time for universities to show their commitment to society. *Times Higher Education Newsletter*, April 2020. Retrieved from <https://www.universityworldnews.com/post.php?story=20200401154815248>