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# Higher education in Brazil: an exploratory study based on supply and demand conditions

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**Abstract** This paper aims to assess the context of Brazilian higher education institutions, its undergraduate courses and students, comparing their supply and demand conditions. It adopts a three-phase methodological approach: first, an inductive and exploratory step through the longitudinal analysis of data provided by the Brazilian Census of Higher Education, between the years of 2008 and 2014 and the Demographic Census of 2010; second, an analysis between the most important variables identified in the exploratory study (step 1) and its influence on the undergraduate courses' perceived quality through the General Index of Evaluated Courses, which is responsible for the evaluation of all higher education institutions (HEIs) in Brazil; third, a comparison to other countries is performed, based on the 2015–2016 OECD Education Indicators. Its contribution shall enable HEIs to identify future trends concerning its sustainability conditions, providing subsidies for strategic information. It concludes that offer conditions are diverse, and that, especially in Brazil, demand is increasingly limited for the population considered ideal for undergraduate courses. Also, the expansion of students' enrollment during the period was desirable and was intertwined with the diversification of higher education establishments and the diversity of programs, due to the national higher education policy system. However, this increasing diversity of HEIs and courses, contrary to what some authors (Teichler in High Educ 56(3):349–379, 1) propose, does not represent an improvement in the number of undergraduate students in Higher Education as most of the students do not conclude their studies.

**Keywords** Higher education · Supply · Demand · Undergraduate courses · Strategic information

## 1 Introduction

The educational system of a country is, as a rule, consistent with the governmental system of that country.

Normally, the future welfare and the national purpose and public policies are dependent upon the universities and other kinds of higher education institutions (HEIs) [2]. Also, the regulatory and funding systems of higher education are national as a rule [3]. Education is one of the major foundations of the economic, social and political development of any nation [4].

However, in the last decades, around the globe, higher education (HE) has been subject to profound changes [5, 6]. Some effects faced by HEIs, in various parts of the world and, also in Brazil, are the result of some internal and external factors as the HEIs operate in broader socioeconomic systems [7]. Some of their recent problems include rising tuition fees, reducing enrollments, cuts in financial aids and evasion rates [8].

Other factors also influence Higher Education development, including demographic changes, technological advances, societal trends, new performance metrics, financial and managerial requirements. The reasons range from globalization of the economy and research to emergence of new HE "service providers" and research performers;

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changing science–society links and societal demands toward universities; "massification" of higher education; student "consumerism"; technological development; tensions in the national or regional budgets financing higher educations, and the concomitant requirements of the so-called public management (accountability, transparency, efficiency and effectiveness, responsiveness); the methods, approaches and norms to organize, manage, validate, legitimate and evaluate HE and research activities [7].

The HEIs also confront themselves with a more diverse generation of students [9], identified by a heterogeneous group concerning age, sex, socioeconomic status, race, ethnic, motivation, expectations and personal projects [6, 10].

As pointed by Teichler [3], the divide of national and international dimensions, necessary to the comparative studies, noted a conflict between "the internationalization of learning and nationalization of the purposes" as even the most widely terms such as "universities," "professors" and "students" have different meanings from country to country. Even though, in recent years, the interest to investigate countries increased in the domain of higher education research [3].

Accompanied by the rapid advances in information and digital technologies, this scenario demands a new role for HEIs in the Knowledge Economy [8, 11]. The HEIs also are impacted by the notions of knowledge and knowledge production, due to the new actors' role of producing, disseminating, using and validating knowledge [7].

As a consequence, the pressures for higher education grew up, and the profit-making educational establishments expanded, creating a fierce competition and an imbalanced marketing condition, which hampered the higher education institutions' flexibility and responsiveness and has threatened their financial and economic sustainability [12].

As some previous research has shown, "amid demands for universities "to do more with less," national education policy makers are designing and embracing new models of governance and frequently transforming HE institutions, the role of the state, as well as the socioeconomic role and function of HE" [5].

The higher education institutions are exposed to marketplace pressures in a similar way to other businesses [12]. Mainly as private providers, they depend on adequate enrollment growth, quality, cost-effectiveness and equitable access to a remarkable extent. Add to this, a more "evaluative" role adopted by the state, which puts pressure on HEI's outputs [13]. This new scenery has modified, as in many different countries, the forms and mechanisms of HEIs management and governance [12].

The remainder of this paper is organized as follows: Section two provides a literature review on supply and demand for Higher Education; section three presents the methodological approach; section four describes the

Higher Education supply and demand data analysis; and discussion and main conclusions are presented in sections five and six, respectively. Recommendations for future research are proposed in section seven.

## 2 Supply and demand for higher education

The terms "Supply" and "Demand" come from the Offer and Demand Law. They are used to identify the relationship between the demand for a product and the amount offered and, also, to describe the consumer's behavior in the purchase of goods and services at certain times, in relation to its amount and price [14].

In periods when the supply of a product far exceeds demand, its price tends to fall. When demand begins to outstrip supply, the trend is the increase in price. The stabilization of the relationship between supply and demand would, in the first instance, lead to a stabilization of the price and a situation of "balance."

Competition could disrupt these relationships, causing price changes. Other factors, besides prices, are included in the conditions of variation between supply and demand. The value of a product can be a positive or negative incentive for consumers to buy goods or services they need, though not the only one. Thus, other factors have been identified as participants in the variation between supply and demand, such as consumer wants and needs; purchasing power; availability of services; and offering and capacity of institutions [14].

One can also add to this discussion, dimensions related to the offering, for example, of products and/or services focused on generating knowledge, involving not only the study of their economic value but also its relationship and impact on its social value [15].

When it comes to the Higher Education Area, in Brazil, it is important to add that only the private higher education institutions are exposed to market supply and demand conditions, as the undergraduate courses offered by the Public HEIs are for free.

Over the past decades, numerous authors have studied the relationship between supply and demand in higher education institutions to identify the demand of students entering and quantify it appropriately (e.g. [16–19]).

### 2.1 Previous studies on supply and demand conditions

Researchers have studied the relationship between supply and demand in higher education institutions to identify the factors that influence them.

These studies are categorized according to the data level of aggregation (microlevel and macrolevel) and its type

(cross-section or time series studies) [20]. Also, these studies have varied significantly in terms of the sources of data, the periods studied, the methods of analysis and the population considered.

Countries such as the USA [18, 21–26], Canada [27], Vietnam [28], Puerto Rico [20], Norway [16], China [29], Spain [30, 31], United Arab Emirates [32], Turkey [33] and Germany [34] faced, at different periods of their history, similar situations of high demand and low supply, interspersed with periods of high supply and low demand.

According to Wetzel et al. [24], most of these studies have limitations or restrictions with respect to the definition of the terms used, the characteristics of the studied units (if public or private institutions, and if aggregated or isolated) and how to obtain the data. They are also restricted to the inherent educational policy issues in their respective countries and limited to the use of a small number of variables.

Besides that, methodological shortcomings and bias in the choice and weighting of indicators are also negative consequences, as pointed out by Millot [35]. There are difficulties in comparing higher education systems as universities and HE systems in different countries operate at different levels. The national universities function at the micro level, while the HE system works at the macrolevel [35].

The value of comparative studies for higher education is recognized; however, there is little consensus about the specific approaches, as research addressing phenomena of similar higher education systems deals with more than one culture, society or nation systematically [3, 36, 37].

This kind of research has faced many challenges, as pointed by [1, 3, 36, 38] due to its complex context; it varies substantially between countries regarding the size and the role it plays. Research on higher education tended mostly to focus in the past on individual countries as it "forms the basis of analysis or the interpretative framework" [36].

In this area, international and comparative research is rising, seeming to be most pronounced in Europe [36].

In Brazil, one of the identified studies is related to HEIs market and the private higher education sector's analysis. It attempts to explain and quantify its particularities, such as the strategy of some institutions to maintain permanent excess demand and its selectivity. It is also very limited as the study already mentioned considered the data of 39 HEIs and 298 Business Administration Schools [39]. Another study related to long-term planning conducts a scenario analysis, based on a model which generates the dynamic behavior of some performance measures to evaluate policies in HE, such as the number of enrolled students in classroom and e-learning classes in the public and private sectors, tuition fees, the occupation rate, the number of degrees awarded and the dropout rates [40].

Based on the literature review, the following variables are identified by their respective authors, in previous studies, concerning supply and demand conditions (Table 1), organized by the authors, according to the categories proposed by Kotler (1996).

## 2.2 Historical context of higher education institutions in Brazil

Until the 1960s, the Higher Education in Brazil was marked by a limited supply. There were a significant number of "surplus" students for places offered, which translated into "candidates who obtained the average rate in college entrance exams but could not enroll in higher-level schools because the number of approved students extrapolated the number of places available" [45]. There was, therefore, a point of "bottleneck." This condition was due to a significant number of students who concluded high school due to promotion policies to higher levels and financing of studies [45].

At the end of the 1960s, this situation began to revert to the idea of "expanding with restraint," supported by an incipient funding policy to public and religious institutions that partially fill this current demand [45–48].

In the 1970s the first expansion of higher education occurred, led by the private sector, to increase the number of educational institutions, courses, places and enrolled students [10].

The late 1980s and early 1990s were marked by periods of growth interspersed with stagnation due to the economic crisis experienced by the country, evidenced by high rates of inflation and unemployment [47].

From the end of the 1990s, a significant increase in some places occurred broadening people's access to higher education. From 1994, private higher education institutions were encouraged to increase the number of places offered and, after 2002, also the number of places provided by public higher education institutions increased. The period was so-called democratization [47] or universalization of higher education [49, 50].

With the Brazilian expansion policy of higher education in the two recent decades, higher education institutions face bigger competitiveness in search of students, resources, quality and price, in addition to offering other modalities, such as technologists training courses or those offered in e-learning or online mode, reflecting directly in their forms of governance.

## 3 Methodological approach

In this paper we propose a three-phase methodological approach, to integrate and analyze data from four different sources: (1) The Census of Higher Education,[1] (2) the

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[1] *Censo da Educação Superior.*

**Table 1** Summary of variables based on literature review

| Category | Variable |
| --- | --- |
| Demographic | Predicted and reported income [21]; sex [23]; demographic characteristics [23]; parents' income [23]; race [23] |
| Economic and financial | Ability to pay [21]; price [22, 24, 41]; price elasticity [22, 23, 25]; foregone earnings [23]; financial aid and support [16, 20, 23, 26]; enrollment [20, 42]; potential enrollees [20]; enrollment rates [34]; cross-tuitions and tuitions fees [16, 20, 24, 34]; cost [26]; benefit-cost [20, 43]; cost of substitutes [26]; direct cost of attendance [20, 23]; total cost of education [25]; cost-of-living [20, 23]; education return [28]; enrolled students [26, 27]; applicants [26, 27]; salary [16]; scholarships [16, 24, 34]; investment [16]; fees [34]; labor choices [44] |
| Political and legal | Real credit [20], grants [24]; institutional strategies [32] |
| Sociocultural | Ability score [21]; intellectual affinity [21, 23]; selectivity of the school type [21, 23]; academic ability [23]; probability of admission [23]; parents' educational achievements [23]; quality [26, 32]; academic quality of the institution [23]; the quality of the most preferred institution [23]; ethnic and community factors [42]; personal, family and social characteristics [31]; family language [42]; parental education [42]; student's recruitment [32]; student's experience [32] |

Brazilian Demographic Census (2010), (3) the General Index of Evaluated Courses (IGC) and (4) the 2015–2016 OECD Education Indicators' Tables.

The Census of Higher Education is a Brazilian annual survey of the education system, conducted by the National Institute of Educational Studies Anísio Teixeira (INEP), an institution linked to the Ministry of Education, from the period of 2008–2014.

The Brazilian Demographic Census (2010) is a statistical study conducted typically every ten years; the 2015–2016 OECD Education Indicators' Tables, which presents several education indexes for all OECD countries.

In the methodological approach proposed, first, we analyze variables from the Census of Higher Education identified as most relevant to the literature review and compare the results against an estimation of the number of possible candidates for the next 20 years, made from the demographic census data. This estimation includes the ideal candidate population, namely young people (aged 18–24) that have completed high school.

In the second phase, we analyze the influence of the General Index of Evaluated Courses (IGC), a Brazilian higher education performance metric index, in the variables identified in the literature review.

Finally, in the third phase, we compare, for the last two years (2015–2016), the Brazilian context to other 47 OECD countries.

The research framework is based on eight steps: (1) the identification of the main variables through literature review; (2) an exploratory study based on the secondary data; (3) data preprocessing with the determination and selection of the most relevant variables; (4) data analysis of the selected variables; (5) analysis and comparison of the IGC Index; (6) comparison to other OECD countries; (7) discussion; and (8) main conclusions, as illustrated in Fig. 1.

Additionally, we analyze the undergraduate e-learning courses' offer during the same period. It is known that the quality of educational resources has improved in Brazil since 2003; however, the lack of computers in schools may
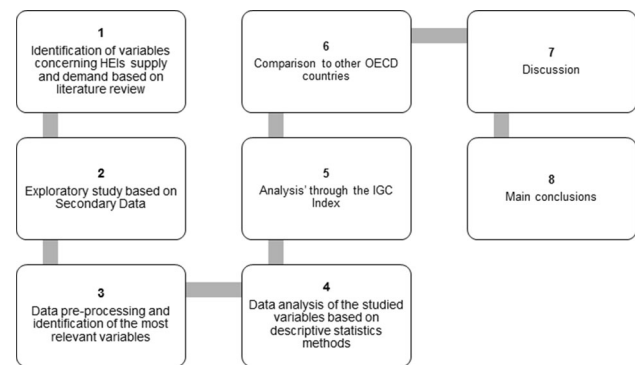


**Fig. 1** Research framework

impede the development of information and communication technology skills (ICT) among the population [51]. ICT is a major component of economic growth, and the youth of today require the use of ICT skills [51], which may impact digital learning.

In this study, we adopt an inductive process as a research strategy and an exploratory and longitudinal methodological approach. We use descriptive statistics analysis as dynamics in the time series that have been summarized and graphically presented, to describe the characteristics of the HEI's whole population, as well as to establish relationships among the selected variables.

## 4 Higher education supply and demand data analysis

In the following sections, we present the higher education supply and demand data analysis.

### 4.1 Census of higher education data analysis

This part presents the analyses of supply and demand conditions for the higher education institutions (HEIs), the undergraduate courses and the students, based on the Census of Higher Education.

### 4.1.1 The higher education institutions—HEI's

Throughout the 1980–2014 period, an increase in the number of higher educational institutions can be observed from data provided by the Census of Higher Education, from 882 (eight hundred and eighty-two) in 1980 to 2368 (two thousand, three hundred and sixty-eight) in 2014, representing a growth of 268.5% in number of HEIs. If we consider the period under study, this percentage is around 105% between 2008 and 2014 (Fig. 2).

In 2014, private HEIs accounted for about 87.4% of all universities in Brazil, while public higher education institutions accounted for some 12.6% of the total. From 2012 to 2014 there was a decrease in the number of HEIs of the two categories in order of 2.02%. There is a predominance in the number of private higher education institutions on the public.

The change in the total number of higher education institutions, between the years 2008 and 2014, has minor modifications (increases or decreases), though their distribution throughout the country and the degree of participation of the five regions (Fig. 3), composed of their states and municipalities (Fig. 4), proved to be different.
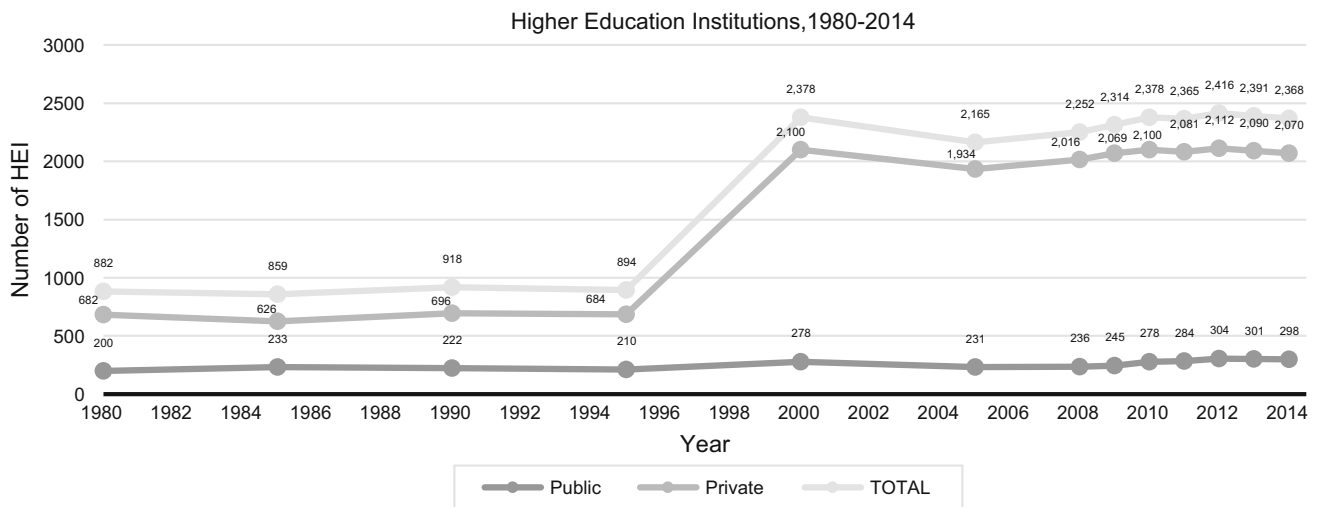


**Fig. 2** Higher education institutions, 1980–2014, Brazil. *Source*: MEC/INEP
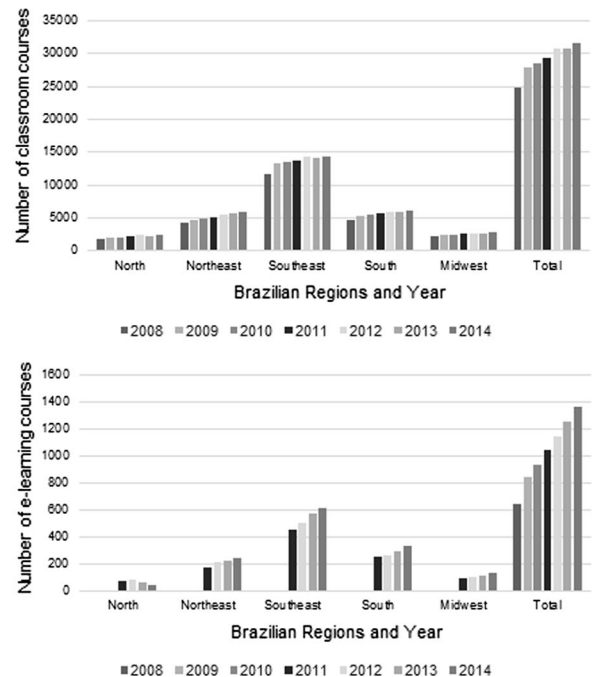


**Fig. 3** Public and private number of HEI in Brazil, 2008–2014. *Source*: MEC/INEP
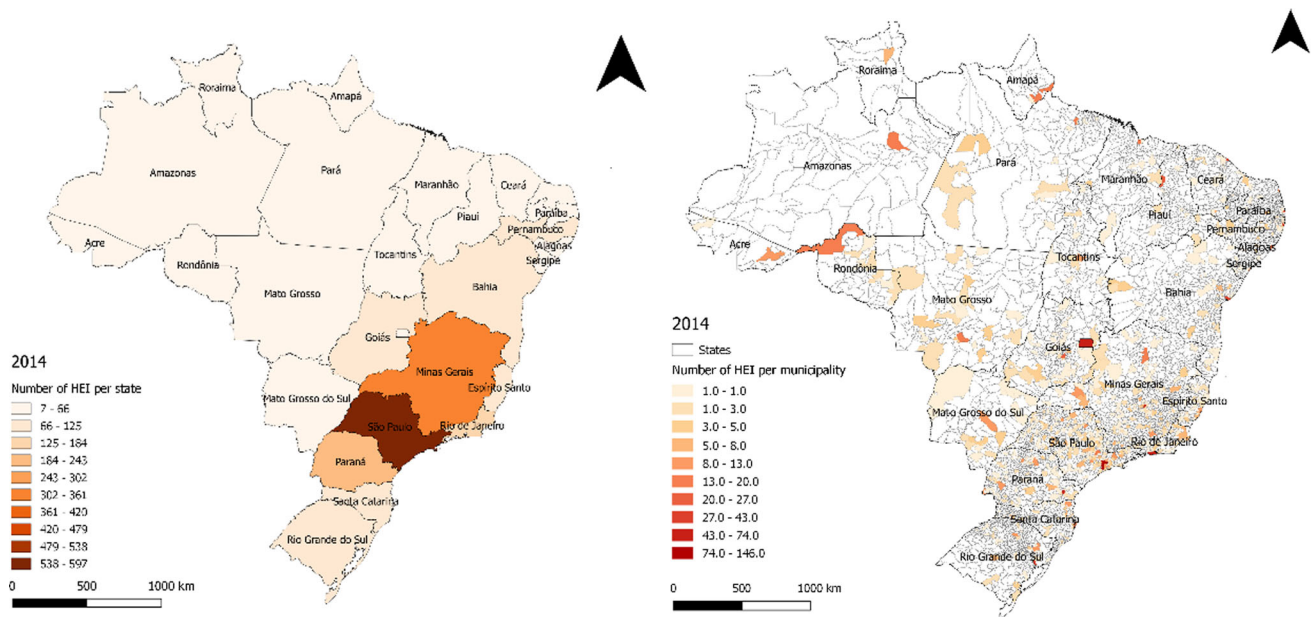
**Fig. 4** Number of HEIs per state and municipality, Brazil, 2014. *Source*: MEC/ICEP and IBGE

In a longitudinal analysis, concerning the public and private HEIs (Fig. 2), a change in the selectivity of the regions to meet potential demands is evident. While the Southeast region[2] continues to be the most "attractive" due to its market share, with the highest number of HEIs (Fig. 3), from the data analyzed, for both kinds of institutions, the focus of the Private HEIs in the last two years is in the Northeast and Midwest regions, while the focus of the Public HEIs has been in the North and Northeast areas where the number of HEIs has increased (Fig. 3). Both situations corroborate with the literature when it mentions the process of expansion of higher education and its internalization to other areas of the country [48, 52].

The distribution of HEIs by state and municipality is illustrated in Fig. 4. It is also observed that most of the HEIs are concentrated in specific areas, the capitals of the states or the metropolitan region areas (Fig. 4) and that they are present in the whole Brazilian territory.

The distribution of HEIs in the Brazilian territory, among its twenty-seven federative units (26 states and one federal district) and municipalities is presented in Fig. 4.

### 4.1.2 The undergraduate courses

When it comes to the undergraduate courses offered (Table 2), there is an increase in their number, contrary to what happened with the number of higher education institutions (HEIs).

**Table 2** Number of undergraduate courses, Brazil, 2008–2014

| Year | Undergraduate courses | Undergraduate E-learning courses |
|------|----------------------|----------------------------------|
| 2008 | 24,719 | 643 |
| 2009 | 27,827 | 844 |
| 2010 | 28,577 | 930 |
| 2011 | 29,376 | 1044 |
| 2012 | 30,718 | 1148 |
| 2013 | 30,791 | 1258 |
| 2014 | 31,513 | 1365 |

*Source*: MEC/INEP

The number of undergraduate courses offered and the following number of vacancies (empty places) has grown substantially over the same period, reaching about 27.5% of undergraduate classroom courses and 112.3% for undergraduate e-learning courses; and around 106.5% for undergraduate classroom courses and approximately 64.8% for undergraduate e-learning courses, respectively. This practically means an increase of 6794 courses and around 1,829,300 places for undergraduate classroom courses and 1,100,869 places for undergraduate e-learning courses since 2008 (Tables 3, 4).

It is argued that HEIs are providing a larger list of options (wider range of courses possibilities) since there is a small change in the absolute number of HEIs. Both the number of undergraduate classroom courses and the number of the undergraduate e-learning courses (Table 2) increased during the period.

Concerning the evolution of the number of places offered, candidates, entrants, enrolled and undergraduate

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[2] The Southeast Region is composed of the States of São Paulo, Minas Gerais, Espírito Santo and Rio de Janeiro.

**Table 3** Number of places, candidates, entrants, enrolled and undergraduate students in classroom courses, 2008–2014. *Source*: MEC/INEP

|  | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| Places offered | 1,715,994 | 3,164,679 | 3,120,192 | 3,228,671 | 3,324,407 | 3,429,715 | 3,545,294 |
| Candidates | 5,534,689 | 6,223,430 | 6,698,902 | 9,166,587 | 10,927,775 | 11,945,079 | 13,245,796 |
| Entrants | 1,505,819 | 1,511,388 | 1,590,212 | 1,686,854 | 1,970,392 | 1,951,696 | 2,110,766 |
| Enrolled | 5,080,056 | 5,115,896 | 5,449,120 | 5,746,762 | 5,923,838 | 6,152,405 | 6,486,171 |
| Undergraduate | 800,318 | 826,928 | 829,286 | 865,161 | 876,091 | 829,938 | 837,304 |

**Table 4** Number of places, candidates, entrants, enrolled and undergraduate students in e-learning courses, 2008–2014. *Source*: MEC/INEP

|  | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| Places offered | 1,699,489 | 1,561,715 | 1,634,118 | 1,224,760 | 1,329,407 | 1,638,427 | 2,800,358 |
| Candidates | 708,784 | 665,839 | 690,921 | 797,176 | 1,029,981 | 1,429,360 | 2,112,930 |
| Entrants | 430,259 | 307,231 | 332,028 | 406,514 | 508,268 | 474,120 | 691,731 |
| Enrolled | 727,961 | 836,594 | 930,179 | 992,927 | 1,113,850 | 1,153,572 | 1,341,842 |
| Undergraduate | 70,068 | 132,187 | 144,553 | 151,552 | 174,322 | 161,072 | 189,788 |

students, data demonstrates an imbalance between supply conditions, represented by the number of places offered, and demand conditions, "translated" by the number of candidates, entrants, enrollments and undergraduates for both modalities—classroom and e-learning courses.

With regard to the undergraduate classroom courses, it is observed that the number of places offered, which has been growing since 2008, is superior to the number of entrants, which sets up an unstable market condition with supply greater than demand. In the data analyzed (Table 3), while this condition was already present in 2008, the number of empty places expanded in subsequent years. In contrast, it is observed that the number of candidates, places, and enrolled students increases, although in very different proportions. The only exception is the number of undergraduate students that does not follow the same ratio of students enrolled.

When it comes to the undergraduate e-learning courses, a similar condition is identified. The number of places offered is higher to the number of entrants, though also higher than the number of candidates and enrolled students (Table 4).

The courses' distribution among the regions of Brazil is distinct for both modalities of undergraduate courses. The undergraduate classroom courses (Fig. 5) are predominantly concentrated in the Southeast, followed by the South, Northeast, Midwest and North regions, respectively. Small variations are observed over the period, as well as a trend of change in the scenario, and a supply shift to other areas, such as Northeast, South, and Midwest. The market remains in unstable condition with supply greater than demand; and the increased offering courses and places by the HEIs.

The undergraduate e-learning courses (Fig. 6)[3] are mainly concentrated in the Southeast, followed by the
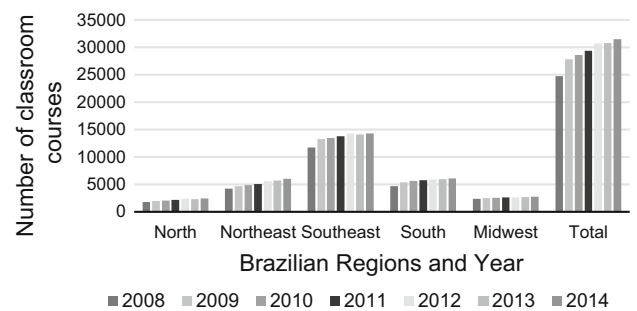


**Fig. 5** Number of undergraduate classroom courses in Brazil, 2008–2014. *Source*: MEC/INEP

Northeast, South, Midwest regions, respectively. A rise is observed over the period for all areas, except the North, where there has been a fall in the offering. This scenario reinforces the unstable market condition beforehand mentioned.

From the demand perspective, the expansion of higher education occurred in the country, predominantly, with the number of vacancies followed by the substantial increase in the number of educational institutions [41]. Despite the growing demand for higher education in Brazil related to the expansion of the completion of basic education rate, this requirement was only partially met, given the predominantly private character of the offered places [41], which requires financial means to match fees charged. Part of the supply of places in private higher education institutions has been accompanied by an increase in the proportion of empty places.

Another reason that contributes to the considerable number of vacant, empty or unfilled places on the higher education institutions is due to the priority and the rapid expansion of the network of universities, not followed by corresponding growth in the lower levels of education, mainly high school, blocking the advance to higher

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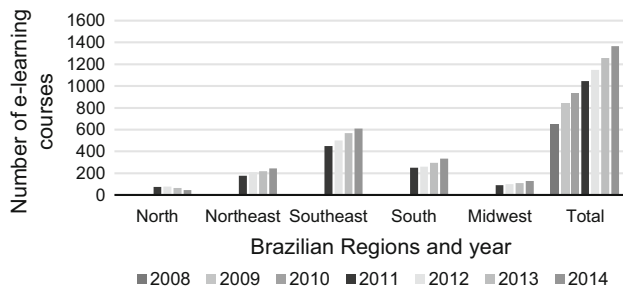[3] The microdata source is available only for the period of 2012–2014.

**Fig. 6** Number of undergraduate E-learning courses in Brazil, 2008–2014. *Source*: MEC/INEP

education [53]. Only a few entered the beginning of school and many stranded midway, due to high failure rates and evasion in this level of education, reflecting in the potential demand for higher education [41, 54].

Other factors influence demand, for example, the great portion of the population that do not have access to higher education in the age group considered "ideal," as well as livelihood opportunities and the needs of the labor market [55]. Therefore, there is a contingent of people over 24 years to be addressed, namely the "late entry" population [41]. Another aspect which can be considered is the limited number of public HEIs comparatively to the Private ones.

All these factors contribute to a lack of efficiency in Higher Education purposes [1].

### 4.1.3 The undergraduate students

Based on the Census of Higher Education [56], Table 5 indicates the number of enrolled undergraduate students in 2013 and 2014.

Based on the data from the most recent years[4] (Table 5), it is observed that the highest and the lowest mean ages of students enrolled in undergraduate courses—classroom and e-learning—varies among 18–60 years old, depending on its fields of interest. Figures 7 and 8 present boxplots for the age variable, allowing to compare the age of the enrolled undergraduate students per field of interest in HEIs in 2013 and 2014.

The age considered "ideal" for undergraduate courses of 18–24 years old has changed when observing the age of students enrolled in undergraduate courses in 2013 and 2014. There is a significant contingent of students older than 24 years old, coherent to what was mentioned before as "late entry population" [41].

Most of the areas have a predominance of students older than 24 (Figs. 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 from "Appendix" Age of Undergraduate Students in the OECD Main Area, 2013–2014, Brazil). The youngest—aged between 18 and 19 observing—are present

**Table 5** Number of enrolled undergraduate students, Brazil, 2013–2014. *Source*: MEC/INEP

| | | Undergraduate classroom courses | Undergraduate E-learning courses | Total |
|---|---|---|---|---|
| Enrolled students | 2013 | 6,486,171 | 1,341,842 | 7,828,013 |
| | 2014 | 6,152,405 | 1,153,572 | 7,305,977 |

in Engineering, Production, and Construction (Fig. 24 from "Appendix"); and Agriculture and Veterinary (Fig. 25 from "Appendix") areas, only in 2013. The oldest are in the areas of Humanities and Arts (Figs. 17, 21 from "Appendix"). These findings also indicate the aging of the students' population. The illustrations ("Appendix" Age of Undergraduate Students in the OECD Main Area, 2013–2014, Brazil) represent the students' ages (*x*-axis) and the HEIs (*y*-axis), in each area of OECD. From the illustrations (Figs. 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 from "Appendix" Age of Undergraduate Students in the OECD Main Area, 2013–2014, Brazil), the areas where there is a significant concentration of enrolled students can be depicted and their preferences or the preferences for potential demand can be mapped.

Considering the Census of Higher Education of 2013 and 2014, it is observed that the age of enrolled students has already increased for Education (from 19 to 21 years old), Engineering, Production and Construction (from 19 to 20), Agriculture and Veterinary (from 19 to 20), Health and Wellness (from 19 to 20), and Services (from 20 to 21 years old). Also, the maximum age of enrolled students has risen in certain areas as Science, Math and Computing (up to 47 years old), Engineering, Production and Construction (up to 28), Agriculture and Veterinary (up to 49 years old), Health and Wellness (up to 52) and Services (up to 43 years old).

These findings are coherent to the OECD's report [51] which concluded that "Between 2009 and 2013, the share of the population aged between 25 and 64 years old having completed tertiary education increased by three percentage points, reaching 14% in 2013."

Another point to be considered is the financial situation of enrolled students, in particular, the undergraduate students who benefit from government economic and funding programs. From the Census of the Higher Education data [56], it is observed that 2,494,014 (32%) of the enrolled students benefited themselves from public financial programs in 2014. Most of them were enrolled in Social Sciences, Business and Law, Health and Welfare, and Engineering, Production, and Construction undergraduate courses.[5] This number has increased since 2013 (Fig. 9).

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[4] Higher Education Census of 2013 and 2014.

[5] In this case, considered only the public scholarships.

**Fig. 7** Boxplot diagram with the ages of enrolled undergraduate students per field of interest, Brazil, 2013. *Source*: MEC/INEP
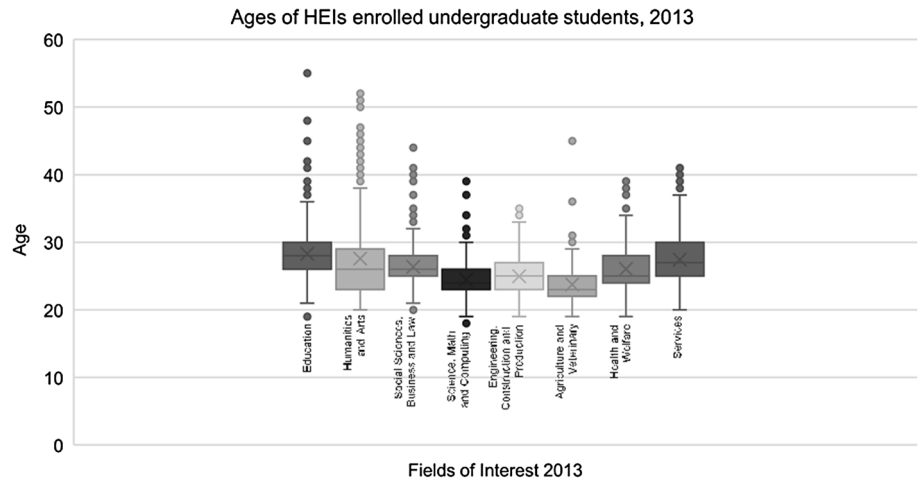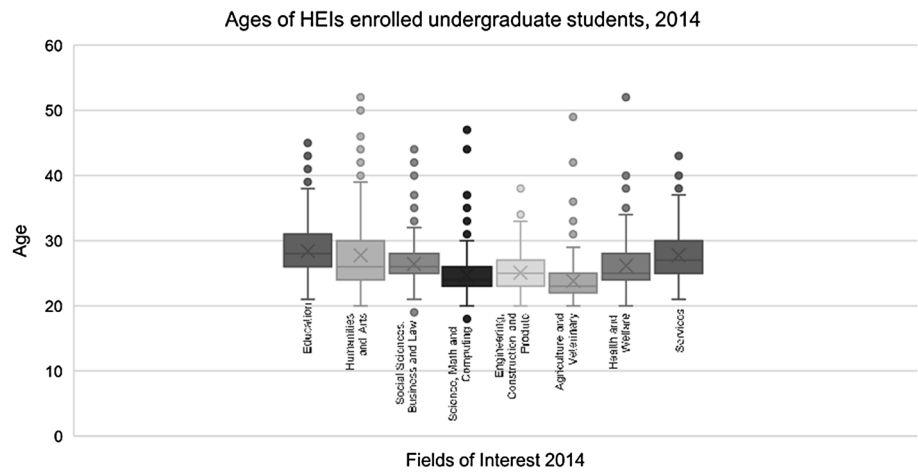


**Fig. 8** Boxplot diagram with the ages of enrolled undergraduate students per field of interest, Brazil, 2014. *Source*: MEC/INEP
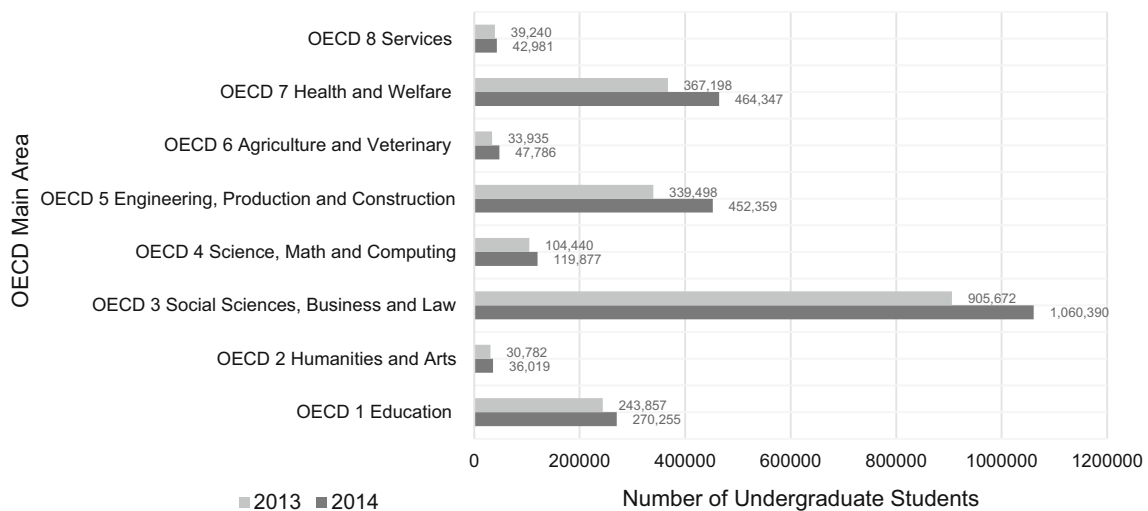




**Fig. 9** Number of undergraduate students with scholarships, Brazil, 2013–2014. *Source*: MEC, INEP

Preferred OECD Main Areas of entrant undergraduate students, 2014



- OECD 8 Services
- OECD 7 Health and Welfare
- OECD 6 Agriculture and Veterinary
- OECD 5 Engineering, Production and Construction
- OECD 4 Science, Math and Computing
- OECD 3 Social Sciences, Business and Law
- OECD 2 Humanities and Arts
- OECD 1 Education
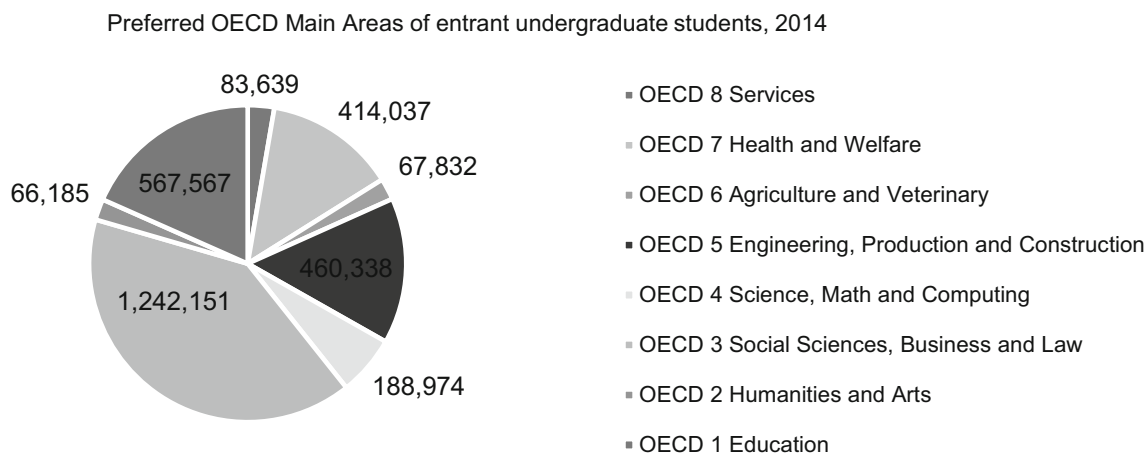
**Fig. 10** Preferred OECD Main Areas of entrant undergraduate students, Brazil, 2014. Source: MEC, INEP

**Table 6** Distribution of enrolled student, Brazil, 2013–2014. *Source:* MEC, INEP

| Gender | 2013 | % | 2014 | % |
|--------|------|-----|------|-----|
| Female | 4,179,621 | 57.23 | 4,486,412 | 57.40 |
| Male | 3,124,169 | 42.77 | 3,329,062 | 42.60 |

Any change in the funding public policy, the country economic situation, and the students or their family income rates can impact, directly or indirectly, the HEIs enrollment rates.

A Research presented by the Brazilian Association of Maintainers of Higher Education—ABMES—showed that 50.5% of young people who wish to join higher education could not afford to pay the tuition fees and need the help of government financial and funding programs. Of them, 37.3% said they could afford the monthly payments, and 12.2% stated that they might afford. The study surveyed a thousand Brazilians aged between 18 and 30 years with high school degree [57]. This statement points a tendency

for the government financial and funding programs' rise policy on the contrary to what has been announced. Moreover, it also indicates the potential demand trend, related to the candidates or entrants to higher education.

In Brazil, it was also observed that the students that enter (entrants) Higher Education have a preference for certain knowledge areas (Fig. 10) such as Social Sciences, Business and Law (40%), Education (18%) and Engineering, Production and Construction (15%), making up for 73% of all preferences.

In relation to gender, the female presence is higher (57%) than the male (43%) in the undergraduate courses in 2014. This condition was similar in 2013 enrolled students' data (Table 6).

The differences between genders are also present in the number of enrolled students per OECD main area. The female preferences are Social Sciences, Business and Law, Education, Health and Welfare. The male preferences are Social Sciences, Business, and Law, Engineering,

**Fig. 11** Enrolled students by gender in OECD Main Areas, Brazil, 2013–2014. *Source*: MEC, INEP

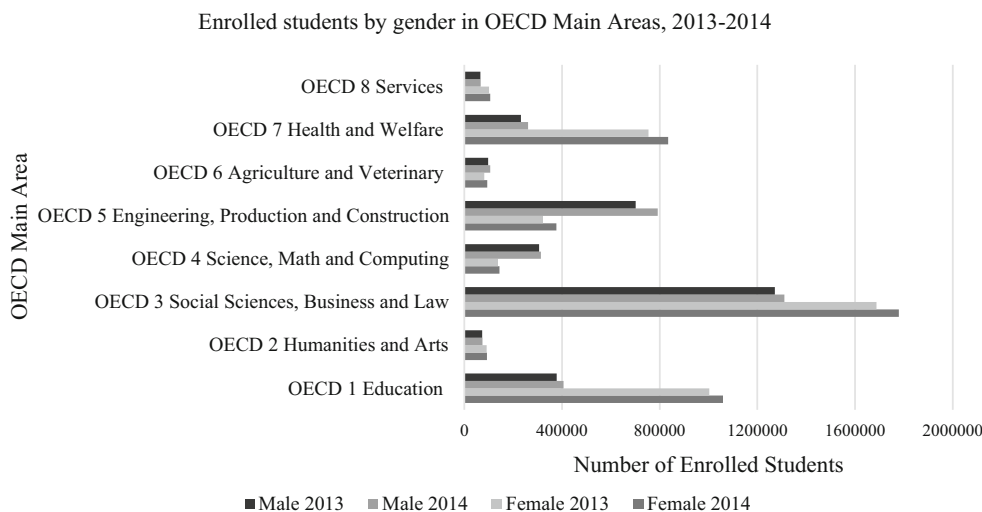Enrolled students by gender in OECD Main Areas, 2013-2014

**Table 7** Total percentage of young people aged 18–24 in the total population. *Sources*: IBGE (Demographic Census 2010) and MEC/INEP

| Total number of places offered | Total proportion of young people aged 18–24 in the total population | | |
|---|---|---|---|
| | 18 years old | 1.77% | 3,367,172 |
| | 19 years old | 1.71% | 3,265,826 |
| | 20 years old | 1.78% | 3,389,729 |
| 3,120,192 | 21 years old | 1.79% | 3,421,736 |
| | 22 years old | 1.84% | 3,510,497 |
| | 23 years old | 1.79% | 3,420,254 |
| | 24 years old | 1.84% | 3,502,976 |
| | Total resident population | 190,755,799 | |

Production and Construction (Fig. 11). This condition is similar for both 2013 and 2014.

## 4.2 Demographic census data analysis

From the demographic point of view, it is assumed that there is a market instability which is getting worse, since the evolution in the size of Brazilian youth, over these last decades, especially in the range of 18 and 24, representing the incoming quota for higher education, is not presented in ascending order. According to the outlook, this young cohort grew until 2008, when it reached its peak and, from there, according to the Department of Strategic Affairs (SAE) [58] of the Presidency of Brazil (2013), it declined.

According to the estimates [58], the youth expanded sharply in a period of 20 years (1983–2002) and will remain stagnant for another 20 years (2003–2022), and then, in the 20 years following, twitching in the same rhythm with which it expanded (the size of the youth is expected to contract by 12.5 million between 2023 and 2042).

Associated with this condition is the fact that Brazil undergoes a period of transition in which there is an increase in life expectancy and lower birth rates, reflected in a reduction in the average number of children per woman. Thus, in addition, to the reduction in the number of children, there is a slowing of population growth, with a significant impact on the youth contingent [56, 59–61].

Brazil had in 2010 a resident population of 190,755,799 people (Census 2010). Of these, 3,367,172 aged 18 were hypothetically entitled to enter higher education. However, this entire contingent did not arrive at higher education, since the data provided by the Census of Higher Education showed that the number of entrants was 1,590,212 and 5,449,120 were registered, less actually than the number of places offered 3,120,192 in 2010 (Table 7).

Theoretically, the number of young people old enough to enter higher education (18 years) is 3,367,172 for 3,120,192 (2010) places offered, considering the hypothesis that all this contingent would meet the pre-requisites to enroll themselves in Higher Education. However, as evidenced by the data from the Census of Higher Education, in practice, the number of entrants was 1,590,212 (2010), which represents only 47% of all young people in the age range considered ideal for pursuing it. Even smaller is the number of undergraduate students. It is forecast that the number of youth will suffer a drastic reduction from 2020, confirming that this "potential demand" will be reduced even further and that there is a contingent of youth people that, for diverse reasons, have not completed higher education.

A smaller number of young people will result in fierce competition. Given the need for subsistence or joining the large contingent of the population entering the labor market, the continuation of studies is further prevented, for a large number of young adults [55].

Based on the above, it can be argued that the expansion of higher education policy has shown signs of exhaustion, with idleness on the number of vacancies offered, student debts and the inability to commit a significant part of the income from the monthly payment [53, 55, 59].

This instability of supply and demand conditions directly affects sustainability and governance of HEIs. That is the main reason why they need consistent demand estimation models as well studies involving educational distribution, especially in a country like Brazil, of large territorial dimensions [62], associated with the review and proposal of public policies conducive to its actual scenario.

## 4.3 General Index of Evaluated Courses (IGC)

The General Index of Evaluated Courses (IGC) is an indicator of quality that evaluates institutions of higher education in Brazil. It is calculated annually considering: (1) the average of the last available CPC[6]s of the establishment's assessed courses in the year of calculation and

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[6] The CPC is an indicator of quality that evaluates higher education. It is calculated in the year following the completion of the ENADE of each area, based on the performance evaluation of students, faculty, infrastructure, didactic-pedagogical resources and other inputs, according to technical guidance approved by MEC/INEP. ENADE—The National Student Performance Exam—is a mandatory exam that evaluates the performance of undergraduate students in relation to the syllabus contents, skills and competences acquired during their undergraduate course.

**Table 8** Distribution of HEIs per IGC, 2014. *Source:* MEC/INEP

| IGC | Number of HEIs | % |
| --- | --- | --- |
| 5 | 25 | 1.1 |
| 4 | 323 | 13.6 |
| 3 | 1,363 | 57.6 |
| 2 | 325 | 13.7 |
| 1 | 5 | 0.2 |
| s/c | 121 | 5.1 |
| Other | 206 | 8.7 |
| Total | 2368 | 100 |

in the previous two, weighted by the number of enrollments in each of the courses computed; (2) the average of the evaluation concepts of the stricto sensu postgraduate programs awarded by CAPES[7] in the last available triennial evaluation, converted to a compatible scale and weighted by the number of enrollments in each of the corresponding postgraduate programs; (3) the distribution of students between different levels of education, graduation or postgraduation stricto sensu, excluding the information of item 2 for institutions that do not offer stricto sensu graduate degree. As the IGC considers the CPC of the courses evaluated in the year of calculation and the two previous years, its disclosure always refers to a triennium, thus comprising all areas evaluated or even the whole evaluation cycle. So, even though IGC evaluates the courses, in the end, it is a performance metrics index which is attributed to the Higher Education Institution. So, to have a better idea of the undergraduate courses in a quality evaluation, offered by the HEIs in Brazil, the studied variables were compared to the HEIs' IGC index. For this analysis, it was considered the 1–5 and the 's/c' (without grade) categories and the results are presented as follows.

According to the Brazilian National System of Evaluation of Higher Education Institutions Indicator, denominated General Index of Evaluated Courses (IGC) of Higher Education Institutions, whose score varies from 5 to 1, with five being the highest and one being the lowest, there is a distribution of HEIs as displayed in Table 8. Most part of the HEIs in Brazil received a 3-score IGC as indicated in Table 8.

The vast majority of the classroom and e-learning undergraduate courses offered in 2014 received a 3-score IGC as indicated in Fig. 12. It is important to state that undergraduate courses that score below three are considered to be of poor quality.

More than 50% of the total of the offered undergraduate courses are concentrated in the Main Areas 1 and 3 of OECD, as indicated in Table 9. Just 26.01% of the courses obtained scores 4 and 3.77% obtained score 5 in the IGC's evaluation, attributed to their HEIs (Table 9).

Considering the variables related to the places offered, entrants, enrolled and graduate students, Fig. 13 illustrates that the vast majority of places offered, entrants, enrolled and undergraduate students are in the Social Sciences, Business and Law (3), Education (1), Engineering, Production and Construction (5) and Health and Welfare (7) OECD Main Areas, respectively, provided by HEIs whose IGC's evaluation score is 3 or 4 (Table 9).

Concerning the professors' Educational Level, when it comes to analyze the undergraduate courses comparing to the IGC index attributed to the HEIs, it is observed that the 3-score HEIs have courses with a predominance of master's professors (26.13%); 4-score HEIs have courses with a slight predominance of Ph.D. (15.20%) over masters (11.19%) professors; and 5-score HEIs have courses with a predominance of Ph.D. (6.28%) professors (Fig. 14).

Most of the undergraduate students with scholarships are concentrated in the OECD Main Areas[8] 3 (42.58%), 7 (18.62%) and 5 (18.09%) as already mentioned (Fig. 9). The vast majority of them are enrolled in 3-score (78.12%) HEIs undergraduate courses (Fig. 15). The 4-score HEIs have 18.15% of students with scholarships. HEIs with 5-score IGC practically do not have students (0.03%) with scholarships, considering all OECD areas.[11] One possible reason for that is that from the 25 (Table 8) HEIs which obtained the 5 grade in 2014, 15 were public and 10 were private institutions; in the public institutions, the undergraduate course is free which does not justify the application for a scholarship.

### 4.4 Comparison of the offer and demand conditions for OECD countries

Comparative studies have been addressed as relevant to improve the robustness of the research, broaden the observation base and to achieve a more extensive and reliable comprehension of the phenomena observed [3, 37].

The education systems can be diverse both across countries and for different individuals within the same country. As people have different abilities, needs, and preferences, most education systems try to offer various types of education programs and modes of participation,

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[7] CAPES is a foundation linked to the Ministry of Education (MEC) of Brazil that works in the expansion and consolidation of *stricto sensu* (master's and doctorate) post-graduation courses in all the states of the country.

[8] OECD 1—Education. OECD 2—Humanities and arts. OECD 3—Social sciences, business and law. OECD 4—Science, math and computing. OECD 5—Engineering, production and construction. OECD 6—Agriculture and veterinary. OECD 7—Health and welfare. OECD 8—Services.

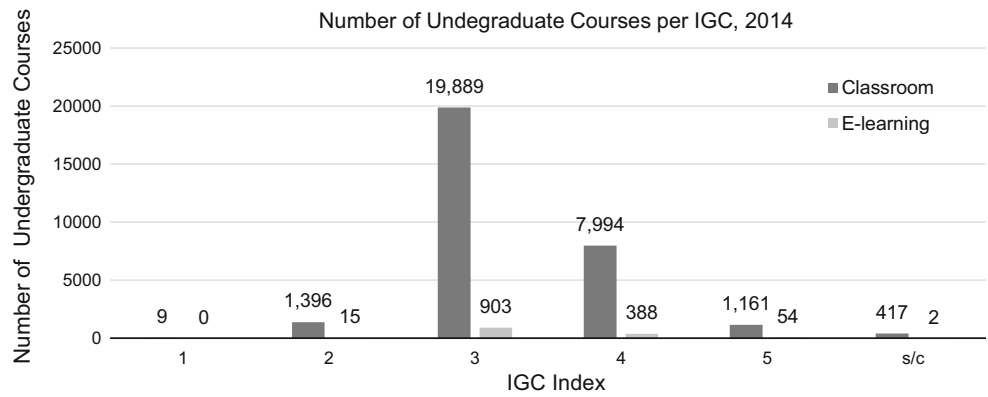Fig. 12 Number of undergraduate courses classified per IGC. *Source*: MEC, INEP, 2014

**Table 9** Undergraduate courses distributed by OECD main areas[11] and by IGC index, 2014. *Source:* MEC, INEP

| IGC | OECD 1 (%) | OECD 2 (%) | OECD 3 (%) | OECD 4 (%) | OECD 5 (%) | OECD 6 (%) | OECD 7 (%) | OECD 8 (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 1.02 | 0.12 | 1.82 | 0.33 | 0.32 | 0.08 | 0.53 | 0.15 |
| 3 | 15.57 | 2.11 | 20.67 | 5.78 | 8.63 | 1.57 | 7.71 | 2.48 |
| 4 | 6.13 | 1.55 | 6.47 | 3.10 | 3.99 | 0.95 | 3.04 | 0.78 |
| 5 | 0.99 | 0.47 | 0.55 | 0.54 | 0.66 | 0.16 | 0.36 | 0.04 |
| SC | 0.33 | 0.03 | 0.49 | 0.05 | 0.15 | 0.03 | 0.19 | 0.03 |
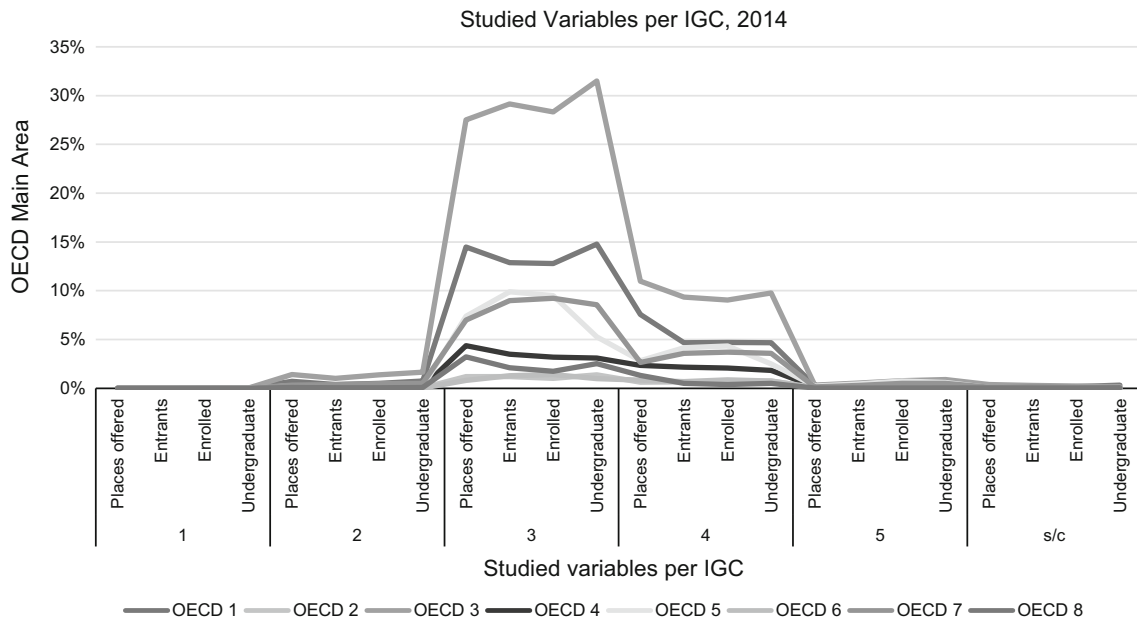


Fig. 13 Main variables' distribution per IGC. *Source*: MEC, INEP

particularly in the most advanced levels of education and for adults [63].

In order to have a reference for a comparison to the Brazilian data, we tried to explore similar information based on the OECD report indicators, which comprise data from 35 countries, two partner countries that participate in

the OECD Indicators of Education Systems programme (INES), Brazil and the Russian Federation, and other partner countries that do not participate in INES (Argentina, China, Colombia, Costa Rica, India, Indonesia, Lithuania, Saudi Arabia and South Africa) [51, 63] as well as the data for Israel. A global overview of information

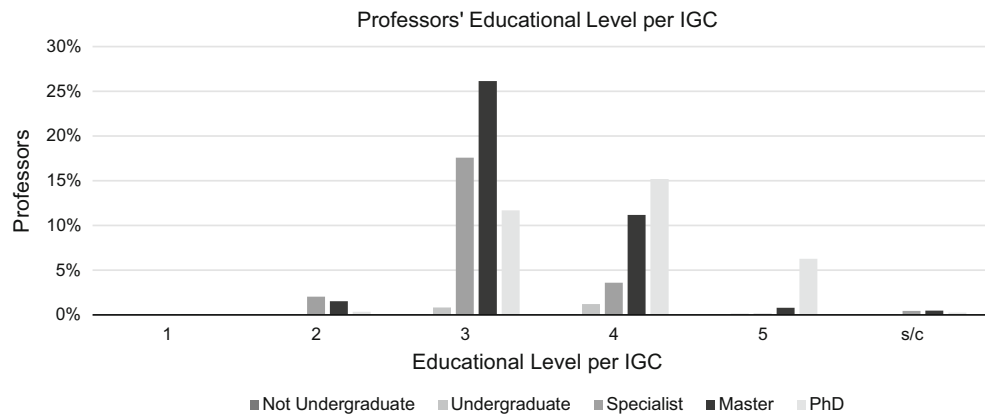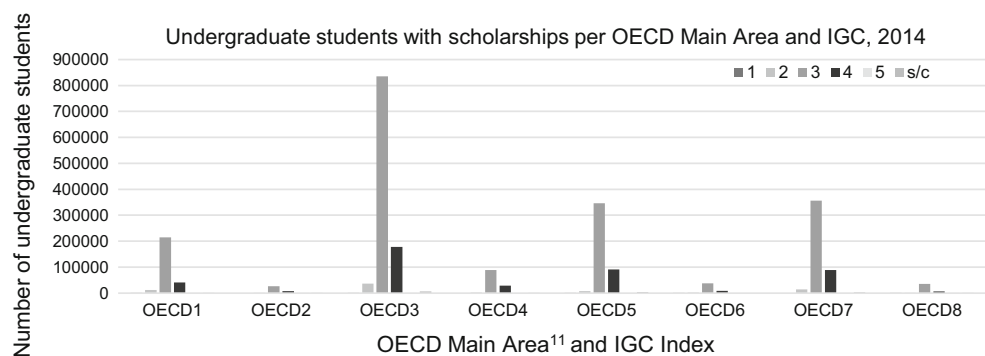**Fig. 14** Professors educational level per IGC. *Source*: MEC/INEP



**Fig. 15** Undergraduate students with scholarships per IGC. *Source*: MEC/INEP



about educational institutions, undergraduate and completion rates, age, sex, genre, and preferred areas for undergraduate courses was depicted.

Although there is a substantial level of private funding at the tertiary level, on average across OECD countries, 84% of all funds for primary to tertiary educational institutions comes directly from public sources. Comparing expenditure on primary to tertiary levels of education combined, the proportion of private funds exceeds 30% in Chile, Colombia, Korea and the USA. By contrast, in Austria, Belgium, Denmark, Finland, Iceland, Norway and Sweden, 5% or less of expenditure on education comes from private sources [63].

An average of 36% of young people across OECD countries today is expected to graduate from tertiary education at least once before the age of 30. Women are over-represented among tertiary graduates (57% across OECD countries) though remain under-represented in some areas such as science and engineering while, in the field of education, four women graduated for every man in 2014.

In 2014, a majority of first-time tertiary graduates (72%) earned a bachelor's degree and 16% earned a short-cycle tertiary diploma. Graduates in science and engineering areas combined represented around 22% of graduates at all tertiary levels. 49% of young people (including international students) today can be expected to graduate from higher education at least once during their lifetime, on

average across the 26 OECD countries with comparable data for 2014. The proportion ranges from 22% in Luxembourg, where many citizens choose to study abroad, to 70% or more in Australia, Japan, and New Zealand. More young people are expected to graduate from a bachelor's degree program over their lifetime than from any other level of tertiary education.

On average across OECD countries, over their lives, 38% of young people in each country are expected to graduate with a bachelor's degree, and 11% are meant to graduate from a short-cycle tertiary program. Although bachelor's degrees remain the most common tertiary diploma to be held by graduates in OECD countries, countries are also promoting other levels of higher education. To improve employability and the transition into the labor market, some countries are promoting short-cycle tertiary programs. The probability of a person in Austria, China, New Zealand and the Russian Federation to graduate from a short-cycle tertiary program over his or her lifetime is 25% or higher. In some countries, a significant proportion of graduates from higher education is international students. The term "international students" refers to students who have crossed borders expressly with the intent to study. For various reasons, international students have a marked impact on estimated graduation rates. Due to the lack of information, they are often considered first-time graduates, regardless of their previous education in other

countries (i.e., an international student who graduates from a second-degree program will be regarded as a first-time graduate in the country of destination). In some countries with a high proportion of international students, such as Australia and New Zealand, graduation rates are thus inflated. When international students are excluded, first-time tertiary graduation rates drop by 30 percentage points for Australia and 17 percentage points for New Zealand [63].

The first-time graduation rate from higher education among people under the age of 30 is an indicator of how many young people are expected to enter the labor force for the first time with a tertiary qualification. On average across the 20 countries with available data, 36% of young people (excluding international students) are expected to obtain a tertiary diploma for the first time before the age of 30. This rate ranges from 47% in Denmark to 12% in Luxembourg. Also, some education systems accommodate a wider range of ages among their students than others. In Chile, Iceland, New Zealand and Switzerland, first-time graduation rates at the tertiary level drop by more than 10% points when restricted to young people under 30 (excluding international students). This may suggest that these education systems are more flexible regarding access to and duration of programs, and are more suitable for students outside of the typical age of study. Finland, Israel, and Switzerland also have mandatory military or civilian service that increases the length of tertiary studies [63].

Across OECD countries in 2014, the average age of first-time graduates was 26. The variation among countries can be substantial, ranging from 23 years in Lithuania and the UK to 28 years in Iceland, Sweden, and Switzerland. The average age of graduation tends to increase in higher degrees. It is the same in short-cycle programs and bachelor's or equivalent level: the average age of graduation is 26. In 2014, an average of 57% of first-time graduates from tertiary education in OECD countries was women, ranging from 49% in Switzerland to 64% in Latvia and the Slovak Republic. Also, more than one in two first-time graduates from all levels of tertiary education—except the doctoral level—were women. On average, 58% of first-time graduates from bachelor's programs or the equivalent were female. The largest differences between the share of women who graduated with a bachelor's degree or the equivalent and those who graduated with a doctorate (20% points or more) were observed in the Czech Republic, Saudi Arabia, and Sweden [63].

The distribution of graduates by field of study is related to the relative popularity of these areas among students, the relative number of positions offered at universities and similar institutions, and the degree structure of the various disciplines in each country. Many countries are pushing for a better balance in the distribution of graduates across all

fields of education. For instance, the USA recently took measures to increase the number of graduates with tertiary science and engineering qualifications by 1 million by 2022 [64]. Similarly, the European Union recently launched the Science with and for Society program which aims to make science more attractive, particularly to young people, and to open further research and innovation activities across Europe [65].

The small share of graduates in science and engineering at the tertiary level hides large differences by level of higher education. While 5% of graduates from short-cycle tertiary programs, 9% of graduates from bachelor's or equivalent programs, and 8% of graduates from master's or equivalent programs earned a degree in science in 2014, 27% of graduates from doctoral programs were in sciences, on average across OECD countries. In Canada, France, Israel and Saudi Arabia, 55% or more of doctoral students graduated from the fields of science or engineering in 2014 [63].

As already mentioned, women are over-represented among tertiary graduates (57% of graduates), although they remain under-represented in some areas of study, such as science and engineering. There are, on average, three times more male graduates in engineering than female graduates. Among all OECD and partner countries, Poland has the lowest gender imbalance in engineering (1.6 men per woman) and Japan the highest (6.9 men per women). In science, only Italy and Portugal have a larger share of female graduates. These results are partially explained by gender differences in young people's attitudes and aspirations. The OECD Programme for International Student Assessment (PISA) has consistently found that 15-year-old girls have higher expectations for their careers than boys though, on average, across OECD countries, fewer than 5% of girls of that age contemplate a career in engineering or computing. The fields of education and health and welfare reveal the other extreme. On average in 2014, four women graduated in education for every man. The ratio is highest in Estonia, where more than 12 women graduated for every man. Similarly, women graduating in health and welfare represented, on average across OECD countries, 3.7 times the number of men. Canada, Estonia, Finland, Iceland, and Latvia have more than five female graduates per male in the field of health and welfare. Regarding the field of humanities and arts, none of the countries with available data have more male graduates than female. The same pattern is observed in the areas of social sciences, business and law, except Indonesia, Japan, Switzerland, and Turkey. The areas of agriculture and services have a more even gender balance [63].

On average across countries with true-cohort data (data on individual students), 41% of students who enter a bachelor's or equivalent program graduate within the

theoretical duration of the program, although sometimes from a different educational level. Within three years after the ideal length of the program, the average completion rate increases to 69%. In almost every country, women have higher completion rates than men at the short-cycle tertiary, bachelors, and first-degree levels. Of the students who enter a bachelors or equivalent program [66, 67], an average of 1% transfer and graduate instead from a short-cycle tertiary program within the theoretical duration of the original program. Within three years after the planned duration, over 1% transfer and graduate from a first degree.

Of students who enter a bachelor's or equivalent program, on average, by the end of the planned duration of the program, 41% have graduated, 18% have left the education system, and 40% continues. Within the planned duration plus three years, the share of students who have graduated increases to 69%, the proportion of students who have left the education system increases to 23%, and the percentage of students still in education decreases to 8% [66–68]. In bachelor's or equivalent programs, the gender gap for completion within the planned duration favors women, as women's completion rates at this level are also higher than men's in nearly all countries, with only one exception in Turkey. The average completion rate in short-cycle tertiary education (68%) is considerably lower than the average for bachelors or equivalent level (75%) and first degrees (72%) [63, 66, 67].

## 5 Discussion

From 2008 to 2014, the number of higher education institutions varied slightly. Considering the year 2008 as a reference, the total number has increased from 2252 to 2367 (Fig. 2).

The number of undergraduate classroom courses increased during 2008–2014 (Table 4); however, this was not reflected in the number of the enrolled students when compared to the demographic, young population data. If, in the 1960s many students were concurring to a place in the HEIs [45], nowadays, the situation inverted. There are a high number of vacant or unfilled places for each potential student. As an example, from 2008 to 2014, the number of places offered for undergraduate courses almost doubled from 1,715,994 to 3,545,294. Also, the number of candidates improved from 5,534,689 to 13,245,796, though, as already said, was not converted in enrolled students as the same candidate can enroll for more than one process in different HEIs. For the same period, the number of entrants has grown from 1,505,819 to 2,110,766 (Table 4).

A similar condition occurred with the undergraduate e-learning courses whose number also increased during 2008–2014 (Table 5), although not reflected in the number of enrolled students. There are also a high number of vacant or unfilled places for each potential student. As an example, from 2008 to 2014, the number of places offered for undergraduate e-learning courses almost doubled from 1,699,489 to 2,800,358. Also, the number of candidates increased from 708,784 to 2,112,930, though, as already said, was not converted in enrolled students. For the same period, the number of entrants has grown from 430,259 to 691,731 (Table 5).

The number of undergraduate students for classroom and e-learning courses is lowest if compared to the enrolled students, calling the attention to the fact that despite all the efforts of the expansion and internalization of HEIs in Brazil, it has little effect in practice: the undergraduates do not actually increase, which reinforces the lack of improvement in the higher education purposes. The same occurs across the 20 OECD countries with available data, as around 36% of young people (excluding international students) are expected to obtain a tertiary diploma for the first time before the age of 30.

Besides that, the information generated from the analysis of microdata of the Census of Higher Education, associated with the Demographic Census data (2010), in Brazil, points to a drastic reduction in the population of young people aged 18–24 years, which is going to be scarce in a short period. Today, Brazil has the largest number of young people in its history [69]. However, as studies indicate [41], from 2025 this figure will be reduced drastically.

Both conditions—reduced number of enrolled and undergraduate students added to the reduction of the young population considered ideal for undergraduate courses—will impact in the private higher education institutions' sustainability conditions. Nowadays, the HEIs already have more places offered than the number of enrolled students.

Moreover, price concurrence varies widely in the country, depending on the knowledge area, country regions, HEI's price and discount policies and government subsidies. It is important to state that Public Education for undergraduate courses is free of charge, while Private Education is paid. In any case, the number of empty places continues for the clear majority of undergraduate courses in both kinds of institutions.

Comparing to the OECD countries, it is also observed that over the past two decades, tertiary education has changed significantly. The student body became more international, more women undergraduate from this level of education and, in some countries, more students have access to the tertiary level of study, mainly in science and engineering fields.

These changes might also reflect concerns about competitiveness in the global economy and the labor market, like what occurred in Brazil, as globalization and

internationalization have a global impact. It is also relevant to note the importance of reducing differences in education opportunities and outcomes for men and women, as women have increasingly improved their participation at all levels of education around the globe, although the differences in earnings persist.

Worldwide, some fields are more popular among students. The areas of science and engineering have a preference and an unbalance gender distribution with a prevalence of male gender. The opposite occurs in the areas of Education, Welfare, and Health where there is a female prevalence.

Independently of the country, there are some challenges to be faced in Higher Education: to confront the evasion and dropout rates as undergraduate average rates are around 40% and, after that, to ease the transition into the labor market for the undergraduate students.

## 6 Main conclusions

Whereas the aim of this paper was to evaluate the context of Brazilian Higher Education to map its supply and demand conditions through the analysis of selected variables and their impact on the HEIs' General Index of Evaluated Courses (IGC) and, complementary, to provide information about other countries for a comparison to subsidize the generation of strategic information, it concludes that offer conditions are diverse, and that demand is increasingly limited for the population considered ideal for undergraduate courses in Brazil. The enrolled students already indicate that their "ideal age" has already changed, and their age varies from 20 to 60 years, depending on the OECD Area of interest. Also, it is observed that the digital e-learning offer has increased, like the classroom offer, though has not achieved its objectives as the undergraduate students are still a number to improve.

When it comes to other countries around the globe, the OECD report points out that the average age of first-time graduates was, in 2014, 26. However, among countries, there is a considerable variation, ranging from 23 to 28 years old.

As in Brazil the Higher Education is mainly provided by the private sector (Fig. 1) and the HEIs have been faced to the presented scenery, this will require new forms and mechanisms of management and governance to grant its sustainability to long term. It is more evident that the HEIs compete for students and financial resources, increasing their quality and variety of services offered, and adapting guides according to competitive forces to new constraints and opportunities. Moreover, this market-oriented model, "which contend that universities function more efficiently when operating as economic enterprises within and for

regional or global markets" defines its policy to increase quality and variety of services offered, strengthening students' choice [5]. In other countries, it is noticed that Education is mainly public funded, as 84% of all funds for primary to tertiary comes from public sources, as already mentioned [63].

In the market-oriented model, HEIs are seen as a commodity, investment, and strategic resource and may offer governments an array of instruments to enhance competition such as regulations on subsidies and instruments affecting pricing structure and enrollment [5]. This condition has created a fierce competition among HEIs.

Thus, from the supply perspective, some tendencies can be observed: a) a slight reduction in the number of HEIs: this may occur due to a high number of mergers, acquisitions, and fusions involving the HEIs in the last years as a result of the globalization and internationalization process; b) an increase in the offering of the undergraduate e-learning courses and other different short-cycle courses or programs; c) a continued misbalance among offer and demand conditions, as the offer is greater than demand (students enrolled).

From the demand perspective, some trends can be observed: (a) a change in the age of the enrolled student considered ideal for the undergraduate courses; (b) an increase in the necessity for government financial and funding programs; (c) a continued misbalance among offer and demand conditions, as demand (students enrolled) is lower than places provided; (d) a preference for e-learning courses and more flexible short-cycle programs; and (e) an increased presence of women and older students in accordance with the age structure and population aging.

On the one hand, this mapping of the scenery calls attention to the practical implications of this study, such as the necessity to retain the enrolled students, avoiding evasion and promoting permanence in the HEIs as a way of improving the number of enrolled and undergraduate students. Also, based on the IGC Index, the immediate necessity of courses' quality improvement. Besides that, the countries' education level has a great impact on its development. So, it would be of great interest and relevance to improve the number of undergraduate students. Thus, HEIs will need to enhance the discussion of forms and mechanisms of governance models as the above conditions, plus fierce competition, impact on their future maintenance.

On the other hand, at the same time they will need to identify new target groups as potential entrants, as they are faced with the falling birth rate and the increasing aging population. In that respect, based on the literature review and the data analyzed, this study identified some tendencies concerning the supply and demand for Higher Education in Brazil, indicating some potential target entrants, despite the ones considered ideal for undergraduate courses, the so-called "late entry" population [41]; the stranded midway

**Table 10** Trends concerning the HEIs

| Internal | External |
|---|---|
| New management models and work processes | New models of relationship among HEIs and their stakeholders |
| Support technologies | Support technologies |
| New student profiles | International students (more global, a distinct profile) |
| Undergraduate courses (classroom, e-learning and hybrid forms of offering) with innovative technologies | Undergraduate courses (classroom, e-learning and hybrid forms of offering) with innovative technologies, focused on the global citizen. |
| Professors' and administrative board training | Internationalization of Education (professors, students, and administrative board) |
| Financial resources and investment to support new challenges | Financial resources and investment to support new challenges |
| | Concurrence: local, regional, national and international |

younger students [53], and the "academic second-training professional" already undergraduate which would like to embrace a new profession [70].

HEIs, specially the private ones, can also involve themselves in business networks or strategic relationships networks to face these new challenges. New opportunities can emerge from this context where the resources are scarce from the market and from the HEI's perspective, from the offer and the demand point of views. Complementary and similar skills and competencies can serve as a reference for defining new patterns of relationships.

It can be concluded that the expansion of students' enrollment during the period was desirable, and expansion was intertwined with the diversification of higher education establishments, due to the national higher education policy system. However, this increasing diversity of higher educational institutions, HEIs, and courses, contrary to what some authors propose [1], did not represent an improvement in higher education purpose when the evasion, dropout, and undergraduate rates are considered. Around the world, the expansion also occurred due to a diversification in upper secondary programs.

As can be observed, to compare different countries is a challenge. Different countries have different educational public policies which impact their methodology concerning data collection, processing, and analysis. It is also observed, as stated by Reale [37], that comparative study can create a dilemma. As Teichler [36] states, "the whole country is a single case; therefore, in order to include more than one case, we are bound to do comparative research between different countries."

On the other hand, this increased interest "to look across countries," according to Teichler [3] is also a trend.

Besides that, the strategic environment of higher education institutions can also be considered. It is important to remember that almost everything we know today will be done differently in the future and the HEIs need to take this fact into account, both to run their own business, to generate new knowledge, and to prepare the students of tomorrow.

From the internal point of view (Table 10), HEIs will need to be attentive to their students' new profile, the availability of new technologies parallel to the generation of new knowledge, to maintain their work processes and management models up to date, and keep the human resources trained to meet the new challenges.

Related to the external point of view (Table 10), globalization and internationalization have required another stance from educational institutions. In addition to what has already been stated, HEIs will need to be attentive to this new international student profile, the courses offered and the specific training of their human resources, including teachers, to meet the challenge of the global citizen.

Finally, in 2015, the world's leaders set ambitious goals for the world for the future of the global community. Goal 4 of the Sustainable Development Goals (SDGs) is related to education and seeks to ensure "inclusive and equitable quality education and promote lifelong learning opportunities for all" [63].

Access, participation, and enrollment variables, such as the ones studied, are imperative to provide equal access to high-quality education for all. Moreover, "what matters are the skills acquired through education. It is the competence and character qualities that are developed through Educational Level that makes people fruitful and resilient in their professional and private lives. They are also key in determining individual well-being and the prosperity of societies" [63].

# 7 Recommendation for future research

Further study will be required to upgrade the analysis with the Higher Education Census data, to accompany its longitudinal and historical evolution of supply and demand conditions. As a consequence, it is important to evaluate its impact in the higher education institutions (HEIs), to enhance the discussion about its forms and mechanisms of governance, their performance metrics index of undergraduate courses and compare them to other countries around the world.

## Appendix: Age of undergraduate students in the OECD main area, 2013–2014, Brazil

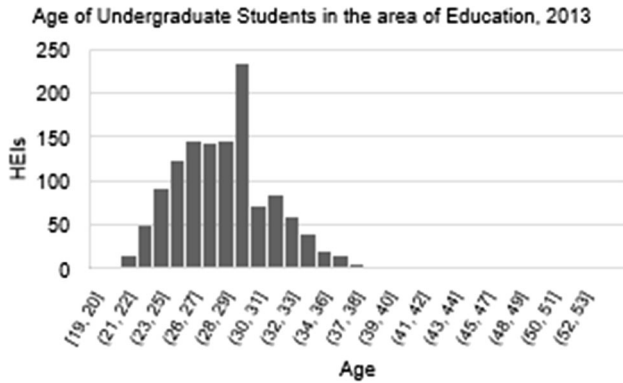See Figs. 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31.



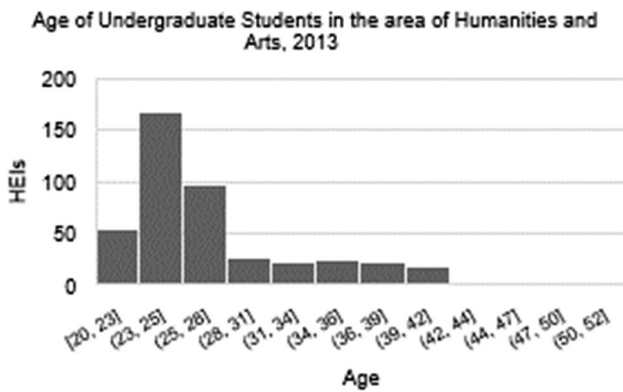**Fig. 16** Age of undergraduate students in education, 2013. *Source*: MEC/INEP



**Fig. 17** Age of undergraduate students in humanities and arts, 2013. *Source*: MEC/INEP
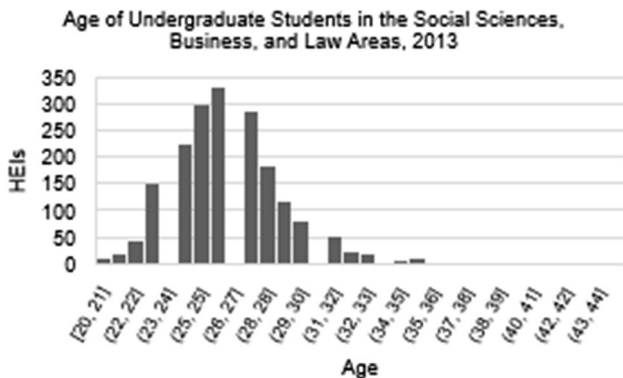


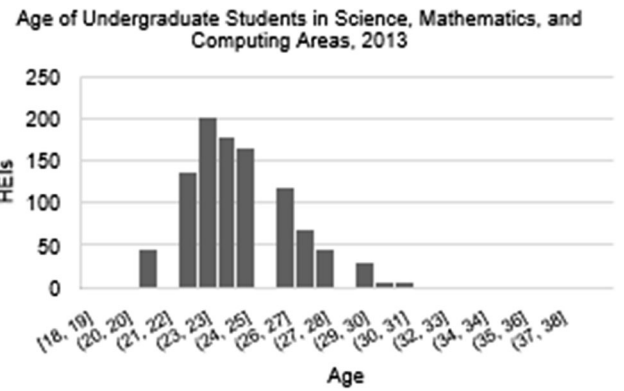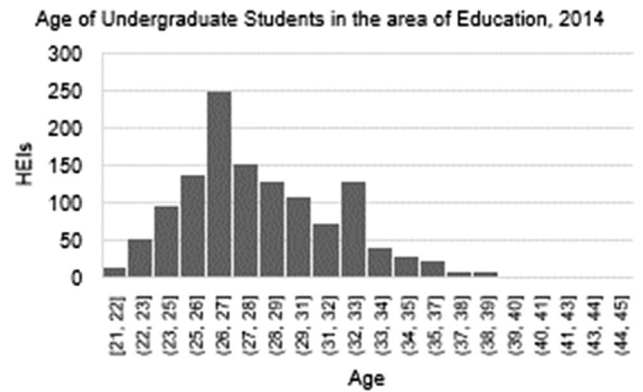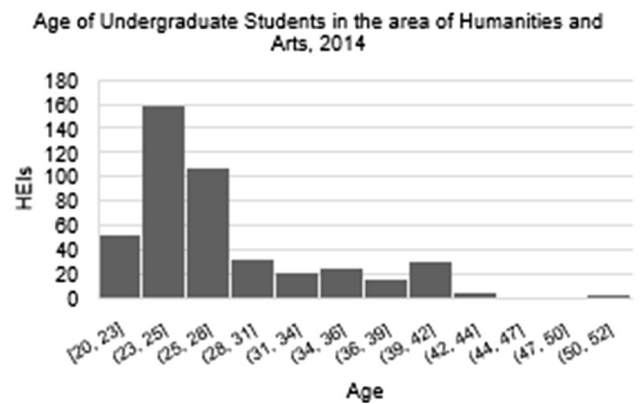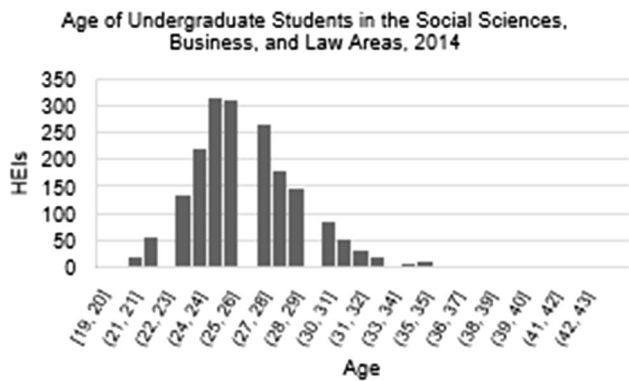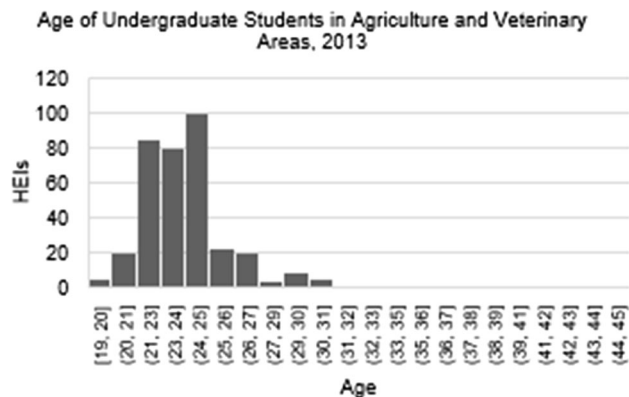**Fig. 18** Age of undergraduate students in the social sciences, business, and law areas, 2013. *Source*: MEC/INEP



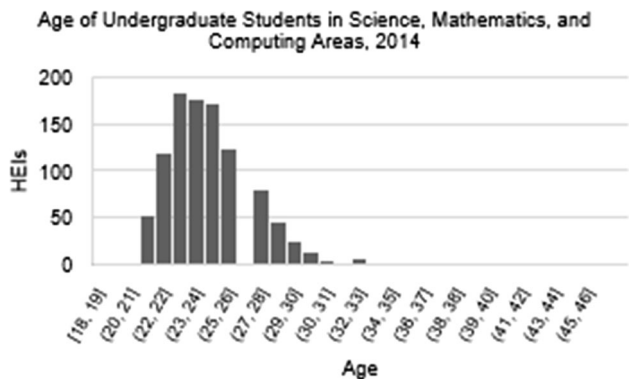**Fig. 19** Age of undergraduate students in science, mathematics, and computing areas, 2013. *Source*: MEC/INEP
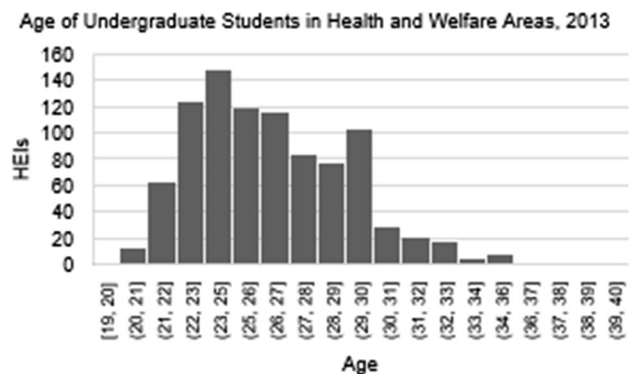


**Fig. 20** Age of undergraduate students in education, 2014. *Source*: MEC/INEP



**Fig. 21** Age of undergraduate students in humanities and arts, 2014. *Source*: MEC/INEP

**Fig. 22** Age of undergraduate students in the social sciences, business, and law areas, 2014. *Source*: MEC/INEP



**Fig. 23** Age of undergraduate students in science, mathematics, and computing areas, 2014. *Source*: MEC/INEP
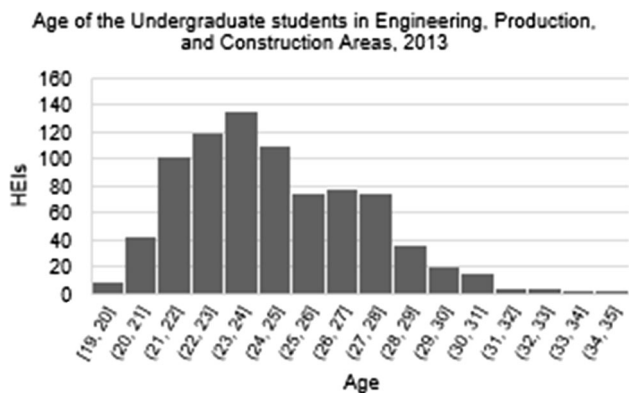


**Fig. 24** Age of the undergraduate students in engineering, production, and construction areas, 2013. MEC/INEP



**Fig. 25** Age of undergraduate students in agriculture and veterinary areas, 2013. MEC/INEP



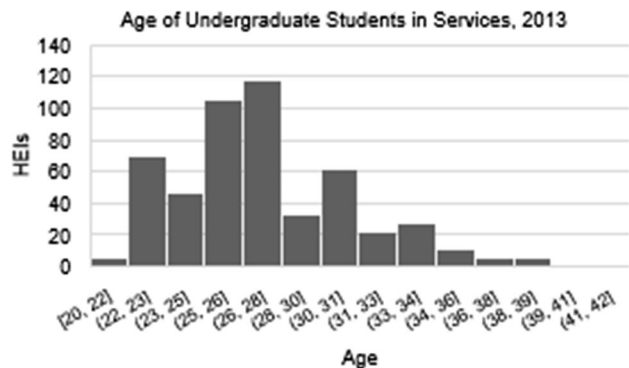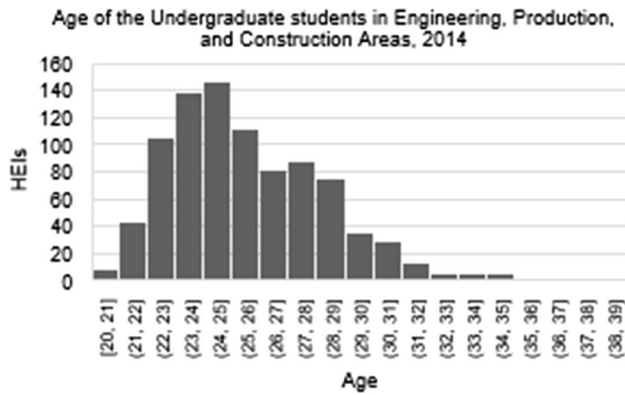**Fig. 26** Age of undergraduate students in health and welfare areas, 2013. MEC/INEP



**Fig. 27** Age of undergraduate students in services, 2013. MEC/INEP

**Fig. 28** Age of the undergraduate students in engineering, production, and construction areas, 2014. MEC/INEP
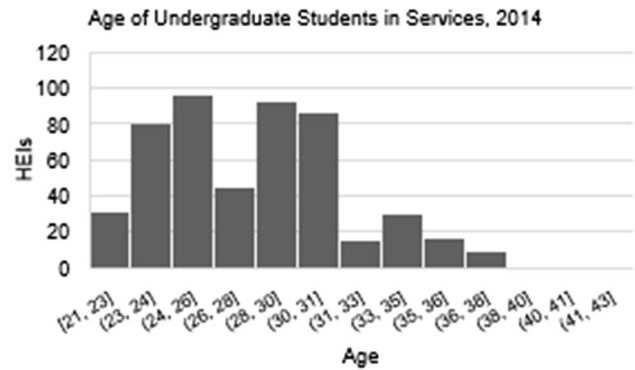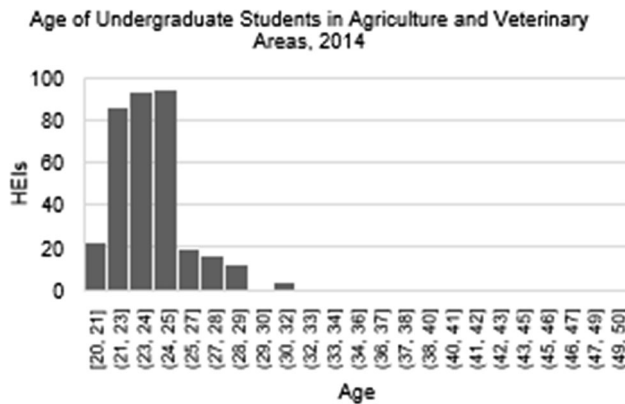


**Fig. 29** Age of undergraduate students in agriculture and veterinary areas, 2014. MEC/INEP



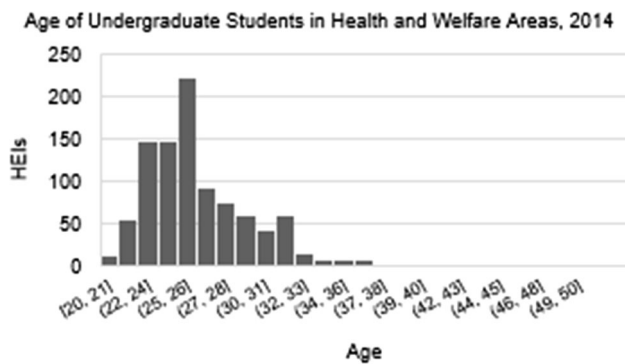**Fig. 30** Age of undergraduate students in health and welfare areas, 2014. MEC/INEP



**Fig. 31** Age of undergraduate students in services, 2014. MEC/INEP

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