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Regionalization of Graduate Education in Southern Brazil: Dispersion of Graduate Programs and Excellence's Concentration

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ABSTRACT

The objective of this article is to analyze the distribution of Postgraduate Programs (PPGs) in the Southern Region from 1998 to 2018. The PPGs represent a meaningful part of the applied and basic research in Higher Education Institutions (HEIs) carried out in Brazil and that has been decentralizing from public policies of higher education. Secondary data were used from the base available in the Capes Georeferenced Information System (Geocapes). The expansion of PPGs reveals differences between the three states as capital and interior, public and private, areas of knowledge and course concepts. Private HEI's contribute to the expansion of PPGs in gaps left by the public offer in the interior of Santa Catarina and Rio Grande do Sul and in the capital of Paraná State. The recent establishment of new Federal Institutions of Higher Education (IFES) campuses has produced effects in the Graduate Education as a scattering of PPGs in the interior and the concentration of excellence in research in consolidated universities in the capitals and large urban centers. PPGs in multidisciplinary areas and vocational master's degrees represent the areas of knowledge and academic degrees that have increased the fastest in the period, but their condition of excellence is still restricted to the interior. As final remarks, the tendency of growth of PPGs in Life, Exact, Technological and Multidisciplinary Sciences is presented in new campuses, new public Higher Education Institutions (HEI) created as of 2000 in the inland municipalities.

KEYWORDS

Postgraduate courses. Higher education institutions. Vocational education. Evaluation methods.

Interiorização da Pós-Graduação na Região Sul: Dispersão *Stricto Sensu* e Concentração da Excelência

RESUMO

O objetivo do presente artigo é analisar a distribuição dos Programas de Pós-Graduação (PPGs) na Região Sul de 1998 a 2018. Os PPGs representam parte significativa da pesquisa aplicada e básica dentro das Instituições de Ensino Superior (IES) realizada no Brasil e que vem se desconcentrando a partir de políticas públicas de educação superior. Foram utilizados dados secundários a partir da base disponível no Sistema de Informações Georreferenciadas da Capes (Geocapes). A expansão de PPGs expõe diferenças entre os três estados em termos de capital e interior, público e privado, áreas do conhecimento e conceitos dos cursos. Enquanto as IES privadas contribuem com a expansão da Pós-Graduação no interior de Santa Catarina e Rio Grande do Sul e na capital do Paraná, ainda há vazios deixados pelos PPGs públicos naqueles dois estados. A reestruturação recente de Instituições Federais de Ensino Superior (IFES) tem produzido efeitos na Pós-Graduação como uma dispersão de PPGs no interior e a concentração de excelência em pesquisa em universidades consolidadas nas capitais e grandes centros urbanos. PPGs nas áreas multidisciplinares e mestrados profissionais constituem as áreas do conhecimento e graus acadêmicos que mais cresceram no período sendo ainda restrita sua condição de excelência para o interior. Como considerações finais é apresentada a tendência de crescimento de PPGs em Ciências da Vida, Exatas, Tecnológicas e Multidisciplinar em novos campi, novas Instituições de Ensino Superior (IES) públicas criadas a partir de 2000 em municípios do interior.

PALAVRAS-CHAVE

Pós-graduação *Stricto Sensu*. Expansão do ensino superior. Mestrado profissional. Avaliação da pós-graduação.

Dispersión de Posgrados en el Interior y Concentración de Excelencia: El Caso de la Región Sur de Brasil

RESUMEN

Este trabajo tiene como objetivo analizar los Programas de Posgrado (PG) en la Región Sur de Brasil desde 1998 hasta 2018. El Postgrado representa una parte importante de la investigación aplicada y básica dentro de las Instituciones de Educación Superior (IES) llevada a cabo por las políticas públicas nacionales de educación superior basadas en objetivos de desconcentración. Utilizamos datos secundarios disponibles en el Sistema de Información Georreferenciada de Capes (Geocapes). La expansión del Posgrado expone la diferenciación entre los tres estados en términos de capital y no capital, público y privado, áreas de conocimiento y grados. Mientras que las IES privadas contribuyen a la expansión de la Educación de Posgrado, existen lagunas en los Programas de Posgrado públicos en el interior de Santa Catarina y de Rio Grande do Sul y en la capital del estado de Paraná. La reciente creación de IES Federales ha producido efectos en la Educación de Posgrado como la dispersión de los GPs en las ciudades no capitales y la concentración de la excelencia en las universidades consolidadas en los grandes centros urbanos como las capitales. Los Programas de Posgrado multidisciplinares y los másteres profesionales en cuanto a áreas de conocimiento y títulos académicos son los que más han aumentado. Sin embargo, la excelencia sigue restringida fuera de las capitales. Se concluye que existen carencias en Ciencias de la Vida, Exactas, Tecnológicas y Multidisciplinares en los nuevos campus, nuevas IES creadas a partir del año 2000 en las ciudades del interior.

PALABRAS CLAVE

Curso posuniversitario. Instituto de enseñanza superior. Enseñanza científica superior. Método de evaluación.

1 Introduction

The role of HEIs as inducers of economic development has regained importance in the scientific literature related to the development of regions where they are located. This highlights the relevance of studies focused on the importance of private and public HEIs in breaking the cycle of economic poverty. Higher education in Brazil is highly competitive, with a large participation of private HEIs that have difficulty in verticalizing their educational services through Graduate Education, being more common the offer of undergraduate courses and specialization at the specialization level. The Graduate Education PhD and master's degree and scientific research are still concentrated in public HEIs. Twenty years after 1998, the year in which considerable innovations were promoted in Graduate Education, studies are needed to address and evaluate the expansion and regionalization of public and private HEIs.

The expansion of Graduate Education courses in a country as unequal as Brazil, occurs differently among the different degrees, by areas of knowledge and grades that represent academic excellence in research, especially in the hinterland of the States, the main locus of university expansion in Brazil. In spatial terms, the categories capital and hinterland, private and public also show differences in the three states of the Southern Region, where even the federal network of higher education is strongly "statized". In this context, "educational frontiers" are evidenced in places with low availability of institutions, campuses, and higher education courses, conforming in a certain way "higher education voids" as Santos and Silveira (2000) pointed out.

The objective of the present article is to analyze the distribution of PhD and master's degree Graduate Programs (GPs) in the Southern Region from 1998 to 2018. The study of a specific region is intended to highlight trajectories, trends, and gaps in the field of Graduate Education to configure a useful tool for analysis of HEI managers, academic community, public policy evaluators in the search for understanding the impacts of intentions to reduce regional inequalities and asymmetries. The long look at twenty years of experience of "regionalization" between 1998 and 2018, seeks to understand, equally, the result in spatial terms of the policies of creation of new public HEIs and induction of expansion policies in Graduate Studies.

The present article is divided into four parts, in addition to this introduction. Firstly, a literature review on the expansion of Graduate Education in Brazil during the 20th century is presented with focus on the South Region and a brief explanation of the current evaluation of GPs. In a second part, the data collection procedures and descriptive analyses are presented. In the part dedicated to the results, a characterization of the differentiations among the three states of the Southern Region is presented, which exposes how the spatial distribution contributed to sustain the asymmetries between public and private with respect to the categories of analysis (hinterland and capital). The concentration of excellence within a context of 'regionalization', that is, deconcentrating of GPs is at the same time a phenomenon of concentration of excellence. Finally, a discussion is presented in relation to the literature

and, as final considerations, the situation of the vocational masters, the GPs in Multidisciplinary areas, and the need for expansion of the Life, Exact and Technological Sciences, especially to the hinterland.

2 Literature Review

The Graduate Education in Brazil arises from the 1950s to re-equip the State by endowing it with a diversity of agencies, among them the National Research Council (CNPq) and the National Campaign for the Improvement of Higher-Level Personnel (Capes), which emerged as a "Campaign" to reorient the Brazilian professional education (PIQUET; LEAL; TERRA, 2005). Today, Capes adopts the word Coordination as the first letter of its acronym and is next to CNPq, the two largest agencies promoting research and Graduate Education at the federal level.

The movement of plans in relation to Graduate Education in Brazil has two key movements: internationalization and expansion focused on the increase in the training of new PhDs. Capes and CNPq have assumed the role of main agents of incentive and conduction of the development of GPs in priority areas through the reduction of existing inequalities in research among the regions of Brazil and are configured as strategic agents, although not the only ones, for the economic and scientific development policies of the State (FERREIRA; CHAVES, 2018).

The context of organization and formatting of a system managed by Capes in the 1960s allowed an expansion and institutionalization of Graduate Education to occur in Brazil in 50 years (MAGALHÃES; REAL, 2020). The Graduate Education is an integral part of the university complex, necessary for the full realization of the purposes of the university, which in its original regulatory document in the Ordinance of the Ministry of Education 977/1965, established the environment and adequate resources for free scientific research and dissemination of university culture to take place (MORAES, 2016).

In the context of Graduate Education, the document called "Development and Education" (MEC, 1975) provided for the increase in the number of master's and doctorate degrees with emphasis on the areas of knowledge of Exact Sciences, Engineering, Social Sciences and Biological Sciences (63% of the formative offer). Even though the document alluded to the training of teachers, education, letters, agro-industrial professions, social professions, and Health Sciences (37%), these would receive less incentive in relation to the former, considered vital for the development of development centers during the military period.

Undergraduate courses, which would become the basis for Graduate Education, in the areas of Applied Social Sciences and Humanities were much more dispersed in the territory if compared to Engineering, Agricultural Sciences and Medicine, which were concentrated in more populated municipalities (CORRÊA, 1974). It must also be admitted that dispersion has

a particular nature, that is, a private one, and concentration has a public nature that also agglutinates in Brazil the condition of power and prestige with respect to academic excellence, being the basis of Brazilian research in university institutions, especially public universities. The concentration is twofold: spatial and institutional, since public universities concentrated, in the 1980s, the largest contingent of Graduate Education courses with 80% of master's degrees (PEREIRA DE SOUZA, 1991).

The indissociability between teaching, research and extension understood as a principle to the operation of Brazilian universities is considered a mark in the Brazilian hierarchy between some public universities at the top and the base formed by a vast number of colleges and isolated institutes with non-university character, in general, private (DEL VECCHIO; SANTOS, 2016).

Universities are an element of the regional institutional system that is struggling to adapt to a competitive global investment and employment process. In this context, there is pressure for local engagement with a particular focus on innovation in which knowledge is seen as a commodity alongside human capital and social capital. Tensions occur between actors regarding eventual benefits and conditioning research funding with criteria typical of location theory (CHARLES, 2006).

Regional inequality is explained by the low attractiveness of investments due to a lower accumulation of installed capacities and a slower development path than other regions. Thus, regions with a lower concentration of researchers such as the hinterland have a lower capacity to attract resources to develop their activities (SILVA; BASTOS, 2014). In the hinterland of the Southern Region, the regional capitals exercised, throughout the twentieth century, the power of attraction of HEIs, undergraduate courses and GPs, as well as researchers and students as a possibility of qualification and specialization closer if compared to Rio de Janeiro, Brasília, and São Paulo.

The regional concentration in the Southeast of the offer of vacancies for undergraduate is even greater in the Graduate Education than in undergraduate, and at the doctoral level only the University of São Paulo (USP), a state university in the state of São Paulo, titled at the end of the 20th century something around half of the doctors in Brazil (SGUISSARDI, 2000). Furthermore, the 27 state capitals comprised 68.7% of the Graduate Education offer and, also, the masters and doctorate courses considered of excellence (grade six and seven) were limited to a few urban centers. In the inland municipalities except for large medium-sized cities, a small number of courses predominated and in a single large area with few courses of excellence (IBGE, 2008).

After the expansion of the Program of Support to Restructuring and Expansion Plans of the Federal Universities (REUNI), the cities of intermediate urban hierarchy such as medium-sized cities have increased their importance as university centers from the expansion of post-graduation courses in the Federal HEIS, although With regard to the increase of

master's and doctorate courses in the hinterland, Brazilian capitals still comprise 57.4% of the courses, and the concentration is even greater in municipalities that present courses of excellence while the distribution of graduation presents a tendency to meet population criteria according to IBGE (2020).

The Report for Capes prepared by the consultancy Clarivate Analytics (2017) recognizes that, in terms of publications and citations, research activity in Brazil is still heavily concentrated in a few states, particularly, in São Paulo. The concentration is at the same time institutional, the three largest states in São Paulo: Universidade de São Paulo (USP), Universidade Estadual Paulista (Unesp), e Universidade Estadual de Campinas (Unicamp) produce something around 1/3 of the articles indexed in major databases. There are also different research focuses on terms of research excellence that makes some states stand out above the national average, as is the case of São Paulo in Medicine, Rio de Janeiro in Mathematics and Physics, and the Federal District in Earth and Environmental Sciences and Social Sciences.

The geographical concentration is also a concentration of resources in terms of publishing and printing production confined to five Brazilian cities (São Paulo, Brasília, Rio de Janeiro, Belo Horizonte, and Porto Alegre). The allocation in basic and applied research, infrastructure, scholarships for scientific initiation and PhD and master's degree graduate programs follows this logic and is the result of decisions on the installed capacity in universities with primacy of those that already hold them (FIALHO, 2012).

This is an asymmetric regional allocation of Brazilian research equipment with the South and Southeast Regions, which concentrate 73% of the Brazilian scientific production and 86% of patent applications, and that is related to the industrialization process in Brazil marked by a movement of "concentrated deconcentration" from the relative loss of importance of the São Paulo capital, at the same time that its condition of economic, social, scientific and academic prestige increases (DINIZ; VIEIRA, 2015).

Silva and Bastos (2014) also evaluate the effects of Graduate Education at the national level between 1999 and 2012 and consider that the South Region has more balanced indicators of GDP/doctors, modest indicator of new doctors and high indicator patents/doctors if compared to other Brazilian regions in the period. The South Region has a low dynamism with respect to specialization, which brings it closer to the Brazilian reality.

The lack of criteria for the distribution of Graduate Education resources has led to the amplification of intra and inter-regional inequalities and imbalances in Brazil. The search for a balance has always been more guided by the fostering agencies in fixing human resources per state and not regionally. In terms of GPs per inhabitant, the three states of the South Region were among the seven best indicators in Brazil, but there were discrepancies such as 65% of resources in scholarships going to UFSC, UFPR and UFRGS (BORTOLOZZI; GREMSKI, 2004). There is a belief that recent expansion would have produced public HEIs

with little research that opposes the select group of more research-intensive HEIs considered elite. This belief is partly due to insufficient investments in human and infrastructure resources and dedication to undergraduate teaching activities, even decreasing the efficiency of the system (VONBUN; MENDONÇA, 2012).

Some authors such as Afonso (2014), Trevisol (2015) and Massucatto, Pezarico and Rubin-Oliveira (2016) consider that there is a change in the institutional and organizational profile of HEIs within the mesoregions of the Southern Region, the result of REUNI actions. Despite not being dedicated to Graduate Education, this change has generated effects in the offer of PhD and master's degree courses from new Federal Higher Institutions of Education (Federal HEIS) that start to occupy hinterland regions and peripheries of large cities. These authors consider that the expansion to the Southwest of Paraná, the Borderland Strip, the mesoregions, and small municipalities that have had HEIs since the 1960s, in 50 years had not yet become verticalized. The creation of new Federal HEIS campuses, in this sense, can be considered a watershed for Graduate Education, from the first decade of 2000 in these places.

Other authors such as Silva Júnior and Catani (2013) consider that the PhD and master's degree expansion, from the REUNI expansion policy, has become a polo irradiador for changes in the Brazilian public university, in a movement of internationalized mercantilization. The way of doing science is based on an economic time that is not the time of knowledge production. The policy represented an advance "drop by drop" requiring reduced research time and ephemeral results before a new paradigm of science based on mass certification in alignment of policies between Capes and the Ministry of Education to foster policies in the areas of teacher training, health areas and research and technological innovation (SILVA JÚNIOR; CATANI, 2013).

The state of Paraná is, alongside São Paulo, the state with the largest number of state public HEIs, Rio Grande do Sul is the state with the largest number of community HEIs, followed by Santa Catarina, which, in turn, has the largest number of municipal HEIs (MORAES, 2016). This condition reveals different models of distribution of GPs in the South Region in the three states and of establishment of HEIs, as the State of Rio Grande do Sul is also one of the Brazilian states with the largest number of federal universities, contrasting with Paraná and Santa Catarina. These HEIs have always been very "coastalized" with greater density of HEIs in the coastal portion and in the capitals, which the recent REUNI sought to reverse, coming to be considered as a phenomenon of "de-localization" pointed out by Trevisol (2015).

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Clarivate Analytics (2017) pointed out that the three states of the Southern Region also have different focuses of specialization by area of knowledge. Rio Grande do Sul has a deficit in scientific publications in the area of Mathematics and Physical Sciences on the order of 5.2%, while the state of Paraná has a large focus on Life Sciences with 13.9% above the national average and a deficit in Medicine on the order of 6.6% and Social Sciences at 1.8%, while the state of Santa Catarina has a large focus on the areas of Engineering and Technology with 3.1% above the average.

The Report of the Commission by Ordinance 126/2012 (MEC, 2014) considers about the impulse in reestablishing the role of the State as inducer of the expansion of higher education through REUNI, that even though it was not foreseen as goals, Graduate Education was considered as one of the main achievements. The document indicated the expansion to priority knowledge areas and consolidation in existing areas for optimization of physical infrastructure (works and equipment) and human resources (technical and administrative staff and faculty) in the perspective of also creating new Federal Higher Institutions of Education (Federal HEIS), new campuses, new undergraduate courses and especially new PhD and master's degree courses (MEC, 2014).

However, the process of verticalization, that is, starting from an undergraduate base to ensure that the GPs located in the hinterland can place themselves at the same level as the GPs located in the state capitals, is still extremely limited at the end of the second decade of the 21st century, especially in municipalities and regions farther from major urban centers. Even though a good part of the Federal HEIS is still finalizing their establishment and, therefore, dedicating themselves more to undergraduate level, the moment is configured as a wonderful opportunity to evaluate the results of the regionalization of public policies and the expansion of Graduate Education in the hinterland of the Southern Region and to recognize the challenges that lie ahead.

3 Graduate Education Evaluation in Brazil

While undergraduate expansion may be considered a non-policy, graduate expansion is the result of long-term inductive policies, guided and conducted by the central government (MARTINS, 2000). The recognition of regional inequalities has always figured in the National Graduation Education Plans (NGEPs), but in the last two editions, the reduction of asymmetries has become a strategic objective to address policies for both Higher Education and socioeconomic development (CAPES, 2010).

The adoption of quality criteria for the evaluation of Graduate Studies, the institutionalization, the focus on performance increase, the optimization of facilities and commitment to economic growth agenda were the main guidelines of the first three PNPGs from 1975 to 1997, while the expansion of the system and the diversification of courses, internationalization, elaboration of new evaluation criteria, incentive to the creation of new vocational master's courses and inter-institutional cooperation have been focused in the design of the last three plans, while academic excellence has been preserved through incentives to preserve the highest level (CAPES, 2010).

The last National Graduate Education Plan (2011-2020) presented a picture of high concentration of GPs (59%) and vocational master's degrees (56%) in the Southeast Region. The VI PNPG (2011-2020) also admitted that the discrepancies between regions, states, and institutions regarding the distribution of courses by knowledge areas were analogous to the socioeconomic inequalities of the national picture (CAPES, 2010).

The evaluation criteria of CAPES have been in force since 1997 where they emphasize a combination of academic indicators such as books, papers, dissertations and theses based on very quantitative aspects and that no longer hold the complexity that the Graduate Education requires, being a frequent complaint of both researchers who qualify it as a "scientific Taylorism" or even critics of the current system who want to create more than one evaluation system with academic and non-academic criteria (SILVA JÚNIOR; CATANI, 2013).

The projects of PhD and master's degree courses are evaluated by ad hoc committees called area committees with the role of performing a specific opinion and subsequent approval or not by a Technical-Scientific Committee. The courses are distributed at CAPES in 9 (nine) fields of knowledge known as major areas, which are allocated to three colleges as per chart 1. This classification, although not the only one, is the most widely used by platforms such as Lattes and Sucupira, and despite the broad knowledge on the part of academia, some framing issues persist about the multidisciplinary area¹.

Chart 1. CAPES Colleges, major knowledge areas and evaluation areas

Life Sciences			Humanities			Exact, Technological and Multidisciplinary Sciences		
Agricultural Sciences	Biological Sciences	Health Sciences	Human Sciences	Applied Social Sciences	Languages, Letters and Arts	Exact & Earth Sciences	Engineering	Multidisciplinary

Source: CAPES (2020)

The vocational and academic master's and doctoral courses, evaluated with a grade equal to or higher than 3, are recommended by CAPES, however, in the case of state and municipal HEIs, this accreditation may occur in the scope of the State Board of Education, which has the autonomy to evaluate, accredit, authorize or recognize the PhD and master

¹ The Biotechnology and Environmental Sciences areas that are not linked to the Life Sciences and the Teaching and Interdisciplinary areas could be better classified under Humanities.

degree and graduate education courses in its respective educational system. The result of the evaluation serves as a basis for the formulation of policies and the dimensioning of promotion such as scholarships, aid, and support, alongside the strategic support area and the region where the HEI is located.

The quality of the PhD and master's degree courses is conducted by Capes' Graduate Education Evaluation System, by means of general and specific pre-established analysis parameters. The GPs are evaluated every four years by the area committees in the first instance and by the technical committee in the second, and the results are expressed on a scale of 1 to 7, with the maximum grade being 5 for master's degrees and 7 for doctorates and a minimum of 3 for master's degrees and 4 for doctorates (MORAES, 2016).

The evaluation is meritocratic, based on areas of knowledge associated with funding and has recognition for being conducted by peers since its inception. GPs evaluated with grade 4 are considered good, with grade 3 are considered acceptable and with grades 2 and 1, GPs cannot perform new enrollments. (CAPES, 2010). As part of the composition of the weighted average of the grades of courses, both undergraduate and graduate PhD and master degree of a HEI, it is natural that it is a concern of coordinators, teachers and students of GPs and the managers of a HEI the optimization of competition in a quasi-market that puts the Graduate Studies in one of the central themes of the dispute for power and prestige of the HEIs in a competitive scenario where the location factor can help understand the dynamics of creation, consolidation and extinction of PhD and master degree courses in the territory.

4 Methods

The research is quantitative and used secondary data, with the database extracted from the Georeferenced Information System (SIG) of Capes, in the acronym Geocapes version 3.6.9, available online. The Geocapes (2020) presents indicators of distribution of Graduate Programs in Brazil among other information such as research scholarships, distribution of students, teachers, access to journals and investment. This system also allows the elaboration of cartograms by Units of the Federation on a national scale and by municipality on a state scale. The searches were conducted between March and July 2020, and from this data was tabulated using calculation software and spreadsheets, making it possible to build a database that aggregates the three states of the Southern Region.

The disaggregation of the GPs in Geocapes was done by year, Federation Unit (States), region, legal status (different from administrative category), program code, name, area, description area, major area, evaluation area, degree, and grade. The analytical category of capital/hinterland location was created to better understand the distribution of GPs. The years 1998 and 2018 were used, the first being a "milestone" as Ferreira and Chaves (2018) recall with regard to Graduate Education by the elaboration of new norms, implementation of new academic degrees such as the vocational master's degree and performance criteria in the

evaluation of PhD and master degree courses and the last and most recent record to evaluate the expansion in the Southern Region.

The very existence of a GIS can be considered a valuable tool for public transparency and demonstrates the interest of funding agencies such as Capes in promoting a fair distribution of resources in Graduate Education. Spatial analysis as in the present study, can also help to better understand the institutional fostering and balancing at national and local levels based on the process conducted by hegemonic (federal and state) and private public agents that at the same time characterize the historical presences, absences and densities of institutions and economic activities in the territory as pointed out by Santos and Silveira (2000).

5 Results

In 1998, there were 217 GPs in the South Region and, in 2018, this number jumps to 926 GPs, in absolute terms a 327% increase in 20 years, according to Table 1. In the three capitals, Florianópolis (SC), Curitiba (PR) and Porto Alegre (PR), the expansion was 140%, going from 150 to 360 GPs, while for the hinterland of the South Region, the increase is 745%, that is, five times higher than in the capitals. This "regionalization", however, follows distinct models in each state.

Table 1. Distribution of Graduate Programs (GPs) in the Southern Region by location in 1998 and 2018

Location	1998	2018	%
Capital	150	360	140%
Hinterland	67	566	745%
Total	217	926	327%

Source: Geocapes (2020)

The growth of GPs is also more significant in private Higher Education Institutions (HEIs) than in public ones, 700% and 262%, respectively. The public segment that grew the most in the period was the state public HEIs, with a higher growth (759%) when compared to the federal HEIs (186%). The federal administrative category has accounted for most of the Graduate Programs since 1998, when it had 163 out of a universe 185 GPs, that is, 88% while state universities accounted for 12% of the total. In 2018, federal universities still concentrated something around 70% of the public offer of GPs, while state universities 28%. Still, 2% of the offer corresponds to municipal HEIs that, as shown in Table 2, had no GPs in 1998.

Table 2. Distribution of Graduate Programs (GPs) in the Southern Region by administrative category and segments in 1998 and 2018

Administrative category	1998	2018	Growth [%]
Private	32	256	700%
Public	185	670	262%
<i>Federal</i>	163	466	186%
<i>State</i>	22	189	759%
<i>Municipal</i>	0	15	-
Total	217	926	327%

Source: Geocapes (2020)

In 1998, the offer was concentrated in public HEIs in the three capitals: Curitiba (PR), Florianópolis (SC) and Porto Alegre (RS), especially the federal ones, UFPR, UFSC and UFRGS that represented 60.37% of all the offer of GPs in the South Region. This percentage drops by almost half in 2018, that is, 30.67% even though it has expanded in all segments. The deconcentration occurred in general terms towards the hinterland with the creation of new public HEIs (federal and state) and through verticalization, that is, creation of master's and doctoral courses through the undergraduate courses in private non-profit HEIs.

In spatial terms, the hinterland of Paraná grows in relative importance from 9.22% to 21.38% in the South Region in the period from 1998 to 2018 pulled by the public expansion of a Paraná system of "regionalized" state HEIs and, in this context of the expansion of universities and Federal Institutes (IFs) with emphasis on the model of the Universidade Tecnológica Federal do Paraná (UTFPR). The expansion to the hinterland of the states of Rio Grande do Sul and Santa Catarina is private with a relative increase in the period of 7.43% and 4.40% respectively.

The three states of the Southern Region have three distinct models of state universities: Paraná boasts a privileged system of state universities, while the states of Santa Catarina and Rio Grande do Sul, have a single university. Santa Catarina has the Universidade do Estado de Santa Catarina (Udesc) with multicampus organizational arrangement since the 1950s, being the third Brazilian state university with relative expansion to the hinterland regions, from the 1990s, verticalized only from the 2000s and with regional vocation for local production (PAZETO, 2020), however, the campuses concentrate higher education courses in related areas as in Specialized Centers while the campus in the capital Florianópolis presents the largest number of centers in various areas of knowledge. In the state of Rio Grande do Sul, the Universidade do Estado do Rio Grande do Sul (UERGS) was created in 2001, late in part due to the considerable number of federal universities that the state has, with campuses in all the mesoregions, still very dedicated to undergraduate education and like UDESC, with higher education courses concentrated in the capital.

The Universidade Tecnológica Federal do Paraná (UTFPR) linked to the Network of Federal Institutes of Education has 47 of 57 GP courses in the whole South Region, while in 1998 there were only 2 Federal Institutes offering PhD and master's degree courses. The

multicampus model of the UTFPR through the transformation of former agrotechnical schools and Technological Centers allowed a rapid verticalization, especially in the hinterland and, in part, due to the density of research experience, faculty and infrastructure accumulated in high school education for decades in some campuses.

Table 3. Distribution of Graduate Programs (GPs) in the States of the Southern Region by location and administrative category in 1998 and 2018

Location/administrative category	1998	Percentage	2018	Percentage	Percentage Variation 1998-2018
<i>Curitiba</i>	34	15,7%	128	13,8%	-1,8%
<i>Privates</i>	2	0,9%	37	4,0%	3,1%
<i>Public</i>	32	14,7%	91	9,8%	-4,9%
<i>Hinterland of Paraná</i>	20	9,2%	213	23,0%	13,8%
<i>Privates</i>	-	-	15	1,6%	1,6%
<i>Public</i>	20	9,2%	198	21,4%	12,2%
<i>Porto Alegre</i>	78	35,9%	143	15,4%	-20,5%
<i>Privates</i>	17	7,8%	39	4,2%	-3,6%
<i>Public</i>	61	28,1%	104	11,2%	-16,9%
<i>Interior do Rio Grande do Sul</i>	44	20,3%	271	29,3%	9,0%
<i>Privates</i>	12	5,5%	120	13,0%	7,4%
<i>Public</i>	32	14,7%	151	16,3%	1,6%
<i>Florianópolis</i>	38	17,5%	89	9,6%	-7,9%
<i>Privates</i>	-	-	-	-	-
<i>Public</i>	38	17,5%	89	9,6%	-7,9%
<i>Interior de Santa Catarina</i>	3	1,4%	82	8,9%	7,5%
<i>Privates</i>	1	0,5%	45	4,9%	4,4%
<i>Public</i>	2	0,9%	37	4,0%	3,1%
Total	217	100%	926	100%	

Source: Geocapes (2020)

For the private segment, two different models stand out: on one hand, the Paraná context with private expansion to the capital, Curitiba (PR), with growth of 3.1% in the South Region, while the capital Porto Alegre has decreased in 3.6% regional importance and Florianópolis (SC) does not even contemplate the first private PhD and master's degree course in 2018 according to Table 3. In the hinterland of the states of Rio Grande do Sul and Santa Catarina, the community universities are loci of private expansion. These HEIs have contributed with the presence of non-state public facilities and, although they have never been close to promoting gratuity, they have filled a void of public higher education originating in municipal foundations conquered from the 1960s.

GPs have been displaced from the capital to the hinterland in the public and private segments in the period. The participation that was 8.76% of private HEIs and 60.37% of public HEIs in the capital is now 8.21% and 30.67%, respectively. However, the "stabilized" participation in the capital goes against the relative increase in the hinterland from 5.99% to 19.44%, like the public offer that goes from 24.88% to 41.68% in the same period. The distribution of GPs in the states demonstrates that the federal segment is still the most relevant with respect to PhD and master's degree which is still concentrated in the capital cities representing ¼ of the state total in Rio Grande do Sul and Paraná and 40.9% in Santa

Catarina. In Paraná, a greater distribution towards the hinterland stands out with 45.2% of the GPs in state universities and 12.9% in Federal HEIS. In Rio Grande do Sul, the federal PhD, master's degree, and graduate education is already interiorized according to Table 4. As gaps it is possible to notice the low representativeness, in Paraná, of Federal HEIS and private HEI in the hinterland, as well as in the hinterland of Santa Catarina the participation of Federal HEIS.

Table 4. Distribution of GPs by location in each state by administrative category in 2018

Administrative category	Paraná		Santa Catarina		Rio Grande do Sul	
	Capital	Hinterland	Capital	Hinterland	Capital	Hinterland
Federal	26,7%	12,9%	40,9%	5,3%	25,1%	35,7%
State	-	45,2%	11,1%	7,6%	-	0,7%
Municipal	-	-	-	8,8%	-	-
Private	10,9%	4,4%	-	26,3%	9,4%	29,0%
Total	100%		100%		100%	

Source: Geocapes (2020)

The private offer of master's and doctorate courses in the capitals has decreased in all the major areas of knowledge, except in Applied Social Sciences, while the public offer has decreased in all areas of knowledge to half except for Health Sciences which continues to be an educational hub in this area. This percentage is occupied by GPs in private HEIs in the hinterland while public HEIs have decreased in the period from 33.33% to 30.65%, according to Table 5.

Table 5. Distribution of Graduate Programs by major areas of knowledge, location of knowledge, location, and administrative category in 1998 and 2018

Knowledge Areas		Capital						Hinterland								
		Private			Public			Private			Public					
		1998	% of total per area	2018	% of total per area	1998	% of total per area	2018	% of total per area	1998	% of total per area	2018	% of total per area			
Health Sciences	1	16,7	13	10,5	3	50,0	53	42,7	-	-	20	16,1	2	33,3	38	30,6
Exact and Earth Sciences	2	7,7	2	3,2	16	61,5	23	37,1	1	3,8	4	6,4	7	26,9	33	53,2
Human Sciences	5	15,2	12	9,4	19	57,6	34	26,8	5	15,1	26	20,5	4	12,1	55	43,3
Biological Sciences	6	12,0	2	3,4	35	70,0	30	50,8	1	2,0	4	6,8	8	16,0	23	39,0
Agricultural Sciences	-	-	1	1,0	13	36,1	20	20,2	1	2,8	10	10,1	22	61,1	68	68,7
Engineering	1	4,2	4	3,8	17	70,8	35	33,6	-	-	18	17,3	6	25,0	47	45,2
Applied Social Sciences	3	14,3	24	16,7	13	61,9	41	28,5	3	14,3	38	26,4	2	9,5	41	28,5
Languages, Letters, and Arts	1	10,0	4	9,37	7	70,0	15	34,9	0	-	8	18,6	2	20,0	16	37,2
Multidisciplinary	0	-	14	8,57	8	72,7	33	20,1	2	18,2	52	31,7	1	9,1	65	39,6
Total	19	8,8	76	8,2	131	60,4	284	30,7	13	6,0	180	19,4	54	24,9	386	41,7

Source: Geocapes (2020)

Some areas of knowledge are historically public such as Health Sciences, Exact and Earth Sciences, Biological Sciences, Agricultural Sciences, Engineering and Linguistics, Literature and Arts, which have more than 70% of the GPs in the segment, while the Human Sciences present more than 60% and the segments of Applied Social Sciences and Multidisciplinary present a greater balance with great private participation, especially in the hinterland, with 26.39% and 31.71% of the total offer in the South Region. The public HEIs in the hinterland have the largest share of courses in the major areas of Exact and Earth Sciences, Human Sciences, Agricultural Sciences, Engineering, Applied Social Sciences, Linguistics, Literature and Arts, and Multidisciplinary. In Health Sciences and Biological Sciences there is still a higher participation of GPs in the capital and in public HEIs.

If we consider grades 5, 6 and 7, the segments present a different condition between capital and hinterland and private and public. More than half of the GPs located in the capital, both in public and private HEIs can be considered of excellence with 2.63% and 7.75% in grade 7, 15.79% and 6.20% in grade 6 and 32.89% and 29.23% in grade 5. The relative number of GPs with grade 3, which is at the base of academic excellence, decreased in the capital cities and represents 13.16% and 22.18% of the total, respectively in 2018, according to Table 6.

Table 6. Distribution of Graduate Programs by grade, location, and administrative category in 1998 and 2018

Grade	Capital								Interior							
	Private				Public				Private				Public			
	1998	% of total per grade	2018	% of total per grade	1998	% of total per grade	2018	% of total per grade	1998	% of total per grade	2018	% of total per grade	1998	% of total per grade	2018	% of total per grade
Grade 3	6	31,6	10	13,2	45	34,3	63	22,2	7	53,8	60	33,3	32	59,3	173	44,8
Grade 4	8	42,1	27	35,5	39	29,8	70	24,6	4	30,8	85	47,2	13	24,1	140	36,3
Grade 5	5	26,3	25	32,9	33	25,2	83	29,2	1	7,7	30	16,7	6	11,1	52	13,5
Grade 6	-	-	12	15,8	13	9,9	46	16,2	1	7,7	4	2,2	3	5,6	14	3,6
Grade 7	-	-	2	2,6	1	0,8	22	7,7	-	-	1	0,6	-	-	6	1,5
Grade A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0,3

Source: Geocapes (2020)

The reality is opposite in the HEIs located in the hinterland, where less than 20% of the courses are in the grade range 5 and above, and still, both in 1998 and 2018. One of the probable reasons for the performance of the hinterland below the capitals has to do with the difficulties in sedimenting specialized professionals and the less robust infrastructure provided than the consolidated HEIs such as public universities or Pontifical Catholic Universities (PUCs) located in Curitiba (PR) and Porto Alegre (RS).

The PhD and master degree courses higher than grade 5 are concentrated in some HEIs such as the State University of Maringá (UEM) with 17 courses of excellence, the Universidade Federal de Santa Maria with 13, the Universidade do Vale dos Rios dos Sinos (Unisinos) in São Leopoldo (RS) with 12, the Universidade Estadual de Londrina (UEL) with 11, the Universidade Federal de Pelotas (UFPel) in the campuses Pelotas with 6 courses and UFPel Capão do Leão with 5 courses, and the Fundação Universidade Federal do Rio Grande (FURG) with 6 and the Universidade do Vale do Itajaí (Univali) with 5.

In this sense, Maringá (PR), Londrina (PR) and Santa Maria (RS) have played a role of greater attraction with respect to the PhD and master degree for the hinterland, while the Graduate Education in terms of excellence is still very "coastalized" in HEI located on the outskirts of the capitals, There remains a "vacuum" of post-graduation and research in the hinterland regions, especially on the borders with neighboring countries where Unila, Unipampa and UFFS have been installed and that, due to their recent establishment, can still contribute with a greater density of supply in areas of knowledge that advance on issues of regional interest.

The GPs in the Great Multidisciplinary Area present 88.03% of the GPs with grades 3 and 4. It is even higher in the vocational experts with 96.81% of these with a grade lower than 5 in the South Region, while in the state capitals, these indicators are 55.32% and 84.62% respectively. This does not imply that the location of this degree and the great area of knowledge is not determining the grade, but that the places that are better equipped, with better facilities and better qualified teachers have higher scores, publish more and thus contemplate more investments and scholarships feeding a virtuous cycle in relation to performance. Excellence becomes an element of differentiation of the GPs, in the South Region with 32.18% obtaining the grade 5, in the hinterland this percentage is 19.08%, in the GPs of the great multidisciplinary area it is 11.97% and, in the vocational masters, the percentage is 3.19%.

In part, this condition can be attributed to the recent condition of the expansion that has not yet reached the maturity of the evaluation cycles. It can be considered, in this way, that the level change is more easily achieved by consolidated HEIs due to their condition of being better located and with better conditions in terms of infrastructure, not to mention the experience accumulated by consecutive evaluation periods. Nevertheless, one must also consider that of the 217 PhD, master's degree, and Graduate Programs (GPs) present in the Southern Region of Brazil in 1998, 94.05% of these were still offering master's and doctoral courses in 2008 and, in 2018, 93.55%, i.e., 203 were still in existence. This indicator expresses the longevity of GP courses after two decades of public policies for higher education at the undergraduate and graduate levels, having to live with successive periods of investment and disinvestment.

In absolute terms, the growth of academic master's degrees and doctorates, from 6 in 1998 located in public HEIs in the capital cities, rose to 146 in the South Region in 2018, 45 of which in private HEIs and 49 in public HEIs. Still, these vocational master's degrees have a higher ratio of dropouts/completers with 20.38%, in 2017, when compared to academic master's and doctoral degrees that reduce these percentages from 32.17% to 12.49% and 27.35% to 13.26%, between 1998 and 2017, according to data provided by Magalhaes and Real (2020). Although evasion imposes new challenges and limits, it should be noted that these indicators are lower if compared to most undergraduate courses in the same period in Brazil and that, also, they contribute significantly to personal and professional qualification in a scientific, technological, social, and human development perspective.

6 Discussion

The term “regionalization” from the lens of the category created for hinterland /capital has limitations due to the presence of HEIs, campuses and GPs in municipalities surrounding the Metropolitan Regions - when considering them as hinterland municipalities one can disregard the territorial condition of location close to the capitals. Even so, according to the IBGE (2020), the undergraduate courses are already quite interiorized in the South Region with emphasis on the private offer, which does not occur for the PhD and master’s degree offer, as the study tried to highlight. The presence of public HEIs, especially universities, is an essential element of differentiation in the regions in the construction of academic and professional qualification.

The term de-localization (TREVISOL, 2015) seems to fit more in the reality of other regions such as the Northeast Region, while for the South Region it does not seem to describe the phenomenon of expansion of GPs to the hinterland, since the concentration of master's and doctoral courses in consolidated HEIs occurs in large centers such as capitals like Curitiba (PR) which is far from the coast. However, the creation of federal universities in the hinterland of Rio Grande do Sul and state universities in the hinterland of Paraná prior to the 2000s demonstrate that some urban centers were considered strategic for the development of regions subjecting to the peripheral condition others considered of low attractiveness. In this context, the slow verticalization of private and public HEIs proliferated.

The use of the term 'concentrative deconcentration' to refer to the expansion of courses beyond the consolidated public HEIs contained in Diniz and Vieira (2015) better fits the phenomenon perceived in the present study from the creation of new campuses, courses and HEIs far from major centers, it is perceived at the same time, an increase in the density of master's and doctoral courses in the capital cities and consolidated HEIs in the hinterland . The argument that many of the new hired professors needed qualification and the consolidated HEIs in central locations are the places with the best conditions to provide it is quite plausible.

Therefore, the intentions of the last PNPG (2011-2020) that there was an attempt to weaken the Humboldtian university more intensely in research pointed out by Silva Júnior and Catani (2013), occurred in the opposite direction, increasing the importance of state and federal universities. As indirect effects of REUNI, there was an increase of PhD and master professors, a quantitative expansion of GPs and strengthening of research groups in federal universities that increased the already good indicators of research with significant development in college areas in Exact and Technological as pointed out by Alonso (2014). Similarly, in Health and Biological Sciences there is still an excessive concentration of PhD and master's degree courses in public HEIs in the capitals in the Southern Region. In the College of Life Sciences, the Agricultural Sciences migrated from the capital to the hinterland of public HEIs from 1998 to 2018.

In these Agricultural Sciences the indicators point to a large participation of master's and doctoral courses mainly in the hinterland of Paraná in the South Region according to Clarivate Analytics (2017), the other areas of Life Sciences such as Biological Sciences and Health Sciences can still grow in HEIs in hinterland regions. A very convincing argument is the difficulty of medical courses at inland HEIs, for example, in hiring faculty with minimum master's degrees. Similarly, while Engineering courses are saturated, especially in Santa Catarina, according to Clarivate Analytics (2017), courses in the Multidisciplinary, Exact and Earth Sciences, and Applied Social Sciences areas have room to develop, especially in new campuses and new HEIs that were still very dedicated to undergraduate education during the period of their establishment.

The mechanisms of the funding agencies have caused the competition in the Graduate Education leading to a quasi-market that puts agents in search of more efficiency in the public sector that has greater "vocation" for research (VONBUN; MENDONÇA, 2012). Still, an evaluation in relation to the performance in terms of excellence is still very incipient since the verticalization of undergraduate courses in new public HEIs must take place in the long term, especially in the university model of some state universities and federal universities. The Federal Institutes and some state universities, except for UTFPR, are still very dispersed in the territory with more modest facilities with little vocation for the verticalization of higher education courses. They have been focused on secondary education in the first case or with smaller size in the second.

This spatial dispersion is also revealed in terms of fragmentation and institutional segmentation with distribution by areas of knowledge and grade approaches the profile of some public HEIs of private ones in terms of indicators as pointed out by De Souza et al. (2014), which may indicate an isomorphism, that is, a tendency to standardization in organizational terms under the multicampus paradigm, resembling these HEIs in spatial terms. In order to overcome the fragmentation of areas and the spatial dispersion of Graduate Education, institutional solidarity (SANTOS; SILVEIRA, 2000) or the inter-institutional cooperation foreseen in the last PNPG (CAPES, 2010) can be used to promote and stimulate the verticalization of graduation and the creation of Ph.D. and master degree courses based

on the existing installed capacity, which includes teachers and infrastructure. The faculty mobility and the realization of inter-institutional masters and doctorates, in this sense, may contribute to the verticalization of courses and the improvement of the grades of new PhD and master's degree courses.

Interdisciplinary graduate courses tend to expand more than basic science courses in the reality of peripheral regions of Brazil along with the number of doctors demonstrating a certain dynamism of HEIs in overcoming conditions to promote development (SILVA; BASTOS, 2014). Professional master's degrees are another example that were initially considered as "second-tier" courses competing with academic GPs because of the flexibility and diversification in their design. However, one must consider that it is still a prerogative of the Ph.D. and master degree, the need to train teachers, researchers, and servers to work in higher education focused on academia, while opposing movements such as the vocational masters follow with the commitment to promote the shortening of distances created between academia and other sectors of society (FELTES; BALTAR, 2005).

Still, as Piquet, Leal, and Terra (2005) point out, the low indicators of vocational master's degrees can be explained by the evaluation criteria that are based on scientific production. Nevertheless, there is a relevance of these types of experts due to the increased demand for qualified personnel by the resumption of issues related to regional development and interdisciplinarity in the application of knowledge (FELTES; BALTAR, 2005; PIQUET; LEAL; TERRA, 2005). The condition of higher ratio of evaders when compared to academic experts and doctorates may also be related to the unequal distribution of scholarships in smaller numbers for these GPs, both in vocational experts and in the multidisciplinary area.

7 Final Considerations

The present article aimed to analyze the distribution of Graduate Programs (GPs) in the South Region from 1998 to 2018. The ballast of research and Graduate Education in the South Region is carried out by the federal universities that have the largest participation of GPs and that has been devolving to the hinterland in recent years through thematic universities as referred to by McCowan (2019) as the first Technological University (UTFPR), linked to the Network of Federal Institutes, the UFFS as an interstate multicampus model focused on the borderlands, the Unila with a vocation for internationalization with South American countries, and the Unipampa located focused on the Mercosur in the same way as the previous two.

The top of this category, that is, the GPs with the best performance remain in the capitals and in the consolidated federal institutions such as UFPR, UFSC, UFRGS, UFPEL, FURG and UFSM, in the state segment, the system of state HEIs from Paraná with UEL, UEM, UNICENTRO, UNIOESTE and UEPG. In spatial terms, there is a gap of excellence in Graduate Education in the central portions of the southern states and in the border region precisely where the establishment of federal universities has expanded with greater intensity

in the last two decades, but which is still strongly focused on the undergraduate level and still very much dedicated to overcoming the challenges of establishment. In these public universities, the verticalization from graduation to PhD and master's degree is still extremely limited, as is the case of the expansion of the Federal Institutes Network, which is still very dispersed in the territory. The state of Paraná with a "system" of "regional" state universities has produced great advances in areas related to Life Sciences, especially Agricultural Sciences. Besides, presenting good indicators of excellence in regions outside the capital Curitiba (PR), which has received an increase of GPs in private HEIs.

The hinterland of the Southern Region offers a potential for the installation of Graduate Education courses in the areas of Health Sciences and Biological Sciences of the College of Life Sciences since the knowledge area of Agricultural Sciences is already more consolidated in this context comparatively. From the verticalization of undergraduate courses in Medicine conducted by the More Doctors Program, for example, there is a need for an increase of professionals and academics with PhD and master's degree education to work in new courses. This segment of Life Sciences, especially Medicine, Biology, and Agronomy, had its focus shifted from basic research to clinical practice, in the North American context, and overlapped the Engineering and Technology sector, as pointed out by Moraes (2017) when evidencing a "health industry" that has been raising these areas to the highest representation of fundraising and, affecting the internal relations in universities in terms of strength, power, and institutional prestige.

The need to increase fivefold the relation of doctors/inhabitants by 2024 to meet governmental goals such as the National Education Plan, in the case of the Southern Region, which has one of the best indicators, should be quadrupled to reach 4 doctors per thousand inhabitants, as Ferreira and Chaves (2018) point out. Inland HEIs can contribute significantly to the increase of these indicators, although we are still extremely far from reaching this goal, especially through vocational master's degrees and GPs in the Multidisciplinary area. These GPs advance in due recognition by Capes have been understood as part of the growing movement that seeks to rethink the fragmentation, neutrality and duality of science and promote interdisciplinarity, the review of the organization of the HEIs themselves and the areas of knowledge that oppose a disciplinary view of knowledge as explained by Rubin-Oliveira and Franco (2015).

The vocational master's courses and GPs in the Multidisciplinary Area occupy a prominent place in the expansion to the hinterland especially in private HEIs and public HEIs conforming the basis for professional, scientific and academic qualification, even if they have to coexist with a less favorable condition in terms of public investments from development agencies or academic prestige, these can contribute to the training of teachers and public servants devoted to a more comprehensive vision of the development of their regions.

The convergence of optimization of resources in a low investment scenario that will compromise the organization of graduate education, where the strategies of public funding agencies and private and public HEIs with a tendency to direct actions in large priority areas such as Health Sciences, Exact and Technological Sciences may compromise the trajectories of GPs that aim at the condition of excellence, with an academic degree of less prestige, in the humanities college still very dependent on scholarships and funding and in areas such as the Multidisciplinary Areas, especially, within the three states of the Southern Region.

While the areas of knowledge of Agricultural Sciences, Exact and Earth Sciences, Human Sciences and Engineering are already relatively "internalized" in the public HEIs there are still big gaps in areas such as Biological Sciences, Applied Social Sciences and Multidisciplinary that need a more detailed look at their mesoregions to adjust to the existing offer taking into account also the private offer in order to avoid shading and overlapping of courses as the VI PNPG (CAPES, 2010) itself had foreseen in its guidelines to overcome the condition of analysis by Units of the Federation that tends to "statize" the solutions.

Doubts about the consolidation and continuation of the phenomenon of expansion of GPs in consolidated Federal HEIs, from austerity policies and reduction of public investment in higher education and increased requirements by development agencies such as Capes are raised by authors like Zancan and Bolzan (2017) in the mid-2010s. The resumption of investment in Graduate Education should also come accompanied by adjustments in public and private PhD and master's degree offerings that could resume the continued upward trend of the last 50 years of trajectory.

Similar studies are suggested that consider the Brazilian macro-regions to verify the distribution of GPs in other parts of the territory. It is also suggested the mapping of courses on an inter-regional and intra-regional scale to ensure a better distribution of GPs for the operation of a more balanced system for Graduate Education avoiding excessive displacement by the academic community and replication of master's and doctoral courses.

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