# Gender roles as indicator of academic failure

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Abstract: Recent empirical literature has highlighted that boys and girls show differences in academic performance. The present study intends to disentangle the contribution of some –less well-known– factors to that gender gap between boys' and girls' achievement in the fourth level of secondary education. To this aim we use recent methodological advances in decomposition techniques applied to a rich dataset with information not only on students' personal characteristics and family environment, but also on real scores –as marked by teachers–, academic track elections and expectations for academic success. Not surprisingly, we observe that girls are more likely to get better marks than boys, whereas boys are more likely to get the worst grades and to fail. More interestingly, expectations and post-compulsory academic elections have been found to explain most of this gap in favor of girls, denoting that girls are more responsible in the achievement of their goals and present higher productivity in studying, while boys rely more on their innate skills to pass. This could be highlighting gender differential attitudes and roles towards academic achievement, what denotes the need to perform policy interventions to the extent that academic achievement will condition career progression.

Keywords: gender differences; students' actual performance; decomposition methods.

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## 1. INTRODUCTION

The rising popularity of the international programs for the assessment of educational achievement (PISA, TIMSS, PIRLS, etc.) has turned the differences in educational achievement between boys and girls into a topic of increasing attention. Concretely, the PISA 2009 report (OECD 2010) highlights that girls achieve higher average scores in reading comprehension than boys in the sixty five participating countries, while boys have higher mathematics' achievement in approximately half of the countries. This trend of higher achievement of girls in reading and boys in mathematics has remained in the next cycle of PISA –2012– (OECD 2014). In spite of the relevance of these results, the differences in achievement between boys and girls that they put into light need to be further analyzed to identify which factors help to produce and retain these differences, so that we can properly understand why this gap in favor of girls has not a clear translation in the context of the Spanish labour market. Besides, the differential academic performance of students by gender can significantly affect their career progression during their adult lives (Dolton et al 2005; De Coulon et al 2011), the fertility rates (Basu 2002) and the economic growth of a country (Klassen 2002), due to the socio-economic level or job security and flexibility they might access, so they can have more children and devote to them time and resources. In addition, to the extent that mothers have an important effect on their children's performance (Marcenaro 2010), a greater graduation of girls would produce a higher performance of future students (Schultz 2002; Doepke, and Tertilt 2009).

In this context, recent empirical studies show that the growing gender educational gap in favour of girls is mainly due to gender differences in children's plans for the future (Fortin et al 2015). In particular, they found –for the case of US– that girls are leaving boys behind at school because more girls than boys expect to attend college. This follows a consensus in the psychology literature suggesting that students form reliable perceptions of their academic competency around fifth grade and already can form some expectations about going to college (Herbert and Stipek 2005). To the extent that we have access to recent data on expectations for boys and girls we will pay special attention to this in our analyses. One of the main advantages of this study is that our database provides us with information on children's administrative grades as well as on a great variety of children and family characteristics. In particular, we use the results of a survey in which each child is asked about his or her plans for the future, which will allow us to estimate the effects of those plans on each student's grades.

In this context, the objective of this research is to analyze which factors could be conditioning gender academic achievement differences in real scores of reading and mathematics. Specifically, we will focus on the effects of children's expectations about the future and some proxies of school abilities reported by parents on the gender gap. This is a valuable contribution due to the virtual inexistence of contributions on this topic in the Spanish literature and the scarce international literature, which is mainly focused on the academic grades self-reported by children and their, also self-reported, abilities (Fortin et al 2015). This is particularly relevant since previous empirical literature have shown that boys rate their grades and their own school ability higher than girls (see for example, Stinebricker and Stinebricker 2012).

This paper is divided as follows: in section 2 we review the literature on gender differences in educational outcomes. Sections 3 and 4 describe the data and the methodology employed in this research, respectively, while the discussion of the main results is reported in section 5. Finally, in section 6, the conclusions which can be drawn from this research are exposed.

## 2. LITERATURE REVIEW

There is a wide variety of explanations in the education literature for the existence of a gender gap in academic achievement, ranging from theories which focus on biological determinants, to theories which assume that the gender gap in educational outcomes is socially conditioned[78].

In the case of the first argument, numerous studies argue that differences in the composition of the brain (Kucian et al. 2005) or that boys and girls begin school with different developmental strengths and weaknesses (Gunzelmann and Connell 2006) may explain gender differences in academic achievement, while others state that they are rooted in innate gender skills (Lawton and Hatcher 2005). Alike, some authors have attributed these gender differences to the rates of maturation (physical and mental) of girls and boys in terms of educational performance (Camarata and Woodcock 2006).

Nevertheless, following Arnot et al (1999), it is quite difficult to rely on biological aspects to account for gender differences in academic achievement, as these differences "are often associated with the culture, period of that culture and the degree of development of boys and girls". Because of that, another field of the literature places the source of gender gap in educational achievement in the difference of social skills between boys and girls (DiPrete and Jennings 2012; Bertrand and Pan 2013). Although boys and girls are thought to receive the same cultural education when they are in the same social class, the gender roles that society imposes to them may be different depending on their socialization and the view they have of their future differential possibilities. For example, Van de Gaer et al (2007) show that girls seem to place a higher value on academic effort and share social affiliation with one another by embracing school activities. Because of the previously stated, we are focusing on social explanations for these differences, so we could deal with them by the use of the proper policy interventions.

Beginning with the relevant social indicators that may explain boys' and girls' differences on academic achievement, the literature has highlighted that students' socio–economic status may be one of the most relevant (Dumais 2002).

Differences in academic achievement between boys and girls may be caused by indicators of the roles that they usually take in the classroom and their academic life in general. Girls are said to put more effort into trying to be better valued by teachers, and also to win self–esteem (Kaufman and Richardson 1982); however, boys might value more showing a dominant position of "rebellion" against the authority of teachers (as indicated by Sadker and Sadker 1994) instead of getting high academic achievement. Hence, values such as conformity,

[78] For a review of literature of both theories see Francis and Skelton (2005).

cooperation, submission and educational success are considered as "female" characteristics (Frosh et al 2002). This, together with the success in sports to enhance their popularity –opposed to more cultural activities as going to the theatre or dance– may reinforce boys' sense of masculinity, maximizing their utility function more than they would do via academic success (Adler et al 1992).

As it has been highlighted during the review of the literature, family socio-economic background is very close related to gender stereotypes. Hence the importance of analyzing whether these characteristics differently affect or not the academic achievement of boys and girls seems quite obvious.

## 3. DATA

The data used in this research was obtained from the survey ESOC10 (Social Survey 2010: Education and Housing), gathered by the Andalusian Institute of Statistics. A total 2,584 students born in 1994 of ages 11-12 and their families took part of this survey by answering questions related to their personal characteristics, as well as their family background and school environment. This survey contains information on each child's actual marks (set by the teachers), which was provided by the Educational authority of Andalusia. The combined database of ESOC10 together with child's actual marks has been recalled as ESOC10-SEN. The database was reduced by the removal of those students who attended a private school, had some kind of disability or the database does not have information on these subjects. Hence, the subsample was reduced to 2,263 observations. The missing values on the explanatory variables analyzed in this research together with the dependent ones also supposed a reduction in the size of the subsamples.

Fortunately, we have information on students' real scores in reading and mathematics –the dependent variable in our estimates– rather than self-reported scores, as the latter are more imprecise figures of the student's academic achievement. We divide these scores into different achievement levels. In particular, level A gathers students who scored in the interval of [8.5 – 10]; level B, for [6.5 – 8.5); level C, for [5 – 6.5); and D for [1 – 5). If a student gets level D in a particular subject, he/she will fail that subject because in Spain a student needs at least 5 points to pass a subject.

The explanatory variables used in this research are a set of dummy variables representing whether each child is Spanish or immigrant, whether he or she lives in a capital of province or not, whether each child have brothers and/or sisters or not, whether he or she lives with all the members of his or her family or not, as well as each father's number of working hours. Additionally, we add a continuous variable representing the number of years of schooling completed by each mother and the number of penalties received by each child due to misbehavior. As above mentioned, one of the main advantages of our database is the availability of information on each student's expectations about the future. Specifically, we use two different variables as indicator of those expectations. First, the number of years of education each child expect to complete, which represents students' long-term expectations because they will need a long period of time to fulfill those expectations. Second, we know

each child's selected future academic track, that is, we know –from the administrative records- the type of educational program in which they are enrolled one year after each child is surveyed; we assume that children have an idea of the type of program in which they want to be enrolled a year later and that this idea coincides, on average, with their choice. Then, we use the type of academic track chosen by each student a year later as a measure of children's short-term expectations about the future.

## 4. ECONOMETRIC SPECIFICATION

Previous literature has used different methodologies to decompose the gender differences in some particular variable into differences in observable characteristics and differences in the effects of those characteristics. The authors usually point out that gender differences in the considered dependent variable that are not explained by differences in observable characteristics can be used as a boundary measure of gender discrimination. This interpretation is only possible if we assume that all the variables affecting the dependent variable can be observed by researchers, but this assumption is unrealistic in most studies. For this reason, we will not attribute the unexplained educational gap by gender to discrimination.

In this paper we follow the decomposition method used by Fortin et al (2015). In particular, we estimate the following equation:

$$Prob[G_i = c] = h_f^c(x_i, x_i^p), c = A, B, C, D \quad (1)$$

Where $G_i$ is each student's grade, $x_i$ is a vector of variables representing child $i$'s characteristics and $x_i^p$ is a vector of variables that includes parental characteristics. Additionally, the subscript $f$ denotes a dummy variable which is equal to 1 when the child is a girl and 0 when the child is a boy, whereas the superscript $c$ denotes the educational outcome achieved by each child. The possible educational outcomes each student might achieve are A, B, C and D –as previously stated in the Data section–. As equation (1) shows, we are assuming that the relationship between each child's grade and the observable characteristics is gender and grade specific. It means that our model is sufficiently flexible to allow the effect of a change in a particular characteristic on the grade achieved by a child to be different for each grade considered and for boys and girls. For example, the effect of an increase in the socioeconomic status of a boy's family on his grade among those boys with the highest grades might be different than the effect among those boys that usually fail. Likewise, those effects might differ from those obtained for girls. Summarising, we estimate a different probability model by gender for each grade.

We estimate a linear probability model because the detailed decomposition of the gender differentials requires linear educational responses. Then, the estimated coefficients can be used to obtain the contribution of each explanatory variable to the gender gap in educational outcomes. Furthermore, it is not necessary to assume that the residuals are normal when estimating the linear probability model and it permits the educational response to be different for each achievement level –unlike ordered probit models–.

Therefore, assuming that the probability of a child achieving a particular grade is a linear function of the observable characteristics, the following equations describe each gender's probability model:

$$Prob[G_i = c|x_i, x_i^p, f = 1] = x'_{1i}\beta_{1c} + x_{1i}^{p\prime}\beta_{1c}^p + \varepsilon_{1ci} \quad (2)$$

$$Prob[G_i = c|x_i, x_i^p, f = 0] = x'_{0i}\beta_{0c} + x_{0i}^{p\prime}\beta_{0c}^p + \varepsilon_{0ci} \quad (3)$$

where $x_{1i}$, and $x_{1i}^p$ are the vectors of girls and their parents' characteristics, respectively, whereas $x_{0i}$ and $x_{0i}^p$ are the equivalent for boys. Moreover, $\beta_{1c}$ and $\beta_{1c}^p$ are the vector representing the effects of the explanatory variables on the probability of achieving a grade of $c$ for girls and $\beta_{0c}$ and $\beta_{0c}^p$ are the same vectors of coefficients for boys. Finally, $\varepsilon_{1ci}$ and $\varepsilon_{0ci}$ are the error terms with zero conditional means and we assume that they are mean independent of the observable characteristics. As usual, $x_{1i}$and $x_{0i}$ include a constant term in equations (2) and (3). From these equations, it is clear that there are three sources of gender differences in educational achievement: differences in the distributions of observable characteristics, differences in the effects of those characteristics on children's education and differences in the unobservable characteristics. For this reason, we need to construct a counterfactual to isolate the contribution of each difference to the gender gap in academic scores. Specifically, we use the reweighting procedure developed by Fortin et al (2011). These authors reweight the sample of boys so that the distribution of their characteristics is similar to that of girls using the following reweighting function:

$$\Psi(x_i, x_i^p) = \frac{Prob(x_i, x_i^p | f=1)}{Prob(x_i, x_i^p | f=0)} = \frac{Prob(f=1|x_i, x_i^p)}{Prob(f=0|x_i, x_i^p)} \cdot \frac{Prob(f=0)}{Prob(f=1)} \quad (4)$$

In this paper, we want to analyse the mean difference in grades between girls and boys, that is:

$$E[G_c|X, f = 1] - E[G_c|X, f = 0] = E(X|f = 1)\beta_{1c} - E(X|f = 0)\beta_{0c} \quad (5)$$

In equation (5), $G$ has now a subscript $(c)$ to show that we are estimating a mean difference for each grade and $X$ is a matrix including children and parents' observable characteristics $(x_i, x_i^p)$. Thus, each estimated difference measures the mean difference between the probability of girls getting a particular grade and the probability of boys getting that grade. It is easy to break down the previous difference into the classical response effect and the composition effect:

$$E[G_c|X, f = 1] - E[G_c|X, f = 0] =$$
$$[E(X|f = 1)\beta_{1c} - E(X_0|f = 1)\beta_{0c}^1] + [E(X_0|f = 1)\beta_{0c}^1 - E(X|f = 0)\beta_{0c}] \quad (6)$$

Where $\beta_{0c}^1$ is the vector of estimated effects using the sample of boys reweighted to look like girls and $E(X_0|f = 1)$ are the means of the observable variables for the sample of boys when they are reweighted to look like girls. These estimations allow us to separate the gender mean difference in grades caused by differences in educational responses, which is represented by the first square bracket in equation (6), from the gender mean difference in grades caused by differences in the averages of observable characteristics, which is measured by the second square bracket in equation (6). As usual, this decomposition methodology assumes that given

a child's observable characteristics, his or her unobservables are independent of whether the child is a boy or a girl.

The educational response term is written as the sum of a pure response effect plus a reweighting error, that is:

$$[E(X|f=1)\beta_{1c} - E(X_0|f=1)\beta_{0c}^1] =$$
$$[E(X|f=1)(\beta_{1c} - \beta_{0c}^1)] + \left[\left(E(X|f=1) - E(X_0|f=1)\right)\beta_{0c}^1\right] \quad (7)$$

The first square bracket of the right hand side in equation (7) is the pure response effect and the second one is the reweighting error, which goes to zero in large samples. It is easy to see that equation (7) is the classical Oaxaca-Blinder decomposition with the sample of girls and the sample of boys looking like girls. In a similar way, the composition effect can be broken down into a pure composition effect and a specification error, that is:

$$E(X_0|f=1)\beta_{0c}^1 - E(X|f=0)\beta_{0c} =$$
$$\left[\left(E(X_0|f=1) - E(X|f=0)\right)\beta_{0c}\right] + [E(X_0|f=1)(\beta_{0c}^1 - \beta_{0c})] \quad (8)$$

Once again, the first addend of the right hand side in equation (8) is the pure composition effect, whereas the second is the specification error. The decomposition shown by this equation is actually the classical Oaxaca-Blinder decomposition using the sample of boys and the sample of boys looking like girls, with the specification error capturing the departures from nonlinearity.

## 5. RESULTS

In this section we present the contribution of each explanatory variable to the gender difference in educational achievement. Tables 1a and 1b, which show the estimated effects of a change in each explanatory variable on the probability of failing reading and mathematics for boys and girls separately.

Regarding the results for reading shown in the first and second columns of Table 1a, we find that a rise in the number of years of education a child expects to complete decreases girls' probability of failing by almost twice as much as that of boys. These results suggest that girls' expectations of studying at the university make them get better grades than boys by taking advantage of their greater productivity at school. As shown in section 3, another way of measuring children's plans for the future is to use the type of high-school program in which they are enrolled one year later. We observe that those children who will be enrolled in a program of medium-level vocational studies, a high school of arts, sciences and technology or social and human sciences are less likely to fail reading than those children who will repeat the course, whereas those children who will be enrolled in an introductory vocational qualification program are more likely to fail the subject. Then, students' plan for the future is a significant determinant of his or her current grades in reading. Moreover, the existence of brothers within the family decreases the probability of failing reading for boys, whereas for girls this variable is not significant. Thus, the interaction with other brothers within a family benefits boys, but girls do not benefit from that social interaction. Living only with their mother reduces

the probability of failing for boys compared to living with both parents. Finally, the number of corrections received by boys significantly increases their probability of failing reading, but it does not affect girls' educational outcomes. This result suggests that boys' misbehaviour may be closely related to their conduct at school affecting their grades, whereas either girls' misbehaviour do not affect their results at school, or girls' grades do not influence girls' conduct significantly.

The third and fourth columns of Table 1a show the same results for mathematics. Now, an increase in the number of years of schooling that a child expects to complete decreases the probability of failing maths among boys by slightly more than among girls[79]. As expected, when a child expects to be enrolled in a high school of arts a year later, his or her probability of failing reading decreases by more than that of mathematics because he or she will need more reading skills than mathematical skills to study arts. Nevertheless, when children expect to study sciences and technology or social and human sciences, they know that they will need both reading and mathematical skills. For this reason, the effects of those plans for the future on the probability of failing reading are similar to those effects on the probability of failing maths. Likewise, when boys do not live with their brothers, their probability of failing mathematics decreases significantly; it seems that these boys are more responsible and, as a result of it, their grades improve. Nevertheless, when boys live only with their father, their likelihood of failing mathematics is higher, while girls' educational outcomes are not influenced by both family changes –sibling and parent related–. In addition, it seems that working fathers have a positive influence on girls' achievement in mathematics, as they decrease their likelihood of failing this subject.

Though the previous results are meaningful, we need to apply the methodology proposed to find out whether the contribution of a particular variable to the gender gap in educational achievement is significant or not. In addition to this, that methodology enables us to deduce whether the gender gap in educational results is due to gender differences in the estimated effects (educational response effect) or to gender differences in children's endowments (composition effect).

The first two columns of table 2 show the Oaxaca-Blinder decomposition obtained for grade D in reading and mathematics. Starting with the estimations for reading, we found that there are more boys than girls failing reading and the difference between the percentages of boys and girls failing reading is 11.3%. Interestingly, almost 100% of that gap is explained by gender differences in the educational responses. Although the composition effect is also statistically significant, the specification error exactly offsets it. However, the contribution of the reweighting error is not statistically significant.

The contribution of each explanatory variable to the educational response effect brings the main determinants of the gender gap in reading to light. Our results show that, when a girl expects to complete more years of schooling, her probability of failing reading decreases more than her male counterpart. In fact, but for that gender difference in the educational response

[79] A greater productivity of boys when studying mathematics may explain this result. See for example, Mensah and Kiernan (2010).

to expectations, the percentage of girls failing reading would have been greater than that of boys. If we consider that parents' level of education and their job status can be a measure of the family's socioeconomic status, we find that boys' educational results are more sensitive to changes in economic resources than girls. A plausible explanation may stem from some evidence suggesting that boys' attention and emotion require greater external facilitation than girls' (Weinberg et al 1999) and that boys need more supervision to study than girls and, thus, boys' learning may be affected to a greater extent by adversity (Hay 1997). Regardless of the explanation considered, our results are in line with those presented by Mensah and Kiernan (2010) for British students and Fortin et al (2015) for American children. For similar reasons, living in a capital of province, where the range of school facilities is wider and its quality –in general–is higher, benefits boys by more than girls narrowing the female advantage. These results are consistent with the estimations obtained by Mensah and Kiernan (2010).

Regarding the composition effect, we observe that the gender gap in children's plans for the future, that is, the difference in the type of high-school program in which they enrol one year later widens the female advantage in reading, but to a lower extent than the pure response effect of the gender difference in expectations. Besides, unlike the results presented by Fortin et al (2015), we obtain that there are not gender differences in the number of years of schooling that children expect to complete. The main difference of our results with theirs is that female advantage at school is mainly due to girls' greater educational response to expectations, whereas they show that the gender difference in expectations about the future is the main determinant of the gender gap in educational outcomes. In comparison with the USA, the tuition fees in Spain are much lower and most Spanish families find affordable to send their children to universities, which may explain that we do not find significant gender differences in expectations. In addition, we find that family background variables do not work to the advantage of boys in our sample, that is, there is no significant composition effect of those variables.

As expected, we obtain that the difference between the proportion of girls failing mathematics and that of boys is lower than the same difference for reading. The decomposition of the gender difference in the grades of mathematics show similar qualitative results, but there are only two minor differences. First, not only does the difference between the types of high-school program in which boys and girls enrol one year later benefit girls, but also the desire to be enrolled in a particular program improves girls' grades by more than those of their male counterparts. These results suggest that girls are not only increasingly choosing those high school programs more oriented towards going to college, but they are benefiting more from these choices than boys. Second, boys received a greater number of corrections due to misbehaviour than girls, which contributes to widening the gender gap in mathematics. In fact, some psychologists have argued that self-control and self-discipline give girls an advantage at school (Duckworth and Seligman 2006). However, the pure educational response effect of this variable is not statistically significant at a 5% significance level. Hence, assuming that boys and girls show different attitudes and adopt different strategies when they misbehave, we do not find that the appraisal systems at school penalize boys' types of misbehaviour as other researchers found.

We only include each mother's level of education and each father's job status to avoid multicollinearity problems, but we have replicated the previous estimations by using mothers' job status rather than fathers' to measure each family's level of income and using each father's years of completed schooling rather than mother's to measure each family's level of education. Since the qualitative results are exactly the same, we do not present the latter alternative specification here to avoid redundancy.

**Table 1a. Estimates of the probability of failing.**

| | Specification I | | | | Specification II | | | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** |
| | | | | | | | | |
| **Education expectations in years of study** | -0.035*** | -0.063*** | -0.043*** | -0.032*** | -0.036*** | -0.057*** | -0.043*** | -0.025*** |
| | (0.007) | (0.007) | (0.007) | (0.008) | (0.008) | (0.007) | (0.008) | (0.008) |
| **Selected track in the course 2010/2011: First course of Introductory Vocational Qualification Program (Ref.: Repeat the course)** | 0.170*** | 0.187** | 0.146*** | 0.359*** | 0.166*** | 0.196** | 0.149*** | 0.378*** |
| | (0.054) | (0.082) | (0.055) | (0.093) | (0.055) | (0.087) | (0.056) | (0.098) |
| **Selected track in the course 2010/2011: Medium-level vocational studies (Ref.: Repeat the course)** | -0.484*** | -0.379*** | -0.460*** | -0.448*** | -0.492*** | -0.377*** | -0.443*** | -0.447*** |
| | (0.095) | (0.088) | (0.096) | (0.100) | (0.099) | (0.088) | (0.100) | (0.099) |
| **Selected track in the course 2010/2011: High School of Arts (Ref.: Repeat the course)** | -0.625*** | -0.321* | -0.428** | -0.113 | -0.631*** | -0.331* | -0.426** | -0.130 |
| | (0.174) | (0.172) | (0.175) | (0.195) | (0.175) | (0.172) | (0.176) | (0.194) |
| **Selected track in the course 2010/2011: High School of Sciences and Technology (Ref.: Repeat the course)** | -0.452*** | -0.287*** | -0.443*** | -0.437*** | -0.459*** | -0.302*** | -0.443*** | -0.453*** |
| | (0.039) | (0.036) | (0.039) | (0.040) | (0.040) | (0.036) | (0.040) | (0.041) |
| **Selected track in the course 2010/2011: High School of Social and Human Sciences (Ref.: Repeat the course)** | -0.430*** | -0.316*** | -0.386*** | -0.397*** | -0.436*** | -0.329*** | -0.392*** | -0.416*** |
| | (0.037) | (0.031) | (0.037) | (0.035) | (0.038) | (0.032) | (0.038) | (0.036) |
| **Selected track in the course 2010/2011: High School of Adults or IESA (Ref.: Repeat the course)** | 0.165 | -0.137 | 0.125 | -0.217 | 0.148 | -0.135 | 0.125 | -0.206 |
| | (0.156) | (0.172) | (0.157) | (0.195) | (0.157) | (0.172) | (0.158) | (0.193) |
| **Immigrant student (Ref.: Native)** | 0.082 | 0.062 | 0.113 | -0.047 | 0.078 | 0.049 | 0.114* | -0.063 |
| | (0.068) | (0.066) | (0.069) | (0.075) | (0.069) | (0.066) | (0.069) | (0.074) |
| **Type of municipality where he/she lives: Capital of province (Ref.: Not a capital of province)** | -0.019 | 0.033 | -0.034 | -0.019 | -0.022 | 0.037 | -0.030 | -0.019 |
| | (0.030) | (0.027) | (0.030) | (0.030) | (0.030) | (0.027) | (0.030) | (0.030) |
| **Brothers or sisters in the household: Does not have brothers or sisters (Ref.: Lives with all brothers or sisters)** | 0.113** | -0.007 | 0.058 | -0.038 | 0.112** | -0.007 | 0.059 | -0.032 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (0.051) | (0.043) | (0.051) | (0.048) | (0.052) | (0.043) | (0.052) | (0.048) |
| **Brothers or sisters in the household: Does not live with all brothers or sisters (Ref.: Lives with all brothers or sisters)** | 0.023 | 0.012 | -0.090** | 0.057 | 0.019 | 0.012 | -0.083* | 0.059 |
| | (0.044) | (0.036) | (0.044) | (0.040) | (0.045) | (0.036) | (0.045) | (0.040) |
| **Parents in the household: Lives only with the father (Ref.: Lives with both parents)** | -0.058 | 0.026 | 0.398** | -0.046 | -0.079 | 0.024 | 0.260 | -0.030 |
| | (0.157) | (0.295) | (0.158) | (0.335) | (0.178) | (0.294) | (0.179) | (0.331) |
| **Parents in the household: Lives only with the mother (Ref.: Lives with both parents)** | -0.170** | -0.039 | -0.089 | -0.003 | -0.170** | -0.039 | -0.090 | -0.020 |
| | (0.073) | (0.055) | (0.073) | (0.062) | (0.073) | (0.055) | (0.074) | (0.062) |
| **Father's job: works more than 8 hours every day (Ref.: Father does not work)** | -0.077 | -0.015 | -0.026 | -0.108* | -0.073 | -0.021 | -0.027 | -0.120** |
| | (0.066) | (0.051) | (0.066) | (0.058) | (0.066) | (0.051) | (0.067) | (0.058) |
| **Father's job: works less than 8 hours every day (Ref.: Father does not work)** | -0.063 | -0.043 | -0.061 | -0.084* | -0.057 | -0.047 | -0.060 | -0.091* |
| | (0.060) | (0.044) | (0.060) | (0.051) | (0.060) | (0.045) | (0.060) | (0.051) |
| **Mother's years of study** | 0.006 | -0.006 | 0.001 | 0.001 | 0.006 | -0.006 | 0.001 | -0.001 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) | (0.004) | (0.005) | (0.004) |
| **Number of corrections due to misbehaviour** | 0.017** | 0.003 | 0.028*** | -0.000 | 0.014* | 0.005 | 0.028*** | 0.001 |
| | (0.008) | (0.013) | (0.008) | (0.015) | (0.008) | (0.013) | (0.008) | (0.015) |
| **Age of beginning to read (months)** | | | | | -0.001 | 0.001 | 0.000 | 0.002* |
| | | | | | (0.001) | (0.001) | (0.001) | (0.001) |
| **Constant** | 1.015*** | 1.400*** | 1.189*** | 1.041*** | 1.114*** | 1.268*** | 1.164*** | 0.871*** |
| | (0.108) | (0.100) | (0.109) | (0.114) | (0.129) | (0.116) | (0.130) | (0.130) |
| **Observations** | 754 | 717 | 754 | 717 | 734 | 700 | 734 | 700 |
| **R-squared** | 0.452 | 0.440 | 0.474 | 0.381 | 0.449 | 0.425 | 0.472 | 0.380 |

Note: Estimation method: Ordinary Least Squares.
Dependent variable: Administrative scores of Reading/Mathematics in SENECA (1=D; 0=other case).
Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.
Source: Authors' own elaboration from ESOC10-SEN.

**Table 1b. Table 1a. Estimates of the probability of failing.**

| | Specification III | | | | Specification IV | | | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** |
| | | | | | | | | |
| **Education expectations in years of study** | -0.036*** | -0.057*** | -0.043*** | -0.025*** | -0.031*** | -0.053*** | -0.042*** | -0.020** |
| | (0.008) | (0.007) | (0.008) | (0.008) | (0.008) | (0.007) | (0.008) | (0.008) |
| **Selected track in the course 2010/2011: First course of Introductory Vocational Qualification Program (Ref.: Repeat the course)** | 0.161*** | 0.197** | 0.146*** | 0.381*** | 0.137** | 0.184** | 0.143** | 0.365*** |
| | (0.056) | (0.087) | (0.056) | (0.098) | (0.056) | (0.086) | (0.056) | (0.097) |
| **Selected track in the course** | -0.491*** | -0.375*** | -0.441*** | -0.442*** | -0.489*** | -0.365*** | -0.442*** | -0.433*** |

| | Specification III | | | | Specification IV | | | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** |
| **2010/2011: Medium-level vocational studies (Ref.: Repeat the course)** | | | | | | | | |
| | (0.100) | (0.088) | (0.100) | (0.098) | (0.099) | (0.087) | (0.100) | (0.098) |
| **Selected track in the course 2010/2011: High School of Arts (Ref.: Repeat the course)** | -0.628*** | -0.333* | -0.425** | -0.131 | -0.616*** | -0.352** | -0.424** | -0.153 |
| | (0.175) | (0.172) | (0.176) | (0.193) | (0.174) | (0.171) | (0.176) | (0.192) |
| **Selected track in the course 2010/2011: High School of Sciences and Technology (Ref.: Repeat the course)** | -0.455*** | -0.301*** | -0.441*** | -0.450*** | -0.452*** | -0.280*** | -0.442*** | -0.429*** |
| | (0.040) | (0.036) | (0.040) | (0.041) | (0.039) | (0.036) | (0.040) | (0.041) |
| **Selected track in the course 2010/2011: High School of Social and Human Sciences (Ref.: Repeat the course)** | -0.433*** | -0.329*** | -0.390*** | -0.417*** | -0.433*** | -0.314*** | -0.391*** | -0.399*** |
| | (0.038) | (0.032) | (0.038) | (0.036) | (0.038) | (0.032) | (0.038) | (0.036) |
| **Selected track in the course 2010/2011: High School of Adults or IESA (Ref.: Repeat the course)** | 0.151 | -0.124 | 0.130 | -0.181 | 0.133 | -0.142 | 0.123 | -0.214 |
| | (0.157) | (0.173) | (0.158) | (0.193) | (0.156) | (0.170) | (0.158) | (0.192) |
| **Immigrant student (Ref.: Native)** | 0.059 | 0.047 | 0.100 | -0.068 | 0.072 | 0.050 | 0.113 | -0.062 |
| | (0.070) | (0.066) | (0.070) | (0.074) | (0.068) | (0.065) | (0.069) | (0.073) |
| **Type of municipality where he/she lives: Capital of province (Ref.: Not a capital of province)** | -0.022 | 0.037 | -0.029 | -0.017 | -0.023 | 0.037 | -0.030 | -0.019 |
| | (0.030) | (0.027) | (0.031) | (0.030) | (0.030) | (0.027) | (0.030) | (0.030) |
| **Brothers or sisters in the household: Does not have brothers or sisters (Ref.: Lives with all brothers or sisters)** | 0.114** | -0.008 | 0.060 | -0.033 | 0.122** | -0.010 | 0.061 | -0.036 |
| | (0.052) | (0.043) | (0.052) | (0.048) | (0.051) | (0.043) | (0.052) | (0.048) |
| **Brothers or sisters in the household: Does not live with all brothers or sisters (Ref.: Lives with all brothers or sisters)** | 0.015 | 0.010 | -0.089** | 0.056 | 0.015 | 0.013 | -0.084* | 0.060 |
| | (0.045) | (0.036) | (0.045) | (0.040) | (0.045) | (0.036) | (0.045) | (0.040) |
| **Parents in the household: Lives only with the father (Ref.: Lives with both parents)** | -0.076 | 0.024 | 0.265 | -0.022 | -0.050 | 0.049 | 0.265 | -0.003 |
| | (0.178) | (0.295) | (0.179) | (0.330) | (0.177) | (0.292) | (0.179) | (0.329) |
| **Parents in the household: Lives only with the mother (Ref.: Lives with both parents)** | -0.171** | -0.038 | -0.090 | -0.019 | -0.166** | -0.051 | -0.089 | -0.033 |
| | (0.073) | (0.055) | (0.074) | (0.062) | (0.073) | (0.055) | (0.074) | (0.062) |

| | Specification III | | | | Specification IV | | | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** | **Reading: D. Boys** | **Reading: D. Girls** | **Mathematics: D. Boys** | **Mathematics: D. Girls** |
| **Father's job: works more than 8 hours every day (Ref.: Father does not work)** | -0.082 | -0.021 | -0.032 | -0.119** | -0.070 | -0.030 | -0.026 | -0.130** |
| | (0.067) | (0.052) | (0.067) | (0.058) | (0.066) | (0.051) | (0.067) | (0.058) |
| **Father's job: works less than 8 hours every day (Ref.: Father does not work)** | -0.060 | -0.047 | -0.061 | -0.093* | -0.057 | -0.050 | -0.060 | -0.095* |
| | (0.060) | (0.045) | (0.060) | (0.050) | (0.060) | (0.045) | (0.060) | (0.050) |
| **Mother's year of study** | 0.006 | -0.006 | 0.001 | -0.001 | 0.006 | -0.005 | 0.001 | -0.000 |
| | (0.005) | (0.004) | (0.005) | (0.004) | (0.005) | (0.004) | (0.005) | (0.004) |
| **Number of corrections due to misbehaviour** | 0.015* | 0.005 | 0.028*** | 0.001 | 0.011 | 0.004 | 0.027*** | -0.001 |
| | (0.008) | (0.013) | (0.008) | (0.015) | (0.008) | (0.013) | (0.008) | (0.015) |
| **Age of beginning to read (months)** | | | | | -0.001 | 0.001 | 0.001 | 0.002* |
| | | | | | (0.001) | (0.001) | (0.001) | (0.001) |
| **Age of beginning to write (months)** | -0.001 | 0.001 | 0.000 | 0.002* | | | | |
| | (0.001) | (0.001) | (0.001) | (0.001) | | | | |
| **Study hours** | | | | | -0.058*** | -0.052*** | -0.011 | -0.057*** |
| | | | | | (0.017) | (0.014) | (0.017) | (0.016) |
| **Constant** | 1.112*** | 1.278*** | 1.173*** | 0.876*** | 1.109*** | 1.278*** | 1.163*** | 0.882*** |
| | (0.130) | (0.118) | (0.131) | (0.132) | (0.129) | (0.115) | (0.130) | (0.129) |
| **Observations** | 731 | 699 | 731 | 699 | 734 | 700 | 734 | 700 |
| **R-squared** | 0.447 | 0.425 | 0.471 | 0.384 | 0.458 | 0.436 | 0.473 | 0.391 |

Note: Estimation method: Ordinary Least Squares.
Dependent variable: Administrative scores of Reading/Mathematics in SENECA (1=D; 0=other case).
Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.
Source: Authors' own elaboration from ESOC10-SEN.

Our econometric specification assumes that students take their abilities into account when they formulate their expectations. To check the consequences of this assumption, we control for each child's ability. We use two different measures of each child's ability to avoid the potential bias that the use of self-reported data might cause: the age at which each child began to read and the age at which he or she began to write. The estimated effects obtained using the former are shown in columns 5-8 of table 1a, whereas those obtained using the latter are included in columns 1-4 of table 1b. Assuming that more able children are those who started to read or to write before, we find that children's ability does not affect significantly their probability to fail reading or mathematics. The estimated effects of the rest of the explanatory variables are quite robust to the inclusion of children's ability. Columns 3-6 of table 2 show the Oaxaca-Blinder decompositions obtained from these specifications. These results show that there are no significant gender differences in school abilities, but boys take more advantage of their innate ability than girls, which narrows the educational gaps –which are in favour of girls–. Despite this, the estimated contributions of the other explanatory

variables to the pure response effect and the composition effect are robust to the inclusion of children's abilities for both reading and mathematics.

Finally, we add the time devoted to studying by each child to our list of regressors because part of the contribution of the gender differences in expectations might be caused by gender differences in the level of effort, as measured by the time each child devotes to studying (reported by the student). The estimated coefficients from this specification can be found in columns 5-8 of table 1b, while the Oaxaca-Blinder decomposition are included in the 7$^{th}$ and 8$^{th}$ columns of table 2. As expected, we observe that the higher the effort made by the student, the lower his or her probability to fail reading and maths. We find that the magnitude of the estimated coefficients of all the explanatory variables is quite insensitive to the inclusion of the time devoted to studying by each child. The detailed decompositions of the gender gap in reading and mathematics show that girls are more productive when they study than boys, which gives girls an advantage at school. Dart et al (1999) suggest that male students are more likely to use a surface learning approach so this may provide an explanation for the gender productivity gap. Moreover, the contributions of the gender difference in children's expectations and plans for the future decrease dramatically when we include children's effort, suggesting that girls get better grades in reading and mathematics when they want to attend more demanding high-school programs or when they expect to complete a greater number of schooling years because they take advantage of their greater productivity per each hour devoted to studying. However, since we do not find significant differences between the effort made by boys and girls, the contribution of the composition effect of this variable is not significantly different from zero and, then, the composition effects of the rest of the explanatory variables are similar to those obtained from previous specifications. Whereas some researches, such as Cotton et al (2015), argue that male students perform less well at school because their overconfidence in their own ability lead them to study less, others claim that girls take education more seriously than boys (Grebennikov and Skaines 2009). Our results support the latter explanation for the observed gender difference in educational outcomes rather than the former.

## 6. CONCLUSIONS

The existence of gender differences in academic achievement has been highlighted by researchers across many countries. In the present study we have analyzed whether or not they are present among the secondary education students from the most populated region of Spain and which individual and family characteristics may be causing them. Our results have shown that boys and girls present differences in their likelihood of failing, which is higher for the former group of students. What is more, we have also found that the differences in expectations of boys and girls may explain almost all these differences in academic achievement in favor of girls. Concretely, girls' advantage at school may be mainly due to their greater educational response to expectations.

In this sense, we found that girls get better grades in reading and mathematics when they want to attend more demanding high-school programs or when they expect to complete a

greater number of schooling years, as they take advantage of their greater productivity per each hour devoted to studying; nevertheless, boys take more advantage than girls of their innate ability. This pattern of gender differences may be showing what the literature has been denoting: girls are more aware of the importance of getting a high level of studies than boys and put more effort on achieving it, while boys focus more on being "visible" in the classroom by misbehaving and, hence, presenting higher failing rates. These results denote the need of policy interventions aimed at getting this vast amount of boys back in track, by the design of programs to provide them with early attention when they start showing this kind of misconducts. In addition, it could be important to manage vocational and university orientation programs, as they could provide students with proper information to form their expectations, and also help to orientate their future career elections.

**Table 2. Oaxaca-Blinder detailed decomposition.**

| | Specification I | | Specification II | | Specification III | | Specification IV | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Reading: D** | **Mathematics: D** | **Reading: D** | **Mathematics: D** | **Reading: D** | **Mathematics: D** | **Reading: D** | **Mathematics: D** |
| **Total differential** | -0.113*** | -0.104*** | -0.123*** | -0.111*** | -0.121*** | -0.111*** | -0.123*** | -0.111*** |
| | (0.022) | (0.023) | (0.022) | (0.023) | (0.022) | (0.023) | (0.022) | (0.024) |
| **Educational responses** | -0.111*** | -0.104*** | -0.122*** | -0.112*** | -0.119*** | -0.111*** | -0.140*** | -0.162*** |
| | (0.019) | (0.021) | (0.020) | (0.021) | (0.020) | (0.021) | (0.028) | (0.030) |
| **Education expectations in years of study** | -1.129*** | -0.755*** | -1.281*** | -0.828*** | -1.249*** | -0.795*** | -1.040*** | -0.547*** |
| | (0.117) | (0.129) | (0.133) | (0.143) | (0.133) | (0.143) | (0.137) | (0.148) |
| **Selected track in the course 2010/2011** | -0.056* | -0.160*** | -0.075** | -0.179*** | -0.069* | -0.175*** | -0.035 | -0.130*** |
| | (0.034) | (0.036) | (0.036) | (0.038) | (0.036) | (0.037) | (0.035) | (0.037) |
| **Immigrant student** | 0.004 | 0.001 | 0.005 | 0.001 | 0.004 | 0.000 | 0.002 | -0.001 |
| | (0.003) | (0.003) | (0.004) | (0.004) | (0.003) | (0.004) | (0.004) | (0.004) |
| **Type of municipality where he/she lives** | 0.032*** | 0.024** | 0.038*** | 0.027*** | 0.038*** | 0.027** | 0.020* | 0.012 |
| | (0.010) | (0.010) | (0.010) | (0.011) | (0.010) | (0.011) | (0.010) | (0.011) |
| **Brothers or sisters in the household** | -0.010 | 0.004 | -0.008 | 0.005 | -0.009 | 0.003 | -0.013 | -0.002 |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| **Parents in the household** | 0.012 | 0.014* | 0.011 | 0.013 | 0.011 | 0.013 | 0.006 | 0.006 |
| | (0.009) | (0.009) | (0.008) | (0.009) | (0.008) | (0.009) | (0.008) | (0.009) |
| **Father's job** | 0.180*** | 0.209*** | 0.186*** | 0.204*** | 0.178*** | 0.198*** | 0.055 | 0.064 |
| | (0.055) | (0.058) | (0.055) | (0.058) | (0.055) | (0.058) | (0.060) | (0.063) |
| **Mother's years of studies** | 0.289*** | 0.502*** | 0.329*** | 0.495*** | 0.314*** | 0.480*** | 0.159* | 0.305*** |
| | (0.067) | (0.071) | (0.070) | (0.073) | (0.069) | (0.072) | (0.083) | (0.087) |
| **Number of corrections due to misbehaviour** | 0.005 | 0.009* | 0.008 | 0.010** | 0.007 | 0.010* | -0.004 | -0.004 |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| **Age of beginning to read (months)** | | | 0.303*** | 0.295*** | | | 0.140* | 0.114 |
| | | | (0.077) | (0.081) | | | (0.081) | (0.086) |
| **Age of beginning to write (months)** | | | | | 0.263*** | 0.257*** | | |
| | | | | | (0.082) | (0.086) | | |

| | Specification I | | Specification II | | Specification III | | Specification IV | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Reading: D** | **Mathematics: D** | **Reading: D** | **Mathematics: D** | **Reading: D** | **Mathematics: D** | **Reading: D** | **Mathematics: D** |
| **Study hours** | | | | | | | -0.187** | -0.345*** |
| | | | | | | | (0.094) | (0.096) |
| **Constant** | 0.562*** | 0.047 | 0.361*** | -0.156 | 0.392*** | -0.130 | 0.757*** | 0.366*** |
| | (0.114) | (0.126) | (0.131) | (0.144) | (0.133) | (0.145) | (0.120) | (0.134) |
| **Reweighting error** | -0.002 | -0.000 | -0.001 | 0.001 | -0.001 | -0.000 | 0.017 | 0.051** |
| | (0.014) | (0.015) | (0.014) | (0.016) | (0.014) | (0.015) | (0.024) | (0.025) |
| **Composition effect** | -0.088*** | -0.091*** | -0.095*** | -0.102*** | -0.093*** | -0.100*** | -0.085*** | -0.096*** |
| | (0.025) | (0.028) | (0.028) | (0.029) | (0.027) | (0.029) | (0.030) | (0.032) |
| **Education expectations in years of study** | -0.019 | -0.023 | -0.023* | -0.027* | -0.022* | -0.027* | -0.019 | -0.025 |
| | (0.012) | (0.014) | (0.013) | (0.015) | (0.013) | (0.015) | (0.014) | (0.018) |
| **Selected track in the course 2010/2011** | -0.062*** | -0.055*** | -0.069*** | -0.062*** | -0.067*** | -0.061*** | -0.062*** | -0.058*** |
| | (0.015) | (0.014) | (0.016) | (0.015) | (0.016) | (0.015) | (0.017) | (0.016) |
| **Immigrant student** | -0.001 | -0.001 | -0.001 | -0.001 | -0.000 | -0.001 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Type of municipality where he/she lives** | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Brothers or sisters in the household** | 0.001 | -0.002 | 0.001 | -0.002 | 0.001 | -0.002 | 0.001 | -0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| **Parents in the household** | -0.001 | -0.003 | -0.001 | -0.002 | -0.001 | -0.002 | -0.003 | -0.003 |
| | (0.003) | (0.002) | (0.003) | (0.002) | (0.003) | (0.002) | (0.004) | (0.002) |
| **Father's job** | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.003) | (0.003) |
| **Mother's years of studies** | -0.002 | -0.000 | -0.002 | -0.000 | -0.002 | -0.000 | -0.002 | -0.000 |
| | (0.002) | (0.002) | (0.002) | (0.001) | (0.002) | (0.001) | (0.002) | (0.002) |
| **Number of corrections due to misbehaviour** | -0.006* | -0.010*** | -0.005 | -0.009*** | -0.005* | -0.010*** | -0.004 | -0.009*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| **Age of beginning to read (months)** | | | 0.002 | -0.001 | | | 0.002 | -0.001 |
| | | | (0.002) | (0.002) | | | (0.002) | (0.002) |
| **Age of beginning to write (months)** | | | | | 0.002 | -0.001 | | |
| | | | | | (0.002) | (0.002) | | |
| **Study hours** | | | | | | | 0.000 | 0.000 |
| | | | | | | | (0.002) | (0.000) |
| **Specification error** | 0.088*** | 0.091*** | 0.095*** | 0.102*** | 0.093*** | 0.100*** | 0.085*** | 0.096*** |
| | (0.024) | (0.025) | (0.026) | (0.026) | (0.026) | (0.026) | (0.029) | (0.031) |

Note: Estimation method: Ordinary Least Squares.
Dependent variable: Administrative scores of Reading/Mathematics in SENECA (1=D; 0=other case).
Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.
Source: Authors' own elaboration from ESOC10-SEN.

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