

# Analysis of determinants of academic achievement in elementary and middle school in the Colombian Pacific region: a study of gaps with a gender and ethnic focus.

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## Motivation

PR is one of **the most forgotten and vulnerable regions of Colombia**. There are all the basic needs unmet, there is a need for integral development.

PR has significant levels of **inequality**, and it is urgent **to ensure access to education**, health and basic security.

Lag of the PR with respect to the Andean strip, presenting social indicators lower than those national, **problems of deficit and quality in housing, and critical sanitary conditions**.

**Education** occupies a **fundamental place** in the process of **socio-economic transformation in the Pacific**.

The conclusions of this work are **an essential input for the construction of public policies that articulate** the improvement of **the education sector** with an improvement in the **socioeconomic level** of households in the region.

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## Introduction

- **Education:** to enable everyone without exception to make all their talents and all their creative capacities bear fruit.
- **Socioeconomic level:** agglomeration of multiple factors such as characteristics: specific to the person, relatives, the educational process, access to technological elements, habits.
- **Family characteristics directly affect the performance of students** (educational level of parents, income, stratum) (Cabrera, 2016).
- The objective is to **show how influential some socioeconomic variables are**, such as:
  - a. Internet access and browsing time
  - b. Number of people in the household.
  - c. Educational level and work of parents.
  - d. Access to a computer.
  - e. Nature and day of the educational institution.
  - f. Number of people in the household.

## Literature Review

- The socioeconomic status of young people has a **directly proportional effect** on academic performance (Piñeros and Rodríguez, 1998).
- The socioeconomic characteristics of the family are not only **determinants of school performance**, but also of **the expected income in adult life**, generating permanent social inequalities (Bonilla, 2014).
- In the departments of **Cauca, Nariño**, Putumayo and **Valle del Cauca**, **access to technology by students at home and their educational institution** has a greater effect than other departments, as well as the socioeconomic stratum and working hours on the part of the student, were significant variables to explain the educational performance of students from the southwest of the country in 2017 (Calderón and González, 2018).
- There is still a **very marked gender gap in academic results**. In addition, they show **that access to technology and the type of educational institution** are relevant factors (Calderón and González, 2017).
- There is a **statistically significant academic gap that disadvantages ethnic students** in the results of the Saber 11 State exam. 60% of the gap is **attributable to differences in students' individual characteristics** (Sánchez, 2014).

## Methodology

Through **descriptive and statistical analysis**, the aim is to guarantee the expected results and provide **greater robustness to the proposed analysis**. To do this, two methodologies are used:

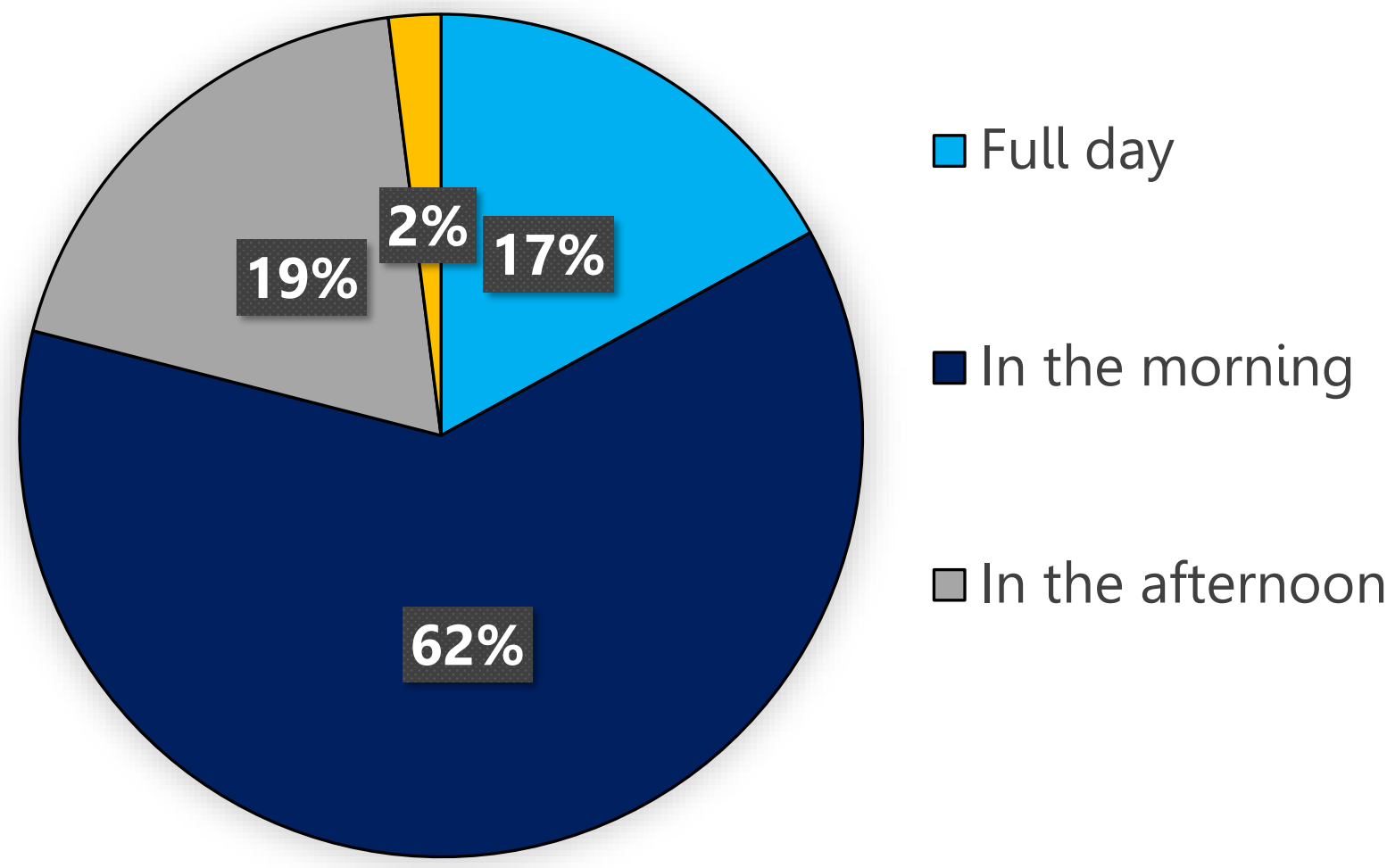
- **Data panel** considers that observations are at different points in time (time series) and cross-sectional units of agents. Data panel estimation is traditionally done through **fixed effects and random effects**. For this analysis, **the ICFES databases** are used to allow the construction of a panel-type data structure with the results of the Saber noveno (9°) tests of the year 2017 and Saber once (11°) for the year 2019 and 2018.
- **Decomposition Blinder-Oaxaca (1973)**, is a methodology used for the comparison of two population groups in order to observe the differences from a common component and another explained by the characteristic that differentiates the groups. In theory, given two groups A and B, a result variable Y, and a set of characteristics, the objective is to know the magnitude of the difference in the mean of both groups ( $E(Y_A) - E(Y_B)$ ). Following this, the difference of the means of the groups is re-ordered taking into account the matrix linear specification remains:

$$[E(X_A) - E(X_B)] * \beta_B + E(X_B) * (\beta_A - \beta_B) + [E(X_A) - E(X_B)] * (\beta_A - \beta_B)$$

- According to the specification, the components are:
  - a. **Endowment factors.**
  - b. **Factors not observed.**
  - c. **Interaction between endowment and unobserved factors.**

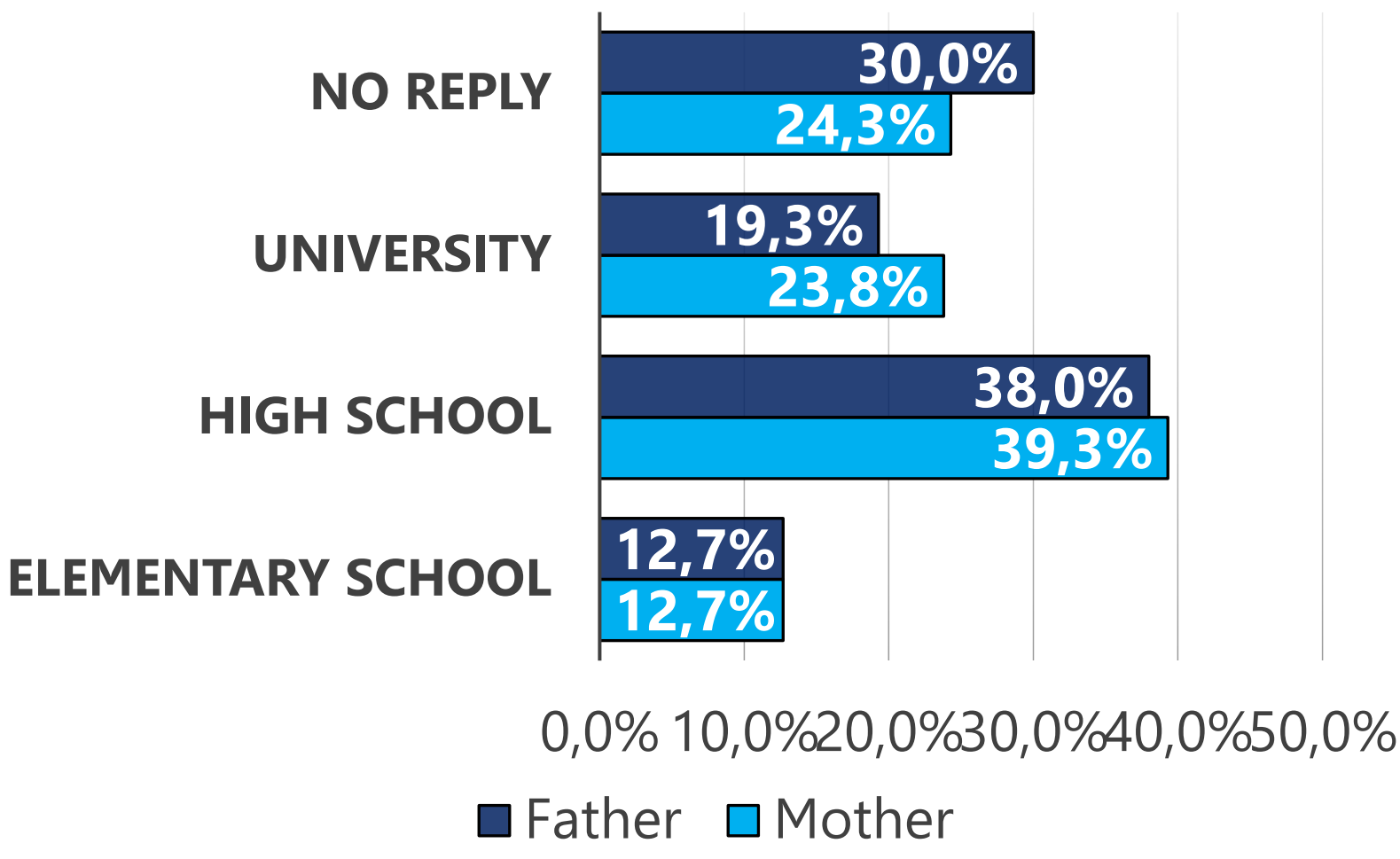
## Estimates and Results

Graph 1. Study day



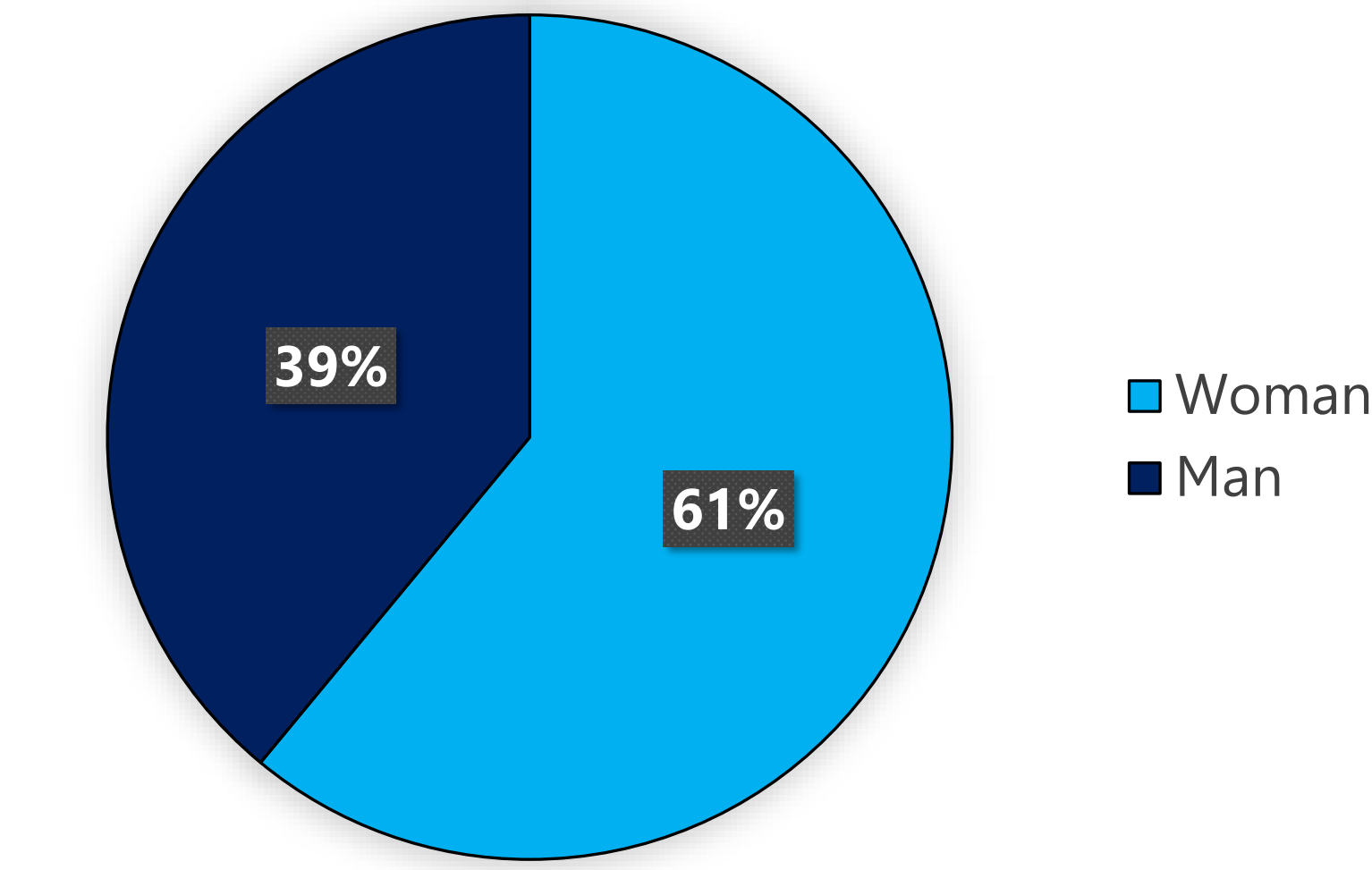
Source: Own elaboration of Saber - ICFES tests

Graph 2. Parent's level of education



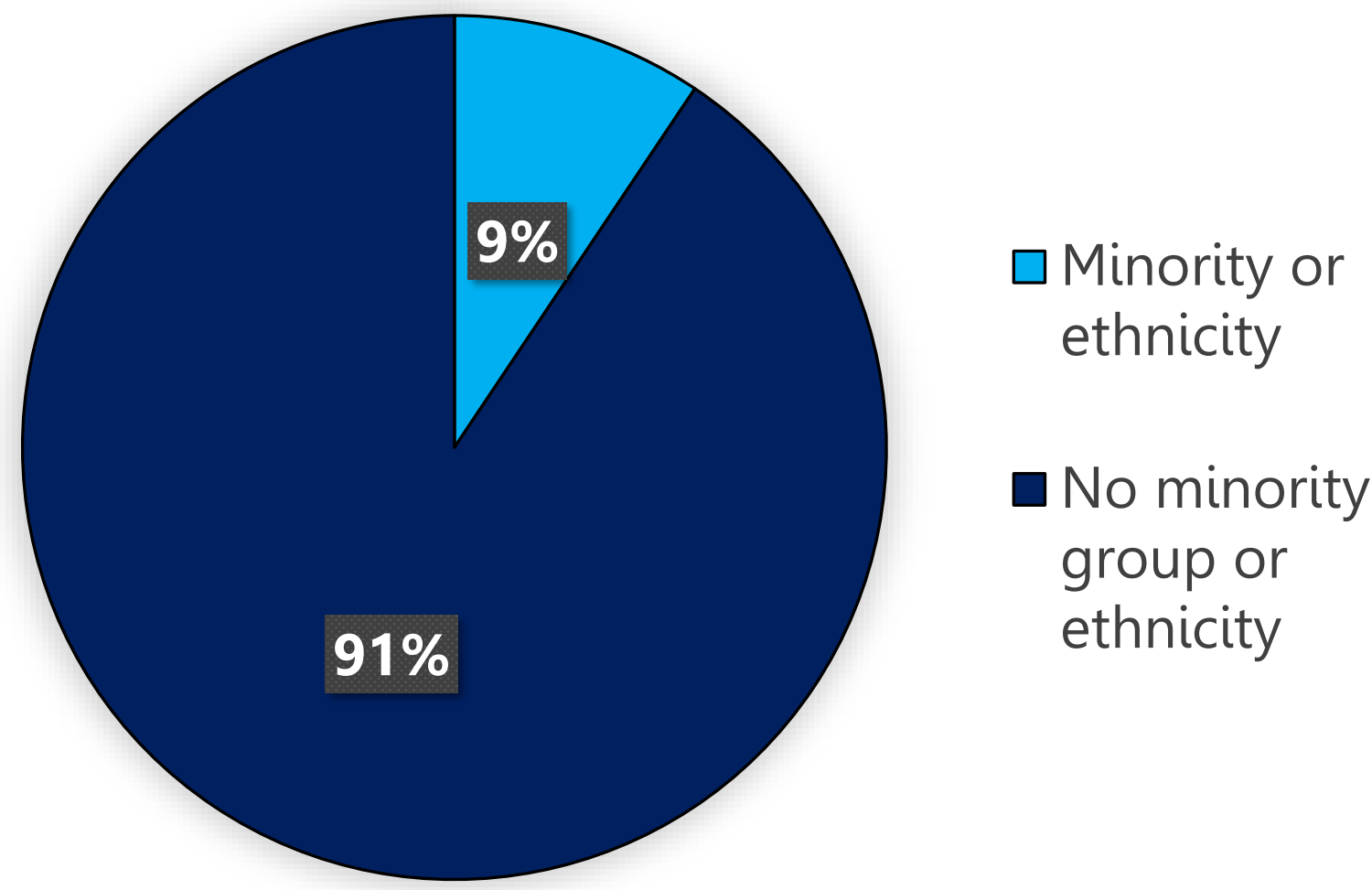
Source: Own elaboration of Saber - ICFES tests

Graph 3. Gender of students



Source: Own elaboration of Saber - ICFES tests

Graph 4. Ethnicity of students



Source: Own elaboration of Saber tests - ICFES

Table 1. Panel Regression of Critical Reading Score Data.

Dependent Variable:		
Critical Reading Score		
	Corrected HT	Uncorrected HT
N. Oficial	-2.531***	-2.531***
	(0.142)	(0.531)
Time on the Internet - Between 30min to 3hrs	3.441***	3.441**
	(0.255)	(1.646)
Mother's Education - Primary	-5.184***	-5.184***
	(0.057)	(0.917)
Father's Education - Primary	-3.083***	-3.083***
	(0.972)	(0.935)
Workday - Full	8.034***	8.034***
	(0.083)	(1.484)
Persons in the Household: 0 to 4	3.889***	3.889**
	(0.260)	(1.609)
Mother's Work - Professional	2.643*	2.643***
	(1.377)	(0.950)
Father's job - Pensionado	5.408***	5.408***
	(0.238)	(1.845)
Observations	3,068	3,068
R2	0.111	0.111
Ajusted R2	0.101	0.101
F Statistic	377.564***	377.564***
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 2. Panel Regression of Mathematics Score Data.

Dependent Variable:		
Mathematics Score		
	Corrected HT	Uncorrected HT
If the school is official	-13.153**	-13.153***
	(5.494)	(2.238)
Mother's Education - Primary	-18.226***	-18.226***
	(6.282)	(3.867)
Father's Education - Primary	-23.336***	-23.336***
	(8.751)	(3.943)
Workday - Full	17.540***	17.540***
	(4.201)	(6.256)
Father's Work - Professional	17.217***	17.217**
	(3.888)	(6.825)
Observations	3,068	3,068
R2	0.111	0.111
Ajusted R2	0.101	0.101
F Statistic	377.564***	377.564***
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 3. Blinder-Oaxaca gender decomposition

Variables	Mathematics		Critical reading	
	Ninth	Eleven	Ninth	Eleven
Average score men	60.2883***	53.5016***	65.80368***	54.2558***
Average score women	57.2793***	50.3568***	66.12885***	53.6047***
Gap	3.0090***	3.1448***	-0.3251672	0.6511

Decomposition				
Endowment	0.1452	0.0910	0.1984	0.0711
Not observable	2.6636***	3.1215***	-0.9410	0.6068
Interaction	0.2000	-0.0677	0.4173	-0.0268

Table 4. Blinder-Oaxaca ethnicity decomposition

Variables	Mathematics		Critical reading	
	Eleven	Ninth	Eleven	Ninth
Mean score No ethnicity	59.0551***	52.2942***	66.7741***	54.4215***
Mean score ethnicity	52.6333***	44.7152***	58.55***	48.4236***
Gap	6.4217***	7.5789***	8.2241***	5.9979***

Decomposition				
Endowment	1.3948*	2.4143**	1.6916*	1.1682
Not observable	3.8232***	5.8132***	5.6109***	4.3576***
Interaction	1.2037	-0.6486	0.9215	0.4721

## Conclusions

- There is a **significant gender gap** in the area of mathematics, of more than 3 points, **in favor of men**. The gap, according to the BO decomposition, is **explained by unobserved factors** (outside the socioeconomic level defined in the research).

- There is a **significant gap (5 to 8 points)** between the saber test results of those who belong to a minority group and those who do not. This, both in the area of mathematics and in the area of reading. The gap is **explained** in all cases, except for the reading area of grade eleven, by **endowment factors (socioeconomic status)**.

- Likewise, it can be observed that when students have a **full day**, their **score increases by approximately 8 points in the Critical Reading test**. On the other hand, if the **mother** obtained at most the educational achievement of **primary school**, the students of the Colombian Pacific **lose approximately 5 points** in the test.

- Similarly, in terms of performance in the **Mathematics** test, the type of **full and unique day** positively influences the same as in the Reading test, **increasing approximately 15 points**. However, if the **father** obtained a maximum of **primary level** in his training, the student **loses approximately 23 points**.

- As a recommendation, public policies could be aimed at ensuring that students in the Pacific receive a type of **full-time and invest in the education** of parents who are heads of household.