Measuring change in institutional diversity in higher education in Brazil

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Research Article

Keywords: higher education, diversification, expansion, latent profile analysis, typology

Posted Date: October 30th, 2024

DOI: https://doi.org/10.21203/rs.3.rs-5355225/v1

Additional Declarations: The authors declare no competing interests.

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Drawing on previous literature emphasising the relationship between types of higher education institutions and institutional logics, this study investigates the impact of the higher education system expansion on the functioning of institutions in Brazil. Using latent profile analysis and administrative data from all Brazilian higher education institutions in 2010 and 2019, we estimate nine groups of institutions. We find that the shifts between groups are concentrated in private HEIs, mainly large for-profit institutions and small private colleges focused on teaching, while integrated research institutions constitute a separate and substantially elitist group, with a relatively higher degree of stability and losing ground to for-profit conglomerates. By following a multi-functional approach to understanding the degree of institutional diversity in an expanding higher education system, our study contributes to a more nuanced capture of its current dynamics and changing patterns over time.

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Introduction

The expansion of higher education systems has been accompanied by increasing pressures to diversify their offer to meet the different needs and demands of students and other stakeholders. Since Birnbaum's seminal study (1983), this process has motivated several studies aimed at classifying higher education institutions (HEIs) and delineating the "institutional topography" they form, in order to discern the operational dynamics beyond official or normative definitions (Trow, 2007; Croxford and Raffe 2015; Harris & Ellis 2020; Huisman et al. 2015). This holds particularly true in regions such as Latin America and the Caribbean, as well as East Asia and the Pacific, where there has been exponential growth in enrollments over the past 30 years, accompanied by a similarly rapid process of diversification in their institutional foundation (Bernasconi, 2006; Zha, 2009; Brunner, 2009; Muñoz & Blanco, 2013; Schwartzman et al., 2021; Labraña & Brunner, 2022). The Latin American case presents special interest not only due to the considerable heterogeneity in the degree of universalization among higher education systems, but also because of the defining

processes of its expansion: significant involvement of the private sector in provision and funding, commercialization of teaching and research, and the establishment of new public management in the state institutions (Brunner et al., 2021).

In this study, we draw on the previous literature emphasising the relationship between institutional types of higher education and institutional logics (Huisman et al., 2015; Fumasoli et al., 2020), to investigate how the expansion of higher education in Brazil has impacted the organisational functioning of HEIs. Although the Brazilian system has largely followed the regional patterns of expansion and diversification mentioned above, not only does its regional importance allow us to better understand those patterns (in 2020, a third of the Latin American enrollments in tertiary education were concentrated in Brazil), but its trajectory poses challenges to research on institutional diversification.

Prior studies find that the centrality of the for-profit sector and distance education as means of achieving massification of access has led to a high degree of concentration of the educational provision in that sector in Brazil (Seki, 2021; Carvalhaes et al., 2023; Tagliari, 2023). From the 2000s onwards, the system has become increasingly concentrated in large publicly traded business groups, after regulatory changes and state subsidies boosted a strong movement of acquisitions and mergers (Carvalhaes et al., 2023; Tagliari, 2022; Scudeler & Tassoni, 2023; Corbucci et al., 2016).

Furthermore, the expansion through the creation of institutional types focused on teaching (such as colleges and university centres[1]) adds an additional layer to the separation of the primary functions of teaching and research into distinct institutions (McCowan, 2017). Additional aspects of such an expansion include: (i) the concentration of educational

[1] HEIs can be accredited by the Ministry of Education to offer undergraduate programs as three types of organisations, in ascending order of administrative autonomy and faculty qualifications: colleges, university centres, and universities. University centres and universities are required to offer, in addition to teaching, scientific initiation programs and third mission activities, and they must have a higher proportion of faculty with doctoral degrees and those working full-time.

provision in a few combinations of fields of study, such as Business and Law, Health and Education (67.9% of enrollments) (Santos et al., 2020); (ii) the consolidation of research in a small proportion of large universities, which are predominantly state-owned integrated institutions, composed of the triad of teaching, research, and community engagement (Schwartzman et al., 2021); and (iii) the transformation of teaching due to a standardisation oriented towards technological mediation, especially at for-profit private institutions, which have led the process of hybridization of higher education (Zuccarelli et al. forthcoming). However, despite previous efforts of classification of the Brazilian HEIs, it remains largely open to what extent these processes of intense institutional diversification have produced different functioning structures of Brazilian institutions or, on the contrary, reinforced traditional differentiations. Additionally, particularly in Brazil, the operating conditions of HEIs, which are multidimensional in nature, have been examined more from a conceptual perspective rather than through empirical or statistical analysis (Bernasconi, 2006; Muñoz & Blanco, 2013).

This study contributes to the literature on the conceptualization and measurement of institutional diversity by seeking to answer two research questions. First, to what extent the organisational functioning, measured in a multidimensional way, differentiates types of institutions? Second, how have systemic changes in Brazilian higher education over the past decade reconfigured the functional classification of institutions, if at all?

We start from the definition of institutional diversity as a description of the higher education system whose elements can be divided into categories of institutional types (Stirling 2007; Harris 2013; Huisman et al. 2015), and adopt a comprehensive perspective on diversity, following the tradition of studies that emphasise a multifunctional approach to higher education (Birnbaum 1983; Huisman et al. 2015; Teixeira et al. 2013). This includes organisational dimensions (such as size), and those relating to the core functions of HEIs

(teaching, research, third mission) and other theorised components of institutional diversity (including international orientation).

Based on the previous literature on institutional diversity across higher education systems and studies focused on Brazil, we expect that dimensions relating to the size of the institution, type of education delivery and academic orientation of educational provision stand out in the organisation of different missions and institutional logics. Additionally, given the expansion logic of for-profit private institutions – generally driven by a client-seeking approach (Shavit et al., 2007) – , and recent regulatory changes in the Brazilian system, we expect that, along with a concentration process in the for-profit private sector, there will be a rise in the importance of this sector as a whole, as well as greater institutional diversity within it. Lastly, consistent with the concept of system-level unbundling (McCowen, 2017), our final hypothesis suggests that multi-faculty research universities – characterised by the triad of teaching, research, and community engagement – are becoming an increasingly smaller group of institutions, which are relatively more stable than other types of higher education institutions (HEIs). In other words, we anticipate evidence that the diversity of institutional logics is primarily seen in the for-profit private sector in Brazil.

Data and methods

Data sources

This study is based on nationwide administrative data from 2010 and 2019 rounds of the Brazilian Higher Education Census (HEC) and tables on enrollment and academic production of postgraduate courses from the Coordination for the Improvement of Higher Education Personnel (CAPES), the agency responsible for evaluating master's and doctoral programs in Brazil. The Higher Education Census is the most comprehensive data source on higher

education institutions that offer undergraduate and sequential specific training courses[2]. CAPES data contain information about master's and doctoral students in Brazil, such as the student's nationality, enrollment year, degree level, status in the graduate program, the Graduate Program and the Institution where the student is enrolled. The HEC/CAPES data includes information on the population of 2,377 and 2,608 HEIs operating in Brazil in 2010 and 2019, respectively.

Despite having limitations, such as a high proportion of non-response in socioeconomic variables and the lack of information on academic selectivity, these are the most comprehensive publicly available databases and have at least three key features that are critical for the purposes of this study: (1) comprehend all HEIs and undergraduate courses in the Brazilian system; (2) include key variables relating to the core functions of HEIs (teaching, research, third mission) and other theorised components of institutional diversity; and (3) allow us to evaluate the stability and shifts among groups of institutions during a period of major regulatory changes in the higher education system.

Measuring the components of institutional diversity

We have chosen a set of 43 variables that represent five theoretical dimensions of organisational functioning: (1) Governance, (2) Educational profile, (3) Research involvement, (4) International orientation, and (5) Third mission. Table 1 presents the complete list of indicators. Concerning the theorised dimensions, there is a consensus that structural features such as size, infrastructure and type of management play a significant role in most institutions' activities, while governance – particularly, the private-public distinction – should relate in some way to the core functions of HEIs (Huisman et al., 2015). However,

[2] Sequential courses are a type of higher education program with a shorter duration, typically lasting no more than two years, and are designed for more specialised training, offering technical qualifications. Traditionally, these courses have accounted for a small percentage of enrollments—in 2019, they represented just 0.8% of the total.

considering the strong duality in the Brazilian higher education system between public and private HEIs, we chose to exclude the administrative sector variable from the analytical models to prevent the results from largely replicating the official classification.

Table 1. Diversity indicators and measures

Dimensions	Component	Indicators
(1) Governance	Size	Staff, students, and faculties (n.)
	Operating time	Years of operation of the first course
	Location	Enrollments in courses offered in capitals (prop.)
	Management	Professors who work in management (prop.)
	Faculty	Female, black, and with disabilities professors (prop.)
	Institution	Courses offering accessibility conditions for people with disabilities
(2) Educational profile	Student	Enrolments by course shift, type of degree, type of offer and field of study, and participating in or receiving scholarship for teaching or non-mandatory internship activities (prop.)
	Faculty	Full-time professors or professors with a doctoral degree (prop.)
(3) Research involvement	Student	Enrollments in master's and doctoral degrees (prop.)
		Undergraduate enrollments with a research scholarship and working in research (prop.)
	Faculty	Professors working in research, with a research scholarship, working in postgraduate courses (prop.)
		Publications in journals indexed in Scopus (n.)
(5) International orientation	Student	Students in international academic mobility (prop.)
	Faculty	Foreign visiting professors (prop.)
(6) Third Mission	Student	Students with a third mission scholarship or in third mission
	Faculty	Professors working in third mission activities (prop.)

Source: Authors' elaboration.

Once the variables were selected, we employed exploratory factorial analysis (EFA) to assess the consistency of each theorised dimension and reduce the data dimensionality. Following previous studies, we decided to keep only those variables that contributed satisfactorily to the estimated factors (loading higher than 0.4 (Morin et al., 2020) or that

could be considered adequate for the factor analysis (MSA > 0.60 (Garson, 2023)). According to these criteria, 27 variables remained in the final model (Table 2).

The EFA results using principal axis factoring and parallel analysis method (Humphreys & Montanelli, 1975) showed the presence of eight factors. These factors account for 60% of the variance in the data and demonstrate a good fit, as indicated by a significant Bartlett's test of sphericity ($p < 0.001$; KMO = 0.72, RMSEA = 0.088).

Table 2 presents the factor loadings and percentages of explained variance. The variables contributing most to the factor are those related to the size of the institution (numbers of enrolments, staff, faculty and courses), which is why we call it “Size” (henceforth, size). The proportions of enrolments in teaching programs and in the field of Education loaded strongly on the second factor, followed by moderate loadings in proportion of enrolments in bachelor degrees (which indicates a negative relation to the factor) and proportion of female professors. We labelled this factor “Emphasis on teacher training” (teacher_training).

The third factor is measured mainly by the proportions of professors with a doctorate degree and working in in-person postgraduate programs (master’s and doctorate degrees), followed by the proportions of full-time professors and number of academic publications. Consistent with the relationship between these variables and research activity in Brazilian HEIs, we decided to label this factor “Faculty qualification for research” (qualification_research).

The next factor, labelled “Involvement in practical activities” (practical_activities), is strongly associated with proportions with students participating in research, non-mandatory internship, third mission and peer tutoring activities. The proportion of enrolments and professors in distance courses and the professor-student ratio load strongly or moderately (as in the case of the latter) on the fifth factor, “Teaching virtualization” (teaching_virtual). We labelled “Emphasis on academic training” (academic_training) the next factor, strongly

positively correlated with the proportion of enrolments in bachelor's degrees and negatively with the proportion of enrollments in technological courses[3].

Finally, the factor "Integration of academic roles" is associated with the proportions of professors working in management, third mission and research activities, and the "Classes' shift" (classes_shift) factor is positively correlated with the proportion of enrollments in full-time courses and in the field of Health, and negatively with the proportion of enrolments in evening courses.

Table 2. Factor loadings and percentages of explained variance for Varimax Rotated seven-factor solution for 27 HEC/CAPES variables (N = 4,982)

Variable	Size	Emphasis on teacher training	Emphasis on academic training	Classes' shift	Teaching virtualization	Involvement in practical activities	Integration of academic roles	Faculty qualification for research
Number of staff	0,866	0,018	0,024	0,036	-0,002	-0,008	0,000	0,399
Number of professors	0,912	0,025	0,030	0,052	-0,020	-0,013	-0,013	0,385
Number of students	0,724	0,005	-0,011	0,097	0,394	-0,025	0,048	-0,130
Number of courses	0,863	0,018	0,005	0,081	0,158	-0,026	0,019	0,089
Professor-student ratio	0,198	0,013	0,007	0,079	0,516	-0,064	0,074	-0,190
Prop. in bachelor degrees	0,010	-0,529	0,830	0,170	-0,061	0,011	0,057	-0,006
Prop. in teaching programs	0,010	0,985	-0,050	-0,134	0,060	0,017	-0,029	0,048
Prop. technological	-0,027	-0,276	-0,941	-0,080	0,022	-0,028	-0,039	-0,044
Prop. full-time courses	0,120	-0,013	0,046	0,590	-0,073	0,040	-0,001	0,403
Prop. evening courses	-0,158	0,020	0,022	-0,638	-0,295	-0,008	0,059	-0,388
Prop. distance courses	0,120	0,057	-0,037	0,034	0,913	0,002	-0,036	0,092
Prop. professors in distance	-0,026	0,037	-0,025	-0,058	0,739	0,025	0,043	0,126
Prop. enroll. in research	-0,016	0,011	0,003	-0,005	-0,014	0,775	0,138	0,006
Prop. enroll. in internship	-0,010	0,007	0,009	-0,034	-0,006	0,691	0,057	0,035
Prop. enroll. third mission	-0,016	0,015	0,044	0,050	-0,007	0,560	0,214	-0,075
Prop. enroll. tutoring	-0,010	-0,004	-0,026	0,013	-0,006	0,772	0,008	0,031
Enroll. in Education	0,010	0,982	-0,047	-0,136	0,060	0,016	-0,028	0,047
Enroll. in Health	0,001	-0,062	0,123	0,445	-0,026	-0,005	0,181	-0,038
Prop. female professors	0,044	0,410	0,123	0,166	-0,006	0,004	0,087	-0,148
Prop. professors in third mission	0,007	0,058	0,033	0,071	-0,006	0,161	0,749	0,058
Prop. professors in managem.	-0,007	-0,022	0,020	0,043	0,058	0,072	0,451	0,088
Prop. professors in research	0,067	0,014	0,005	0,054	-0,005	0,182	0,664	0,300
Prop. professors on-campus	0,103	-0,008	0,001	-0,030	0,027	0,010	0,157	0,505
Prop. professors with a PhD	0,200	-0,068	0,001	0,309	0,065	-0,020	0,199	0,587
Prop. full time professors	0,280	0,060	-0,068	0,201	0,039	-0,014	0,215	0,451
Professors in master's and	0,044	-0,030	0,025	0,059	-0,003	-0,002	0,028	0,435
Number of bibliographic	0,520	0,037	0,018	0,003	-0,087	-0,005	0,026	0,531
% of variance	21	15	10	8	12	13	9	13

Source: Authors' elaboration based on Higher Education Census/CAPES data.

Analytic strategy

The eight factors estimated by EFA were used in a series of latent profile analyses (LPA) to identify latent groups of HEIs and assess if they changed over time and, if so, how. LPA uses

[3] Undergraduate programs in Brazil can award three types of degrees: bachelor's, teaching degree and technological. The first provides a broad education, either scientific or humanistic, while the second equips graduates with the skills to work as teachers in basic education. Both types of programs generally take four years to complete. The third offers specialised training and has a shorter duration, typically two to three years.

observed quantitative data to estimate latent profiles, or groups of cases, based on their similarities and differences on the observed data (Barringer & Pryor, 2022; Hagenaars & McCutcheon, 2002; Goodman, 2002). This technique has been used in higher education research as they allow researchers to incorporate various measures of multidimensional concepts, such as governance or academic orientation, to analyse differences and patterns across cases within a population and determine the extent to which sub-populations are present (Barringer & Pryor, 2022; Barringer et al., 2019). Additional benefits of LPA relative to other clustering methods, which justify its use here, include: (1) it allows for better model estimation by providing multiple measures of model fit that can improve model specification relative to other clustering techniques; and (2) enables evaluation of the significance of variables used to estimate latent profiles (Barringer & Pryor, 2022).

We carried out a series of LPA models to evaluate different model specifications and different numbers of latent profiles using the tidyLPA package in R (Rosenberg et al., 2019). We incorporated both editions of HEC/CAPES data in order to estimate a single model that incorporated information from both years and included a "year dummy" (coded 1 for 2019) as a predictor of membership in the latent profiles, to account for the potential for time to influence class membership. Using a combination of two criteria, the change in log-likelihood and the Bayesian Information Criterion (BIC) (Weller et al., 2020; Schmidt et al., 2021), we determined a nine-clusters model to be the best-fitting across all data in both years of our analysis. Table 3 shows the fit statistics of the estimated models.

Table 3. Model fit statistics for different cluster solutions generated by latent profile analysis (LPA)

Number of clusters	AIC	BIC	Log-Likelihood
1	110735	111022	-55323,48
2	--	--	--
3	--	--	--
4	97102,7	97565,2	-48480,35
5	95633,8	96154,9	-47736,92
6	93029,5	93609,2	-46425,73
7	95153	95791,3	-47478,49
8	93497,4	94194,3	-46641,7
9	91233,3	91988,8	-45500,62
10	92577,8	93392	-46163,88

Note: AIC = Aikake information criterion. BIC = Bayesian Information Criterion.
Source: Authors' elaboration based on Higher Education Census/CAPES data.

Findings

Typology of higher education institutions

The institutional types revealed by LPA not only indicate different operational logics of HEIs but also reflect structural changes in the Brazilian higher education system over the last decade. These include the significant shift towards distance education, concentration of enrolments in the for-profit sector, and the increased offer of technological and STEM courses. Thus, while the LPA identified nine clusters between 2010 and 2019, we observed changes in profiles during this period: while the number of clusters decreased from eight to seven, a new cluster emerged due to changes in the system's configuration.

In this section, we describe each of the nine clusters estimated using LPA, in descending order of enrolments (in 2010 or 2019): (1) *Applied and academic training*, (2) *Distributed and multifunctional*, (3) *Large and virtualized vocational*, (4) *Humboldtian institutions*, (5) *Education institutions* (6) *Technical institutions*, (7) *Specialised and professional institutions*, (8) *Small and focused on teacher training*, (9) *Distributed and community integrated*. Table 4 presents descriptive statistics by cluster. To contextualise our findings, we supplement the description of institutional factors estimated using EFA with information regarding the official classification of HEIs into administrative categories and academic organisations, and

educational profile in terms of enrolments by fields of study from Higher Education Census for both years. Tables 1 and 2 in the Appendix present these descriptions, while Table 3 shows the number of HEIs and enrolments by cluster and year.

Table 4. Descriptive statistics by cluster (2010-2019)

		Large & virtualized	Distributed & multifunctional	Applied & academic evening	Specialised & professional	Humboldtian	Technical	Education	Community-integrated	Small & Teacher training
N Enroll.	Mean	30213	2194	2122	1537	31878	605	2483	901	477
	SD	67934	4076	3994	2230	30726	988	4328	2142	1507
N. Courses	Mean	48,9	14,6	10,6	8	135,2	4,9	16,8	8,4	4
	SD	103,3	21,8	17,5	12,6	93,6	7	31,6	16,7	9,3
N of professors	Mean	294,5	120,8	119,5	179,3	2357,4	49,5	186,6	55,6	36,7
	SD	626,4	201,8	172,3	222,5	1032,4	85,2	311,5	99	101,8
N of staff	Mean	703,1	227,1	220,4	370,3	4957,6	95,5	334,3	112,9	71,9
	SD	1268,3	400,4	350,1	501,9	3044,1	191	582	239,1	185
Distance learning (%)	Mean	0,697	0,015	0,003	0,005	0,06	0,005	0,018	0,022	0,003
	SD	0,203	0,052	0,027	0,022	0,068	0,031	0,065	0,1	0,023
Bachelor degrees	Mean	0,434	0,846	0,885	0,945	0,681	0,05	0,457	0,652	0,071
(%)	SD	0,282	0,178	0,14	0,11	0,145	0,117	0,139	0,386	0,12
Teaching programs	Mean	0,339	0,091	0,063	0,038	0,267	0,019	0,482	0,215	0,913
(%)	SD	0,29	0,137	0,094	0,093	0,145	0,069	0,119	0,322	0,135
Technological	Mean	0,226	0,063	0,051	0,014	0,038	0,917	0,06	0,133	0,016
degrees (%)	SD	0,26	0,104	0,101	0,052	0,084	0,187	0,126	0,302	0,058
In Evening courses	Mean	0,232	0,802	0,818	0,094	0,313	0,811	0,781	0,8	0,876
(%)	SD	0,173	0,237	0,242	0,137	0,135	0,249	0,278	0,325	0,249
Full-time professors	Mean	0,299	0,24	0,16	0,352	0,758	0,212	0,272	0,217	0,192
(%)	SD	0,214	0,221	0,158	0,319	0,209	0,268	0,321	0,241	0,254
Enroll. in Education	Mean	0,34	0,092	0,065	0,039	0,266	0,019	0,479	0,215	0,912
(%)	SD	0,29	0,137	0,099	0,093	0,144	0,07	0,124	0,322	0,141
Enroll. In Engineering	Mean	0,052	0,136	0,067	0,078	0,154	0,216	0,031	0,055	0,004
(%)	SD	0,075	0,229	0,168	0,203	0,104	0,35	0,079	0,178	0,029
Female professor	Mean	0,458	0,461	0,425	0,456	0,457	0,35	0,484	0,476	0,611
(%)	SD	0,138	0,14	0,136	0,153	0,054	0,16	0,11	0,197	0,186
PhD professors	Mean	0,272	0,234	0,109	0,428	0,609	0,166	0,131	0,155	0,122
(%)	SD	0,203	0,172	0,118	0,253	0,246	0,154	0,157	0,168	0,131
N. HEIs		118	1809	1478	188	89	539	253	100	408

Source: Authors' elaboration based on Higher Education Census/CAPES data.

Applied and academic evening training (3)

This group of institutions represented 62.2% of HEIs and approximately half (48.7%) of enrollments in 2010, ceasing to exist in 2019. The institutions in this profile have an average enrollment number (2,222) slightly below the system average (3,014) and focus on academic degrees typically offered through in-person and evening classes. These institutions show a notably low percentage of professors holding doctoral degrees (10.9%), which is related to the fact that they are predominantly organised as private colleges (86.2%) within the private sector (51.4%). Institutions in this group include Centro Universitário das Faculdades Metropolitanas Unidas (FMU), PUC of Paraná, and Universidade Anhembi Morumbi.

Distributed and multifunctional (2)

The HEIs in this cluster were the most prevalent in 2019, accounting for 69.3% of institutions and 46,1% of enrolments. The majority of them (80.7%) belonged to the group of *applied and academic evening training* in 2010, and were supplemented in 2019 by the group of *education institutions* (10.7%) (described below). The main differences compared to the previous cluster are a more highly qualified faculty (qualification_research = -0.07, *p*-value = 0.02) whose roles are distributed among research, extension, and administration (academic_roles = 0.35, *p*-value = 0.00), combined with a more diverse range of course offerings in terms of shifts (classes_shift = 0.07, *p*-value = 0.00) and fields of study. Finally, it is noteworthy that the institutions in this group have an extremely low level of virtual education, with only 5.9% of enrollments in distance learning courses. This result contradicts the common sense that most of the private sector is dominated by distance education or large institutions, demonstrating the heterogeneity of this sector. The institutions belonging to this cluster include Centro Universitário das Faculdades Metropolitanas Unidas (FMU), PUC of Paraná, and Mackenzie University.

Large and virtualized vocational (1)

This profile accounts for one-third (31.7%) of enrollments in 2019, showing the largest relative increase during the analysed period, even though it represents only 3.3% of HEIs (or 88 institutions) in the last year. The sheer size of this group is impressive: it has 824,009 more enrollments than the combined total of all other groups, except for the *distributed and multifunctional*. The most distinguishing feature of this group is the emphasis on distance learning (teaching_virtual = 5.56, *p*-value = 0.00), with more than three-quarters (77.6%) of enrollments in this mode and a median of 67.9%. In 2019, 85.0% of distance learning enrollments were in this profile. This cluster is also characterised by a greater emphasis on teacher training courses (teacher_training = 0.29, *p*-value = 0.00), which account for nearly one-third (29.0%) of enrollments, and less emphasis on bachelor's degree courses

(academic_training = -0.23, p-value = 0.00), which make up less than half (46.0%). In contrast, they have a relatively high percentage of enrollments in technological courses (one quarter, compared to the system average of 14.3%), concentrating 55.7% of the total enrollments in this degree in 2019. This group is almost entirely composed of private institutions (93.2%), most of them for-profit, and a relatively high proportion of university centres (24.5%) and universities (22.9%) compared to the private sector overall (9.1% and 4.1%, respectively). Paulista University (UNIP), University of Northern Paraná (UNOPAR), Estácio de Sá University, and Anhanguera University of São Paulo are some of the HEIs included in this group.

Humboldtian institutions (5)

Institutions in this group account for the third-highest percentage of enrollments (15.8%) in 2019, with their share decreasing by 6.8% since 2010, and they comprise the smallest cluster in terms of HEIs (only 45 or 1.7%). This group is distinguished by having the highest concentration of large institutions (size = 4.91, p-value = 0.00), with a minimum of around 12,000 enrollments, six times more than the third quartile of the system (2,049 enrollments). The second characteristic that most distinguishes this profile from others is professors' qualification with an emphasis on research (qualification_research = 3.4, p-value = 0.00). On average, these institutions have about two-thirds (71.4%) of faculty members with a doctoral degree, four-fifths of full-time faculty (81.2%), half (49.1%) engaged in research, and one-third (29.2%) in master's and doctoral programs. With the exception of research involvement, the other percentages place this group in the bottom decile of each indicator. Institutions in this profile have low percentages of distance learning enrollments (8.8%) (teaching_virtual = -0.87, p-value = 0.00), and are characterised by a relatively high offering of teacher training courses (teacher_training = 0.25, p-value = 0.00) and a minimal offering of technological courses (5.3% of enrollments, the second lowest percentage among the clusters in 2019). Institutions in this

group are mostly public universities (83.0%) and include University of São Paulo (USP), Federal University of Rio de Janeiro (UFRJ), Brasília University, and Pontifical Catholic University of São Paulo (PUC-SP).

Education institutions (7)

This profile accounted for 10.6% of HEIs and 9.7% of enrolments in 2010, the only year this group was identified by the LPA analysis. Institutions in this group are characterised by a high concentration of enrollments in teacher training courses (teacher_training = 1.04, p-value = 0.00), which account for 47.2% of enrollments, and in Education courses (85.4% of enrollments). The faculty are more dedicated to teaching activities than to other activities compared to other groups of HEIs (academic_roles = -0.34, p-value = 0.00), and there is a low participation of professors with PhDs (13.1%). These characteristics are consistent with the relatively low availability of practical activities (practical_activities = -0.18, p-value = 0.00). The educational offerings of this profile are also characterised by a strong emphasis on in-person courses (92,3% of enrollments), and a higher than average concentration in evening courses (78.1%). Colleges made up the most common type of organisation in this group (76.6%), although 40 HEIs, all public, are universities (15.9%). Institutions in this group include mainly for-profit (46.4%) and non-profit (27.2%) private organisations (e.g. Sumaré College and Catholic College of Uberlândia), but we also observe state and federal institutions (e.g. State University of Maranhão and Federal University of Sergipe).

Technical institution (6)

This group of institutions accounts for 10% of all HEIs and 1.5% of enrollments in 2019. Its most distinguishing characteristic is a high concentration of enrollments in 2-year vocational courses (85.8%) (academic_training = -2.52, p-value = 0.00; teacher_training = -0.69, p-value = 0.00). Institutions in this profile predominantly offer evening courses (on average, 81.1% of

enrolments; classes_shift = -0.24, *p*-value = 0.00) almost exclusively through in-person classes (teaching_virtual = -0.21, p-value = 0.00) and professors mostly dedicated to teaching (academic_roles = -0.11, *p*-value = 0.00). It should be noted that this profile, focused on offering vocational courses, also has the lowest average percentage of female professors (35.5%). The institutions in this group are almost exclusively organised as colleges (95.3%), which are distributed almost equally among the private for-profit and nonprofit (e.g. SENAI and SENAC), and state sectors (e.g. São Paulo Technology College - FATEC, Rio de Janeiro Technology College – FAETERJ). However, it also has federal institutions of technology (e.g. Federal Institute of Rio Grande do Sul).

Specialised and professional institutions (4)

Institutions in this profile represented 5.18% of the HEIs in 2019 and 2.23% in 2010, presenting the second largest relative increase during the period. They are primarily characterised by a concentration of full-time courses (classes_shift = 3.29, p-value = 0.00) and a relatively high presence of highly qualified professors involved in research (qualification_research = 1.19, p-value = 0.00), second only to Humboldtian institutions. Those institutions are characterised by the highest percentage of enrolment in academic training (94.5% in bachelor's degree), which are almost exclusively offered in-person, and the lowest percentage of enrolment in evening courses (9.4%). For-profit institutions organised as colleges constitute the most common type of organisation in this group, accounting for 39.9% and 81.3%, respectively. HEIs in this cluster concentrate those institutes and colleges specialising in specific fields, such as business (Ibmec), military education (Aeronautical Technology Institute - ITA and Military Institute of Engineering - IME), health and medicine (Einstein's Teaching and Research Institute, Federal University of Triângulo Mineiro), Law (Rio de Janeiro Law School and São Paulo Law School), and agricultural sciences (FAZU).

Small and focused on teacher training (9)

This group of institutions has the second smallest average size (size = -0.32, p-value = 0.00), with an average enrollment of 477 students, representing only 7.3% of HEIs and 1.3% of enrollments in 2019. These small-sized institutions have the highest proportion of enrolment in Teaching programmes (91.3%; teacher_training = 2.67, p-value = 0.00), offered mainly on evening and in-person courses. Emphasising the strongly female-dominated profile of teacher-training in Brazil, they present the highest proportion of women among their faculty composition (61.1%). The institutions in this group are almost exclusively organised as colleges (97.3%) privately owned (41.4% for-profit and 45.1% non-profit) and include institutes and colleges heavily specialised in teacher training, such as the Faculty of Educational Sciences (FACE), Higher Institute of Education of Rio de Janeiro, and Higher Institute of Education Anísio Teixeira.

Distributed and community-integrated (8)

This profile has the third smallest average enrolment of students (901), representing 2.4% of the institutions and 0.8% of enrolments in 2019. In addition to its small size (size = -0.11, p-value = 0.00), the second defining characteristic of this group is its extensive provision of practical activities (practical_activities = 5.93, p-value = 0.00), some of which are conducted externally to the institution, such as third mission initiatives and non-compulsory internships. Regarding their educational offering, these HEIs focus on academic training, primarily offering bachelor's degree programs with in-person classes typically scheduled during evening hours. Similar to teacher training and technical institutions, this group is almost exclusively organised as colleges (91%), of which 55% are for-profit and 42% are non-profit. Institutions in this group include colleges such as Linear College, Fleming College, and Innovare College.

Stability and change in institutional typologies

We now proceed looking at the relative prominence of clusters of institutions over time, the movement of institutions between them and the emergence of new groups.

The specialised and professional institutions are the most stable cluster, with 93.5% of institutions remaining in the same group in 2019 (Table 5). Next in descending order of stability, we observe the humboldtian (83.7%) and large and virtualized vocational institutions (65.5%). Although all clusters have institutions performing differentiated shifts (i.e., movement of institutions from one profile into multiple other profiles), which indicates patterns of diversification across different segments in the system as a whole, two clusters stand out in this regard: distributed and community-integrated (72.5%) and small and focused on teacher training (39.1%). The group of distributed and multifunctional HEIs, which emerged between 2010 and 2019, received most (59.9%) of the 728 institutions created over the period, mostly for-profit ones (77.3%).

Table 5. Percentage of institutions that remained in the same cluster or shifted between clusters (Brazil, 2010-2019)

	Clusters in 2019						
Clusters in 2010	Large & virtualized	Distributed & multifunctional	Specialised & professional	Humboldtian	Technical	Community-integrated	Small & Teacher training
Large & virtualized	65.5 (24.7)	34.5 (0.7)	--	--	--	--	--
Distributed & multifunctional	3.2 (50.6)	90.4 (80.7)	2.9 (40.4)	--	0.4 (3.5)	2 (52.2)	1.1 (12)
Applied & academic evening	--	6.5 (0.2)	93.5 (48.3)	--	--	--	--
Humboldtian	4.7 (2.6)	11.6 (0.4)	--	83.7 (80)	--	--	--
Technical	3.4 (9.1)	25.5 (3.8)	1.5 (3.4)	1 (4.4)	64.2 (92.9)	3.4 (15.2)	1 (1.9)
Education	3.1 (7.8)	75.4 (10.7)	3.1 (6.7)	3.6 (15.6)	1.5 (2.1)	2.1 (8.7)	11.3 (20.4)
Community-integrated	4.5 (1.3)	54.5 (0.9)	4.5 (1.1)	--	4.5 (0.7)	27.3 (13)	4.5 (0.9)
Small & Teacher training	2.6 (3.9)	31.3 (2.6)	--	--	0.9 (0.7)	4.3 (10.9)	60.9 (64.8)

Source: Authors' elaboration based on Higher Education Census/CAPES data.

Combined with the previous findings on the stability of public institutions, these results support the hypothesis that the multidimensionality of institutional logics is observed mainly

in the for-profit private sector. Since their funding depends largely on tuition fees, they are typically under greater pressure to be responsive to the diverse needs of students (Teixeira et al. 2013). That these institutions adopt measures such as increasing the offer of low-cost, distance and evening courses is related to the predominance of working, low income students in the population that attends higher education in Brazil.

The creation of a significant number of higher education institutions in the last decade attests to the expansion of the system and ongoing reconfiguration processes: the predominance of private for-profit institutions focused on teaching, and the socio-spatial reconfiguration with the interiorization of higher education and the expansion of its offer in previously unserved municipalities (Vieira & Macedo 2022). There was also the entry of a massive number of working students. The adoption of institutional strategies to serve this population of older students is clearly stated: 81.3% of enrollments on average were in evening courses in 2019 and were mostly composed of students from public high schools (79.8%) and over 24 years old (53.4%).

Discussion and conclusion

The current paper has shown that following a multi-functional, generic approach to understanding the degree of institutional diversity in a higher education system allows for a more nuanced capture of its current dynamics and changing patterns over time. This can be especially true for those systems that, although formally binary, such as the Brazilian one, or even unitary, have taken large steps towards greater differentiation within sectors or organisational forms. Overall, our findings suggest that, although institutional types can and do change in different meaningful ways, these changes assume a very particular form in Brazil: the shifts between clusters are concentrated in groups of private HEIs, such as large for-profit institutions and small private colleges focused on teaching, a significant proportion

of which were created or merged in the last decade. On the other hand, changes are relatively uncommon among research-oriented private and public institutions, which are generally stable over time and perhaps more likely to continue as bundled institutions.

These findings support some of our expectations. First, that the size of institutions is among the most relevant dimensions to describe the current state and changes in the system. This goes against previous studies indicating that the strongest factor in defining clusters of HEIs would be the sector (public or private). On the contrary, especially the growing concentration of educational provision in a few private for-profit groups and the polarization between these groups and a multitude of small and medium-sized institutions have substantially affected the estimation of HEI clusters. Second, that integrated research institutions and universities constitute a separate and substantially elitist group, with a greater degree of stability than the others and losing ground to for-profit conglomerates. Third, that the exponential growth of distance education, especially since 2017, constituted a dimension capable of distinguishing groups of institutions, with public and confessional universities at one extreme and large for-profit institutions at the other. However, contrary to what is often assumed, distance education is almost irrelevant for the other groups, which are characterised by a low degree of virtualization. Fourth, the feminization of higher education has been characterised by the massive presence of women in low-prestige (such as Education) or care-related courses (e.g. Health), in such a way that it distinguishes specific groups of institutions, especially small private ones.

Our findings also confirm the strong academic orientation of most Brazilian HEIs, expressed in the preference for bachelor's degrees, typically characterised by a greater investment in abstract training, to the detriment of practical knowledge. Perhaps the mark of academicism, particularly in the large public research universities, is among the factors contributing the most to maintaining the elitist character of the training traditionally offered

in the Brazilian system. The institutional types that are most malleable to change are also those that are more oriented towards so-called 'vocational' education, which could be more properly defined as more attentive to the labour market and social change. This would indicate that the changes captured in our analysis are driven not only by the commercial contest for students but also by social and political disputes over what is intended for higher education in the country.

As to implications for the wider literature on diversity in higher education and public policies, our findings add some nuance to the discussion about institutional diversification in an expanding system like the Brazilian one, challenging prior studies and formal classification. The results show a greater level of diversity of institutional types than should be expected according to analyses concerned with the growing concentration of educational provision. In general terms, we found that the two phenomena can occur at the same time: more diversity of institutional types coexisting with a concentration of enrollments in one of these types. Our analytical strategy contributed decisively to this: by adopting a multi-functional approach and considering a wider range of institutional dimensions, we were able to capture the complex configuration of the Brazilian system in a more nuanced way. This points to the importance of having policies aimed at expanding and evaluating the system based on how the organisations are effectively functioning.

Our study has some limitations, which point at future areas for research and improvement. There are also no public data sources that we can use with entrance exam scores for all HEIs. Finally, more complete information about the for-profit conglomerates that make up one of the estimated clusters may allow us to advance our understanding of the group that has dominated the offer of higher education in Brazil.

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Appendix

INSERT TABLE 1 HERE

INSERT TABLE 2 HERE

INSERT TABLE 3 HERE