



ISSN: 2230-9926

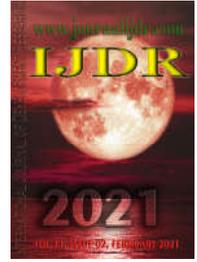
Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research

Vol. 11, Issue, 02, pp. 44756-44762, February, 2021

<https://doi.org/10.37118/ijdr.21166.02.2021>



RESEARCH ARTICLE

OPEN ACCESS

IMPACT ANALYSIS OF SISU AT THE FEDERAL UNIVERSITY OF TOCANTINS

Flávio Fernandes De Melo, Carlos Eduardo Alves Cavalcante, Patrick Letouze Moreira, Andreas Kneip and *José Itamar Mendes De Souza Júnior

Universidade Federal do Tocantins, Palmas - TO, Brasil

ARTICLE INFO

Article History:

Received 11th December, 2020

Received in revised form

25th December, 2020

Accepted 17th January, 2021

Published online 28th February, 2021

Key Words:

SISU; ENEM, Entrance Exam,
Applied Statistics.

*Corresponding author: José Itamar Mendes
De Souza Júnior

ABSTRACT

This work aims to analyze the possible impacts of using the Unified Selection System (SiSU) at the Federal University of Tocantins. Thus, statistical and comparative research was carried out, using data generated from 2008 to 2018. Through statistical data, it was possible to compare results from the use of SiSU and the selection process previously used by the university.

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Citation: Flávio Fernandes De Melo, Carlos Eduardo Alves Cavalcante, Patrick Letouze Moreira, Andreas Kneip and José Itamar Mendes De Souza Júnior. "Impact Analysis of SiSU at the Federal University of Tocantins", *International Journal of Development Research*, 11, (02), 44756-44762.

INTRODUCTION

The proposal to create a Unified Selection System (SiSU) aimed, according to the Ministry of Education (MEC) (BRAZIL, 2010b), to achieve greater democratization of opportunities for access to higher education institutions (HEIs) in the country. In this same direction, Nogueira *et al.* (2017) state that the use of SiSU should supposedly produce at least three initial advantages, namely:

- The reduction of the operational costs of the selection processes, which until then were carried out individually by each institution;
- Greater efficiency in filling vacancies, with an increase in the number of possible candidates; and,
- Increase social inclusion, making it possible for the poorest to apply for any vacancy at participating institutions at no additional cost, or the need to travel to take tests in other cities.

In this context, some studies were carried out to analyze the impacts of SiSU, Santos (2011) observed that after the adoption of SiSU at the Federal University of Recôncavo da

Bahia (UFRB), there was a considerable increase in the number of applicants and in the rate of filling in vacancies. Gómez and Torres (2015) identified in their research the reduction of dropout in engineering courses at the Campus Medianeira of the Federal Technological University of Paraná (UTFP). In another research on the topic, Barbosa *et al.* (2017), using binomial statistical tests, found significant variations in the dropout rates at the University of Uberlândia, when analyzing areas of knowledge separately, the author identified, for example, a significant increase in the dropout rate of Exact Sciences and Terra, on the other hand, identified a reduction in the dropout rate in the areas of Human Sciences, Linguistics, Letters and Arts. In turn, Li and Chagas (2017) studied, using data from ENEM from 2009 to 2014 and data from ENADE (National Higher Education Examination) of the years 2007 and 2008, the effects of SiSU on student migration and dropout nationwide. The study was determined through mathematical models that show that the use of the SiSU would increase the likelihood of interstate migration while reducing intra-state migration. Furthermore, according to the authors, the probability of evasion in the first year would also increase by 4.5% with the use of SiSU.

Therefore, the papers cited showed different possibilities, aspects, and impacts of the application of SiSU in each of the federal universities that were studied. Hence, this plurality of possibilities encourages the need to study the effects of SiSU in other universities that adhere to the Unified Selection System proposed by MEC. Thus, it is relevant to assess the impact of SiSU at the Federal University of Tocantins (UFT). Currently, approximately 3,300 vacancies are offered by UFT, distributed in classes of 53 undergraduate courses in its 7 campuses. From 2004 to 2015, the university admission process of students was carried out by the Permanent Selection Committee (COPESE), managed by the university itself. In 2010, in Ordinance No. 2 of the MEC (BRAZIL, 2010a), the use of the National High School Examination Notes (ENEM) was instituted, as a basis for the selection processes of public HEIs in the country. For this, SiSU was created, with national coverage, which allowed interested institutions to replace their individualized selection processes. UFT initially allocated only part of its vacancies to SiSU, maintaining the application of the entrance exam conducted by COPESE, its main selection process. The number of places available for SiSU has been systematically changed since 2010 until reaching the total number of places in 2015, remaining so until 2018.

Given the above, this work aims to verify the possible impacts of the adoption of SiSU by UFT. In pursuit of this purpose, statistics were generated and analyzed for data produced between the years 2008 and 2018. This period includes the implantation and use of SiSU, as the main university selection process.

METHODOLOGICAL ASPECTS

In order to carry out the evaluation of the impacts of SiSU at UFT, the data provided by the institution itself will be used, in order to generate evidence that supports conclusions or that leads to further in-depth studies. Thus, in this methodological path, the defined process will be presented to seek to answer whether the adoption of SiSU was a correct decision or not. In this work, the proposal of Santos (2007) was adopted, that is, for a statistical study to produce reliable results, it is necessary to fulfill some essential steps: problem identification, planning, data collection, presentation of information, its analysis and interpretation. Based on these steps, this work analyzes some statistics impacted by the adoption of SiSU by UFT. Aspects such as age, sex, dropout rate by type of selection process, and the entry of academics from other states were analyzed.

In particular, in this work, a special focus was given to new students through the university's affirmative action system. These actions were defined by UFT through resolutions No. 3A / 2004 (CONSEPE, 2004) and No. 14/2013 (CONSUNI, 2013), which instituted the reservation of vacancies for self-declared indigenous and quilombola candidates, respectively. Following the definition of the problem, the raw data was collected and organized. All data studied were requested from the Dean of Undergraduate Studies, which provided a general report of the information used for the academic census. This report was processed and imported into a database, so that the records were organized and grouped year by year, from 2008 to 2018. After obtaining and organizing, the data were then exported in a table format, to facilitate computational processing using algorithms in Software R. The R is a language and environment for statistical computing that offers a wide variety of techniques and graphics (R

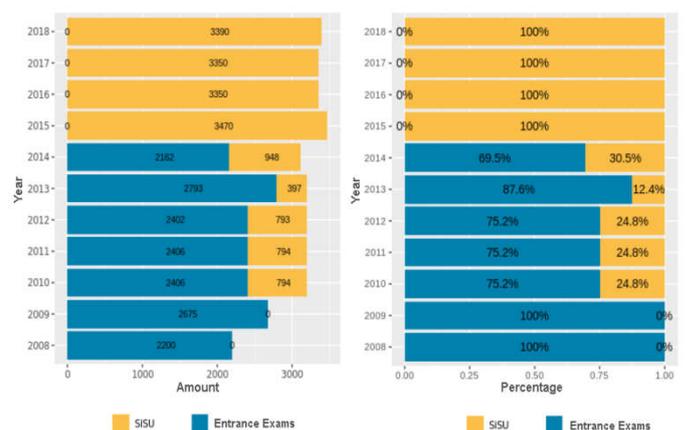
DEVELOPMENT CORE TEAM, 2018). With the aid of R, some metrics were calculated to allow the analysis of the information. Among the statistics generated, basic measures were used, such as: minimum, maximum, and average values. In addition, the standard deviation was determined as a measure of dispersion, whose utility, as described by Feijoo (2010), is to find a value that summarizes the variability of a data set, describing the degree of dispersion around a central position. In the last step, after the data processing has been completed and all predetermined statistics have been calculated, the results have been compiled and presented in a graphic format, facilitating visualization and understanding, which are analyzed and discussed in the following sections.

DATA ANALYSIS

In this section, we seek to separately analyze each of the statistics that have been generated regarding the impacts of using SiSU at UFT. In the following subsections, the availability of vacancies, the rate of filling vacancies, the number of calls per process, the age of the freshmen, sex, the origin of the freshmen, and data on the dropout rate of UFT students were analyzed.

Vacancy: The vacancies offered by SiSU in 2013 were reduced to almost 12.5%, maintaining this value until the first semester of 2014. For the second period of 2014, the number of vacancies for SiSU has changed again, this time to 50%, which determined a final annual rate of 30.5% in the aggregate of the two semesters. In 2015, 100% of undergraduate courses were allocated to SiSU, which became the university's main selection process. The total availability of places for SiSU remained until 2018.

It is important to note that, due to the non-filling of all vacancies even after making extra calls to the waiting list, as of 2015, the use of Complementary Selective Processes (PSC) was instituted for the remaining vacancies. The PSCs performed by UFT, also use the grades obtained in the ENEM test. However, these processes were entirely managed by the institution itself. Figure 1 presents graphs that represent the distribution of vacancies offered for the selection processes: own entrance exam and SiSU. In the years 2008 and 2009, the UFT selection process was exclusively the entrance exam. In 2010, SiSU started to be used as one of the selection processes, providing almost 25% of the total vacancies, with the same rate remaining until 2012.

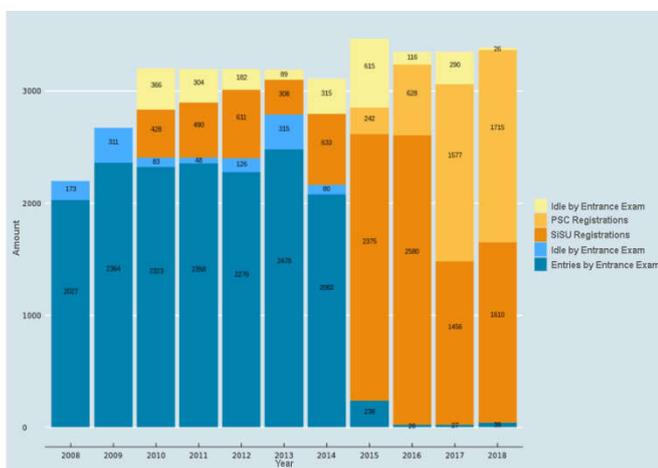


Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 1 – Vacancies by Ticket Form.

Annual Registration: In 2008 and 2009, the entrance exam was the only selection process, registering vacancy filling rates of 92.1% and 88.4% respectively. In 2010, already with the use of SiSU, 96.5% of the places destined for the entrance exam were filled, while the occupation of the places destined for SiSU was only 53.9%. In 2011, the entrance exam filling rate rose to 98.0%, in the same year the SiSU occupancy rate increased slightly, ending the year at 61.7%. The occupancy rates for the entrance exams and SiSU in 2012 were 94.8% and 76.9%, respectively. In 2013, there was a significant reduction in the number of places available for SiSU. However, the percentage of SiSU vacancies that were filled this year remained at the same level as the previous year, at 77.6%. Conversely, with a greater offer of vacancies this year, the percentage of occupation by the entrance exam fell to 88.7% of the total. After further changes in the vacancies offered by UFT's selection processes, in 2014 the occupation of vacancies from SiSU decreased to 66.8%.

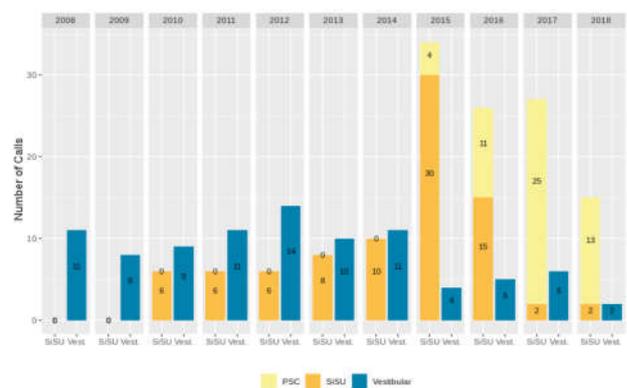
In turn, the occupation of vacancies offered by the entrance exam had significant growth, representing 96.3% of the vacancies offered for this process. As of 2015, the institution began to make the vacancies available to SiSU in full. However, even after some extra calls and the use of the PSC, the occupation of vacancies was low, registering 75.4%. Considering only the filling of vacancies by SiSU, the rate was only 68.4%. In the years 2017 and 2018, The UFT made only the regular call and one call from the SiSU waiting list, leaving all vacancies that remain idle in charge of the PSCs, making the number of enrolled by the latter more expressive than in fact by SiSU. In relation to 2017, we have 42% enrolled through the SiSU process, 45.5% through PSCs, and 8.4% idle vacancies. At the end of 2018, the total number of enrollments by PSCs registered an increase again reaching 49.4% of the total vacancies, against 46.4% of SiSU, thus we have the lowest vacancy rate registered in the analyzed periods, 0.7% of vacancies offered. It is also worth mentioning that, in addition to the use of several PSCs, there were some "extras entrance exams" and vacancy rescheduling processes, courses with lower demands for others with more waiting candidates, which also helped to reduce the number of vacant vacancies in these last few years. the full use of SiSU. Figure 2 shows a graph showing the status of the vacancies that were offered by UFT. The data were grouped separately for the entrance exam, SiSU and PSCs. The idle vacancies of SiSU and PSCs were grouped because they are the same vacancies.



Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 2. Status of vacancies by school year

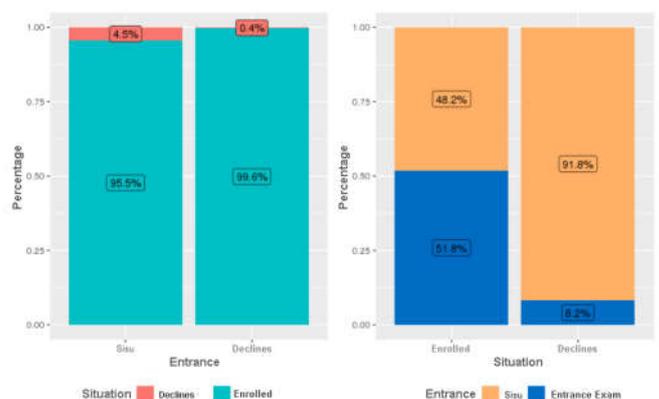
Quantity of Calls: In the analyzed period, there was a significant increase in the number of calls and complementary processes. From the information in Figure 3, it can be seen that the number of calls from the entrance exam changes little. There were small fluctuations until 2015, falling from this year onwards since only vacant vacancies were offered in classes that had already started. In the case of SiSU, until 2014 the number of calls was less than the number of calls from the entrance exam "vestibulares". With the use of SiSU as the main means of entry, it was necessary to significantly increase the number of calls to fill the vacancies offered. The number of SiSU calls went from 10 in 2014 to 30 in 2015 with 4 extra calls coming from PSCs, decreasing over the years, reaching the lowest level in 2018 with 2 calls to the SiSU national process and 13 other calls made by PSCs. It is also observed that, with the strategy of making only two calls from students from the process conducted by the MEC, the PSC becomes the process with the highest number of calls.



Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 3. Number of Calls per Entry Process

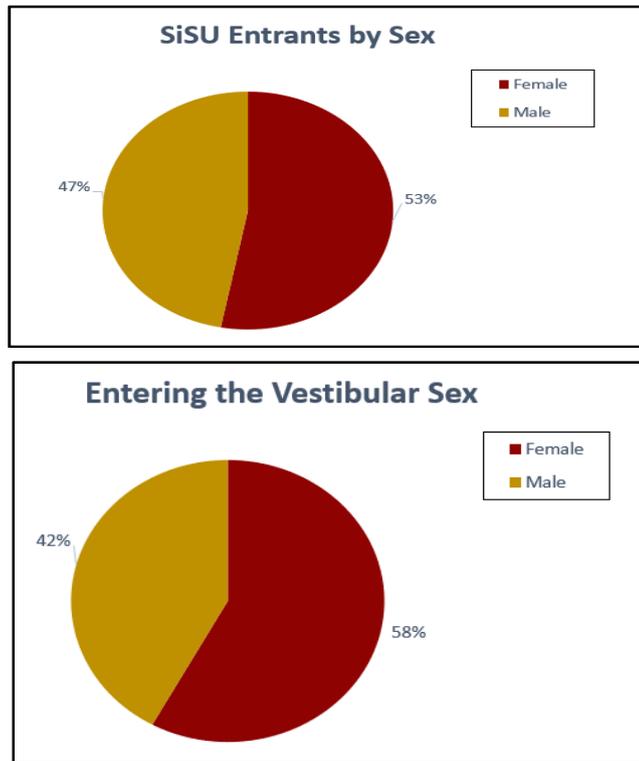
Declinants: Another aspect analyzed was the number of students who, although enrolled, for some reason gave up their places at the university before the effective start of the course and requested the cancellation of their enrollment. In this case, the university automatically cancels enrollment and classifies them as declining. The graphs in Figure 4 show the relationship between total enrolled and declining students from 2008 to 2018 grouped by the selection process. It is possible to identify that the percentage of declines in the institution is less than 5%. However, most of the declines in the analyzed period were selected through SiSU, representing 91.8% of the total.



Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 4. Relationship between declining and enrolled students by admission process

Sex of Members: Analyzing the data on the sex of the students who entered UFT, during the studied period. It was identified in the graph in Figure 5 that the number of female entrants exceeds the number of males in both forms of selection. The female sex represents 53% of those entering SiSU. Regarding the entrance exam, this percentage rises to 58% of newly enrolled students. It is important to emphasize that the database currently used is not fully adapted to consider new concepts on gender identity. For this reason, the analysis was restricted to the two basic genres already mentioned.



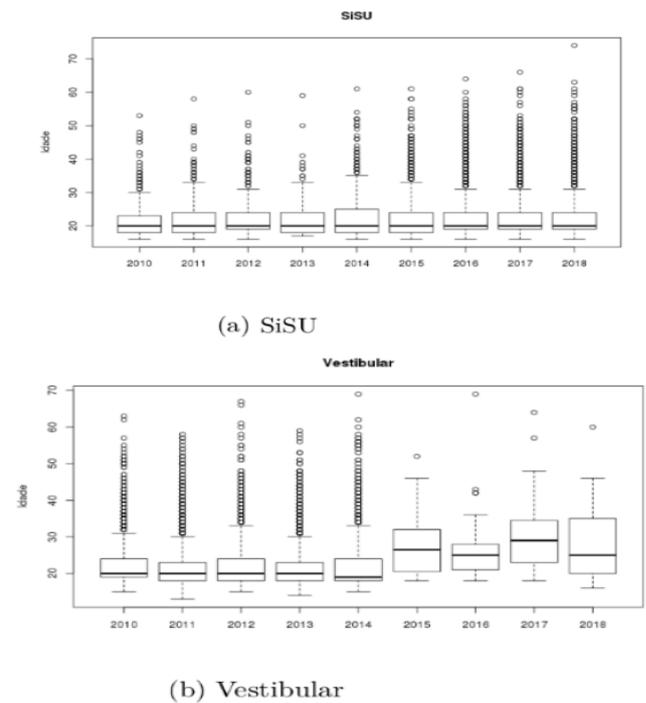
Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 5. Enrollments grouped by gender

Age of Members: In order to perform a better analysis of the age of the freshmen, it was decided to consider only the period from 2010 to 2018, to allow a year-to-year comparison between the forms of selection studied. Also, the outliers of each sample were disregarded in order not to influence the efficiency of the analyzes. Therefore, the box diagram presented in figures 6(a) and 6(b) was used, which facilitate understanding. Considering only students selected by the entrance exam, in Figure 6 (b), there was a greater variation in the mean and in the age deviations.

Initially, the values found remained close to those of SiSU, with an average of 22 years and a maximum of 31 years. From 2015, the values fluctuated more, reaching the maximum age of 48 years in 2017. At the end of 2018, we found an increase in the average to 28 years and a 9.7 standard deviation. Analyzing the entrance exam data, there is a smaller number of outliers compared to SiSU.

State of Origin of Academic: One of the great advantages that should be obtained by using SiSU would be the increase in academic mobility in the country. This was one of the main forecasts of the MEC, which were contained in the proposal submitted to the National Association of the Directors of Federal Institutions of Higher Education (ANDIFES), in 2010 (BRASIL, 2010b).



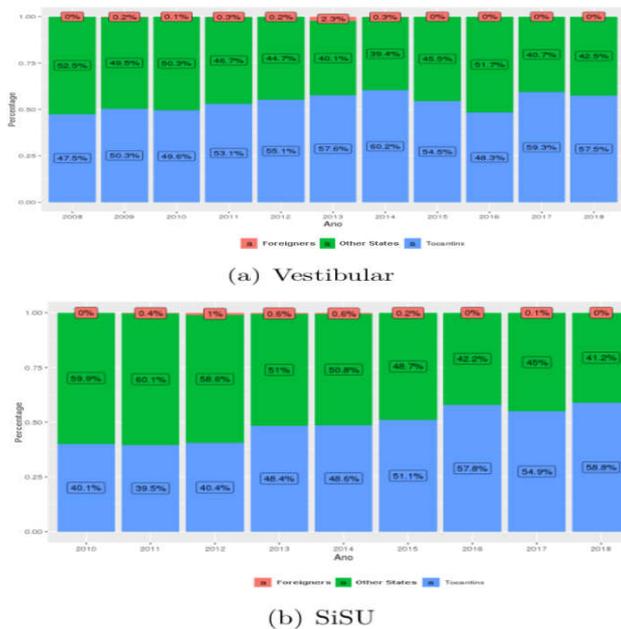
Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 6. Age distribution by admission process

Given this assumption, we seek to verify the real influence of SiSU on the statistics of the naturalness of UFT students. In this study, only interstate migration was analyzed, not considering mobility between municipalities in the state itself. When analyzing the graph in Figure 7 (a), it can be seen that the total number of students from the state itself remained almost always higher than students from other states. Only in the years 2008, 2010 and 2016, students from other states surpassed the total of Tocantins. Despite this, the number of non-Tocantins who entered the university entrance exam remained very expressive, always above 39%. The total number of foreigners selected, in turn, remained low, with the exception of 2013, which registered 2.3%.

The graph in Figure 7 (b) indicates that in the initial years of using SiSU, the MEC's forecast for increasing academic mobility came to fruition. In the period between 2010 and 2014, the total number of students from other states exceeded the number of students from the Tocantins, at a higher rate than that found in the numbers related to the entrance exam. However, from 2015 onwards, the number of new entrants from the Tocantins began to exceed the total number of students from other states, a different behavior than expected with the use of SiSU. The number of foreign students selected through SiSU represented a tiny portion of those entering, almost always being below 1% of the total. In general, the academic community at UFT, whether selected via entrance exam or SiSU, remains very diverse.

The number of non-Tocantins students selected, remains significant in the institution, since more than 39% of all students selected in the analyzed period, were not born in the state. However, the use of SiSU did not have a permanent impact on general academic mobility related to UFT.



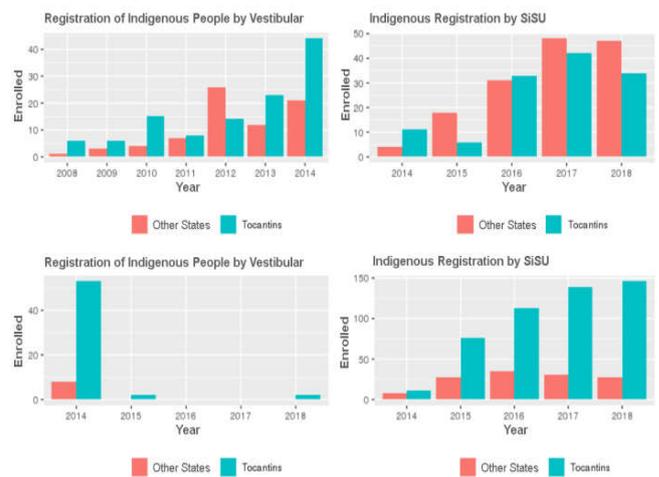
Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 7. Grouping of Origin of Enrolled Persons

Affirmative Actions: The main affirmative actions developed by UFT are the reservation of vacancies for indigenous and quilombola candidates. For this reason, special attention was paid to the analysis of the impact of SiSU, in relation to the origin of the newcomers by these actions. The data obtained are compiled in the graphs shown in Figure 8. In detail, the reservation of places for indigenous students began in 2003. During the period studied, most of the indigenous people entering through the entrance exam were from the Tocantins. Only in 2012, the total number of students from outside the state surpassed the number of Tocantins. In contrast, with the use of SiSU, indigenous students from other states had greater access to UFT vacancies. The number of non-Tocantins students surpassed the total number of local students entering SiSU, in most years analyzed, with the exception of the years 2014 and 2016, demonstrating that in the case of indigenous candidates, SiSU represented greater access of students from other states to places reserved by UFT.

In turn, the reservation of places for quilombola students began in 2014, the last year before the use of SiSU as the main means of selection. In this way, the numbers related to the entrance exam after 2014, consider only quilombolas entering through the extra-entrance exam for vacant vacancies, which explains the low number represented in the graph, and all of them being of the Tocantins. However, in relation to students entering through SiSU, it is possible to verify that the total number of quilombola students from the Tocantins always remains well above those from other states. Of the selected, the students' quilombolas born of Tocantins represented 79% of the total quilombolas registered by SiSU, against 21% in other states. However, despite remaining below the total number of Tocantins, the number of quilombolas from other states had a considerable increase in relation to those selected by the entrance exam, from 8 candidates approved in the 2014 entrance exam to an average above 25 with the use of SiSU.

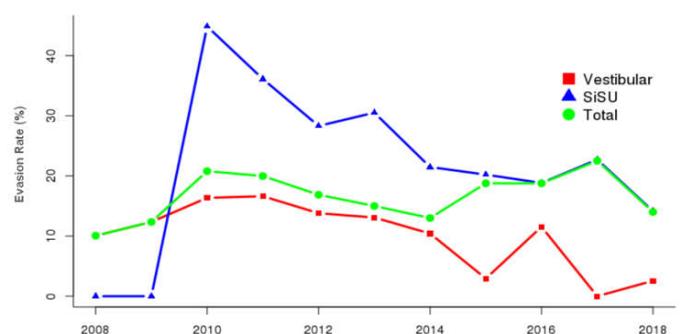
Evasion: A negative consequence of using SiSU as a means of entry is the possible increase in evasion, as determined by Li and Chagas (2017).



Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 8. Grouping of enrolled origin (affirmative actions)

The evasion of new students by SiSU appears to be associated with student migration and strategic behaviors, for example, the possibility of selecting other universities as a second option during enrollment at SiSU. To verify if this effect reached UFT, Figure 9 that shows the survey of students who gave up their enrollment at the institution, in the same year they entered. From the graph, we see that in the years 2008 and 2009, when the SiSU had not yet been implemented, the dropout rate represents an average of 11.21% of the total enrolled. In 2010 the dropout of enrolled students, selected by SiSU, registered a rate of 44.9%, raising the total dropout rate to 20.8%. Despite the beginning with such a high rate, over the years it was gradually reduced until 2012, when it obtained a rate of 28.3%, however, remaining quite high. In 2013, the evasion rate at SiSU had a slight jump to 30.5%, but since it represented only 25% of the vacancies available, the total evasion did not suffer major changes, decreasing by 1.9%, since the entrance exam, with greater weight over this year's rate, had a drop of 0.7% in its evasion rate.



Source: Authors' elaboration based on data from PROGRAD, UFT, 2019.

Figure 9. Comparison between dropout rates by entry mode

2014 was initially marked by a decrease in the number of vacancies offered by SiSU in the first semester and an increase in the second. The dropout rate was still higher than the entrance exam, about 21.5% against 10.4% in the annual aggregate. Total evasion, however, declined slightly reaching 13%, as a result of the 9.0% drop in SiSU evasion in relation to the previous year. From 2015 to 2017, with the adoption of 100% of vacancies by SiSU, the dropout rate is basically not affected by new entrants through the entrance exam, since the same is done only to fill idle vacancies.

Thus, the total dropout rate is basically represented through the SiSU, going up to 18.8% and continues to gradually rise until reaching 22.5% in 2017. However, in 2018 the total number of dropout students is calculated at 14, 0%, which represents a decrease of 8.5% compared to the previous year. In comparison to the effect of SiSU on the total dropout rate over the years, we can observe that regardless of the number of vacancies offered by this form of selection, there was an increase in the total dropout rate. According to the numbers surveyed, in the analyzed period, the average dropout rate from the entrance exam (disregarding the years without selection processes) was 13.0%. SiSU, in turn, had an average rate of 26.4% of dropout students. With the use of SiSU, UFT's average total evasion rate rose to 16.6%, resulting in an increase of 3.65% overall, close to that estimated by Li and Chagas (2017) in their article, of 4,5 percentage points.

FINAL CONSIDERATIONS

One of the impacts of the adoption of SiSU at UFT was the low filling of vacancies offered in the process, which demanded the need to make multiple calls, raising this amount significantly. However, even with the high number of calls, it was still necessary to create and use complementary selection processes in addition to the relocation of vacancies, which generates an additional cost and effort on the part of the university management, not fulfilling one of the objectives intended by SiSU the reduction of operating costs. Another unwanted effect by SiSU, was the increase in the number of declining students related to this process, more than 90% of the total declining students in the studied period were students selected by SiSU. Regarding the characteristics of the freshmen, it is observed that the profile of the students, little changed, given the use of SiSU. It was identified that the average age and the general number of enrolled grouped by sex did not suffer any relevant impacts. Although they did not impact the average age, there was a small increase in the number of older people who joined through SiSU. When analyzing the academic background, it is noteworthy that the share of freshmen from other states has always been quite significant. With the implementation of SiSU, during the first three years, the representativeness of these students grew as an expected consequence of adopting a nationwide process. However, this effect has diminished over the years, demonstrating a temporary impact on the institution. In turn, the migration of students using affirmative actions has had a greater impact due to the adoption of SiSU, enabling a considerable increase in the access of these students to UFT. In the case of indigenous people, students from outside the state started to represent more than half of those selected in the modality referring to this affirmative action by SiSU. Similarly, access to UFT vacancies for quilombola students from other states has increased significantly with the use of SiSU as a selection process, practically tripling the number of quilombola students from other states at UFT. Regarding the permanence of academics, since the implantation of SiSU as a selection process, there was a relationship between the form of admission used and a higher dropout rate.

In this sense, although we cannot determine that it is the only cause, since the implantation of SiSU, the evasion rate of the institution increased, principally after 2015 when 100% of vacancies were allocated to SiSU. Despite some positive impacts with the use of SiSU, such as increasing the inclusion of indigenous and quilombola students from other states and

the initial reduction in the costs of the selection process, some other impacts proved to be quite negative. The reduction in initial costs is overcome by the need for several calls, complementary processes, and relocation of vacancies, thus requiring a great effort to fill the vacancies offered by the institution. The considerable increase in dropout in the first year together with the growth in the number of declines related to SiSU also testify against the effectiveness of the process. These facts maybe some of the motivators for the institution to take the entrance exam again in 2019, reserving only 50% of the places in undergraduate courses for SiSU, seeking to reduce the negative impacts while maintaining the benefits obtained. Thus, it is concluded that the use of SiSU as the only form of admission was not successful as expected, and it is still interesting to be used as a complementary process, making the form of admission of the institution a little more comprehensive. As future work, the mentioned impacts can be further investigated using, for example, individual studies by courses or areas of knowledge. In this way, we could identify a possible occurrence of the Simpson paradox (also known as the reversal paradox or Yule-Simpson effect), which according to Mheen and Shojania (2014) refers to an association or effect found in several subgroups, but which is canceled or reversed when data from these groups are aggregated. The use of new variables can generate situations similar to the results of Barbosa *et al.* (2017) that may differ from the results initially found in this work. For this reason, it is pertinent to deepen the studies carried out to obtain a more precise analysis of the results found.

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