PANORAMA
ISSN: 1909-7433
ISSN: 2145-308X
ednorman@poligran.edu.co
Politécnico Grancolombiano
Colombia

ACADEMIC PERFORMANCE GENDER GAP IN SABER PRO FOR BUSINESS ADMINISTRATION PROGRAMS IN THE DEPARTMENTS OF COLOMBIA

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PANORAMA, vol. 13, núm. 25, 2019

Politécnico Grancolombiano, Colombia

Disponible en: https://www.redalyc.org/articulo.oa?id=343963314019

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Artículos de investigación científica y tecnológica

ACADEMIC PERFORMANCE GENDER GAP IN SABER PRO FOR BUSINESS ADMINISTRATION PROGRAMS IN THE DEPARTMENTS OF COLOMBIA

Brecha de rendimiento académico por género en saber pro en programas de administración en los departamentos de Colombia

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PANORAMA, vol. 13, núm. 25, 2019

Politécnico Grancolombiano, Colombia

Recepción: 28 Agosto 2019
Aprobación: 21 Octubre 2019

Redalyc: https://www.redalyc.org/articulo.oa?id=343963314019

Abstract: Gender gaps are noticeable in access and graduation rates of higher education. This work makes progress in producing an index of learning gender gaps in higher education in the departments of Colombia between 2016 and 2018, evidenced in the results of the Saber Pro test. Significant differences are often reported between scores of men and women in Saber Pro, deriving from the context of differences in their social origin. To perform the analysis proposed in this work, non-normal distribution of the scores of men and women in the five competences evaluated in Saber Pro are confirmed (Kolmogorov-Smirnov test) and statistically significant differences between male and female scores in that test are confirmed at national level and in different departments (nonparametric Mann–Whitney U test and Kruskall-Wallis test). Then, results of the Gender Performance Gap Index proposed per competence in Saber Pro and by department are introduced. Gender gaps tend to exist in Colombian departments with the highest number of students in Saber Pro, and the smallest gaps are present in departments with the lowest performance in this exam. Findings are discussed in light of geographical concentration of opportunities.
Gender gap; academic achievement; administration; higher education.
https://doi.org/10.15765/pnrm.v13i25.1410

Keywords: Gender gap, academic achievement, administration, higher education.

Resumen: Se evidencian brechas de género en acceso y graduación de la educación superior. Este trabajo avanza en la construcción de un índice de brechas en aprendizaje en la educación superior, evidenciado en Saber Pro, que muestre dichas brechas en los departamentos de Colombia entre 2016 y 2018. Repetidamente se reportan diferencias significativas entre puntajes de hombres y mujeres en Saber Pro, en el contexto de diferencias según su origen social. Para realizar el análisis propuesto en este trabajo, se confirma la distribución no normal de los puntajes de hombres y mujeres en las cinco competencias evaluadas en Saber Pro (prueba de Kolmogorov-Smirnov), y las diferencias estadísticamente significativas entre puntajes de hombres y mujeres en estas competencias, a nivel nacional y en diferentes departamentos (pruebas no paramétricas U de Mann-Whitney y Kruskall-Wallis). Luego, se presentan resultados del índice de brecha de rendimiento por género propuesto por competencia en Saber Pro y por departamento. Las brechas por género tienden a mantenerse en los departamentos con mayor número de estudiantes en Saber Pro, y las menores, en departamentos con

menor desempeño en este examen. Esto se discute desde la concentración geográfica de oportunidades.
Palabras clave: Brechas de género, logro educativo, educación superior.

Introduction

Gaps in payment and labor force participation rates exist in Colombia (World Economic Forum, 2018; OCDE, 2015). These gaps have subsequently been reported in higher education and are known as access or graduation rates (Becerra Gualdron, Gallardo Sánchez, & Becerra Gualdron, 2018). Yet, fewer studies analyze these gaps in terms of learning attained by students (Ramírez, 2014; Bernal & Bernal, 2016; Arias-Velandia, Rincon-Baez, & Cruz-Pulido, 2018). This study characterizes academic achievement gaps between men and women enrolled in benchmarked programs of business administration and alike in the Saber Pro test between 2016 and 2018. Said gaps are depicted for Colombia's departments (the country's political-administrative division).

This text is based on three concepts: academic performance (or academic achievement), gender gap and geographic distribution of students' characteristics. Academic performance or achievement refers to learning attained by each student in the areas he/she has studied or is currently studying, with the support of the educational system (Cuenca, 2016; Hederich-Martinez and Camargo-Uribe, 2000; Moreno, 1998). This accomplishment may be caused by studying in an educational institution, its programs and teachers, or by other factors of the student and his/her origin (Centro Nacional de Consultoria, 2017; Rincon-Baez and Arias-Velandia, 2017). In this regard, it may reveal differences between students in external tests (World Bank, 2009; Blackman, 2011; Felder and cols., 1995; ICFES, 2016; ICFES, 2017; Ramirez-Torrado, 2014). Colombian higher education has academic performance gaps based on geographic localization and on structural elements of the educational system (Celis, Jimenez and Jaramillo, 2012).

Gender gap is understood from a perspective of student's success criteria in the educational system (Cuenca, 2016), said success is assessed based on availability, access, attained learning, and on resources and assistance to remain enrolled in higher education (Tomasevski, 2003). Worldwide, 52% of the students of business administration programs and other associated areas are women (*World Economic Forum*, 2017) the figure in Colombia reaches 60% (Ministry of National Education, 2017). However, women in Colombia underperform in four of the five modules of the Saber Pro test, which could be related to factors such as being married (60%) and being financially responsible for other people (60% of the cases); comparatively, only 30% of men face the same conditions (Arias-Velandia, Rincon-Baez and Cruz, under review). With the added fact that education socialization practices usually instill fewer capacities for science-related jobs on women (Machin and MacNally, 2005; Marks, 2008).

Geographic analysis is a geolocation distribution of a particular phenomenon. Aspects such as the gender gap are analyzed in terms of regional resource distribution patterns (economic, social and cultural) (Cardona-Roman, Sanchez-Torres and Acosta-Marquez, 2018) and of the assistance provided by the vicinity (Clark, 1979; Krugman, 1999) among geographic spaces or regions. In this study, it refers to the geolocation distribution of the gender gap in different departments of Colombia (Arias-Velandia and cols., 2018).

Explanation and Approach to the Study of Differences in Academic Performance Between Men and Women

Differences in academic performance between men and women and its approaches have been explained differently. One explanation arises from differences between men and women in terms of organic development and their central nervous system, which undergoes a differentiation of hemispheres during cerebral maturity. Stemming from this differentiation, most right-handed men yield better performance than women in mathematics and better analysis and reorganization capacities of study materials and work; while most right-handed women yield better performance with language and have more capacity to integrate information and connect it with contexts where it presents itself (Hederich-Martínez, 2007). These bases are quite varied in terms of what people develop when engaged in different activities in their cultural groups (Hederich-Martínez, 2007).

Aligned with the foregoing, other explanations and approaches try to outline the weight of organic factors and cultural aspects in men's overperformance in mathematics (which should result in better performance in activities that demand problem-solving using alternative or innovative means) and in women's overperformance in language (which should result in better performance in tasks that demand memorization and use of conventional solutions) (Caro-Acero and Casas, 2013). These suggest that women tend to develop better skills for integrating information, while men develop better visuospatial capacities (Caro-Acero and Casas, 2013) based on their genetic heredity's interaction between male and female differentiation chromosomes (Caro-Acero and Casas, 2013), patterns of hormonal activity (Penner, 2008) and socialization experiences (Halpern and cols., 2007).

The third set of explanations and approaches to the study of differences in performance or achievement between men or women places more emphasis on their socialization and on cultural and institutional factors (Guiso and cols. Cited in Caro-Acero and Casas, 2008 and 2013). On one hand, they propose that gaps such as gender gaps tend to close as wellbeing indexes in different social groups increase (Cuenca, 2016). In favor of the aforementioned, the 2015 PISA study results show that the gender gap among young respondents is smaller in countries with higher scores (OCDE, 2015). On the other hand, it has been proposed that adults around children, different areas of operation within

their contexts and the operation of educational institutions as well as how relevant actors proceed, tend to unconsciously drive differentiated patterns of interaction and activities that reproduce extended ideas regarding the roles of men, women and teenagers, ideas which in turn are incorporated concerning the way in which they perceive their own academic performance, sense of self-regulation and achievement of partial goals prior to overall goals in particular learning (Caro-Acero and Casas, 2013).

According to this section, more emphasis is placed on organic development, socialization or diverse interactions between both to explain why male students usually have higher scores than women in mathematics and areas alike, and to the reasons why female students usually have higher scores than men in areas related to language. The next section compares this generality with the evidence shown by tests taken by large samples of students in national and international spheres.

Evidence of Performance in External Evaluations by Male and Female Students

The gender gap has been documented in terms of access to education and in academic accomplishment or performance. Colombia ranks 30th among 144 countries that were measured by the Global Gender Gap Report (World Economic Forum, 2017) in 2017. In higher education, Colombia has a female/male enrollment index (f/m) of 1,16: larger women enrollment. However, equity in education comes from guaranteeing successful student learning and not just access to education (Flores, 2014): differences between learning by men and women are considered the indicator of the *academic performance gender gap*. This gap is understood as the difference in academic performance between men and women (Baron, 2012; OECD, 2015), historically, results of the Saber Pro test have confirmed this gap (Arias-Velandia and cols. 2018; Ayala-Garcia, 2015; Baron, 2012; Celis, Jimenez and Jaramillo, 2012).

The 2015 international study Programme for International Student Assessment (PISA) revealed a global trend: the greater weight of student scores was placed on socioeconomic level and gender, and that score weight or relation with these variables is smaller in countries with overall higher test scores (OECD, 2016). Since sciences was the focus of the 2015 test, complementary questionnaires inquired on expectations of finding science-related jobs in the future, in many countries results showed a trend of male students feeling much more inclined than women towards finding science-related occupations (especially in information and communications technology). Women have expectations to be trained and work in science, but they tend to prefer the areas of biology and health (OECD, 2016). Moreover, students have persistent ideas instilled in their contexts related to some jobs being more "masculine" than others, e.g., technology, and other more "feminine" jobs drift away from sciences, and to differential treatment of boys and girls in their

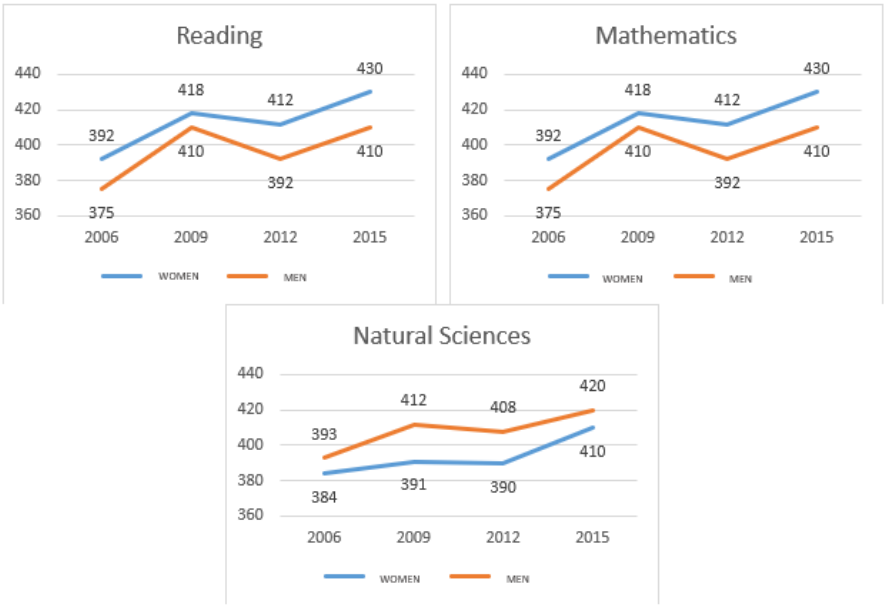
families when they begin attending school (Machin and MacNally, 2005; Marks, 2008).

A similar trend is observed in the results of students in Colombia in the 2015 PISA study (Graph 1), which show higher scores for men in sciences and mathematics and higher scores for women in reading, although there is a tendency to close this gap in sciences, and, more noticeably, in mathematics (ICFES, 2016 y 2017).

Graph 1.

Change in scores per gender for students in Colombia in the PISA-OECD study's three areas, 2006-2015.

Source: Colombia, ICFES (2016).



Graph 1 .
Change in scores per gender for students in Colombia in the PISA-OECD study's three areas, 2006-2015.
Source: Colombia, ICFES (2016).

Problem and Research Question

Women have lower results than men in external tests that measure academic performance. Specifically, the 2015 PISA study (Programme for International Student Assessment) (implemented by the Organisation for Economic Co-operation and Development, OECD) shows women overperform men in reading and underperform them in sciences and mathematics (ICFES, 2103 and 2017; OECD, 2016); and the Saber Pro test reveals higher scores by men in critical reading, quantitative reasoning, citizenship competences and English, while women only achieve higher scores in written communication (Arias-Velandia and cols., 2018). No detailed studies have been found regarding the way in which educational achievement changes in different departments of Colombia, despite studies that analyze differences in student performance per region being in place (Arias-Velandia and cols., 2018;

Castro, Ruiz and Guzman, 2018). Differences in performance between men and women, both in Saber 11 (upon culmination of secondary school and to access higher education) and Saber Pro (upon culmination of undergraduate programs) tests (Arias-Velandia and cols., 2018) have been documented. This research intends to determine if any patterns exist regarding the academic performance gender gap per departments in the 2016 Saber Pro for the benchmark group of business administration programs and alike.

Method

Type of Study and Participants

The study is descriptive and cross-sectional (Hernandez-Sampieri, Fernandez-Collado and Baptista-Lucio, 2010). It uses secondary sources and geolocated descriptive analyses (Anselin, 2013). An extensive descriptive analysis is conducted, revealing the academic achievement gender gap for students in the benchmark group of business administration programs and alike, as follows: with 45,251 students (63% women and 37% men) in 2016 and with 51,624 students (63% women and 37% men) in 2017; scrutinizing the academic performance gender gaps per departments in Colombia based on the five modules of generic competences of the Saber Pro test.

The following departments were excluded from this examination: Amazonas, Guainia, Guaviare, San Andres y Providencia, Vaupes and Vichada, due to the fact that less than thirty students took the exam per year. The proposed analysis was conducted by calculating the *academic performance gender gap (BRG, for its Spanish acronym)* based on a comparison per gender of the department's average scores in the five modules of the Saber Pro test.

Procedure to Generate and Present Results

A confirmation and validation analysis came first in order to generate and present the results; afterward, the analysis of the academic performance gender gap was conducted.

The confirmation and validation analysis intends to give weight and validity to the academic performance gender gap, according to characteristics and types of scale in the variables. As part of these analyses, the Kolmogorov-Smirnov test was applied, this statistical test measures goodness of fit to calculate if the score distribution of men and women fits the pattern of normal distribution or not.

To complement it (once the previous analysis was finished) comparisons of means between independent samples of men and women scores in the five generic modules of the Saber Pro test took place, at general level and per departments. This comparison shows if there are enough bases to assume statistically significant differences between men

and women's scores, which might substantiate an analysis of academic performance gender gap.

After the confirmation and development analysis came the development of the *academic performance gender gap analysis*, which generated the results of this analysis for each module of the 2016 and 2017 Saber Pro test (quantitative reasoning, critical reading, citizenship competences, English and written communication) per each department included in the study. For each Saber Pro test, a graph is shown to compare the academic performance gender gap of the results in that module of the test for each of the departments included in the study. In light of this information, each Saber Pro test exposes the departments with its gap, dimension and whether it favors male or female students.

Academic Performance Gender Gap Indicators and Analysis

An approach to the performance gap is developed in an analog way to what has been developed with the OECD's unadjusted gender payment gap, which is defined as "the difference between men and women's average income regarding men's average income" (OECD, 2018). Meaning, an unadjusted *academic performance gender gap (BRG)* will be determined as follows:

$$\boldsymbol{BRG} = \frac{PPSH - PPSM}{PPSH} * 100$$

Where
is a dimensionless quantity percentage factor,
is the average men's score in Saber Pro and
is the average women's score in Saber Pro. In case there is equality in the Saber Pro scores, factor
; if
the amount is positive.

Results

Results of students in Colombia in different levels of the Saber[1] test, applied by ICFES (Colombian Institute for the Promotion of Higher Education), also reveal score trends with differences between men and women. As in the PISA study, primary education has higher scores by men in mathematics and areas related to sciences, and higher scores by women in areas related to reading and writing (ICFES, 2016 and 2017; OECD, 2016). However, an analysis by the Saber Pro test pertaining students who concluded higher education programs in business administration and alike in 2016, shows higher scores by men in quantitative reasoning, citizenship competences, English and critical reading. The aforementioned breaks a trend by studies that usually

showed women overperforming in areas related to language (which in this test take place in the written communication test, the only module that is not a questionnaire and that asks students to produce written texts that are evaluated *a posteriori*) (Arias-Velandia, 2018; Arias-Velandia and cols., 2018).

In any case, an important predictor of the weight of the four modules in the 2016 Saber Pro test for business administration programs and alike in Colombia is students' score in biology and language compared with their score in Saber 11, the test conducted upon termination of high school (Arias-Velandia, Rincon-Baez and Cruz, ongoing; Ramirez-Torrado, 2014; Rodriguez-Albor, Gomez-Lorduy and Ariza-Dau, 2014). It has been found that academic performance in prior educational levels can reliably predict academic performance in subsequent educational levels (Conger and Long, 2010; Morgan and cols., 2016; Ramirez-Torrado, 2014; Türut-Asik and Meltem, 2007; Wells, 1985), it does not seem to apply in the case of Colombia, where the transition from primary and secondary education to higher education does not show predictable scores; women's scores overall tend to go down between levels, which suggests the academic performance gender gap in higher education in Colombia can be extensive.

However, it is valid to inquire into the factors that can open academic performance gender gaps in external evaluations of Colombia's higher education. A key attempt at trying to answer this question might be the students' geographic location. Previous studies show that different geographic areas in Colombia have dissimilar characteristics that show major differences in academic performance of students who reside there, namely: 1) in general, many social phenomena are located in particular geographic spots and are clustered in vicinities per zones that share characteristics that bring them closer or farther from the problem being analyzed (for example: areas with overperforming students versus areas with underperforming students) (Castro, Ruiz and Guzman, 2018; Clark, 1979; Krugman, 1999; Türüt-Asik and Meltem, 2007); 2) areas that are central to the Andean mountain ranges and valleys are usually more populated and have better access to water systems, electricity, information technologies and traded goods than the rest of the country's areas (Hederich-Martínez, 2007); 3) these areas have enhanced urban, economic and cultural modernization compared with other areas of the country (Hederich-Martínez, 2007); 4) areas with enhanced urban, economic and cultural modernization have more mobility and social roles become more flexible between groups, especially gender roles (Hederich-Martinez, 2007; Türüt-Asik and Meltem, 2007); 5) as a general trend, academic performance in external tests is usually higher in central areas, especially in its large cities (Arias-Velandia, Guarnizo-Mosquera, Ortiz-Romero and Rojas-Benavides, 2018), with some exceptions in performance by students from other regions in the last five years (Arias-Velandia and cols., 2018) and 6) a large part of the students with lower scores are women who are based in regions that are not located in the country's central areas, who are enrolled in distance programs

(mostly traditional) and where they often underperform compared to virtual distance or classical classroom programs (Rincon-Baez and Arias-Velandia, 2017).

Therefore, geolocation becomes an aspect of critical importance to analyze achievement gender gaps, such as the academic performance gender gap, and not just its differences with other zones in the country.

Analysis of Confirmation and Validation

The Kolmogorov-Smirnov test of goodness of fit (Table 1) showed that the distribution of scores by men and women present asymptotic significance below 0.05; meaning it presents statistically significant differences with the normal distribution. Therefore, the distribution of scores by men and women do not adjust to the normal distribution pattern.

Kolmogorov-Smirnov test for a sample

		QUANT. REAS.	CRITICAL READ.	CITIZ. COMP.	ENGLISH	WRITTEN COMM.
N		51,742	51,742	51,742	51,742	49,548
Normal parameters [a,b]	Mean	144.19	142.78	136.45	146.35	148.27
	Standard deviation	28.077	29.720	31.224	29.998	30.523
Maximum extreme differences	Absolute	.022	.027	.020	.068	.039
	Positive	.022	.027	.020	.068	.039
	Negative	-.010	-.017	-.018	-.040	-.016
Test statistic		.022	.027	.020	.068	.039
Asymptotic sign. (bilateral)		.000[c]	.000[c]	.000[c]	.000[c]	.000[c]

a. Test distribution is normal.; **b**. Calculated based on data.; **c**. Lilliefors significance correction.

Table 1 .
Kolmogorov-Smirnov test of the sample of students who took the 2017 Saber Pro test, in terms of student gender.
Source: compiled by the authors using software SPSS[2], from databases of FTP_ICFES 2018.

Given the previous result, the nonparametric Mann–Whitney U test is used to compare independent samples in the general mean comparison between all of the scores by men and women in the five generic modules of the Saber Pro test (Table 2). Each obtained significant differences (significance of 0.05 or below) between scores by men and women in all of the generic competences' scores: Mann–Whitney U test, asymptotic sign. = 0.000, significance level of $p <= 0.05$, rejecting the null hypothesis in all of the modules' scores.

	Null hypothesis	Test	Sig.	Decision
1	The distribution of QUANTITATIVE_REASONING is the same among GENDER categories	Mann–Whitney U test for independent samples	.000	Reject the null hypothesis
2	The distribution of CRITICAL_READING is the same among GENDER categories	Mann–Whitney U test for independent samples	.000	Reject the null hypothesis
3	The distribution of CITIZENSHIP_COMPETENCES is the same among GENDER categories	Mann–Whitney U test for independent samples	.000	Reject the null hypothesis
4	The distribution of ENGLISH is the same among GENDER categories	Mann–Whitney U test for independent samples	.000	Reject the null hypothesis
5	The distribution of WRITTEN_COMMUNICATION is the same among GENDER categories	Mann–Whitney U test for independent samples	.000	Reject the null hypothesis

Table 2 .
Mann–Whitney U test of the sample of students who took the 2017 Saber Pro test, in terms of student gender.
Source: compiled by the authors using software SPSS[3], from databases of FTP_ICFES 2018.

Summary of Hypotheses Test

The nonparametric test of Kruskall-Wallis (Table 3) was applied to compare means in three or more independent samples between men and women in each department; this test led to significant differences (significance of 0.05 or below) among men and women's scores in the generic modules of the Saber Pro test in every department in Colombia: Kruskall-Wallis, asymptotic sign. = 0.000, significance level of $p <= 0.05$.

Test statistic [a,b]								
	Quant. Reas. score	Critical Read. score	Citiz. Comp. socre	English score	Written Comm. score	Generic Saber Pro average	Org. mgmt. score	Fin. mgmt. score
Chi-square	3327.407	2065.013	2171.205	3007.886	945.756	3324.008	2747.489	1740.570
gl	65	65	65	65	65	65	65	65
Asymptotic sign.	.000	.000	.000	.000	.000	.000	.000	.000

a. Kruskal Wallis test; **b**. Grouping variable: Gender per department.

Table 3 .
Kruskall-Wallis test of the sample of students who took the 2017 Saber Pro test, in terms of student gender.
Source: compiled by the authors using software SPSS[4], from databases of FTP_ICFES 2018.

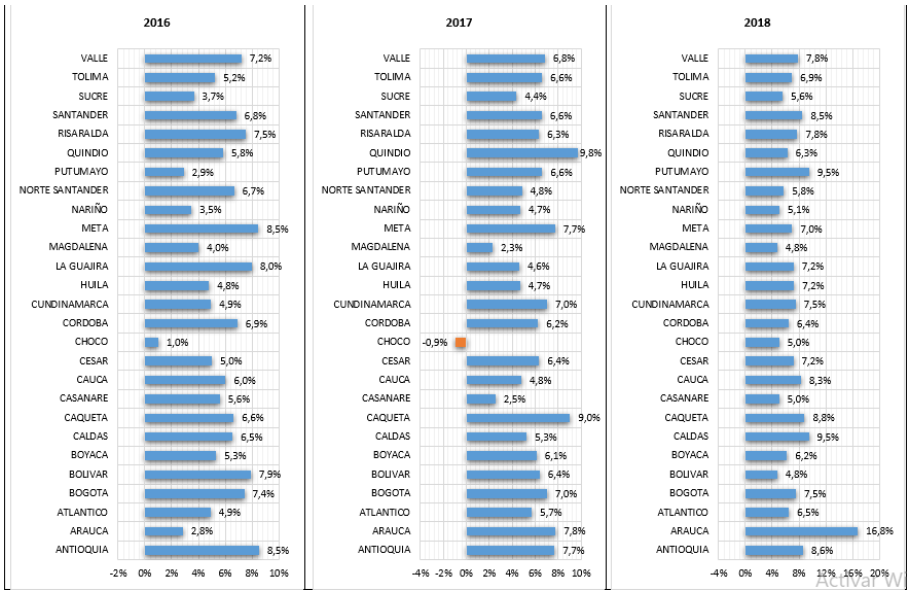
The aforementioned allows concluding that it is viable and that there is quantitative significance in the analysis of scores by men and women through the analysis of performance gender gaps that has been proposed herein.

Academic Performance Gender Gap Analysis

The academic performance gender gap (BRG) presents a different pattern in all of the modules. From 2016 to 2018, BRG is seen in quantitative

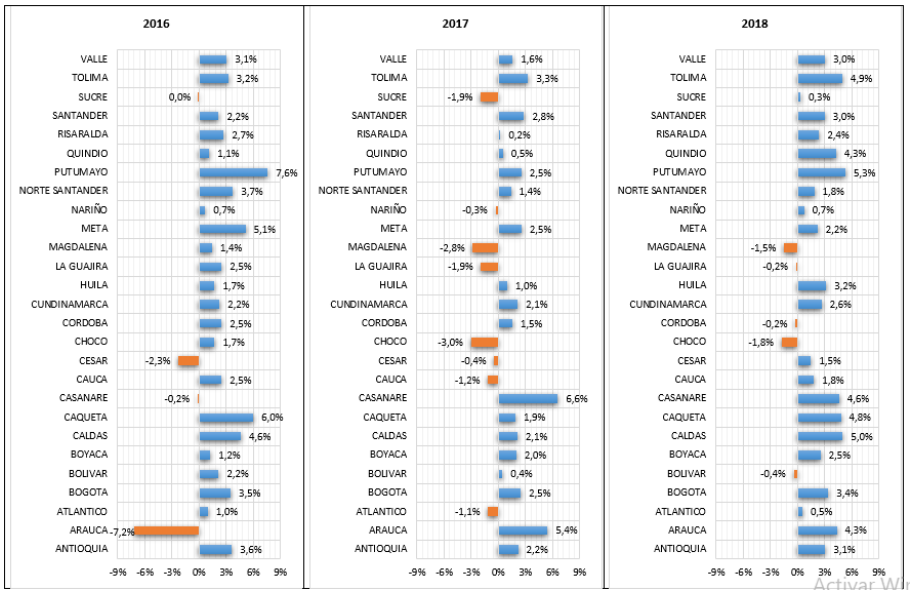
reasoning, English and written communication and change in critical reading and citizenship competences. Huila, Magdalena and Guajira exhibit the lowest BRG in two of the three years, while Antioquia and Caqueta are among the five departments with highest gaps in the three analyzed years.

IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.



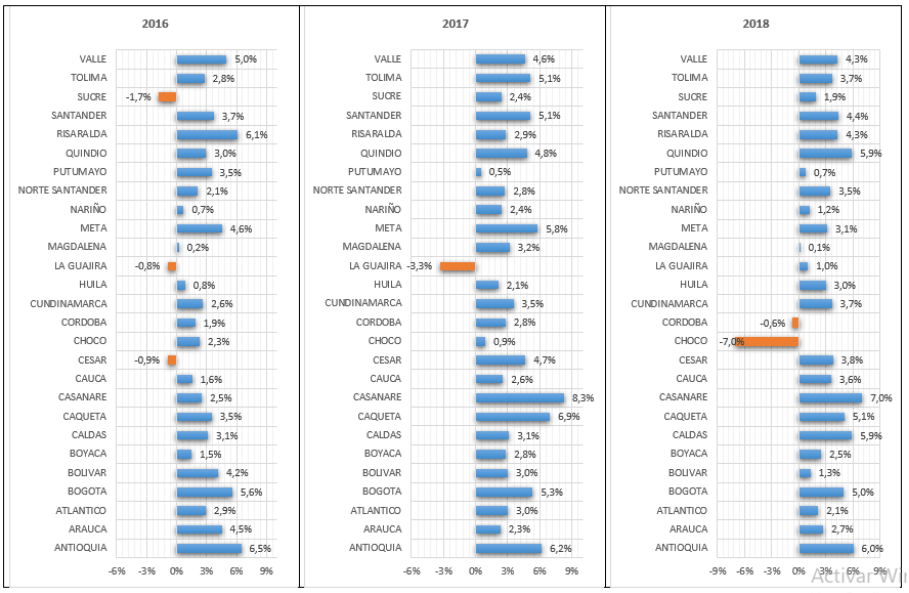
Graph 2 .

Comparison of academic performance gender gap per territorial entities in Colombia, quantitative reasoning module of the Saber Pro test. Source: compiled by the authors from databases of 2019 Saber Pro ICFES.



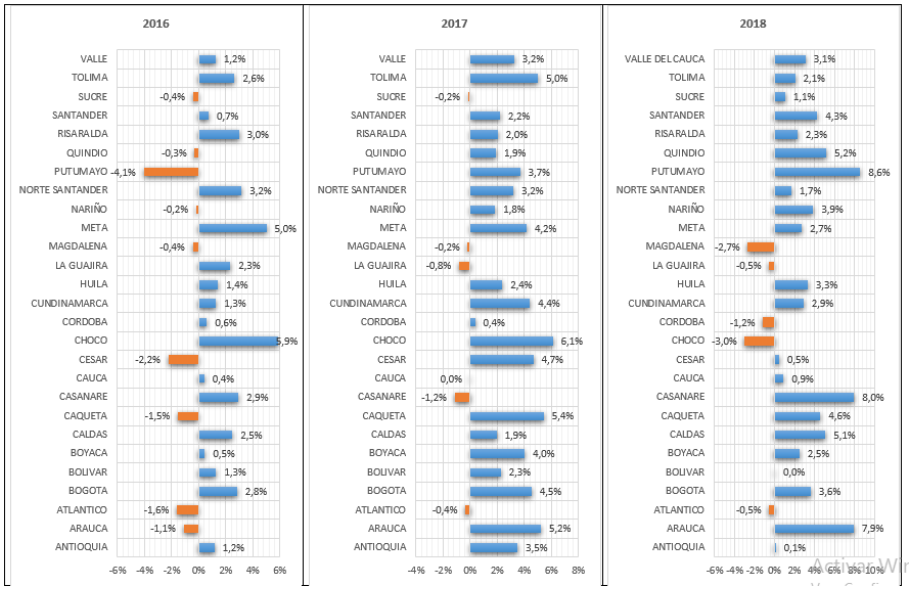
Graph 3 .

Comparison of academic performance gender gap per territorial entities in Colombia, English module of the Saber Pro test. Source: compiled by the authors from databases of 2019 Saber Pro ICFES.



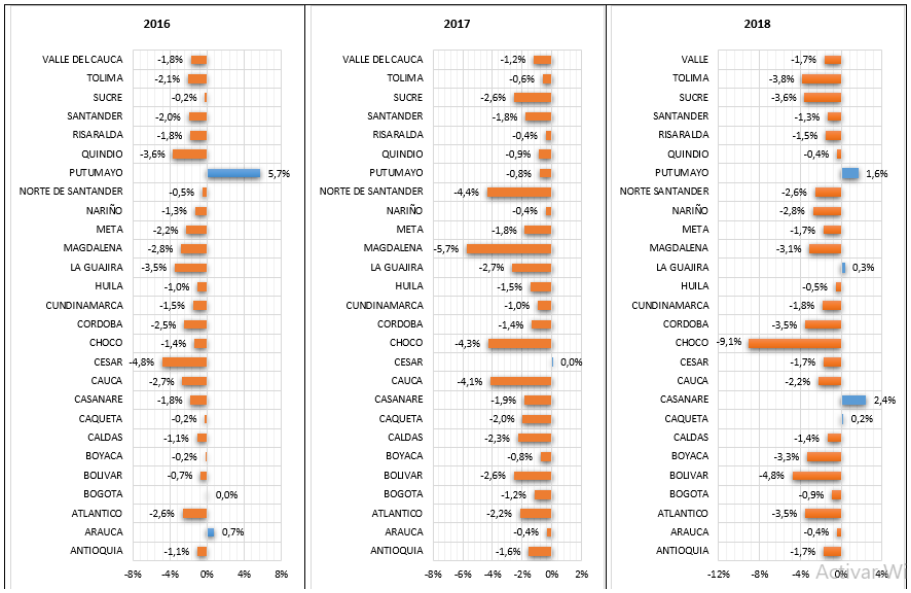
Graph 4 .

Comparison of academic performance gender gap per territorial entities in Colombia, critical reading module of the Saber Pro test. Source: compiled by the authors from databases of 2019 Saber Pro ICFES.



Graph 5 .

Comparison of academic performance gender gap per territorial entities in Colombia, citizenship competences module of the Saber Pro test. Source: compiled by the authors from databases of 2019 Saber Pro ICFES.



Graph 6.

Comparison of academic performance gender gap per territorial entities in Colombia, written communication module of the Saber Pro test. Source: compiled by the authors from databases of 2019 Saber Pro ICFES.

The most noticeable academic performance gender gap (BRG) is seen in quantitative reasoning (Graph 2) and English (Graph 3), every department shows BRG in favor of men. Antioquia, Atlantico, Bogota, Cundinamarca and Valle del Cauca, the departments with the largest number of students, show less variation in their gap and sustain it from 2016 to 2018. There is higher variation of BRG in departments with smallest number of students. Choco has the smaller gap throughput the three years in quantitative reasoning.

Critical reading (Graph 4) and citizenship competences (Graph 5) display more changes in BRG, which favor men in most departments. Critical reading has the lowest BRG throughout the three years in Atlantico, Nariño and Sucre, and the highest in Putumayo in 2016 and 2018. In terms of citizenship competences, Choco has the largest gap in 2016 and 2017, while Cauca and Magdalena have the lowest. This last department's BRG always favors women.

The written communication module shows a completely different situation: the gap favors women in most departments. The only gap that favors men in 2016 and 2018 is in Putumayo. The largest gap in favor of women throughout the three years is Choco's. The smallest for the three years are in Bogota and Caqueta.

Discussion and Conclusions

This work proposes an achieved learning and competence progress index. Contrasting with other indexes based on figures of enrolled students and graduates (Becerra Gualdron, Gallardo Sánchez, & Becerra Gualdron,

2018). The latter correspond to institutional or social actions, while the index proposed by this work also approaches personal or student achievement. Said work was suggested in the benchmark group of business administration programs and alike, seeing as it has the largest coverage in Colombia, thus having the possibility of being proven and extended to other benchmarked groups and areas (Arias-Velandia N. , Rincón-Báez, Becerra, & otros, 2018).

The area of business administration programs and alike is one with the largest demand at national level, with approximately 19% of the national enrollment in 2017 (Rincon-Baez and Becerra, 2018), it also has a positive gap concerning the amount of graduates, with at least 63% of women graduates throughout the country (World Economic Forum, 2017). Despite the aforementioned, there is an educational gender gap in the results of the Saber Pro test, which has been named herein as academic performance gender gap (BRG). Said gap is sustained or tends to increase in Saber Pro's competences test modules citizenship competences and English in favor of men, and in written communication in favor of women. Quantitative reasoning and critical reading's results gap shows an overall decrease.

Research in both secondary and higher education refer to gaps in quantitative reasoning and mathematics in favor of men (Abadia and Bernal, 2017; Celis, Jimenez and Jaramillo, 2012; Guiso, Mont, Sapienza and Zingales, 2008; Ramirez-Torrado, 2014). This study proves that said gap steeply favors men and is present in 16 of the 32 departments in Colombia, thus it can be affirmed that this gap is present in different regions and not just at national level. In most of the country the gap closes in favor of women. Departments of Antioquia, Valle del Cauca and the city of Bogota –where most of the country's graduates are concentrated– are some places in which the gaps are larger, although they close in 2017 with a slight increase in women results. In Colombia's result in the PISA study this difference between men and women in basic education is present and tends to decrease (ICFES, 2017). This suggests that Colombian education might be implementing fruitful efforts –however limited– in closing the gaps in quantitative competences and mathematics between men and women.

This work also evinces phenomena of regional concentration regarding student gender. The large and sustained gap in quantitative reasoning and English in favor of men may be related to the privileged social origin of some male students (Ramírez Torrado, 2014), while the gap in written communication in favor of women can be much more related to differential tendencies of academic socialization (Arias-Velandia, Rincon-Baez, & Cruz, en sometimeinto).

The largest gender gap in departments with the largest amount of students in Saber Pro may be related to the persistence of these dynamics deriving from contexts that are advantageous for the enrollment of new students, while deficiencies in regions with most disadvantaged students persist (Fujita, Krugman, & Venables, 2001). This reaffirms the need to build capacities in regions that are traditionally underprivileged,

and for its institutions, linked to student gender, such as those that propose improving English for business administration students, as well as leveraging the offer of distance education in isolated regions (Arias-Velandia, Rincon-Baez, & Cruz-Pulido, 2018; Rincón-Báez, Becerra-Plaza, Arias-Velandia, & Durán-Becerra, 2018).

Concerning critical reading, the general trend shows gaps closing in favor of increased women scores in this competence. In general, there are departments with gaps that favor both men and women, with a trend of closing or opening, although many departments show low gaps. Surprisingly, critical reading in Colombia consistently presents gaps in favor of men (Arias-Velandia and cols., 2018) and not women, as covered in the international literature (Blackman, 2011; Caro-Acero and Casas, 2013; Conger and Long, 2010; Halpern and cols.; 2007; ICFES, 2017; Machin and MacNally, 2005; Marks, 2008; OECD, 2015; Penner, 2008; Türüt-Asik and Meltem, 2007). Therefore, it must be investigated if this gap closing is the effect of educational action in higher education or if the county scores appear to resemble international trends in women and men performance.

In contrast, the only competence that favors women and in which the gap is negative is in the written communication module. It is also the only competence in which the gap favors women in every department in 2017 and in most in 2018. In half of the country's departments this gap in favor of women increases, and in the national average as well. This trend is also seen in secondary education, the Saber 11 test reports it as well (Abadia and Bernal, 2017; Celis, Jimenez and Jaramillo, 2012; Ramirez-Torrado, 2014); in international research, women also have higher scores in reading and writing tests (Conger and Long, 2010; Halpern and cols., 2007).

Gaps increase in the modules of citizenship competences and English. There is an upward pattern in favor of men or women in English but there is no defined pattern in different departments. Distinctively, the departments with the largest gap in favor of women are located in the Caribbean coast: Sucre, Guajira and Magdalena. Possibly, these competences still reflect some differences tied to the student's social origin (Cuenca, 2016); which in the case of English are noticeable in terms of the students' parents educational level and income (Arias-Velandia and cols., 2018), and in citizenship competences, it can be linked to the heritage of symbolic resources and opportunities, which in Colombia are concentrated in central regions and in large cities (Arias-Velandia, 2018; Cuenca, 2016).

Another aspect of this study's findings is that (although an analysis of the test's average score is not conducted) Bogota, Antioquia and Meta have gaps that favor men and not women in most competences. In this departments, Abadia and Bernal (2017) have identified the same phenomenon in the overall score of the Saber 11 test (taken upon culmination of secondary education) and Ramirez-Torrado (2014) addressed a trend about women's academic performance being more connected with being single, having mid and high income and studying university programs compared with men. Castro, Ruiz and Guzman

(2018) also mention that trends in Saber 11 scores are usually highly correlated to Saber Pro scores, but when spatial variables (geographically weighted) are introduced to regression models, no gender effects are found regarding student performance.

The general pattern of reproduction of students' performance from Saber 11 to Saber Pro is shattered when thoroughly looking into gender gaps in critical reading and quantitative reasoning scores. Aside from the average score, no department remarkably increases results[5]. Anyway, results differentiated between competences are inclined to breaking the traditionally reported outcome of higher scores by women in linguistic tasks and by men in mathematics tasks; this demands an exhaustive analysis of educational practices that might impact this aspect.

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[5] It is necessary to explain again that results are compared with the previously explained *BRG* mehtod, since scores between departments would not be comparable.