THE GENDER GAP IN SCHOOL AND LABOUR MARKET EXPECTATIONS DURING ADOLESCENCE: AN EMPIRICAL ANALYSIS

Cristina Valentina Heghes

UNIVERSITAT ROVIRA i VIRGILI

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Department of Economics

PhD Dissertation

THE GENDER GAP IN SCHOOL AND LABOUR MARKET EXPECTATIONS DURING ADOLESCENCE: AN EMPIRICAL ANALYSIS

Author:
Cristina Valentina Heghes

Thesis Advisor:
Luis Díaz-Serrano, PhD

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FAIG CONSTAR que aquest treball, titulat "**THE GENDER GAP IN SCHOOL AND LABOUR MARKET EXPECTATIONS DURING ADOLESCENCE: AN EMPIRICAL ANALYSIS**", que presenta **Cristina Valentina Heghes** per a l'obtenció del títol de Doctor, ha estat realitzat sota la meva direcció al **Departament d'Economia** d'aquesta universitat.

HAGO CONSTAR que el presente trabajo, titulado "**THE GENDER GAP IN SCHOOL AND LABOUR MARKET EXPECTATIONS DURING ADOLESCENCE: AN EMPIRICAL ANALYSIS**", que presenta **Cristina Valentina Heghes** para la obtención del título de Doctor, ha sido realizado bajo mi dirección en el **Departamento de Economia** de esta universidad.

I STATE that the present study, entitled "**THE GENDER GAP IN SCHOOL AND LABOUR MARKET EXPECTATIONS DURING ADOLESCENCE: AN EMPIRICAL ANALYSIS**", presented by **Cristina Valentina Heghes** for the award of the degree of Doctor, has been carried out under my supervision at the **Department of Economics** of this university.

Reus, 27-05-2024

El/s director/s de la tesi doctoral
El/los director/es de la tesis doctoral
Doctoral Thesis Supervisor/s

DIAZ SERRANO LUIS - 46234676F

Firmado digitalmente por DIAZ SERRANO LUIS - 46234676F
Fecha: 2024.05.27 14:03:14 +02'00'

Luis Díaz Serrano

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"It always seems impossible—until it's done."
Nelson Mandela

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Before concluding, I want to express my deepest gratitude to my family. From our earliest years, my sister and I have resonated with the Romanian proverb 'Ai carte, ai parte' (approximate translation: 'Knowledge is a treasure'). This family mantra has underscored the profound value of education, the most precious investment one can make. Despite their limited understanding of 'papers', 'regressions', 'dependent/independent variables', and 'empirical studies', my family members have made a valuable contribution with their unwavering patience, support, and understanding.

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All remaining errors are my own.

Sincerely,
Cristina Valentina Heghes
Reus
May 2024

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Al reflexionar sobre la época anterior a embarcarme en el programa de doctorado, recuerdo mi curiosidad innata por comprender las cosas. Esta curiosidad me impulsó a realizar el Máster en Mercados Internacionales en la Universitat Rovira i Virgili (URV), donde opté por la carrera de investigación. Como estudiante de maestría, di mis primeros pasos en la investigación adquiriendo conocimientos y habilidades bajo la guía de profesores dedicados. Al mismo tiempo, tuve el privilegio de recibir una beca de iniciación a la investigación en el Departamento de Economía y Empresa de la universidad. Esta experiencia fue invaluable y solidificó mi decisión de embarcarme en el viaje de una tesis doctoral.

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Antes de concluir, quiero expresar mi más profundo agradecimiento a mi familia. Desde nuestros primeros años, mi hermana y yo hemos resonado con el proverbio rumano "Ai carte, ai parte" (traducción aproximada: "El conocimiento es un tesoro"). Este mantra familiar ha subrayado el profundo valor de la educación, la inversión más preciosa que uno puede hacer. A pesar de su comprensión limitada de los 'artículos', las 'regresiones', las 'variables dependientes/independientes' y los 'estudios empíricos', los miembros de mi familia han hecho una valiosa contribución con su inquebrantable paciencia, apoyo y comprensión.

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CHS	Continuous Household Survey
CIA	Conditional Independence Assumption
ECO-SOS	Research Centre on Economics and Sustainability
EIs	Entrepreneurial Intentions
ESO	Educación Secundaria Obligatoria (Secondary Compulsory Education)
GRM	Gender Role Model
MRM	Masculine Role Model
NCDS	National Child Development Study
NEET	Not in Employment, Education, or Training
NLSY-C	National Longitudinal Study Children
NLSY79	National Longitudinal Survey of Youth of 1979
NYU	New York University
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PISA	Program for International Student Assessment
PPVT	Peabody Picture Vocabulary Test
PSID	Panel Study of Income Dynamics
PSM	Propensity Score Matching
QURE	Quantitative, Urban and Regional Economics
STEM	Science, Technology, Engineering, and Mathematics
TPB	Theory of Planned Behaviour
U.N.	United Nations
UQR	Unconditional Quantile Regression
WEF	World Economic Forum

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CHAPTER 1

Foreword and Data

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1.1 Foreword

Studies on gender in economics are not new, but the topic has attracted more scholarly attention only recently. Researchers have long wanted to understand how gender influences various aspects of human life, ranging from cognitive abilities and expectations to personality traits and career choices. Even though the global population's demographic distribution indicates a near parity between the number of males and females worldwide, persistent gender differences are evident in various domains.

Traditionally, family roles have been characterised by females as the caregivers and homemakers and males as the breadwinners (Eagly and Steffen, 1984; Eagly et al., 2000). Educational indicators, occupational aspirations, and career choices consistently reveal gender disparities. For instance, the representation of female students is often lower in fields like science, technology, engineering, and mathematics, and the representation of male students is relatively low in education, welfare, and health (Organisation for Economic Co-operation and Development [OCDE], 2017; World Economic Forum's [WEF], 2017). Analogously, expected and realised earnings are systematically higher for males than for females (Reuben et al., 2017; Weichselbaumer and Winter-Ebmer, 2005). For instance, according to the OECD, females working fulltime earn roughly 88 cents for every euro or dollar earned by their male counterparts (OECD, 2023). Similarly, females may display a lower tendency towards risk-taking behaviour. These are just a few examples of the abundant evidence pointing to gender gaps. Although organisations such as the United Nations and the World Bank are constantly committed to promoting gender equality, females continue to find themselves in disadvantageous positions across multiple dimensions[1]. These pieces of evidence suggest that gender studies are essential for gaining a deep understanding of gender patterns and recognising the diversity within society. Identifying individuals/groups in need of support can facilitate progress towards a more equal and inclusive society. The underrepresentation of females/males in particular fields is seen as a notable loss of untapped potential and a missed opportunity for economic growth and development.

There are diverse studies addressing gender differences in human capital and labour market outcomes in Western countries from the perspective of individuals' expectations and aspirations. However, these empirical studies typically employ gender as a dummy variable in their estimations or consider gender as an additional demographic variable. Studies conducting gender-separate analyses are virtually non-existent. This approach is particularly interesting because separate estimations could offer in-depth insights into gender-specific dynamics. Furthermore, empirical evidence on birth-order effects in educational and labour market expectations and aspirations, as well as the determinants of the gender gap in labour market expectations during adolescence, remains limited. This is an important issue, because during adolescence, individuals form and solidify expectations about education and the labour market, which in turn condition the schooling choices that determine their educational attainment, their entry into the labour market, and their professional careers' evolution during adulthood. The fact that it has distinct characteristics or endowments may in part determine the outperformance of one group over another in the labour market. These differences, if not suppressed, could at least be minimised through policy interventions during adolescence, when expectations, beliefs and preferences are still malleable. Taking collectively, these points suggest that this strand of literature deserves much more attention. We attempt to fill this gap in the current study.

The central focus of this thesis lies in the examination of gender differences across a wide range of factors. Differently from most authors of empirical studies within the economics literature, we conduct

[1] According to the WEF's 'The Global Gender Gap Report 2023' (WEF, 2023), gender gaps in educational attainment and health outcomes have been almost completely closed in the 146 countries considered. However, gaps in political empowerment, and economic participation and opportunities are still significantly large.

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separate regression analyses for male and female adolescents. Chapters 3 and 4, besides examining gender differences, study the determinants of the gender gap in expected earnings and entrepreneurial intentions (EIs), respectively.

This thesis is a compendium of articles. 'Chapter 2 The Birth-Order Effect Revisited: The Role of Expectations, Aspirations, and Non-cognitive Abilities during Adolescence'; 'Chapter 3 Gender Gap in Expected Earnings: Stereotypes and the Gender Role Model'; 'Chapter 4 Can the Gender Role Model Explain the Gender Gap in Entrepreneurial Intentions Among Adolescent Students?' There are some common features among the three studies. The rich dataset allowed us to analyse all the empirical studies and to control for a wide range of factors that are generally not available in administrative data. Additionally, the data enabled the incorporation of school fixed effects in all the models, allowing us to control for potential peer effects and school unobserved heterogeneity. We think this is important in analysing school-related and other outcomes in adolescence. The inclusion of family fixed effects would have been ideal, but we were unable to incorporate them because of data limitations. Nonetheless, the data allowed us to control for several relevant family characteristics, mitigating family fixed effects' absence.

Each chapter studies students' expectations and aspirations across various dimensions (e.g. human capital, labour market outcomes, among others). According to the theory of planned behaviour developed by Ajzen (1991), intentions represent the initial stage preceding behaviour. In labour economics, expectations match reality quite well (Webbink and Hartog, 2004). Thus, studying students' expectations and aspirations does not have to be a matter of concern.

Regarding methodology, ordinary least squares (OLS) was the technique employed across all chapters. When examining the determinants of the gender gap in expected earnings and EI in Chapters 3 and 4, several techniques were taken into consideration. The literature offers a range of methodologies for studying gender gaps, spanning from parametric to non-parametric methods. Recently, the non-parametric method – in particular, propensity score matching – has gained popularity among researchers, but the matching strategy builds on conditional independence assumption[2]. This technique was considered during the determination of the empirical methodology, but its implementation would have required careful consideration of several criteria. Following the prescribed steps would have led to a reduction of the sample size. Our dataset did not allow us to apply the methodology rigorously. Consequently, the traditional Blinder-Oaxaca decomposition was considered.

Chapter 2 analyses the birth order effect on a broad spectrum of outcome variables – encompassing educational aspirations and labour market expectations during adolescence – revealing a difference among siblings. This paper aims to go beyond the traditional studies by exploring the potential drivers of the birth order effect, providing insights into the factors that cause inequality among siblings. In Chapter 3 the focus shifts to investigating the effect of our key variables, namely, gender role models and stereotypes, on expected wages (starting salary and salary at 35–40 years) and reservation wages. Besides the traditional OLS regression, this paper incorporates a decomposition technique. This methodology serves to quantify the covariates' contribution to the gender gap in expected wages and reservation wages. Chapter 4 measures the effect of two types of gender role models (inspirational and parental entrepreneurial role models) on students' EIs. Similar to the previous chapter, the traditional Binder-Oaxaca decomposition was employed to provide insights into factors contributing to gender gap in EIs.

[2] Caliendo and Kopeinig (2008), offered practical guidance on the technique.

The three studies of this thesis significantly contribute to the existing literature by emphasising the presence of heterogeneous effects between adolescent boys and girls. Furthermore, they provide insights into the potential drivers of the issues studied. This is accomplished by the use of a rich dataset, which enables to control for a wide spectrum of factors, leaving little room for omitted variable bias.

Following this introductory section, Section 1.2 presents the source of the data and provides a general overview of the variables employed to conduct this dissertation.

1.2 Data

1.2.1 Data source

The data used in this study came from a survey conducted in April and May 2016 in secondary education schools in Catalonia in the northeast region of Spain. The survey was specially designed to collect data for a research project on the determinants of school success in secondary education. The database contained variables reflecting socio-demographic characteristics, personality traits, cognitive and non-cognitive skills, family background, school outcomes, students' academic intentions for the next year, and academic and labour market expectations and so on. The surveyed students were attending the last year of secondary compulsory education (age 16) or were enrolled in the post-compulsory lower vocational training (VT) track or high school (ages 17–18). Appendix A contains a reduced version of the survey for students enrolled in the last year of secondary compulsory. Surveys for the other education levels were quite similar, with course adjustments made where necessary. For example, a lack of mathematics and language subjects in VT; resulted in the omission of these questions in the survey.

An invitation to participate in the survey was sent out to all public secondary schools in Catalonia (564); 92 agreed to participate. This was a reasonably good sample because it represented 16% of all public schools in Catalonia and consisted of 9,275 students[3]. Almost half of the students (45.5%) were attending the last grade of secondary compulsory education, 35.7% were enrolled in high school, and the remaining 18.7% were attending the lower vocational track. Depending on the specific focus of each chapter and the availability of data, estimations were conducted with one sample or another. Each empirical study within this thesis provides detailed information about the sample utilised.

Although our sample was not random, it was very representative of the Catalan adolescent population. Table 1.1 compares our data with the data from the Spanish Continuous Household Survey (CHS) of 2016 for Catalonia. We compared the socio-economic characteristics of the households in both surveys. We observed that marital status, birthplace, education level, and employment status of the parents of the adolescents in our survey were similar to the comparable population in the CHS, which consisted of all parents with at least one child aged 24 or younger. Differences between both surveys were fairly small, and in variables such as parental education or employment status, these differences may be due to the fact that, in our survey, a non-negligible share of the students declared that they did not know this information regarding their parents. This was probably the case for adolescents with divorced parents. In the CHS, the parents themselves reported their education level and employment status.

One interesting feature of our data is that they reproduced with accuracy the choices made by the population of students in Catalonia. In Table 1.2, we compared several measures, including, the educational expectations and schooling intentions in our sample with the administrative data the Regional Government of Catalonia provided. According to this source, approximately, 66% of the students who

[3] For schools that decided to participate, the questionnaire was administered in the classroom. Because class attendance is compulsory for those attending secondary education, all students present on the day of the survey completed the questionnaire. Thus, we did not consider that attrition to be an issue of concern.

finished secondary compulsory education opted for attending high school. This proportion was higher for girls (around 70%) than for boys (around 60%). Our data matched these numbers. From the 92 schools that decided to participate in our study, the share of students attending high school was 65.6%, out of which 70.2% were girls and 60.2% were boys.

Table 1.1
Comparison of socioeconomic characteristics in our data and the Continuous Household Survey (2016)

	Our data (2016)		CHS[1] (2016)	
Marital Status				
Married	70.1%		71.6%	
Divorced/Single	27.4%		26.0%	
Widowed	2.5%		2.4%	
	Father	**Mother**	**Father**	**Mother**
Birthplace				
Spain	79.0%	78.3%	79.6%	81.2%
Abroad	21.0%	21.7%	20.4%	18.8%
Education				
Primary or lower	44.5%	39.3%	41.3%	34.7%
Secondary (high school)	9.0%	11.1%	14.2%	13.4%
Secondary (vocational training)	17.9%	18.9%	21.2%	21.3%
University	16.2%	22.1%	23.4%	30.7%
I don't know	12.4%	8.7%		
Employment status				
Salaried	59.5%	59.0%	60.5%	60.9%
Business owner/self-employee	21.4%	13.8%	20.4%	9.6%
Unemployed	6.1%	8.3%	11.1%	12.5%
Inactive	5.9%	14.4%	8.1%	16.9%
I don't know	7.1%	4.4%		

Notes: (1) Population statistics are taken from administrative registers of the Spanish Continuous Household Survey (CHS)

Regarding intentions to go to high school or to enrol in the vocational track after completing compulsory education, our data again matched the official data from the Regional Government of Catalonia. From the sample of students in the last year of compulsory education, almost 60% answered that they were going to attend high school, whereas 33% answered that they were going to attend the lower vocational track. The proportion of girls that wanted to go to high school was 63%, whereas this figure was 54% for boys. The small discrepancies in the administrative data, around 5-6 percentage points, were due to the fraction of surveyed students that answered they did not know what they were going to do next year.

The measure, namely, expectations to achieve a university degree also behaved as in other well-known surveys. More specifically, in our data the share of students who expected to obtain a university degree was 56.3%. Girls were more likely to report they expected to obtain a university degree (62.6%) than boys (49.6%). In the 2015 wave of Program for International Student Assessment (PISA), this question was also asked to all participants in the last grade of compulsory secondary education. The

results indicated that 59.2% of the Catalan students expected to graduate from university. The figures were 63.6% for girls and 55.1% for boys, practically the same as the figures observed in our data.

Finally, according to the Regional Government of Catalonia, approximately 75% of the Catalan students who successfully graduated from high school chose to attend higher education, whereas the remaining 25% either opted for advanced VT programmes or entered the labour market. In our survey, the share of students in the last year of high school who reported their intention to go to university the next year was 67%, whereas the share of the students who reported they were going to take an upper vocational programme was 19%. The proportion of girls that wanted to go to university was 70%, whereas this figure was 62% for boys.

Table 1.2
Summary statistics of the outcome variables in our data compared with data coming from different sources

	Post-compulsory secondary education					
	Our data			**Population statistics(2)**		
	All	**Boys**	**Girls**	**All**	**Boys**	**Girls**
% attending high-school	65.6%	60.2%	70.2%	66%	60%	70%
% attending vocational track	34.4%	39.8%	29.8%			
	What are you going to study next year?					
	Our data			**Population statistics(2)**		
	All	**Boys**	**Girls**	**All**	**Boys**	**Girls**
Students in 4th grade						
High-school	59%	54%	63%	66%	60%	70%
Lower vocational-professional track	33%	36%	31%			
Do not know	8%	10%	6%			
2nd grade high-school						
University	67%	62%	70%	75%		
Upper vocational-professional track	19%	22%	17%			
Do not know	10%	10%	10%			
Other	4%	6%	3%			
	Expectations achieving university degree					
	Our data			**PISA data**		
	All	**Boys**	**Girls**	**All**	**Boys**	**Girls**
Students in 4th grade	56.3%	49.6%	62.6%	59.2%	55.1%	63.6%

Notes: (2) Population statistics are taken from administrative registers of the Regional Government of Catalonia

1.2.2 Overview of variables

The unusually rich dataset allowed us to explore a broad spectrum of variables, facilitating in-depth analyses and uncovering patterns and trends that might not have been possible with more standard datasets, thus minimising the risk of omitted variable bias. In the thesis, a vast array of outcome variables was explored. Additionally, we controlled for a myriad of variables. The nature of our dataset allowed us to manipulate variables, giving rise to new variables derived from the original ones.

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In this section, I provide a general overview of the variables used in the thesis; detailed information is presented in the appropriate section in each chapter.

Regarding outcome variables, Chapter 2 stood out because of its empirical analysis with an extensive array of measures, encompassing cognitive abilities (e.g. students' test scores), personality traits, life aspirations, and labour market expectations, among others. Chapters 3 and 4 examined two distinct measures of labour market outcomes, own expected salary and EI, respectively.

Besides outcome variables, the analysis incorporated explanatory variables (variables of interest) and control variables. The variables of interest were quite distinct in each chapter. In Chapter 2, the key variable was birth order, represented as a dummy variable indicating whether the student was second-born, third-born, or fourth or higher-born. In contrast, the last two chapters considered two explanatory variables. Chapters 3 and 4 shared one explanatory variable, the gender role model, representing the gender of individuals' career referents. Additionally, Chapter 3 included a measure of stereotypes (an index capturing boys' and girls' sexist attitudes from a list of questions), and Chapter 4 contained a key variable, the parental entrepreneurial role model (capturing whether each parent was self-employed).

Finally, bountiful control variables were incorporated into the analysis. A set of individual and family characteristics like gender, birthplace, parents' education level, number of siblings, or parents' labour status were common across all three empirical studies. Additionally, each chapter introduced specific control variables that were selected based on economic reasoning and prior evidence in the literature. For instance, in Chapter 3, which explored the effect of gender role models and stereotypes on expected earnings, specific control variables like occupational, employee, and life goal aspirations were exclusively included. In Chapter 4, which tested the effect of inspirational role models and parental entrepreneurial role models on EIs, a measure of job characteristics was exclusively considered as a control variable in the estimations.

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Appendix A: Last year of secondary compulsory education survey

Hello!

We are conducting a study on young people of your age to understand **your motivations and academic and professional expectations**. This is a matter of great importance. The decisions you make regarding your studies now can determine your future and that of your children.

There are no right or wrong answers. You may not understand why we ask you certain questions, but everything is related. We may also ask about things you have never thought about; perhaps now is a good time to start considering them.

Your answers will be treated as completely confidential, so please feel confident in **answering honestly**. Otherwise, this research will not be useful.
Concentrate on the survey, and you will finish very quickly.
Go ahead!!!

1. School name (…):

2. Date of birth (dd/mm/yyyy):

3. Gender:

Woman	Man
☐	☐

4. During this school year, have you ever considered dropping out of studies?

Yes	No
☐	☐

5. What do you plan to do next year?

- ☐ Repeat the course to obtain the secondary compulsory education diploma (ESO), although I will not continue studying afterwards.
- ☐ Repeat the course to obtain the secondary compulsory education diploma (ESO), and then I will decide what to do.
- ☐ Repeat the course to be able to study a Vocational Training Cycle afterwards.
- ☐ Repeat the course to be able to study in high school afterwards.
- ☐ If I do NOT achieve the secondary compulsory education diploma (ESO) this year, I will stop.

studying.

- ☐ High school.
- ☐ Vocational Training Cycle.
- ☐ I do not know.

6. For what reason do you want to pursue High school? (You can choose more than one)

- ☐ There are no centers to study vocational training near home/village.
- ☐ It's what my parents want.
- ☐ The vocational training does not seem attractive to me.
- ☐ I would prefer to work, but now it is difficult to find a job.
- ☐ It's what will allow me to find a good job.
- ☐ It's what the teachers/counselors at the school recommended.
- ☐ I want to go to university.
- ☐ The offer of vocational training is not wide enough to find one that I like.
- ☐ It's the one that best suits my abilities.
- ☐ It's what my friends will do.
- ☐ Other: ☐

7. Which high school track will you choose?

- ☐ Science and technology
- ☐ Humanities and social sciences
- ☐ Arts
- ☐ I do not know.

8. For what reason do you want to pursue this High school track? (You can choose more than one)

- ☐ It's the one I like the most.
- ☐ It's the one I believe best fits my abilities.
- ☐ It's the one that will allow me to find a good job.
- ☐ It's the one recommended by my parents.
- ☐ It's what my friends will do.
- ☐ It's the one that will allow me to study the university degree I want to pursue.
- ☐ It's what my teachers/counselors at school have recommended.
- ☐ Other: ☐

9. Suppose that at the end of this academic year you are offered a job with a long-term contract, which fits with your current level of education. What is the monthly salary you would require to take this job and abandon your studies?

- ☐ I would not take this job.
- ☐ I should be paid €/month: ☐

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Next, we will ask you some questions regarding your beliefs about the salaries and opportunities in the job market that you would have in the hypothetical case that you achieved different levels of education. These are fictitious situations, so you will need to imagine each of them. There are no right or wrong answers; we just want to know your perceptions.

10. Imagine that you keep studying until you get a University Degree. If you started looking for a job with the title of this University Degree in your pocket...

	Number
How many months do you think it would take you to find a job?	
Once you find a job, how much do you think you will earn (€/month)?	
When you will be 35–40 years old, how much do you think you will earn (€/month)?	

11. What is the highest level of education you expect to achieve?

- ☐ None, if I don't get my compulsory secondary education degree (ESO), I will stop studying.
- ☐ Only compulsory secondary education (ESO); when I get the ESO degree, I will stop studying.
- ☐ High school.
- ☐ Lower vocational-professional track.
- ☐ Upper vocational-professional track.
- ☐ A university degree.
- ☐ I do not know.

12. What is the profession you would like to do in the future? (For example: teacher, doctor, footballer, athlete, hairdresser, etc...)

13. When you finish studying and find a job, in which sector do you think you are most likely to end up working?

- ☐ Agriculture, livestock, in the countryside in general.
- ☐ Construction.
- ☐ Retail (grocery, supermarkets, etc.).
- ☐ Hotels, restaurants, tourism in general
- ☐ Industry (production companies, production centers, factories, etc.).
- ☐ Other qualified services (education, health, etc.).
- ☐ Other non-qualified services (cleaning, security, etc.).
- ☐ I do not know.

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14. In the future, would you like to ...

- ☐ Work in a private company.
- ☐ Work in the public sector (civil servant).
- ☐ Have your own business.
- ☐ I do not know.

15. From the following characteristics, select the 3 that you consider most important for a job: (You can only choose 3)

- ☐ That it has social utility.
- ☐ That it is socially well-regarded work.
- ☐ That it facilitates relating with people (colleagues, clients, etc.).
- ☐ That it has a good salary.
- ☐ That it is creative.
- ☐ That the schedule is flexible.
- ☐ That it is a long-term contract.
- ☐ That I can work autonomously.
- ☐ That it is suitable for my studies.
- ☐ That it does not involve physical effort.
- ☐ That it does not generate much pressure.

16. Of the following two options, which one do you choose?

- ☐ Receive a government aid of 1,000 Euros per month for 6 months without having to work.
- ☐ Work earning a salary of 1,000 Euros per month for 6 months.

17. Imagine that you get a sales job to sell a certain product and that you can choose between the following forms of payment, which would you choose?

- ☐ A fixed monthly salary of 1,200 Euros.
- ☐ A fixed monthly salary of 1,000 Euros + 400 Euros if you reach a sales target.
- ☐ A fixed monthly salary of 800 Euros + 800 Euros if you reach a sales target.
- ☐ A fixed monthly salary of 600 Euros + 1,200 Euros if you reach a sales target.

18. Imagine that you have the opportunity to receive 100 Euros today, but you are told that if you wait a month you will be able to receive a larger amount. In each of the following situations choose option A or B.

	Option A	**Option B**
(A) 100 Euros today - (B) 110 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 120 Euros a month from now	☐	☐

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(A) 100 Euros today - (B) 130 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 140 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 150 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 160 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 170 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 180 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 190 Euros a month from now	☐	☐
(A) 100 Euros today - (B) 200 Euros a month from now	☐	☐

19. What were your last grades in the following subjects?

	Failure	**Sufficient**	**Good**	**Very Good**	**Excellent**
Mathematics	☐	☐	☐	☐	☐
Catalan language	☐	☐	☐	☐	☐
Spanish language	☐	☐	☐	☐	☐
Foreign language	☐	☐	☐	☐	☐

20. Have you been diagnosed with any learning difficulties? (dyslexia, attention deficit...)

Yes	**No**
☐	☐

21. According to my abilities/intelligence I consider that

☐ My grades are better than I expected.
☐ My grades are worse than I expected.
☐ They are what I expected.

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22. Score yourself in the aspects related to your abilities in the following areas:

	1	2	3	4	5	6	7	8	9	10
Mathematical ability (numerical calculation, …)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ability to express myself verbally.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Social skills (making friends, contacts, …).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Commercial capacity (ability to convince others of what you want or your ideas).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Effort capacity (willingness to do things that I don't completely like).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ability to understand what I read.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

23. If you had the opportunity to live someone's life, from a professional point of view, whose life would you choose?

☐

24. In your opinion, what would a successful life be for you?

☐ Having a great deal of money.
☐ Being famous.
☐ Having social recognition.
☐ Being useful to society.
☐ Being able to live with enough time for myself.
☐ Starting my own family.
☐ Having a good professional career.

25. How often ...

	Never	Sometimes	Often	Always
The exams get me nervous.	☐	☐	☐	☐
I get nervous when the teacher asks me in classroom.	☐	☐	☐	☐
My parents demand too much from me in studies.	☐	☐	☐	☐
My parents are happy with my grades.	☐	☐	☐	☐
I feel like everything is going wrong.	☐	☐	☐	☐

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My parents tend to question my decisions.	☐	☐	☐	☐
I don't understand almost anything the teacher explains.	☐	☐	☐	☐

26. Answer the following questions ...

	Never	**Sometimes**	**Often**	**Always**
I am interested in what I learn in class.	☐	☐	☐	☐
I finish my homework on time.	☐	☐	☐	☐
I only do the minimum necessary to get through the course.	☐	☐	☐	☐
I finish what I start.	☐	☐	☐	☐
I follow my impulses.	☐	☐	☐	☐
I like the books that I am assigned to read at school.	☐	☐	☐	☐
I plan my tasks/activities carefully.	☐	☐	☐	☐

27. Express your degree of agreement or disagreement with the following statements:

	Strongly disagree	**Somewhat disagree**	**Somewhat agree**	**Strongly agree**
It bothers me if a classmate of the opposite sex gets higher grades than me.	☐	☐	☐	☐
In a household, it is preferable for the man to work and not the woman.	☐	☐	☐	☐
The fact that a man earns more money than a woman is justified.	☐	☐	☐	☐
In the event of a childbirth, it is the woman who should stop working and not the man.	☐	☐	☐	☐
Both members of the couple must share 50% of the household chores.	☐	☐	☐	☐

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It is important to have control over my partner.	☐	☐	☐	☐

28. Where were you born?

☐ Catalonia
☐ Valencian Country
☐ Balearic Islands
☐ Rest of Spain
☐ Outside of Spain

29. Do your parents give you a weekly financial allowance for your expenses?

Yes	**No**
☐	☐

PERSONAL DATA II

30. How much time do you spend daily on ... ?

	Hours/day
Playing video games/using the computer.	
Browsing the internet.	
Sleeping.	
Homework/studying after school.	
Chatting on the phone.	
Watching television.	

31. What is the highest level of education completed by your FATHER?

☐ No education
☐ Primary or compulsory education (ESO, EGB, etc.)
☐ Secondary education (high school)
☐ Vocational training
☐ University studies
☐ I do not know.

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32. What is the highest level of education completed by your MOTHER?

- ☐ No education
- ☐ Primary or compulsory education (ESO, EGB, etc.)
- ☐ Secondary education (high school)
- ☐ Vocational training
- ☐ University studies
- ☐ I do not know.

33. What is the age of your parents?

	Age
Father	
Mother	

34. What is the marital status of your parents?

- ☐ Married
- ☐ Living together as a couple without being married
- ☐ Separated/divorced
- ☐ Widowed
- ☐ Single

35. Regarding your household...

	Number
How many people live in your home most of the time? (including yourself)	
How many siblings do you have?	
How many of your siblings dropped out of school while studying Secondary Education, High School, or Vocational Training?	
Among your siblings, what is your position in terms of age order? (1 would mean you are the oldest)	

36. Answer the following questions:

	Never	**Sometimes**	**Often**	**Always**
My father attends school meetings.	☐	☐	☐	☐

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My mother attends school meetings.	☐	☐	☐	☐
My father helps me with homework.	☐	☐	☐	☐
My mother helps me with homework.	☐	☐	☐	☐

37. In which of the following work situations is your FATHER?

☐ Working for a private company.
☐ Working in the public sector (civil servant, municipality, etc.).
☐ Working in his own business or as self-employed.
☐ Not working, unemployed.
☐ Not working, has a disability.
☐ Not working outside the home, takes care of household tasks.
☐ Not working, retired.
☐ I do not know.

38. In which of the following work situations is your MOTHER?

☐ Working for a private company.
☐ Working in the public sector (civil servant, municipality, etc.).
☐ Working in his own business or as self-employed.
☐ Not working, unemployed.
☐ Not working, has a disability.
☐ Not working outside the home, takes care of household tasks.
☐ Not working, retired.
☐ I do not know.

Thank you for your collaboration!

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The survey encompasses six different courses, necessitating adaptations of the survey for each educational level. Despite variations, no significant differences are observed. For instance, students enrolled in vocational training lack math and language subjects, resulting in the exclusion of such questions from the survey. On the other hand, students in the last year of high school, in addition to answering questions regarding salary expectations, were also asked to provide information about their reservation wages. The question format for students in the last year of high school was as follows.

Imagine that you keep studying until you get a University Degree, if you started looking for a job with the title of this University Degree in your pocket...(*)

	Number
How many months do you think it would take you to find a job?	
Once you find a job, how much do you think you will earn (€/month)?	
When you will be 35–40 years old, how much do you think you will earn (€/month)?	
You wouldn't take any job if you weren't paid at least (Euros/month)	

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CHAPTER 2

The Birth-Order Effect Revisited: The Role of Expectations, Aspirations, and Non-cognitive Abilities during Adolescence

Abstract: We find robust evidence of a persistent birth-order effect on cognitive and non-cognitive abilities, school attitudes, and educational and labour market aspirations of adolescents. We observe that firstborn children have higher grades, higher educational aspirations, higher earnings expectations, and higher aspirations to be employed in high-skill jobs. These differences differ by gender. Our results match with what has been observed in previous empirical studies regarding educational attainment and labour market outcomes during adulthood. This finding implies that birth-order effects could be, if not suppressed, at least mitigated through policy intervention during adolescence, when expectations and aspirations are more malleable.

Keywords: birth order, cognitive abilities, non-cognitive abilities, educational aspirations, labour market expectations, school attitudes, adolescence.

2.1 Introduction

Researchers have long been interested in illustrating the impact of birth order on human capital and labour market outcomes over the life cycle. Traditionally, this issue has been widely studied in subject areas such as psychology and sociology, so it is relatively new in the field of economics. A large body of literature has identified robust evidence of persistent and negative birth-order effects in the Western world, revealing that firstborn children tend to have an idiosyncratic advantage over their younger siblings. More specifically, they outperform them on key outcomes, such as cognitive and non-cognitive outcomes (Barclay, 2014; Lehmann et al., 2016), educational attainment (Black et al., 2005; Booth and Kee, 2009), earnings (Kantarevic and Mechoulan, 2006), and occupational achievement (Black et al., 2018).[4]

While birth-order effects in educational and labour market outcomes in adulthood have been extensively explored, studies analysing birth-order effects in educational and labour market expectations and aspirations during adolescence are virtually non-existent. This is an important issue, since during adolescence, individuals form and consolidate expectations about education and the labour market in the short term, which, in turn, conditions the schooling choices that determine their educational attainment, their entry into the labour market, and the evolution of their professional careers during adulthood. If the outperformance of the firstborn children over their later-born siblings in the labour market is in part determined by the fact that they have higher expectations, these differences, if not suppressed, could at least be attenuated though policy interventions during adolescence, when expectations and aspirations are still malleable.

Analogously, in contrast with the abundant literature reporting birth-order effects on educational and labour market outcomes, much less empirical research has been devoted to pinpoint the drivers behind this effect. Still, the bulk of studies focuses on specific sources such as parental investment and behaviour, while the role of individuals' non-cognitive factors has not received much attention. Black et al.'s (2018) study is an exception, since these authors find a significant impact of birth order on individuals' non-cognitive capacity. For example, previous empirical research documented that firstborns receive from both parents more minutes of quality time each day (Price, 2008) and higher investment (de Haan, 2010), while it is also observed that mothers of firstborns take less risk during pregnancy (Lehmann et al., 2018). Indeed, a recent contribution (Pavan, 2016) documented that dissimilarities of parental behaviour are responsible for more than 50% of the gap between siblings in cognitive skills. These studies documented discrepancies in parental systematic changes in attitudes, investment, as well as parenting style, but they are insufficient to explain the persistent negative birth-order pattern in human capital and labour market outcomes. Still, there are few convincing mechanisms that explain the birth-order effect. This is primarily because prior research has been limited due to a deficiency of datasets containing enough information to disentangle these effects. This situation leads us to wonder: what are the further driving factors, in addition to the ones already studied, behind the birth-order effect?

To shed further light on the birth-order differences, in this paper we empirically analyse whether there exists a birth-order effect on educational aspirations and labour market expectations during adolescence, which, in turn, may have an impact on school outcomes and choices as well as attitudes towards schooling, such as effort and motivation. We estimate birth-order effects across a wide range of cognitive and non-cognitive outcomes. More specifically, we attempt to go beyond and unearth the potential drivers of the birth-order effect, which is not only appealing on its own but may allow us to

[4] For example, in Britain, empirical research using the 13 waves of the British Household Panel Survey (BHPS) predicts that being the eldest in the family is associated with a probability of 14% of obtaining a university degree or higher qualification, while this probability is 9% for younger siblings (Booth and Kee, 2009).

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gain insight into which factors cause inequality among siblings and, in this way, lead us to fill the gap in the literature. To do so, we use an unusually rich dataset constructed from a survey carried out in 92 secondary education public schools in the region of Catalonia (Spain). Our final sample consists of more than 9,000 observations from students attending the last year of compulsory secondary education and post-compulsory secondary education. The dataset contains information regarding cognitive and non-cognitive abilities, personality and psychological traits, habits, academic and labour market expectations, aspirations and plans, and a large set of family background variables. Most of these outcomes have not been accessible in previous studies. Our data also make it possible to control for school fixed effects, which allows us to control for potential peer effects and school unobserved heterogeneity. We think this is important in analysing school-related and other outcomes in adolescence. Ideally, it would also be interesting to control for family fixed effects, but our data do not allow for that. Still, our data allow us to control for several relevant family characteristics that may mitigate the lack of family fixed effects.

Our findings illustrate a persistent negative birth-order pattern on the wide variety of outcomes. Estimated effects are in some cases quite sizeable. We also find that when looking from the perspective of gender, there are also important differences between boys and girls. Consistent with Hotz and Pantano (2015), we find that later-born children are associated with lower grades in math and languages. Similar birth-order patterns are also observed when we explore educational expectations (aspirations), as well as salary and occupational expectations during adolescence. More precisely, firstborn children have higher expectations to achieve a university degree and to be hired in a high-skill job than the later-born, while the opposite holds for low-skill jobs. These findings regarding students' aspirations and expectations match with the birth-order effects on educational attainment and labour market outcomes during adulthood already observed in previous studies. Our results suggest that the poorer performance in the labour market during adulthood of the later-born might in part be explained by the fact that they have poorer academic aspirations and lower labour market expectations. We think this link has important policy implications. If so, birth-order effects could be, if not suppressed, at least mitigated through policy intervention in schools during adolescence, when expectations are still malleable.

An outstanding contribution of our paper is the exploration, as in Black et al.'s (2018) and Pavan's (2016) studies, of the potential mediating role of adolescents' non-cognitive abilities of the birth-order effects on school outcomes by looking to the link between birth order and several personality traits and habits. Our analyses show that firstborn boys are less impatient and put more effort into their studies. Indeed, the estimated birth-order effect on impatience is quite sizeable. We also observe, for both boys and girls, that the firstborn are more self-confident, less prone to improvise in their daily activities, and spent less time watching TV and socializing with their mobile phones. In contrast with some previous studies, we find mixed evidence regarding differences by birth order in the time parents spend on their children's school activities. While there is clear birth-order pattern on parents attending school meetings with teachers, evidence regarding the time parents spend helping their children with school homework is weaker.

The rest of the paper proceeds as follows. In Section 2.2, we discuss the theoretical and empirical literature on the birth-order effect. In Section 2.3, we provide an in-depth description of the data used in this paper. In Section 2.4, we explain our empirical model. In Section 2.5, we present and comment on our findings. Finally, Section 2.6 summarizes and concludes the paper.

2.2 Literature Review

There is abundant literature in psychology and social sciences on the so-called "birth-order effect". This is not a modern phenomenon. Francis Galton's book *English Men of Science* (Galton, 1874)[5] was one of the first empirical references in this field. Galton managed to collect birth-order data from 99 successful scientific men in the United Kingdom; consequently, he tentatively concluded that firstborns were associated with better outcomes. Thenceforth, several researchers have explored how birth order influences human capital and labour market outcomes. Study in the economic area remains relatively new, with outstanding contributions to the literature and providing compelling evidence that firstborn children in developed countries tend to have better outcomes.

In the popular perception, those with distinct birth order differ in their cognitive and non-cognitive abilities; in particular, people hold defined beliefs that firstborn children are higher achievers. Earlier-born children were rated as more intelligent, ambitious, responsible, obedient, and independent, among other attributes, whereas the last-born are believed to be less intelligent, more creative, and sociable, irresponsible, friendly, and disobedient (Herrera et al., 2003). It is remarkable that popular perception matches empirical reality quite well. A substantial body of empirical studies reported that sibling position can have important long-term effects in terms of educational and labour market achievements.

2.2.1 Educational attainment and labour market outcomes

The literature regarding this issue provides compelling evidence that in developed countries, compared with the later-born, firstborn children tend to have higher educational attainment and better outcomes in the labour market during adulthood. Some of the earliest empirical evidence in the economics literature was provided by Behrman and Taubman (1986). They used cross-section data consisting of a sample of 4,000 children and their parents, drawn from the twins in the National Academy of Science/National Research Council data of 1981, and found a birth-order effect on schooling and earnings for young US adults, although the latter effect was not robust for all specifications. More recent evidence in the US, and outside of the US, consistently tends to reproduce these results. Using a large administrative dataset from the entire population of Norway, Black et al. (2005) found that firstborn girls have higher earnings, a greater likelihood to work full-time, and less likelihood to become mothers as a teenager. Using data from the Panel Study of Income Dynamics (PSID), Kantarevic and Mechoulan (2006) found a firstborn advantage in the US for educational attainment and earnings. After controlling for the age of the mother at birth, they found statistically significant evidence that earlier-born children have higher earnings (6.3%) than the later-born; however, when they omitted this variable, they observed no association between birth order and earnings. Black et al. (2011) observed in Norway that IQ scores decline by birth order. In comparison with second-born children, firstborns have roughly three IQ points more, which represents roughly 2% higher annual salaries in adulthood. Further, Björklund and Jäntti (2012) suggest an advantage of the firstborn of 0.2 years of schooling. They also report that in the age interval 31–40, earlier-born children tend to have roughly 0.25% greater long-term earnings.

In a sample drawn from several European countries, Bertoni and Brunello (2013) observed that firstborn children have a temporary advantage in the labour market at entry, enjoying a salary between 13.5% and 18.6% higher than their younger siblings. They suggest that the reason for this gap is that the firstborn are more likely to be employed in their initial job as a white-collar worker or in the public sector. However, they also observe that at the age of 50 this gap vanishes and that this result might be partially

[5] Unfortunately, his model does not capture female children when revealing his outcomes.

due to the fact that the last-born are changing their employers more frequently and moving to higher-paying jobs. Using data from Sweden, Black et al. (2018) show that later-born children are more likely to be self-employed and are hardly likely to be employed in a managerial position; moreover, they are in jobs that demand fewer leadership skills. Mechoulan and Wolff (2015) also found an educational and occupational advantage during adulthood for earlier-born children in France. Further, using the National Longitudinal Survey of Youth of 1979 (NLSY79), Grinberg (2015) documented that in comparison with the later-born, firstborn children were more likely to be employed in managerial positions, but this probability declined with each additional sibling. She examined two possible hypotheses about why the firstborn are attracted to managerial positions. In the first, Frank Sulloway and his supporters claim that their relative birth-order position fosters the firstborn in unique personality traits in terms of managerial and leadership skills. In the second, conversely, several economists, including Gary Becker, claim that firstborns have more access to parental resources than other children. Grinberg (2015) sustains Becker's hypothesis; however, Black et al. (2018) proved that Sulloway's hypothesis was also true.

As we discuss in the following subsections, empirical evidence suggests that the birth-order effect in labour market outcomes and educational attainment can be attributable to differences in cognitive and non-cognitive abilities, which, in turn, might also be due to different resource allocation and endowment from parents, including time, to their children depending on their birth order.

2.2.2 Cognitive abilities

Within the birth-order effects literature, the link between birth order and cognitive outcomes is probably the issue that provides the biggest number of contributions. In this regard, most of the latest empirical literature has found a monotonically declining relationship between cognitive abilities and birth order. The significance of the birth-order effect on test scores at ages 7, 11, and 16 has been partially corroborated by Silles (2010), who, using the UK National Child Development Study (NCDS), finds that at an early age last-born children do slightly better than firstborns, but by the end of compulsory education firstborns obtain a higher test score than their younger siblings. Conversely, using data from the NLSY79, Lehmann et al. (2016) do not find any cross-over effect; however, they report that earlier-born children score higher in cognitive assessments across all age groups (0 to 14 years old). Using the same data, Heiland (2009) finds that even after controlling for family size and child characteristics, earlier-born children display greater scores in the Peabody Picture Vocabulary Test (PPVT). Using similar data, Hotz and Pantano (2015) estimated four assessment test scores (three PIATs and a PPVT) and documented that between ages 10 and 14 cognitive ability declines by birth order; in particular, earlier-born children score 0.15 to 0.2 standard deviations higher on test scores than lastborn children. Further, in Sweden, Barclay (2014) carried out a within-family analysis among males in the military and documented that as more children enter the family, the cognitive ability declines. Bjerkedal et al. (2007) observed the same pattern in Norway. They used both within-family (comparing siblings within the same families) and between-family (comparing individuals with different birth order from different families) data.

There are some studies in the economics, psychology, and related literature that investigate the effect of birth order on intelligence. The confluence model proposed by Zajonc and Markus (1975) stated that there is a negative relationship between birth order and intellectual performance, but only when there is a low gap between siblings. Belmont and Marolla (1974) provide empirical evidence of Zajonc and Markus's model for the Netherlands using data of approximately 400,000 men. In a more recent study, using the Wisconsin Longitudinal Study, Kim (2019) finds a persistent negative relationship between birth order and IQ; moreover, he also finds that roughly half of the birth-order effects on educational

attainment are ascribed to the IQ score. In sharp contrast, other empirical investigations using within-family designs suggest no causal effect between birth order and intelligence (Kanazawa, 2012; Retherford and Sewell, 1991; Rodgers et al., 2000).

2.2.3 Non-cognitive abilities and personality traits

While literature analysing the existence of birth-order effects on cognitive outcomes is relatively abundant, the number of studies analysing the link between birth order and non-cognitive abilities, or personality traits, is significantly smaller. Contrary to what is observed with cognitive abilities, evidence regarding the birth-order effects on non-cognitive abilities is more mixed. Using Swedish data on a large sample of military men, Black et al. (2018) documented that firstborn children are more emotionally stable, open, extraverted, agreeable, persistent, socially outgoing, willing to assume responsibility, able to take initiative, as well as possessing a higher leadership ability, in comparison with later-born children. In general, it can be said that the firstborn possesses a variety of non-cognitive abilities that makes them more likely to pursue and achieve managerial positions during their adulthood. Lehmann et al. (2013) document a negative association between birth order and self-worth for both global and scholastic measures. Conversely to the popular perception, Lehmann et al. (2016) do not find a relationship between birth order and non-cognitive abilities from birth to adolescence, except for the self-perception of scholastic abilities. Similarly, using within- and between-family models, Rohrer et al. (2015) and Boccio and Beaver (2019) documented no association between birth order and personality traits.

2.2.4 The role of parents in explaining the birth-order effect

Considering the strong evidence on birth-order effects on cognitive and non-cognitive abilities and educational attainment and labour market outcomes reported in some studies, much of the recent research on birth effects has been devoted to pinpoint the possible drivers behind firstborn achievement. However, following Becker's hypotheses, the handful of economics studies on this issue gave special attention to parental resources, birth endowments, and maternal quality time as a plausible explanation. In this regard, Behrman and Taubman (1986) were the first in formalizing through an economic model the parental preferences for resource allocation by birth order, considering taste heterogeneity, budget constraints, and family background. Resorting to this model, they suggest that the firstborn advantage in schooling and earnings they observe in their empirical analysis might be due to the fact that the firstborn are endowed with higher household resource allocation.

Lehmann et al. (2016), using the NLSY79, suggest that the potential channels of birth-order differences in cognitive abilities are parental behaviour and home environment. They find that, during their first pregnancy, mothers are more likely to decrease alcohol and cigarette consumption, seek prenatal visits more often, and breastfeed after giving birth. However, Black et al. (2011) document that the negative relation between birth order and IQ scores is unlikely to be driven by birth endowments such as birth weight, gestational period, and head size, which are supposed to be related with alcohol and cigarette consumption during pregnancy. In a recent contribution, Pavan (2016) not only shows that parents devote more resources to firstborns but also quantified the birth-order gap, revealing that dissimilarities of parental investment are responsible for more than 50% of the gap in cognitive skills among siblings. Similarly, a second explanation is the influence of parental behaviour on their children. Using the National Longitudinal Study Children (NLSY-C), Hotz and Pantano (2015) find that last-born children are hardly likely to be punished by their parents if they earn bad grades.

Several studies have assessed the role of parental time allocations as a potential determinant of the persistent negative birth-order effect on test scores. Price (2008) documented that elder siblings spend

a greater amount of quality time with both parents. Monfardini and See (2016) observed similar evidence using data from the PSID-CDS. They find that, compared with their older siblings, last-born children between 0 and 12 years old spend less quality time with their parents. Moreover, Black et al. (2018) show that the negative effects of birth order on non-cognitive abilities could partially be driven by measures of parental investments (e.g., discussing schoolwork). In contrast with this evidence, using French data, Mechoulan and Wolff (2015) found that despite comparison with their younger siblings, earlier-born children receive greater financial transfers from their parents, although this does not explain the birth-order gap in educational and labour market outcomes during adulthood.

2.2.5 Our contribution

A common pattern in the previous economics literature analysing the birth-order effect is that a substantial body of the empirical research has largely focused on the consequences of birth order on various human capital and labour market outcomes. More specifically, firstborn children are more likely to have university studies, be employed in high-skill jobs, and have higher earnings during adulthood. However, the sources and the nature of this link have not been studied so extensively. One interesting question is to what extent this evidence observed during adulthood can also be anticipated during adolescence. That is, the question is whether the reason for the later-born adolescents performing worse in school and in the labour market during adulthood is because they have lower aspirations and expectations than the firstborn. We believe this is an important issue, since policy interventions at young ages can be effective, since expectations and aspirations are still very malleable. This circumstance allows policymakers to nudge adolescents toward better educational choices that allow them to pursue better jobs. For instance, experimental evidence reveals that lower-achieving students in their last year of compulsory education may modify their immediate educational choices by simply changing their expectations of employment and earnings through informative sessions (e.g., Barone et al., 2019; Goux et al., 2017; Jensen, 2010).[6,7,8]

A common feature in the previous literature is that researchers remain somewhat limited in their ability to uncover the mechanisms of the birth-order effect. Far fewer empirical studies provide an alternative theory beyond parental inputs and behaviour. In this paper, we try to fill this gap. One of the most interesting features of our dataset is that, in addition to cognitive and non-cognitive outcomes, it contains a wide variety of individual and family characteristics not included in the datasets used in previous studies. More specifically, we collect information regarding students' personality traits, such as procrastination, effort, planning of tasks, impatience, and the daily time spend on watching TV and using smartphones. Our data also contain variables picking up the degree of involvement of the parents on the surveyed adolescents' education.

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[6] The effectiveness of informative sessions in redefining students' objectives and modifying their plans for further education has been previously shown. Goux et al. (2017) used a randomized controlled trial to demonstrate that low-achieving students in French middle schools who receive information about the educational perspectives that are aligned with their academic aptitudes are more likely to change their high school plans. The meeting with the tutors allowed underperforming students to modify their academic expectations, resulting in a decrease in grade repetition and dropout by 25% to 40%.

[7] In another field experiment in Italy, Barone et al. (2019) showed the benefits of counselling interventions revealing future occupational prospects in determining and modifying the choice of major of high-school students who plan to go to university. They observed that 8% of the girls in the last year of high school decided to adjust their choice of field of specialization, moving from an initial, uninformed plan to specialize in a "weak" field to a new, informed decision to pursue a major in "selected intermediate or strong fields".

[8] Jensen (2010) carried out an experiment with eighth-grade students in the Dominican Republic. The experiment consisted of informing about the observed returns to secondary education, which were significantly higher than those perceived by these students. The author observed that students at randomly selected schools completed on average 0.2–0.35 more years of school over the next four years than those who were not.

As we already mentioned in the introduction, in our study we observe, among other results, that later-born boys are more impatient. We think this is a quite salient result,[9] since impatience (delay discounting) is greater in adolescents than in young adults (Christakou et al., 2011). More impatient individuals are found to have lower IQ scores (Dohmen et al., 2010), lower grades in university exams (De Paola and Gioia, 2015; Non and Tempelaar, 2016), a lower university graduation rate (Golsteyn et al., 2014), more disciplinary referrals at school (Castillo et al., 2011), greater likelihood to make inconsistent decisions (Cadena and Keys, 2015), and lower wages (Della Vigna and Paserman, 2005).

We believe our study also makes some other essential contributions to the birth-order literature. Despite increasing evidence of the effect of birth order on cognitive and non-cognitive abilities, no other paper has emphasized heterogeneous effects across gender, while also studying the existence of birth-order effects in a number of individuals' non-cognitive factors, which has not been studied previously, such as educational and labour market expectations, and personality traits.[10,11] Last but not least, our study is also the first to provide empirical evidence from Spain. We think that this is relevant if we take into account that, for example, from the 21 studies published in economics journals we cite here, 12 are based on US data, four on Scandinavian data (Denmark, Sweden, and Norway), two on British data, and three on data from other countries (Canada, Ecuador, and France). In a Mediterranean country such as Spain, culture and family ties are very different from Anglo-Saxon or Scandinavian countries, from where most of the empirical literature regarding birth-order effects comes from. For example, in Spain, the average age at which sons and daughters leave the parental home is 32, and marriage or moving in with their partner is the main reason. In no other developed country in the world is such a high emancipation age observed.

2.3 The data and variables

In this section, we present the date source and the variables employed in the study. The variables are grouped by typology and presented separately in different subsections. While in Table 2.1, we show a descriptive statistical analysis for all the outcome variables that will be presented sequentially in this section, in Table 2.2 we show the descriptive statistics for the control variables.

2.3.1 Data source

Detailed information about the data source is provided in the introductory chapter, specifically in Section 1.2.1. The original dataset employed in this research consists of 9,275 students. However, due to the study's objectives and the availability of relevant measures, estimations were conducted with different samples, consequently variations in the final samples are evident. For instance, cognitive abilities (self-reported test scores), were exclusively collected from students enrolled in the last year of secondary compulsory education and high school. For those enrolled in lower vocational training the date was not available, as generally these subjects were not part of their curricula. Therefore, when conducting

[9] In the literature, the terms *impatience* and *delay discounting* are used interchangeably. In general, more impatient individuals, or with greater delay discounting, are less future-oriented. This implies that more impatient individuals are less prone to undertake long-term investments, such as pursuing a university education.

[10] Black et al.'s (2005) study is the only paper we acknowledge that explores the birth-order effect on human capital and labour market outcomes by gender. However, although it sheds light on explaining the relationship between birth order and family size, the authors do not attempt to pinpoint the potential mechanisms behind the birth-order effect.

[11] To the best of our knowledge, Alm's (2019) and Bu's (2016) studies are the only papers that explore the relationship between birth order and educational expectations (aspirations). However, Alm (2019) carries out a simple descriptive analysis, while, perhaps due to data limitation, in Bu's (2016) study the number of controls used in the regressions is limited.

estimations with test scores, the sample size was slightly smaller. In the results section it is specified the specific sample that were considered in estimating our model.

2.3.2 Outcome variables

Cognitive abilities

The first dependent variables used in the analysis are a set of cognitive abilities. These variables are self-reported grades in mathematics and languages (Spanish, Catalan, and foreign). These grades are based on a five-point ordinal scale (E, D, C, B, and A), with E being the minimum grade and A the maximum. More specifically, E stands for failure, D sufficient, C good, B very good and A excellent. These variables are collapsed to binary indicators taking the value 1 if students report having the grade A or B, and 0 otherwise. Self-reported grades are collected for students attending compulsory secondary education and high school.

The top panel of Table 2.1 shows the means and standard deviations of the cognitive abilities, subdivided by gender and birth order. Notably, girls consistently achieve higher test scores compared to boys. Furthermore, a significant decline in self-reported grades is evident with increasing birth order, with the exception of language grades for boys. Going into details, language test scores follow an inverted U-shaped pattern. Apparently, second-born boys are performing better than the first-born, but for the third and higher born the performance is fairly lower than that of the first-born.

Additionally, surveyed students were asked to report whether they have been diagnosed with a learning difficulty. More specifically, this variable is obtained from the elicited responses to the following question: 'Have you ever been diagnosed with a learning difficulty? (such as dyslexia, attention deficit disorder, ...)'. Learning difficulty is defined by the National Centre for Learning Disabilities as 'a neurological disorder that affects the brain's ability to receive, process, store and respond to information'. Dyslexia is the most common learning difficulty, which may negatively affect reading, writing, spelling, and speaking. Other, less frequent cognitive learning difficulties are dysgraphia (disorders involving visual information-processing skills) and dyscalculia (disorders involving math). Although attention disorders do not have a neurological origin, they can also impede learning. Among others, the most common attention disorder is ADHD (attention deficit hyperactivity disorder). Our learning difficulty indicator is a binary indicator that takes the value 1 for those students who answer 'yes' to the question of whether they have been diagnosed with any learning difficulty and 0 if they answer 'no'. The learning difficulty dummy variable is used not only as a cognitive outcome, but also as a control variable when estimating the determinants of grades and other outcomes.

Table 2.1 shows that learning difficulty increases by birth order, suggesting that children of higher birth order are more likely to have neurological issues. In our sample, gender differences in learning disabilities are evident. Specifically, the proportion is higher among boys of fourth or higher birth order (around 16%) compared to girls (around 13%).

Educational expectations/aspirations and the pathway to university

Our measures of academic expectations incorporate a set of variables picking up the expectations of academic achievement, aspirations, and school choices in the short term of the surveyed students. The first one is based on the responses to the following question: 'Which is the highest level of education you expect to achieve?' From the answers, we define a binary variable that takes the value 1 if surveyed students expect they will graduate from university in the future, and 0 for those who expect to achieve a lower level of education than university. This is what we define as "*university expectations*". In their last year

Table 2.1
Descriptive statistics of the outcome variables

	Girls								Boys							
	1st born		2nd born		3rd born		4th born or >		1st born		2nd born		3rd born		4th born or >	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Cognitive abilities																
Math	0.394	0.489	0.377	0.485	0.343	0.476	0.225	0.419	0.372	0.484	0.369	0.483	0.312	0.465	0.278	0.451
Catalan language	0.456	0.498	0.441	0.497	0.350	0.478	0.265	0.443	0.287	0.453	0.306	0.461	0.232	0.423	0.196	0.399
Spanish language	0.494	0.500	0.456	0.498	0.400	0.491	0.381	0.487	0.316	0.465	0.323	0.468	0.241	0.429	0.216	0.413
Foreign language	0.511	0.500	0.465	0.499	0.458	0.499	0.288	0.455	0.403	0.491	0.422	0.494	0.329	0.471	0.235	0.426
Leaning difficulty	0.082	0.275	0.087	0.282	0.119	0.324	0.133	0.340	0.113	0.316	0.109	0.312	0.125	0.332	0.163	0.371
Academic expectations																
Expect university degree	0.723	0.447	0.678	0.468	0.606	0.489	0.480	0.501	0.555	0.497	0.525	0.500	0.490	0.501	0.342	0.476
Choose university track	0.607	0.489	0.564	0.496	0.466	0.500	0.304	0.461	0.437	0.496	0.393	0.489	0.333	0.472	0.200	0.401
Though in dropping out	0.196	0.397	0.191	0.393	0.209	0.407	0.199	0.400	0.142	0.349	0.161	0.368	0.199	0.400	0.216	0.413
Dropout for a job	0.361	0.480	0.387	0.487	0.453	0.499	0.453	0.499	0.585	0.493	0.601	0.490	0.626	0.467	0.680	0.486
Labour market expectations																
Start. expected salary	7.064	0.436	7.013	0.452	7.078	0.469	7.156	0.504	7.255	0.449	7.205	0.446	7.211	0.473	7.305	0.492
Expected salary 35-40	7.415	0.421	7.375	0.419	7.379	0.469	7.395	0.504	7.647	0.429	7.593	0.456	7.605	0.426	7.629	0.445
Duration job search.	3.255	2.837	3.242	2.981	3.191	3.135	2.813	2.607	2.942	3.037	2.922	3.212	2.706	2.848	2.487	2.323
High-skill job	0.730	0.444	0.706	0.456	0.710	0.454	0.647	0.479	0.599	0.49	0.548	0.498	0.205	0.405	0.429	0.497
Low-skill job	0.105	0.306	0.107	0.309	0.134	0.341	0.205	0.405	0.123	0.329	0.149	0.357	0.300	0.459	0.200	0.401
Middle-skill job	0.165	0.372	0.187	0.39	0.156	0.363	0.147	0.355	0.277	0.448	0.303	0.459	0.241	0.428	0.37	0.485
Non-cognitive abilities																
I finish homework on time	0.673	0.469	0.628	0.484	0.633	0.483	0.582	0.495	0.579	0.494	0.564	0.496	0.520	0.501	0.435	0.498
I always finish what I start	0.824	0.381	0.814	0.389	0.813	0.390	0.782	0.414	0.776	0.417	0.782	0.413	0.779	0.416	0.746	0.437
Minimum effort at school	0.263	0.441	0.264	0.441	0.302	0.460	0.406	0.493	0.439	0.496	0.466	0.499	0.520	0.501	0.558	0.498
I do plan my tasks accurately	0.514	0.500	0.517	0.500	0.526	0.500	0.541	0.500	0.437	0.504	0.410	0.508	0.446	0.502	0.409	0.507
Everything I do goes wrong	0.320	0.466	0.316	0.465	0.321	0.468	0.333	0.473	0.250	0.433	0.253	0.435	0.283	0.451	0.257	0.439
Impatience	0.457	0.350	0.446	0.322	0.479	0.330	0.532	0.404	0.459	0.335	0.444	0.326	0.498	0.347	0.581	0.411
Hours mobile phone	2.990	3.594	3.329	4.112	3.256	3.697	3.654	4.067	4.557	4.368	4.814	4.508	4.889	4.804	5.311	5.139
Hours watching TV	1.476	1.781	1.589	2.014	1.480	1.654	2.086	2.173	1.468	1.539	1.551	1.668	1.724	2.134	2.098	2.658
Parents involvement																
Father attend school meetings	0.310	0.463	0.257	0.437	0.207	0.406	0.208	0.407	0.307	0.461	0.292	0.455	0.238	0.427	0.226	0.420
Mother attend school meetings	0.727	0.446	0.668	0.471	0.559	0.497	0.361	0.482	0.687	0.464	0.648	0.478	0.553	0.498	0.342	0.476
Father helps school homework	0.130	0.336	0.106	0.308	0.087	0.282	0.083	0.276	0.098	0.297	0.101	0.302	0.113	0.318	0.152	0.360
Mother helps school homework	0.169	0.374	0.155	0.362	0.155	0.363	0.094	0.292	0.131	0.337	0.123	0.329	0.123	0.329	0.160	0.368

Notes: Own elaboration

of compulsory secondary education, students must report their educational choices for the following year. The timing of our survey is convenient since it was carried out at the end of the academic year. Therefore, most of the students already knew what they wanted to do in the academic year after the survey. Students could choose among attending high school (pre-university track), a lower vocational training track, or no further education. Although it is not compulsory, students who have the intention to go to a university when they complete post-compulsory secondary education choose to enrol in high school.[12] We create a dummy variable taking the value 1 for those students who report that the next year they are going to attend high school, and the main reason for this choice is that they have the intention to go to a university, and 0 otherwise. To this group, we also add those students who are currently attending high school and who declared that the reason to attend high school is that they want to go to a university.[13] This is what we define as "*university aspirations*", which do not necessarily coincide with the expectations to have a university degree. These two measures garnered significant attention in Section 1.2.1, where they were compared with administrative data. One interesting feature of our data, which indicates their suitability, is their accurate replication of the choices made by the population of students in Catalonia.

In addition to the "*university expectations*" and the "*university aspirations*", we also consider two more variables related to dropout intentions, which we think might also be indicative of students' educational aspirations. The first is a dummy variable constructed with the answers to the following question: 'At some point during this school year, have you thought about dropping out of school?' The second considers the intention to drop out of school if they were offered a long-term job. We believe this indicator is quite interesting since it reflects to what extent schooling is important for their future labour market outcomes or if, on the other hand, students do not think schooling is going to substantially improve their future working life. We should expect students ready to drop out for a job to exhibit poor ambition in terms of future labour market outcomes. More specifically, we ask them to answer the following question:

> *Suppose that at the end of this academic year you are offered a job with a long-term contract, which fits with your current level of education. What is the monthly salary you would require to take this job and abandon your studies?.*
>
> *a. I would not take this job.*
> *b. I should be paid _____ €/month.*

From the answers, we define a binary variable that takes the value 1 if the surveyed students answer with a certain amount of money, and 0 for those who answer they would not take this job.

Apparently, educational expectations/aspirations are monotonically declining by birth order, with second-borns expressing lower educational expectations/aspirations than first-borns, and this trend continues with subsequent siblings (Table 2.1). Moreover, girls and boys differ substantially in educational expectations/aspirations. In the sample, girls tend to have greater educational expectations/aspirations than boys. While 68% of second-born girls expect a higher educational level only 53% of boys do so.

[12] High school is the shortest track to go to a university (2 years) vs. the vocational track (2+2 years), i.e., lower vocational and upper-vocational education. Students enrolled in high school receive pre-university specific education, while the range of studies to be chosen in college by upper-vocational track graduates is limited.

[13] We condition this variable to the intentions to go to a university, because students attending high school may have direct access to upper-vocational studies. Indeed, in our sample, more than 1/4 of the surveyed students who have the intention to enrol in high school or are currently attending high school report the intention to attend upper-vocational studies after completing high school.

Regarding the measure of drop out intentions, on average children of higher birth order are fairly more likely to drop out. This tendency is particularly pronounced among boys.

Labour market expectations

To investigate whether there are birth-order differences in labour market expectations/aspirations, we use four different outcomes: expected starting monthly earnings, expected monthly earnings at the age of 35–40, expected time to find a job after completing education, and which type of occupation (in terms of required skills) they expect to have in the future.

Surveyed students are asked to report their earnings expectations and the duration of job search under the hypothetical scenario that they complete a university degree in the future. More specifically, they must answer the following question:

> *Suppose you complete a university education, and after that you enter the labour market. With this educational level …*
>
> *a. How many months do you think you would need to find a job?* _____
>
> *b. Once you find a job, how much do you think you will earn (€/month)?* _____
>
> *c. When you will be 35–40 years old, how much do you think you will earn (€/month)?* _____

We ask about monthly earnings, not hourly or yearly, because in Spain workers are paid monthly; therefore, this is the periodicity people use to assess if a salary is good or bad. We think that adolescents may have a reference of what people around them may earn every month, but they probably do not have a clue of the annual salary that people agreed on in their contracts. We are not explicit in whether expected earnings would come from a full-time or a part-time job; however, we presume that students are reporting the expected earnings of a full-time job. Dominitz and Manski, (1996) show that American high school students and college undergraduates tend to answer this kind of question considering that they will be in full-time employment. Students' answers to this question were recorded in an open text field, which provided us with more accurate expectations than if they were asked to choose an earnings interval.

Regarding occupational aspirations, students were asked to respond in an open text field to the following question: 'What job would you like to do in the future?' After coding this variable, we constructed an ordinal indicator of occupational rank as follows: low-skill jobs, middle-skill jobs, and high-skill jobs.

Overall, several notable trends emerge from the middle panel of Table 2.1. First, both salary expectations display a reversed U-shaped pattern. Specifically, regardless of gender, second-born individuals exhibit the lowest expected salary. Second, a distinct pattern emerges in occupation aspiration. Whereas the aspiration for high-skill jobs declines by birth order, the opposite trend is observed for middle and low-skill jobs. Third, a significant gender gap is evident across all measures. Boys not only have greater salary expectations but also express greater confidence in finding a job in a shorter timeframe compared to girls. However, they report lower aspirations for high-skill jobs. For instance, 73 % of first-born girls aspire to high-skill positions, whereas only around 60 % of first-born boys share this aspiration.

Personality traits, non-cognitive abilities, and habits

In our survey, we ask students about a wide array of personality traits. These variables pick up not only general personality indicators, but also indicators regarding attitudes towards schooling that may reflect non-cognitive skills such as procrastination, effort, planning of tasks, and impatience. These characteristics are fundamental to perform adequately in school. In this paper, we focus on a selection of personality traits and non-cognitive abilities that in this analysis have turned out to be correlated with

birth order. More specifically, individuals must choose one point on a four-point Likert scale (never, sometimes, often, or always) regarding several questions. We collapse these ordinal responses to binary indicators that take the value 1 if individuals answer 'often' or 'always' and 0 otherwise. Among other questions, in our survey individuals are asked about the following statements: 'I finish school homework on time'; 'I finish everything I start'; 'I only make the minimum necessary effort to pass the course'; 'Everything I do always goes wrong'; 'I plan my tasks/activities accurately'.

The last personality trait we consider in our analysis is related to "*time preference*" or "*impatience*", which is measured using a standard question where individuals must choose between receiving a fixed amount of money now or a higher deferred payment in the future. In our survey, students are required to answer about a set of hypothetical questions picking up preferences for an immediate financial reward of 100€ vs. a set of higher delayed rewards to be received in one month. More specifically, we present the students with the following task:

> *Imagine that you have the opportunity to receive 100€ today, but if you wait for a month, you can receive a larger amount. In each of the following situations, choose between options A and B.*

The students had to complete a sequence of 10 binary choices (A or B), in which option A was always to receive 100€ today, while in option B the amount of money to be received in one month increased by 10€ in each new pair of options, up to the highest amount consisting of 200€. In the choice where students switch from 100€ to a higher amount, we set the impatience level. This is the standard way of measuring impatience in surveys. Our measure of impatience is calculated as the chosen amount minus 100 divided by 100. This yields a variable that ranges from 0 to 1. Although some researchers claim that this way of measuring "impatience" is only reliable if it has associated real rewards, empirical evidence shows that survey questions are equally reliable. Johnson and Bickel (2002), using a within-individual study, find a correlation of 0.83 between the degree of discounting elicited by survey responses and real rewards offered in an experiment. In addition, test–retest studies also reveal time consistency with survey data. Correlation with one-week difference was 0.91 (Simpson and Vuchinich, 2000) and 0.71 with one-year difference (Kirby, 2009). Impatience, elicited through either survey questions with hypothetical rewards or experimental studies with real rewards, has an important impact on school outcomes for both high school and college students (e.g., Cadena and Keys, 2015; De Paola and Goia, 2013; Heckman et al. 2010; Kirby et al., 2005; Non and Tempelaar, 2016). Finally, we also include in our analysis two variables related to habits but that can also be indicative of the students' personality and may also have a negative impact on school achievement. These variables are 'the number of daily hours students spend using their smartphones' and 'the number of daily hours students spend watching TV'.

The fourth panel of Table 2.1 presents the descriptive statistics of personality traits, non-cognitive abilities, and habits, where for most of the outcomes there is a clear pattern by the birth order. Compared with later-born, firstborn deliver school homework on time, have lower impatience levels, and allocate fewer hours to watching TV or using smartphones. Notably, substantial gender differences are observed in these outcome variables. Independently of the ordinal position, a higher share of girls delivers school homework on time than boys. Shifting the focus to habits, among firstborns, boys tend to spend over an hour daily on the smartphone than girls.

Parental involvement

As we mentioned in our overview of the literature, some studies find that the quality and quantity of time that parents devote to their children decrease as the number of siblings increases. This circumstance

implies that parents' involvement in their children's education may vary with birth order. To account for this, in the questionnaire we ask students to respond whether their mother/father helps them with their school homework and whether their mother/father attends school meetings with teachers. As before, the elicited responses are based on a four-point Likert scale (never, sometimes, often, and always). We ask separately for mothers and fathers, and as before, we collapse responses to binary indicators.

The bottom panel of Table 2.1 presents their descriptive statistics. For parental involvement, we observe some birth order patterns and important differences between girls and boys. Apparently, the attendance of both parents at school meetings declines monotonically by birth order. Regarding the parental involvement in homework, variations emerge based on both birth order and the gender of the offspring. For girls, the assistance from both father and mother in homework declines as birth order increases. Conversely, for boys, paternal involvement with homework increases with birth order, while maternal involvement presents a U-shaped pattern.

2.3.3 Explanatory variables

The control variables (X_{ij}) we include in our estimations are a set of individual characteristics (age, gender, birthplace, and whether students have been diagnosed with a learning difficulty) and family characteristics (mother's and father's education, father's labour status, parents' marital status, mother's age, and the number of siblings). In Table 2.2, we report the descriptive statistics of these control variables used in our regressions (including birth order). Most children in our sample are firstborn (50%), while 36% are second-, 9% third-, and only 5% are fourth- or higher-born. On average, the children are 17 years old, and about 53% of the sample are girls. Children born in Catalonia are predominant in our sample (80%), and the remaining 3% and 17% of the children are born in the rest of Spain and abroad, respectively. About 11% of the children have been diagnosed with a learning difficulty. Adolescents with fathers working as salaried employees in private companies comprise most of our sample (40%), while 18% of the fathers work in the public sector, 21% are business owners, 12% are unemployed, and roughly 8% of the surveyed students do not know their father's occupation. The latter group is probably composed by adolescents with widowed, single, or divorced parents.

Students in our sample have on average 1.4 siblings, and the average age of their mothers is around 46 years old. Finally, almost 22% of the mothers have a university education, while this figure is 16% for fathers.

Table 2.2
Descriptive statistics for the control variables

Variables	Mean	Std. Dev.
Individual characteristics:		
Birth order		
Firstborn	0.507	0.499
Second-born	0.357	0.479
Third-born	0.088	0.283
Fourth or higher born	0.047	0.212
Girl	0.528	0.499
Age	17.479	5.251
Birthplace		
Catalonia	0.797	0.402
Spain	0.029	0.17
Abroad	0.173	0.378
Diagnosed learning problems	0.106	0.308

Table 2.2 (continued)

Family characteristics:		
Mother age	46.335	5.964
Parents' education level		
Mother university	0.217	0.412
Father university	0.161	0.368
Father's labour status		
Working private employee	0.585	0.493
Business owner	0.214	0.409
Unemployed	0.124	0.329
I don't know	0.078	0.268
Parental marital status		
Married	0.696	0.46
Divorced	0.217	0.412
Widowed/Single	0.087	0.282
Number of siblings	1.434	1.133

Notes: Own elaboration

2.4 Empirical model

To estimate the relation between birth order and adolescents' outcomes, we use the following model:

$$y_{ij} = \alpha + \sum_{k=2}^{K} \beta_k O_{ij}(k) + \delta X_{ij} + \gamma F_{ij} + \lambda_j + u_{ij}\,, \qquad (1)$$

where the subscript j refers to the school where the individual i is studying, and λ_j represents the school fixed effects. In equation (1), our key variable birth order (O_{ij}) is a set of dummy variables picking up the birth order (k) of each student. The outcome variables (y_{ij}) in equation (1) are related to students' cognitive and non-cognitive abilities, psychological traits, educational expectations and aspirations, earnings and occupational expectations, and parental involvement in students' school activities. The matrix X_{ij} contains a set of individual characteristics: age, birthplace, and a dummy variable picking up whether the student has a diagnosed learning difficulty. The matrix F_{ij} contains a set of family characteristics: number of siblings, mother's age, parents' education level, parents' labour status, and parents' marital status. Equation (1) is estimated separately for boys and girls.

Our data have two interesting features. On the one hand, the data allow us to account for a large set of family characteristics. In this regard, variables like parents' education or parents' involvement in the school tasks of their children might play a crucial role. The omission of these types of variables might cause biased estimates of the effect of birth order on students' outcomes. On the other hand, we can also control for peer and school effects by accounting for school fixed effects. In individual surveys and administrative data, school characteristics or information regarding school peers is generally not elicited. This is especially problematic when we analyse these outcomes during adolescence, since at this age the influence of peers is important in many school outcomes as well as in non-school-related outcomes. As a result of this omission, the parameter associated to birth order may be affected by the bias coming from unobserved school heterogeneity.[14]

[14] Several studies report that school characteristics affect educational achievement (e.g., Author et al., 2016; Booker et al., 2011; Deming et al., 2014). The influence of school peers on students' BMI is also well documented (e.g., Asirvatham et al., 2018; Halliday and Kwak, 2009).

2.5 Empirical analysis

In this section, we present the empirical results of the estimation of equation (1) for the different students' outcomes. The econometric results for each set of outcomes are grouped by typology and presented separately in different subsections.

2.5.1 Cognitive abilities

Results of the birth-order effects on students' cognitive abilities are reported in Table 2.3. Our results regarding grades are in line with previous studies, which reinforces the reliability of our empirical approach and our data. For each dependent variable, we first present the estimates for the full sample, followed by separate estimations for boys and girls. Consistent with recent empirical evidence, our results document a negative relationship between birth order and grades. Estimated birth-order effects are large and statistically significant in all outcomes regarding grades (math and languages) for both boys and girls. The only exception is for the Catalan language, where birth order has turned out to be statistically significant only for girls.

Compared to the firstborn, last-born girls are 20 percentage points less likely to have a grade of A or B in math, while this figure is 13.2 percentage points for boys. This difference also holds for second- and third-born children in the case of girls, 5.4 and 8.9 percentage points, and for the third-born in the case of boys, 7.2 percentage points. For foreign language, we observe a similar pattern for both boys and girls. Compared with the firstborn, later-born boys and girls are 13.2 and 17.5 percentage points less likely to achieve a grade of A or B, respectively. For the third-born, this difference is 9.2 and 7.2 percentage points for boys and girls, respectively.

For the Catalan language, for the latest-born girls the probability of having the highest grades is 11.8 percentage points smaller than for the firstborn, while for the third-born girls, this figure is 10.5 percentage points. For boys, these differences are not statistically significant. Finally, regarding the Spanish language, we only observe statistically significant differences between the firstborn and the second- and third-born. These differences are 5.1 percentage points for the second-born girls 7.8 and 8.3 percentage points for the third-born boys and girls, respectively.

Our results regarding grades for both math and languages are in line with recent evidence in developed countries finding a significant birth-order pattern (Barclay, 2014; Hotz and Pantano, 2015; Silles, 2010); however, they contrast to recent US studies that do not find a birth-order effect on math grades (Hotz and Pantano, 2015; Lehmann et al., 2013; Monfardini and See, 2016; Pavan, 2016). For example, in a recent study, Breining et al. (2020), who focused exclusively on boys, found that in Denmark, the second-born scored lower on a math test than the firstborn, while in the case of the US (Florida), they do not observe statistically significant differences.

It has been suggested in some of the previous literature, though not tested empirically, that the worse performance of later-born children on test scores can be attributed to cognitive problems. In this subsection, we also test for the existence of a birth-order effect on the probability of being diagnosed with a learning difficulty. To test for this, in all the models presented in Table 2.3, we estimate equation (1) with and without the diagnosed learning difficulty dummy. The idea is that if this conjecture was true, in the regressions of the determinants of students' grades, we should expect part of the birth-order effect to be captured by the learning difficulty dummy; however, in both regressions the estimated birth-order effects remain practically unaltered for grades in math and languages. As one might expect, we observe that those who have being diagnosed with a learning difficulty perform much worse in all subjects, which, in turn, indicates that the variable learning difficulty is reliable. Finally, we also estimated equation (1) using the learning difficulty dummy as the outcome variable (not reported in Table 2.3), and we did not

observe statistically significant differences across the birth-order dummies. All our results taken together do not seem to support the conjecture that the lower school achievement of the later-born is due to their higher cognitive difficulties.

Table 2.3
Estimated birth order effects on school grades

	Math			Spanish Language		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0354**	-0.0135	-0.0545**	-0.0290**	-0.0008	-0.0513***
	(0.0153)	(0.0225)	(0.0211)	(0.0142)	(0.0209)	(0.0196)
3rd Born	-0.0777***	-0.0721*	-0.0892**	-0.0781***	-0.0787**	-0.0836**
	(0.0285)	(0.0423)	(0.0390)	(0.0266)	(0.0389)	(0.0367)
4th born or >	-0.165***	-0.132**	-0.2001***	-0.0450	-0.0861	-0.0262
	(0.0436)	(0.0662)	(0.0591)	(0.0410)	(0.0620)	(0.0557)
	Foreign language			**Catalan Language**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0435***	-0.0100	-0.0733***	-0.0151	-0.0038	-0.0313*
	(0.0144)	(0.0217)	(0.0194)	(0.0139)	(0.0104)	(0.0174)
3rd Born	-0.0792***	-0.0919**	-0.0723**	-0.0820***	-0.0019	-0.1049***
	(0.0268)	(0.0404)	(0.0362)	(0.0259)	(0.0193)	(0.0360)
4th born or >	-0.153***	-0.132**	-0.175***	-0.0856**	-0.0306	-0.1179**
	(0.0415)	(0.0645)	(0.0549)	(0.0403)	(0.0294)	(0.0551)

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. All specifications control for age, birthplace cognitive skills (diagnosed learning problems), number of siblings, parents' marital status, parents' education, parents' occupation, and mother's age. The estimations for test scores are conducted exclusively with students enrolled in the final year of secondary compulsory education and high school.

2.5.2 Educational expectations/aspirations and the pathway to university

In this subsection, we test for the potential relationship between birth order and educational choices and expectations. This analysis is of special interest for two reasons. On the one hand, it could be possible that the lower school performance of the later-born is because they have poorer expectations of academic achievement. On the other hand, if there was a link between birth order and academic expectations, it could also explain the lower academic achievement of the later-born during adulthood. To carry out this test, we use a set of variables picking up the expectations of academic achievement, aspirations, and school choices in the short term of the surveyed students.

In Table 2.4, we report the results of the estimation of equation (1), including the relationship between birth order and university expectations and aspirations, as well as with dropout propensities. This analysis is of special interest since most of the previous literature just focused on school grades and educational attainment in adulthood. If we observe that later-born children have lower educational expectations/aspirations than their older siblings, it may explain why they perform worse in school and have lower educational achievement. We find quite strong birth-order effects on educational expectations/aspirations for both boys and girls, while the effect on the dropout propensities is mixed.

Our results indicate that latter-born children are less likely to expect to achieve university studies. Estimated birth-order effects are quite sizable and similar for both boys and girls. Compared with the firstborn children, the latest-born (boys and girls) are around 12 percentage points less likely to expect having university studies. For the third- and second-born children, these figures are above 6 and nearly 4 percentage points lower. Estimated birth-order effects for both boys and girls move near these values. These results are supported by the corresponding estimated effects on the probability of choosing the university track in post-compulsory secondary education. Although many times the concepts "school expectations" and "school aspirations" are used interchangeably, we think that the choice of the university track is closer to the concept of "aspiration" to have a university degree than an "expectation". In this regard, studies in education and sociology, such as by Marjoribanks (2002) and Lee et al. (2014), found that girls tend to have higher educational aspiration in comparison with boys. From the standpoint of birth order, in both cases (boys and girls) estimated effects are statistically significant, and quite sizable, though the observed patterns across children of different birth order are steeper for girls than boys. More specifically, for girls, compared with the firstborn, for the second-, third-, and fourth-born children the probability of choosing high school (pre-university track) in post-compulsory secondary education is 3.5, 8.4, and 17 percentage points smaller, respectively. For boys, these figures are 5.5, 8.2, and 11.5 percentage points, respectively.

Table 2.4
Estimated birth order effects on educational expectations/aspirations

	Expectations to have a university degree			**Choice of university track in post-compulsory secondary education**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0371***	-0.0382**	-0.0364**	-0.0436***	-0.0553***	-0.0347**
	(0.0126)	(0.0194)	(0.0165)	(0.0124)	(0.0186)	(0.0167)
3rd Born	-0.0635***	-0.0541	-0.0725**	-0.0799***	-0.0823**	-0.0845***
	(0.0230)	(0.0355)	(0.0304)	(0.0227)	(0.0342)	(0.0307)
4th born or >	-0.121***	-0.123**	-0.127***	-0.144***	-0.115**	-0.168***
	(0.0353)	(0.0560)	(0.0458)	(0.0349)	(0.0537)	(0.0464)
	Had thoughts of dropping out			**Drop out for a long-term job**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	0.0254**	0.0455***	0.00951	0.0244	-0.0034	0.0428**
	(0.0111)	(0.0158)	(0.0157)	(0.0157)	(0.0248)	(0.0206)
3rd Born	0.0465**	0.0884***	0.0131	0.1024***	0.1071**	0.1122***
	(0.0207)	(0.0294)	(0.0294)	(0.0297)	(0.0464)	(0.0392)
4th born or >	0.0425	0.110**	-0.00411	0.1027**	0.1185	0.1222**
	(0.0320)	(0.0469)	(0.0445)	(0.0479)	(0.0796)	(0.0606)

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. All specifications control for age, birthplace cognitive skills (diagnosed learning problems), number of siblings, parents' marital status, parents' education, parents' occupation, and mother's age. The estimations for educational expectations/aspirations were conducted with all the groups. Conversely, due to data constraints, the estimations of the dropout intentions were specifically conducted with the last year of secondary compulsory education and high school.

Finally, in the bottom panel of Table 2.4, we also report the estimated birth-order effects on the dropout propensities. Regarding the question of whether *"students have had during the school year thoughts of dropping out from school*", we estimated a statistically significant birth-order pattern only for boys. Estimated effects are quite sizable. Compared with the firstborn, the latest-born boys are 11 percentage points more likely to think of dropping out. For the second- and third-born, these figures are 4.5 and nearly 9 percentage points, respectively. Regarding the dropout propensities for a long-term job, we estimate statistically significant birth-order effects for both boys and girls. Compared with the firstborn, the probability of dropping out from school for a long-term job is above 10 percentage points smaller for the third- and latest-born children. For the second-born, the effect is statistically significant only for girls (4.3 percentage points).

Taken together, our findings reveal consistent evidence of a negative birth-order effect on educational expectations/aspirations, which is also robust after controlling for gender and a wide range of control variables. Recent research in economics and education indicated that educational expectations and aspirations vary by gender, race, and ethnic minorities; however, our results reveal that these outcomes also differ by the birth order of children. In a more general context, Reynolds and Pemberton (2001) established that there is a fundamental discrepancy between educational expectations and aspirations. We also corroborate this distinction from the perspective of birth order.

The effects for the remaining control variables (not reported here) indicate that having higher parental education and an older mother are associated with a positive impact on educational expectations/aspirations across both genders. Meanwhile, diagnosed learning problems are negatively related to children's educational expectations/aspirations. Further, when exploring the place of birth, we find evidence that children born abroad hold lower educational expectations/aspirations than those born in Catalonia, with slight variation between genders.

2.5.3 Labour market expectations

As we mentioned in the overview of the literature, earlier-born children tend to have an advantage in terms of educational achievement, wages, and the types of jobs they achieve in the labour market during adulthood. This is supported by systematic empirical evidence in the US and some European countries. With this evidence, one interesting question is whether later-born children already exhibit lower labour market aspirations during adolescence. As in the case of educational expectations, the analysis we carry out here linking birth order and labour market expectations is also of special interest. First, having poorer labour market expectations may explain why later-born children have poorer educational expectations, which, in turn, may explain why they also have poorer school performance. Second, it also may explain why later-born children perform worse in the labour market during adulthood.

Now, we investigate whether there are corresponding birth-order patterns in terms of salary expectations in the short and long term, job search duration of the first job, and job aspirations through the estimation of equation (1). Results are reported in Table 2.5. In line with the literature on observed labour market outcomes, we find strong evidence of a birth-order effect on labour market expectations and aspirations during adolescence.

After completing a hypothetical university degree, the second- and third-born children expect to have initial earnings that are 5% and 7% lower than the ones expected by the firstborn. When we carry out separate regressions by gender, results are quite similar to the full-sample estimates. The birth-order pattern in expected earnings we estimate here is in line with what other studies find for observed salaries during adulthood (Bertoni and Brunello, 2013; Black et al., 2005; Kantarevic and Mechoulan, 2006). These findings are revealing, since they suggest that adolescents may anticipate their labour market outcomes with a high degree of accuracy. For long-term earnings expectations, the birth-order pattern is

much stronger and steeper for girls than for initial earnings, while for boys it remains similar. Compared with the firstborn girls, second-, third-, and fourth-born girls expect to have earnings at age 35–40 that are 5%, 10%, and 12.6% lower, respectively. This result contrasts with the findings of Bertoni and Brunello (2013), who found that observed birth-order differentials in initial earnings during adulthood tended to disappear after 10 years.

In the previous literature analysing birth-order effects on labour market outcomes, it has also been found that the firstborns are more likely to be employed in managerial positions because they are more predisposed to become managers than their younger siblings. The notion behind this argument is that their position in the family allows them to acquire management and leadership skills. While previous evidence in this regard is based on observed labour market outcomes, in this paper we test for the first time if later-born children are indeed less predisposed to be employed in high-skill occupations, which include managerial jobs. We estimate three binary models on the probability of expecting to work in a low-, middle-, and high-skill job.

Table 2.5
Estimated birth order effects on labour market expectations

	Expectations initial salary			**Salary expectations age 35-40**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0515***	-0.0461**	-0.0582***	-0.0482***	-0.0501***	-0.0497***
	(0.0126)	(0.0188)	(0.0171)	(0.0125)	(0.019)	(0.0167)
3rd Born	-0.0720***	-0.0755**	-0.0627*	-0.0869***	-0.0700**	-0.0986***
	(0.0234)	(0.0346)	(0.032)	(0.0233)	(0.035)	(0.0315)
4th born or >	-0.0277	-0.0187	-0.0452	-0.0685*	0.0101	-0.126***
	(0.0367)	(0.0573)	(0.0482)	(0.0367)	(0.0588)	(0.0475)
	Search duration 1st job			**I would like a low-skill job**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0263	-0.0496**	-0.0141	0.0367***	0.0488***	0.0278**
	(0.0164)	(0.0251)	(0.0219)	(0.0096)	(0.0152)	(0.0123)
3rd Born	-0.0471	-0.146***	0.0287	0.0776***	0.101***	0.0577**
	(0.0306)	(0.0476)	(0.0409)	(0.0207)	(0.0324)	(0.0263)
4th born or >	-0.116**	-0.187**	-0.0594	0.105***	0.0733	0.134***
	(0.0491)	(0.0764)	(0.0651)	(0.0346)	(0.0488)	(0.0489)
	I would like a middle-skill job			**I would like a high-skill job**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	0.0176	0.0196	0.0128	-0.0543***	-0.0684***	-0.0406**
	(0.0121)	(0.0196)	(0.015)	(0.0137)	(0.0212)	(0.0178)
3rd Born	0.00418	0.0297	-0.0246	-0.0818***	-0.131***	-0.0331
	(0.022)	(0.0364)	(0.0254)	(0.0259)	(0.0392)	(0.0333)
4th born or >	0.0154	0.069	-0.0265	-0.120***	-0.142**	-0.108**
	(0.0342)	(0.0594)	(0.0373)	(0.0403)	(0.0622)	(0.054)

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. All specifications control for age, birthplace cognitive skills (diagnosed learning problems), number of siblings, parents' marital status, parents' education, parents' occupation, and mother's age. Estimations were conducted with all groups within the dataset.

Our results reveal a strong birth-order pattern for both adolescent boys and girls in occupational aspirations. More specifically, we observe that firstborns are more likely to aspire to be employed in high-skill occupations, while the later-born are more likely to aspire to be employed in low-skill occupations. However, we do not find a birth-order pattern for the medium-skill jobs. Compared with the firstborns, second-born girls are almost 3 percentage points more likely to aspire to be employed in a low-skill job, while for the third- and fourth-born girls, this probability increases to 5.8 and 13.4 percentage points, respectively. For boys, these figures are about 5 and 10 percentage points higher for the second- and third-born, respectively. For the fourth-born, although the estimated coefficient is big (7.3), it is not statistically significant. Analogously, the estimation of the determinants of the probability of aspiring to work in a high-skill job decreases significantly with birth order. For boys, compared with firstborns, this probability decreases by 6.8, 13.1, and 14.2 percentage points for the second-, third-, and fourth-born, respectively. For girls, these figures are 4, 3.3, and 10.8 percentage points.

In Table 2.5, we also show the results of the estimation of birth-order differentials in the job search duration of the first job in the hypothetical scenario of having a university degree. We do not observe a birth-order pattern for girls; however, the pattern for boys is statistically significant and markedly steep. In this regard, contrary to what one could expect in view of the previous results, we observed that later-born children are quite confident. The third- and the fourth-born children expect to find a job almost 0.15 and 0.19 months earlier than the firstborn, respectively. One potential explanation for this result is that given that the later-born expect to work in jobs that require lower skills, they may expect to find this type of job more easily than a job that requires higher skills. However, the fact that we do not observe a birth-order patter for girls may also suggest that in this regard, later-born boys are more overconfident than firstborn boys.

2.5.4 Personality traits, non-cognitive abilities, and habits

So far, in the previous subsections we found that, compared with younger siblings, elder siblings are not cognitively more capable, but they have better school outcomes. These results might be caused by the firstborn having higher educational expectations and aspirations, which, in turn, might be associated with personality traits and poorer non-cognitive abilities, like more impatience or less effort in school. In this subsection, we now test for the existence of birth-order effects in some personality traits and non-cognitive abilities, which, according to the literature, have proven to be associated with poorer school performance and lower educational achievement.

The results regarding the estimation of equation (1) relating to the effect of birth order on the personality traits and non-cognitive abilities are reported in Table 2.6. Our results report several important findings. Note that the estimates for the full sample provide strong birth-order effects, with firstborn children being less likely to have personality traits and habits that can be harmful to school performance, though for some of the variables full-sample results are driven by gender. That is, in these cases birth-order effects are very strong for one gender but weak or not statistically significant for the other gender. Only the number of daily number of hours watching TV and using smartphones to socialize have reported very strong birth-order effects for both genders.

For the effort variables, we do find significant birth-order effects for boys. Compared with the firstborn, last-born boys are almost 9 percentage points more likely to declare they devote a minimum effort to pass a course. For the third- and second-born boys, the estimated effects are 6.2 and 3.6 percentage points, respectively. For the variable picking up whether students deliver school homework on time, we estimate again a clear birth-order pattern for boys. Compared with the firstborn boys, the third-born are 8 percentage points less likely to deliver school homework on time, while this figure is 18 percentage points less for the last-born. Compared to the firstborn, later-born boys are more prone to

improvise, less perseverant, and more impatient. More specifically, the last-born boys are 12 percentage points less likely to plan their tasks accurately, and this figure is 5.5 and 2.8 percentage points less for the third- and second-born, respectively. Analogously, the last-born boys are almost 6 percentage points less likely to report they finish everything they start, while this figure is 2.5 and 1.4 percentage points less for

Table 2.6
Estimated birth order effects on personality traits and non-cognitive abilities

	Finishing homework on-time			**I finish everything I start**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0458***	-0.0320	-0.0549***	-0.0085**	-0.0144**	-0.0030
	(0.0145)	(0.0218)	(0.0197)	(0.00378)	(0.00612)	(0.00474)
3rd Born	-0.0510*	-0.0799**	-0.0261	-0.0101	-0.0254**	0.00273
	(0.0264)	(0.0399)	(0.0356)	(0.00686)	(0.0112)	(0.00857)
4th born or >	-0.117***	-0.181***	-0.0556	-0.0203*	-0.0580***	0.0136
	(0.0404)	(0.0618)	(0.0541)	(0.0105)	(0.0173)	(0.0130)
	I do plan my tasks accurately			**Minimum of effort**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0166	-0.0279*	-0.00327	0.0246*	0.0358**	0.0159
	(0.0113)	(0.0152)	(0.0166)	(0.0130)	(0.0171)	(0.0196)
3rd Born	-0.0665***	-0.0552**	-0.0781***	0.0244	0.0621**	-0.0006
	(0.0204)	(0.0278)	(0.0300)	(0.0237)	(0.0314)	(0.0354)
4th born or >	-0.0594*	-0.123***	-0.000659	0.0515	0.0809*	0.0331
	(0.0313)	(0.0432)	(0.0456)	(0.0362)	(0.0485)	(0.0538)
	Impatience			**Everything I do goes wrong**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.00283	0.00604	-0.0135	0.0243**	0.0205	0.0260*
	(0.00971)	(0.0143)	(0.0134)	(0.0115)	(0.0189)	(0.0143)
3rd Born	0.0420**	0.0615**	0.0275	0.0635***	0.0694**	0.0599**
	(0.0178)	(0.0261)	(0.0246)	(0.0209)	(0.0345)	(0.0258)
4th born or >	0.0668**	0.149***	0.000345	0.0271	0.0494	0.0128
	(0.0275)	(0.0410)	(0.0376)	(0.0320)	(0.0533)	(0.0393)
	Use of mobile phones			**Time watching TV**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	0.327***	0.157	0.445***	0.158***	0.124*	0.170***
	(0.0887)	(0.116)	(0.133)	(0.0450)	(0.0693)	(0.0595)
3rd Born	0.628***	0.503**	0.675***	0.282***	0.273**	0.328***
	(0.166)	(0.213)	(0.254)	(0.0831)	(0.129)	(0.110)
4th born or >	1.019***	1.056***	1.028***	0.711***	0.893***	0.584***
	(0.258)	(0.340)	(0.388)	(0.129)	(0.203)	(0.168)

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. All specifications control for age, birthplace cognitive skills (diagnosed learning problems), number of siblings, parents' marital status, parents' education, parents' occupation, and mother's age. Estimations for the outcome variables "impatience", "use of mobile phones" and "time watching TV" were conducted with all the educational levels within the dataset. However, due to data constraints, the estimations for the remaining outcome variables were specifically conducted with all the groups in the dataset, excluding those enrolled in the last year of high school.

the third- and the second-born boys, respectively. Also, compared with the firstborn, the third-born boys score 0.06 points more in the impatience scale, while the last-born score almost 0.15 points more.

Recall that this impatience scale ranges from 0 to 1. In all non-cognitive abilities and personality traits commented on above, we do not find a birth-order pattern for girls. However, we do find a birth-order effect regarding the "pessimism" indicator for both boys and girls, though the pattern is less clear. The second-born children are 2.4 percentage points more likely to think that everything they do goes wrong, while this impact is 6.3 percentage points for the third-born. Surprisingly, we do not find statistically significant effects on this variable for the last-born. Finally, we also estimate that last-born children (boys and girls) spend a bit more than one hour a day using their smartphones than the firstborn while the second- and the third-born spend about 20 and 36 more minutes, respectively. A similar pattern is observed for both boys and girls regarding the time the surveyed students spend watching TV.

These results are in line with what is observed in the previous literature; during adolescence, children of different birth order have a well-defined personality. According to this literature, firstborn children are more likely to have more positive personal qualities, which typically favour better school performance and are also required in high-skill and managerial occupations. However, according to our results, this pattern is generally observed only for boys. The fact that the later-born boys are more impatient is also quite revealing, since impatience has been shown to be negatively associated with schooling and labour market outcomes (Cadena and Keys, 2015; Non and Tempelaar, 2016; Van Huizen and Alessie, 2015). As we do here, Black et al. (2018) also documented that the latter-born devote more time to watching TV or playing on the computer, which, in turn, implies that they spend less time on school homework than firstborns. Similarly, using data from the NLSY79, Pavan (2016) shows that higher birth order is associated with devoting more hours to watching TV on the weekend. All our results together can be taken as a plausible explanation of the lower cognitive achievement of later-born boys, though it does not say much regarding the lower cognitive achievement of later-born girls.

2.5.5 Parental involvement

Previous research in economics reveals that the birth-order effect can also be explained in a large proportion by the parental behaviour and investment. However, there is surprisingly little compelling work on differences in parental influence and involvement across siblings of different birth order in terms of gender, presumably due to the lack of data. Hence, we now turn our research to the last set of potential mechanisms behind the negative birth-order effect on school outcomes. In this subsection, we test whether there is a birth-order pattern in parents' involvement in helping their children with their school homework and attending school meetings. We ask students about these two questions separately for fathers and mothers.

In Table 2.7, we report the results for parental involvement. The estimations reveal meaningful insights into the drivers of the firstborn effect, which are different depending on the gender. Results are a bit puzzling. Contrary to what could be expected, compared with the oldest sons, parents are 8–9 percentage points more likely to spend time helping their youngest sons with their school homework. This result is similar for both the father and the mother. However, no statistically significant differences are found between the firstborn and the second- and third-born. For girls, although estimated effects are not statistically significant, opposite to boys, all the coefficients are negative and sizable in some cases. One potential explanation could be that parents are aware of the worst performance of their later-born children and then decide to spend more time with them doing their school homework, but, it does not explain the divergence in the sign of the estimated coefficients between boys and girls. We regret that these specific results cannot be used as a potential explanation for the better school performance of the firstborn.

Surprisingly, the probability that parents, either the father or the mother, attend school meetings exhibits a strong negative correlation with birth order. The observed pattern is much steeper for mothers than for fathers. For example, compared with the firstborn, for the second-born, the probability that the father regularly attends school meetings is 4.1 percentage points lower, while for the mother this probability is 5.1 percentage points lower. For the last-born, these figures are 9 and 19 percentage points lower, respectively. Studies in education and psychology reveal that last-born children perform worst on cognitive outcomes and are more likely to engage in risky behaviours. Such outcomes should motivate parents to be more involved in the school life of their youngest child, but our estimates reveal the opposite. Parents tend to be more involved with firstborns in terms of attending school meetings. However, this result is line with studies revealing that parents spend more quality time with their earlier-born children (Monfardini and See, 2012; Price, 2008), devote further resources to the firstborn (Pavan, 2016), and give a more disciplined education to their firstborn children (Hotz and Pantano, 2015).

Table 2.7
Estimated birth order effects on parents' involvement in school activities

	Father attends school meetings			**Mother attends school meetings**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.0553***	-0.0411**	-0.0645**	-0.0566***	-0.0514***	-0.0630***
	(0.0125)	(0.0187)	(0.0170)	(0.0126)	(0.0189)	(0.0171)
3rd Born	-0.108***	-0.0942***	-0.111***	-0.0880***	-0.0756**	-0.111***
	(0.0230)	(0.0342)	(0.0316)	(0.0232)	(0.0348)	(0.0316)
4th born or >	-0.0830**	-0.0905*	-0.0713	-0.181***	-0.189***	-0.171***
	(0.0356)	(0.0539)	(0.0480)	(0.0359)	(0.0548)	(0.0480)
	Father helps with school homework			**Mother helps with school homework**		
	Full sample	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
2nd Born	-0.00944	0.00662	-0.0234*	-0.00870	-0.00359	-0.0135
	(0.00883)	(0.0127)	(0.0124)	(0.00992)	(0.0139)	(0.0142)
3rd Born	-0.0120	0.0233	-0.0372	-0.00222	0.00653	-0.0122
	(0.0163)	(0.0233)	(0.0230)	(0.0183)	(0.0256)	(0.0262)
4th born or >	0.0131	0.0906**	-0.0417	0.00250	0.0792**	-0.0651
	(0.0251)	(0.0367)	(0.0348)	(0.0282)	(0.0404)	(0.0398)
	(0.0251)	(0.0367)	(0.0348)	(0.0282)	(0.0404)	(0.0398)

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. All specifications control for age, birthplace cognitive skills (diagnosed learning problems), number of siblings, parents' marital status, parents' education, parents' occupation, and mother's age. Estimations were conducted with all groups within the dataset.

2.6 Conclusions and Discussion

Earlier research has paid considerable attention to analysing the impact of the birth-order effect on school outcomes such as cognitive ability and educational and occupational attainment during adulthood. However, far fewer empirical studies have been devoted to pinpointing the drivers behind the better performance of the firstborn compared with their younger siblings. In addition to what the previous literature found, but that has not been analysed previously, we state that one potential reason is that the

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later-born children have poorer aspirations and expectations, which causes them to be less motivated to perform better in school and develop poorer non-cognitive abilities, which are important for future educational and occupational choices during adulthood.

Taking advantage of a rich dataset constructed from a survey carried out in 2016, we can estimate the relationship between birth order and measures of cognitive and non-cognitive abilities, personality traits, habits, as well as academic and labour market aspirations and expectations. There is unambiguous evidence that earlier-born children perform better in school: Silles (2010) in the United Kingdom, Hotz and Pantano (2015) in the United States, and Barclay (2014) in Sweden. In line with this evidence, we also provide consistent evidence that lower birth-order children tend to have higher grades in math and languages. Previous studies do not differentiate by gender; however, in our research, we conduct separate analyses for boys and girls. Our results indicate that as far as school grades are concerned, the birth-order effect is stronger for girls than for boys.

Our study also makes several essential contributions to the birth-order literature. To the best of our knowledge, our paper is the first to document the birth-order effect across students' expectations and aspirations. We show that there are corresponding birth-order patterns in adolescents' educational and labour market aspiration, such as having a university degree, salary expectations, or occupational achievement. We find robust evidence that the expectations and aspirations to achieve a university degree are significantly higher for older siblings. In line with this finding, we also find that firstborn children have higher salary expectations, are more likely to aspire to achieve high-skill occupations and are less likely to aspire to low-skill occupations, which indeed matches perfectly with what is observed regarding educational and labour market realizations for adults. Black et al. (2018), Mechoulan and Wolff (2015), and Grinberg (2015) found that firstborns (boys and girls) are more likely to occupy managerial and leadership positions than later-born children, which is in line with our findings regarding occupational aspirations.

Additionally, when we study the potential determinants of the persistent birth-order patterns, we find support for the hypothesis that there exists a birth-order pattern in the type of personality traits, habits, and non-cognitive abilities that have been shown in the previous empirical literature to have an impact on school outcomes. For example, we find that the firstborn children (boys and girls) spend far less time using their smartphones and watching TV. For these two outcomes, estimated birth-order effects are particularly sizeable. We observe that the birth-order patterns on personality traits differ between boys and girls. Firstborn boys try much harder in school, plan their tasks accurately, are more perseverant, and are less impatient. For girls, this pattern is either weaker or not statistically significant. All these findings taken together may explain not only why younger siblings (especially boys) perform worse at school, but also why they have lower academic and labour market achievements during adulthood.

Previous empirical literature also find that parents devote more time and more quality time to their firstborn children. These studies do not estimate a direct causal relationship but use this finding as a plausible explanation of the birth-order pattern in school outcomes. However, our findings only match this evidence partially. While parents are more likely to attend the school meetings of their elder children, they spend more time helping their youngest sons with their school homework. Surprisingly, the latter result does not hold for girls.

We believe our results are a good starting point for further research in this field. Forthcoming work, however, should try to address if birth-order patterns are preserved even after controlling for important sibling characteristics, such as sex composition or birth spacing. Unfortunately, our data do not allow us to control for this. Overall, our findings offer relevant insights and directions towards policy implications, in terms of implementing school/family programs intended to improve the

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expectations/aspirations of the later-born children and thus their academic and labour market achievements during adulthood. We also estimate different birth-order patterns between boys and girls, which stresses the importance of integrating the gender perspective into policy programs.

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CHAPTER 3

Gender Gap in Expected Earnings: Stereotypes and the Gender Role Model

Abstract: The literature provides overwhelming evidence that expected earnings are systematically lower for females than for males, potentially influencing human capital and labour market outcomes. Evidence of the gender gap in expected earnings in Western countries is abundant; however, the determinants of this gap have rarely been tested. In this study, we examined the role of gender role models and stereotypes as determinants of the gender gap in expected earnings and reservation wages. To carry out this test, we used data obtained from a survey of Catalan adolescent students enrolled in their last grades of secondary compulsory education and high school. The results were consistent with the well-established pattern in the literature of girls (females) expecting lower salaries than boys (males). Decomposition results indicated that a large part of the gender gap can be attributed to differences in observed endowments (characteristics and skills) between adolescent girls and boys. Compared to prior studies in developed countries examining students' expected salaries, our research identified a larger and statistically significant explained part of the gender gap that was primarily driven by gender role models. Specifically, gender differences in masculine role models explained between 12% and 14% of the overall gender gap. Notably, this factor explained the gender gap in expected earnings to a similar extent as a rich set of control variables.

Keywords: gender gap, expected earnings, reservation wages, gender role model, masculine role model, stereotypes, adolescents.

3.1 Introduction

Although the gender wage gap has narrowed in recent decades, progress has been slow, and the difference in wages between males and females persists (Blau and Kahn, 2017). As the Organisation for Economic Co-operation and Development (OECD, 2023) reported, the gender wage gap at the median in OECD countries was 11.9% in 2021. Briefly, females working full-time earn roughly 88 cents for every euro or dollar their male counterparts earn. The largest and smallest gap in the OECD countries was observed in Korea (31.5%) and Belgium (1.2%), respectively[15]. These differences in pay between genders have a significant economic and social impact. Consequently, the gender wage gap stands out as one of the most intensively studied phenomena in labour economics.

Gender differences extend beyond realised earnings and are evident in the younger generation's expectations regarding their future earnings (Alonso-Borrego and Romero-Medina, 2016 in Spain; Briel et al., 2020, 2021 in Germany; Filippin and Ichino, 2005 in Italy; Reuben et al., 2017 in the US). According to empirical studies, females expect lower wages even before entering the labour market. Moreover, several empirical studies have indicated that students anticipate a widening gender gap in pay from starting to peak salaries. For instance, Reuben et al. (2017), using a sample of undergraduate students from New York University (NYU) in the United States, found that women expected to earn 19% less at age 30 and 23% less at age 45 compared to their male counterparts. One might, therefore, wonder whether expected earnings align with observed wages. Using Dutch panel data Webbink and Hartog (2004) found no evidence of under- or overestimation effects between expected and realised earnings.

These persistent differences in expected earnings can influence observed wages through various channels. Primarily, expected earnings play an essential role in students' decision-making processes, shaping their choice of educational path, including the level of schooling (Attanasio and Kaufmann, 2014; Belfield et al., 2016; Hartog et al., 2012) and the choice of university degree (Arcidiacono et al., 2012; Arcidiacono et al., 2014). These expectations may also influence individuals' formation of a reservation wage (the minimum salary an individual is willing to accept for a job). In a study involving unemployed job-seekers in Germany, Caliendo et al. (2017) decomposed the gender wage gap, documenting that differences in reservation wages were the covariate that mostly explained the gender gap in realised wages. The literature suggests that expectations contribute to shaping reservation wages, influencing starting salaries, and affecting future wages. Unfortunately, females not only tend to have lower expected salaries – as has been extensively documented in the literature – but also lower reservation wages (Orazem et al., 2003), and a greater dislike for competitive environments (Niederle and Vesterlund, 2007) and the negotiation process (Babcock and Laschever, 2003). Additionally, females may have fewer opportunities to negotiate their salary (O'Shea and Bush, 2002), and if they do negotiate, they may experience fewer positive outcomes (Gerhart and Rynes, 1991). Collectively, this body of evidence suggests that studying expected earnings is vital for comprehending the roots of the gender wage gap and individual decision-making processes, facilitating early interventions and the development of effective policies.

Despite the myriad literature addressing gender differences in expected earnings in Western countries, empirical evidence focused on understanding the determinants of gender gap in wage expectations is scant. Several economic and psychological explanations for the gender differences in expected earnings have been offered, encompassing factors such as the field of study (Bonnard and Giret, 2016), occupation (Kiessling et al., 2019), overconfidence (Briel et al., 2020), and biased beliefs (Briel et al., 2021). Even after using the traditional Blinder-Oaxaca decomposition method, a substantial part of

[15] Data on the gender wage gap were extracted from the OECD. The unadjusted gender wage gap was calculated as the difference between men and women's median earnings relative to men's median earnings. The data included both full-time employees and self-employed people.

the gender gap in expected earnings remains unexplained (Bonnard and Giret, 2016; Kiessling et al., 2019). Generally, the unexplained component indicates the presence of potential discrimination or unobserved variables. Whereas the effects of human capital and personality traits variables are quite well known, the effects of other factors are yet to be understood.

Another reason girls might have lower wage expectations than boys may be attributable to the gender differences in role models and gender stereotypes, which in some way might serve to perpetuate the earnings gap. However, this approach has not been entirely considered in the literature on expected earnings. Both experimental and empirical evidence indicate that girls(boys) not only have a female (male) as a role model but also exhibit a higher interest in occupations performed by the same gender. Consequently, gender role models and stereotypes can shape individuals' expected earnings, which, in turn, might contribute to explaining the persistent gender gap in these earnings. Specifically, girls might compare their human capital outcomes with those of other females than males. Females are generally paid less than males and often occupy positions in female-dominated fields. These circumstances could serve as a reference for girls when forming their expected and reservation wages. In particular, there might be a tendency for girls to adopt a lower social comparison standard than boys.

The limited empirical evidence in the field has focused mainly on measuring the effect of human capital and personality traits variables on the gender gap in expected earnings, but as far as our knowledge extends, previous empirical studies investigating this issue from the perspective of masculine role models (hereafter MRM) and stereotypes are virtually inexistent. If the gender gap in expected earnings is in part determined by the fact that girls and boys have distinct gender role models and stereotypes, these differences, if not suppressed, could at least be minimised through effective policy interventions aimed at eliminating gender stereotypes and role models at schools during childhood and adolescence, when beliefs and attitudes are still malleable.

Keeping the above mind and since empirical evidence has constantly shown that both stereotypes and gender role models affect educational and career expectations, this study seeks to determine whether gender role models and stereotypes are significant drivers of expected earnings and whether these drivers, in turn, contribute to explaining the persistent gender gap in expected earnings[16]. Given the key variables' relevance, we hypothesise that those girls with an MRM are more likely to expect higher earnings. As students approach high school graduation, they might possess more accurate information regarding earnings and form more realistic expectations (Alonso-Borrego and Romero-Medina, 2016). Therefore, we complement our analysis by examining the effects of key variables in reservation wages, data on which are collected from students enrolled in the last year of high school. This unique feature allows for a deeper exploration of expected earnings. Based on previous research, we expect girls to expect significantly lower starting and peak salaries as well as reservation wages than their male counterparts (e.g. Briel et al., 2020, 2021; Jackson et al., 1992; Major and Konar, 1984; Reuben et al., 2017).

To address these research objectives, we use an unusually rich dataset constructed from a survey carried out in 2016 across 92 secondary education public schools in Catalonia (Spain). The original sample was made up of more than 9,000 observations from students enrolled in the last two years of compulsory education and post-compulsory secondary education. In the survey, students self-reported data on the wages they expected to earn in their early career and mid-career phases, based on a hypothetical scenario where they had obtained a university degree. Furthermore, the share of students in the last year of high

[16] For example, Major and Konar (1984), by using a small sample of management students in the United States, speculated that social comparison might be an essential determinant of expected earnings. McFarlin et al. (1989), by using a small sample of management students, found that the reference group was a stronger predictor of expected earnings. However, their social comparison variables referred to pay expectations for others (i.e. what their sample thought others earned in the same job). Jackson et al. (1992) and Heckert et al. (2002) are along the same line of our research, however, as far as we are aware scant empirical evidence adopted a similar approach that we are doing in this paper.

school reported their reservation wages. The dataset included detailed information encompassing various dimensions such as gender role models, stereotypes, cognitive abilities, personality traits, and labour market outcomes. This wealth of information enabled us to study a considerable number of different factors using a single dataset. For the purpose of this study, only students enrolled in the last years of secondary compulsory education and high school were considered, resulting in a final sample of roughly 7,600 observations.

Our findings clearly showed that girls tended to have lower wage expectations than boys across all the scenarios studied, in line with the dominant evidence in the literature. For instance, the raw gender gap in expected own initial salaries was about 18.9%, a figure close to those in other studies on the gender gap in expected starting salaries (18.1% in Kiessling et al., 2019, and 17.2% in Briel et al., 2020). Additionally, we found that MRM and stereotypes accounted for a larger proportion of the gender gaps in expected earnings compared to the rich set of variables capturing labour market aspirations, abilities, or individual and family characteristics among others. Furthermore, the Blinder-Oaxaca decomposition method illustrated that most of the gap was attributable to differences in endowments between boys and girls, in contrast to prior studies examining students' expected earnings (Bonnard and Giret, 2016; Kiessling et al., 2019). A detailed decomposition underscored that gender differences in MRM played by far a more important role in explaining gender gaps in both expected earnings. This variable allowed us to provide a higher explained component than in previous studies.

This paper is divided into five sections. Section 3.2 offers a conceptual framework alongside an in-depth literature review that delves into stereotypes and gender role models. Additionally, it explores gender differences in wage expectations and the determinants of the gender gap in expected earnings. Section 3.3 provides insights into the data and variables utilised in this study, whereas Section 3.4 outlines the methodology. Section 3.5 discusses the results beginning with the presentation of ordinary least square (OLS) estimates and followed by the decomposition method. Ultimately, our conclusions, limitations and avenues for future research are drawn in Section 3.6.

3.2 Conceptual framework and the literature

To simplify the connection of the literature with our paper, we provide a comprehensive review of the literature on stereotypes and gender role models (Section 3.2.1). Then, we offer an overview of gender differences in wage expectations (Section 3.2.2). Next, we succinctly summarise the determinants of the gender gap in wage expectations (Section 3.2.3). We present the hypotheses in Section 3.2.4, and we explain the study's contributions to the literature in detail in Section 3.2.5.

3.2.1 Stereotypes and the gender role model

Traditionally, family roles have been characterised by males as breadwinners and females as caregivers and homemakers (Eagly and Steffen, 1984; Eagly et al., 2000), giving rise to a plethora of stereotypical beliefs regarding earnings, occupational preferences, or family roles. Generally, males are employed in higher-paying jobs while females are employed in an unpaid or low-paying jobs. There is a prevailing tendency to associate male-dominated jobs with wealth, perpetuating the earnings gap. Even though male and female roles in society have already become less traditional, gender stereotypes have remained constant over the past decades (Haines et al., 2016). For instance, a recent study on US university students, showed that both genders believed men should earn more than women (Williams et al., 2010).

Studies on occupational gender stereotypes have consistently revealed that in Western countries, children tend to aspire to occupations that follow traditional gender-based patterns (Becky, 2002; Chambers et al., 2018; Franken, 1983; McGee and Stockard, 1991; Sellers et al., 1999), to be more

interested in occupations performed by the same gender (Hayes et al., 2018), to choose occupations that are dominated by their own gender (Beede et al., 2011), and to be less likely to link males to occupations in female-dominated fields and females to occupations in male-dominated fields (Ikonen et al., 2019). Although occupational gender stereotypes are formed early on (in childhood), they still persist in adolescence (Hewitt, 1975; Miller and Budd, 1999). Some researchers have observed a reduction in occupational stereotyping with age, especially in the case of girls (Franken, 1983; Miller and Budd, 1999; Vogler, 1994). Gender stereotypes likely influence educational and vocational choices which may have an impact on earnings expectations, and which in turn would affect future outcomes.

Regarding gender role models, many studies have found that girls and boys pick their role models from their environments. They pick people with whom they are familiar, such as family members, teachers, peers, and celebrities, with significant gender differences in their selections. There are notable gender differences in role models among students making occupational choices. The experimental and empirical literature has noted individuals' tendency towards same gender career referents (Lockwood, 2006; Sumner and Brown, 1996); in particular, females (males) tend to see their career paths as similar to those that other females (males) have taken. In parallel, a growing body of literature on role model effects has linked students' outcomes and teacher gender, showing that children respond differently to same- and opposite-gender teachers (Breda et al., 2018; Carrell et al., 2010; Dee, 2007). Even though females identify as role models at the same high level as men do, there is a tendency for females to have lower career expectations (Gibson and Lawrence, 2010). Taken together, the above literature indicates that if a girl selects a female as a role model, her career and earnings expectations may tend to remain lower than if she chooses an MRM. This is because, on average, feminine role models tend to hold lower-level positions in terms of earnings and occupations than males.

Scientists across a broad range of disciplines have shown that there are gender differences in human capital outcomes that might be partially attributed to the lack of same-gender role models. In particular, a paucity of feminine role models has been observed in male-dominated areas. Feminine role models are thought to play an essential role in reducing gender differences. In response to this, several policies and interventions have attempted to increase the share of females in sectors where they are significantly underrepresented (Breda et al., 2021[17]; Porter and Serra, 2020)[18,19]. There are bountiful experimental and empirical studies in industrial countries that have estimated the effect of individuals' exposure to same-gender role models on educational and occupational outcomes (Bettinger and Long, 2005; Breda et al., 2021; Canaan and Mougaine, 2021; Carrell et al., 2010; Dee, 2007; Hoffman and Oreopoulos, 2009; Kofoed and McGovney, 2019; Lim and Meer, 2017; Mansour et al., 2018; Porter and Serra, 2020). These studies have reported small to substantial positive effects for females. Using a sample of American economics students, Porter and Serra (2020) conducted a field experiment aiming to boost women's participation in economics. Exposure to successful females in the field increased females' students' likelihood of majoring in economics by 8 percentage points.

3.2.2 Gender differences in wage expectations

Expected earnings play a crucial role in numerous studies, especially education and career choice studies. Thus, in recent years, interest in understanding wage expectations' formation has grown.

[17] 'For Girls in Science' (Pour les Filles et la Science) was launched by the L'Oréal Foundation: https://www.forwomeninscience.com/

[18] Porter and Serra (2020) conducted a field experiment with US students with the aim of increasing the share of women in economics. The intervention consisted of exposing students to feminine role models majoring in economics who had graduated from the same university. Their intervention significantly increased the share of women not only taking economics classes but also majoring in economics by 8 percentage points.

[19] National Science Foundation's ADVANCE program, https://www.nsf.gov/crssprgm/advance/

Initial work in this field, Kodde (1985) collected data from 1,078 high school students in their final year in the Netherlands. Students self-reported their expected wages with different graduation levels, specifically secondary and tertiary education. Across both education levels, females had systematically lower earnings expectations than their male counterparts. This research method has steadily gained ground in labour economics. Subsequent empirical studies in Western countries have consistently reinforced the above results (Alonso-Borrego and Romero-Medina, 2016; Briel et al., 2021; Brunello et al., 2004; Heckert et al., 2002; Major and Konar, 1984; Schweitzer et al., 2014)[20]. These studies indicated that even before entering the labour market, females anticipate lower wages in all the scenarios studied. Using data from medical college students in the United States, Nicholson and Souleles (2001) explored expected incomes with 5, 10, and 20 years of experience. Female medical students forecasted lower future incomes than males, irrespective of the years of experience. Analogously, Reuben et al. (2017) by using a sample of undergraduate students from NYU (United States), found that compared to men, women expected to earn 19% less at age 30 and 23% less at age 45. Martin (1989), goes one step further and provided in the survey information about the salary for each speciality area, and still documented a similar pattern. What seems to emerge from the above studies on labour market expectations is the fact that gender plays a relevant role in the ability to form wage expectations. However, some studies have provided inconsistent evidence regarding gender differences in anticipated wages (Blau and Ferber, 1991; Davidson et al., 2012)[21]. Díaz Serrano et al. (2016), who collected data predominantly from economics and business students in four locations (Amsterdam, Peking and two locations in Spain), found no evidence of gender differences in mean earnings expectations. A common conclusion is that these differences in expectations may arise because of the particular degrees or majors to which the sample is restricted, the diverse sample sizes, and the various individual characteristics of students.

Using different methodological frameworks, several empirical studies in industrialised countries have examined whether the gender gap in expected earnings matches the real gender gap in pay (Bonnard and Giret, 2016; Carvajal et al., 2000; Fernandes et al., 2021; Filippin and Ichino, 2005). These studies employed surveys to collect data and used two different samples (students and recent graduates). Generally, they compared students' expected earnings with recent graduates' wages. Using data from students and graduates at Florida International University, Carvajal et al. (2000), observed that the gender gap in expected wages matched the real wage gap. Filippin and Ichino (2005) used data from a university of business and economics in Italy and found similar results. Bonnard and Giret (2016), using data on earnings reported by recent college graduates and earnings expected (1 and 10 years after graduating) reported by first-year students at a French university, observed a gender gap in both expected and realised earnings. However, the gaps did not align perfectly. While the wage gap one year after graduating was overestimated (16% expected vs. 9.2% realised), the wage gap after 10 years was underestimated (20% expected vs. 30.4% realised). Although both genders overestimated their salary, females' expectations tended to be more realistic for starting salary. A reversed pattern was observed for salary 10 years after graduation. In Switzerland, Fernandes et al. (2021), go further than the existing literature, not only compared students' expected earnings with alumni's realised earnings, but also provided information about actual wages. Again, they observed a similar pattern. Moreover, both genders overestimated their wages, with males exhibiting greater overconfidence than females (in both starting salary and salary with three years of experience). Webbink and Hartog (2004), who used Dutch panel data, did not focus on

[20] For example, Hojat et al. (2000) studied income expectations in a sample of medical students in the United States. Similarly, Hogue et al. (2010) used a sample of 458 undergraduate students from a large university in the United States, revealing that males had higher expected starting and peak salaries). More recently, Briel et al. (2020) observed a similar trend in a sample of prospective students in Germany.

[21] Blau and Ferber (1991) examined a sample of college business school students in the United States, revealing that both females and males anticipated similar starting salaries. In a similar vein, Davidson et al. (2012) explored gender differences in expected wages within a sample of university business students in Australia and the United Kingdom.

gender perspective instead, they measured earnings expectations and realisations for the same student. They found a close correspondence between students' expected and real incomes. In summary, these studies collectively indicated that when comparing expected and observed wages using two different samples (students and recent graduates), under- or overestimation effects may arise. However, when considering the same students, barely any effects are observed.

Some studies outlined the potential channels through which the gender gap in expected wages might be translated into the actual gender wage gap. First, from the perspective of human capital theory, having higher expected wages increases incentives to invest in schooling. Researchers documented that expected earnings are a key determinant for the choice of level of schooling to follow (Attanasio and Kaufmann, 2014; Belfield et al., 2016; Hartog et al., 2012) as well as the choice of university degree (Arcidiacono et al., 2012; Arcidiacono et al., 2014). At the same time, recent evidence has shown that even before entering the labour market, females tend to have lower wage expectations that can easily become self-fulfilling. These expectations can contribute to the formation of reservation wages, which are accurately reflected in starting wages[22]. Women with lower wage expectations would be not only willing to accept lower salary offers but also highly unlikely to bargain for a higher salary.

3.2.3 Determinants of the gender gap in wage expectations

In the literature, there seems to be a consensus that wage expectations are systematically lower for females than for males. Consequently, alongside the empirical literature on wage expectations, another line of studies has attempted to investigate the determinants of gender differences in wage expectations. In recent years, this approach has steadily gained ground. However, individual studies have yielded mixed results. Additionally, a large number of determinants has been understudied so far. In their seminal work, Major and Konar (1984) examined a sample of 50 management students in the United States. They proposed a five-factor model to explain differences in wage expectations, revealing that gender differences in pay comparison standards, career paths (e.g. education, occupational choice), and job features (e.g. high salary, promotional opportunities), collectively accounted for 75% of the variance associated with gender differences in career entry expectations. This study served as a foundation for subsequent empirical studies.

Our literature review identified four main categories that might drive gender differences in wage expectations: education and career choice, psychological factors, social factors, and personal and professional planning factors. These are reviewed in greater detail in the subsequent sections.

Education and Career Choice

Girls and boys choose different education levels and make dissimilar career decisions, leading to gender differences in wage expectations. A body of research provides different results. Alonso-Borrego and Romero-Medina (2016) found that females expect to be paid more than males in female-dominated occupations than male-dominated occupations. Meanwhile, Hogue et al. (2010) revealed that males tend to expect higher salaries at the beginning and at the peak of their careers, irrespective of whether the occupation is female- or male dominated. Schweitzer et al. (2014), who studied a sample of 452 post-secondary students from across Canada, found that women's intention to work in a specific industry (traditionally female and lower paying) explained a significant proportion of the gap in pre-career salary expectations. Nevertheless, they found no evidence of gender differences in expected hours of work and future education. Bonnard and Giret (2016) revealed that factors such as the anticipated degree, the field of study, and career plan explained 29% (45%) of the gender gap in expected earnings 1 year (10 years)

[22] See Orazem et al. (2003) and Van Ophem et al. (2011).

after completing higher education. Kiessling et al. (2019) estimated that differential sorting into majors, occupations, and industries were the covariates that mostly explained the gender gap in wage expectations; for the gender gap in starting salary, they found a joint contribution of these three measures of 42%, whereas for the gender gap in lifetime wages, they found a contribution of 35%.

Psychological factors

A second explanation for gender differences in wage expectations is rooted in personality traits, personal characteristics, and biased beliefs. Using a sample of about 460 undergraduate students, Hogue (2010) showed that self-esteem does not contribute to the gender gap in starting and peak-career salary expectations. However, they found evidence that self-efficacy moderates the relationship between gender and wage expectations at both career points. Increased self-efficacy for females is translated into higher expected starting wages, whereas for males, it is translated into a reduction in peak-career wage expectations. Briel et al. (2020), by using Blinder-Oaxaca decompositions, found that overconfidence explains 7.7% of the overall gender gap in own expected starting salaries. In a similar vein, a recent study by Reuben et al. (2017) showed that 18% of the gender differences in wage expectations are attributable to overconfidence and competitiveness. Briel et al. (2021) pointed out that biased beliefs play an important role in explaining the gender gap in expected own salary.

Social factors

Social factors include reference groups, stereotypes, social comparison, social learning, and social discrimination. Even before entering the labour force, students form their expectations based on their social environment's influence. Differences in social learning (Hojat et al., 2000) and social comparison (Jackson et al., 1992; Major and Konar, 1984; McFarlin et al., 1989) may contribute to gender differences in wage expectations. Individuals not only tend to compare themselves to others (Festinger, 1954) but also they are highly possible to form their expectations based on information provided by individuals of the same gender. Research evidence has shown that females constantly have lower wage expectations because their references are female (Gibson and Lawrence, 2010). In a laboratory experiment conducted in the United States, Bordalo et al. (2019) observed that gender stereotypes were potential drivers of self-beliefs and own performance, especially in the case of males (not females). In a similar vein, Jackson et al. (1992) showed that gender differences in fair pay standards play an essential role in explaining the gap. Compared to males, females not only report lower peak-career salary expectations but also perceive less pay as fair pay. Moreover, some studies suggested that gender differences in wage expectations can be partially attributed to the anticipation of discrimination in the labour market by young women[23].

Personal and professional planning factors

For gender differences in attitudes towards family and professional preferences, the research is limited. However, it provides valuable insights. The traditional division of labour within the family might lead to both genders having different priorities in terms of career and life planning. The fact that females expect career interruptions because of family responsibilities like childbearing and child-rearing might explain gender differences in wage expectations. In Switzerland, Fernandes et al. (2021) used both Blinder - Oaxaca decomposition and semiparametric propensity scores to quantify the contribution of career choices, family preferences, and family plans to the gender gap in expected earnings. Their atypical dataset was unable to explain fully the gap, and it seems that a significant unexplained component remains. Using a large sample of German students Kiessling et al. (2019), quantified the contribution of a rich set of

[23] See for example Filippin and Ichino (2005)

covariates to the gender gap in expected starting salaries, including occupational sorting, personality traits, labour supply, and family planning. They found that negotiation style, weekly working hours, and family planning together contributed to explaining around 27% of the gender gap in expected starting salaries. Negotiation style (14%) and expected working hours (10%) rather than child-related career breaks (3%) explain most of the variance. Conversely, in the gender wage gap literature – specifically, in a sample of British graduates – it was found that gender differences in career break expectations for family reasons were one of the main explanatory covariates; specifically, it accounted for 10% of the explained gender wage gap.

3.2.4 Hypothesis

As illustrated in the literature review section, some explanations have been offered for the persistent gender gap in expected earnings. These explanations range from gender differences in human capital variables (e.g. education, career choice), to personality traits or personal and professional planning factors. The influence of the social environment, where boys and girls tend to have same gender career referents, is another possible factor. However, evidence from this last research strand is virtually non-existent.

The present paper aims to test whether there is a gender gap in expected earnings in adolescents and to quantify the effect of MRM and stereotypes on this gender gap. Based on our literature review, we propose the following hypotheses:

> *Hypothesis 1:* Is there a difference in own expected wages (both initial salary and peak salary) among adolescent girls and boys with a university degree?
> *Hypothesis 2:* Do gender differences exist in reservation wages?
> *Hypothesis 3:* Is it plausible for girls with an MRM to anticipate higher earnings?
> *Hypothesis 4:* Can differences in expected earnings be partially attributed to different MRMs and stereotypes between girls and boys?

Building upon previous research (e.g. Briel et al., 2020; Jackson et al., 1992; Reuben et al., 2017), we argue that even before entering the labour market, girls have significantly lower starting and peak salaries, as well as reservation wages, compared to boys.

3.2.5 Our contribution

The present paper contributes to the labour literature stream in three significant ways. First, we analyse gender differences in wage expectations. There is bountiful empirical evidence revealing that females consistently report lower wage expectations compared to their male counterparts[24]. Prior studies have mostly shed light on wage expectations among students enrolled in particular colleges/universities or fields of study[25]. It is vital to take one step back and examine how students forecast their earnings even before making their most important educational choice (self-selection into different fields and levels of education). This study explores gender differences in own expected earnings with a university degree at two distinct points in the future: initial salary and salary at 35-40 years old.

[24] Heckert et al. (2002); Hogue et al. (2010); Major and Konar (1984); Schweitzer et al. (2014), and so forth.

[25] Briel et al. (2020, 2021); Dominitz and Manski (1996); Gasser et al. (1998); and Zambre (2018) are an exception. Nonetheless, those studies had relatively small sample sizes. Gasser et al. (1998) examined 186 students from three age groups (elementary school, secondary school, and college students), whereas Dominitz and Manski (1996) examined 110 observations from students enrolled in high school and college. Whereas Zambre (2018) used 1,430 observations from students in their penultimate year in high school, Briel et al. (2020) and Briel et al. (2021) used 2,048 observations from prospective university students.

Second, several studies have mostly focused on reservation wages among the adult population[26], showing that these play a vital role in the gender wage gap. However, the empirical evidence regarding wage expectations during adolescence is relatively scarce. Obtaining information about reservation wages will allow us to not only take a closer look at gender differences but also better understand why gender gap in expected wages arises.

Third, the economics and psychology literature has faced challenges in identifying the determinants of gender differences in wage expectations. In response, we endeavour to analyse a set of possible drivers of the gender gap in wage expectations using one coherent framework. Specifically, we seek to assess whether gender differences in MRMs and stereotypes are possible drivers of the gender gap in wage expectations. As far as we are aware, these factors have not been empirically studied. Bonnard and Giret (2016) found a high unexplained component in both wage expectations (1 and 10 years after graduation) that is generally attributed to discrimination or to unobserved factors. Perhaps because of the low explained component, in the study it has been suggested to incorporate variables related to job stereotypes as well as those containing aspects of individuals' career expectations (job characteristics, full-time or part-time job, and career priority). Furthermore, in addition to our key variables (MRMs and stereotypes), our dataset enables us to associate gender differences in expected wages with a wide range of potential drivers using one coherent framework, such as labour market expectations, life aspirations, skills, and personality variables among others. Therefore, through the present paper, we attempt to contribute to the labour literature.

3.3 The data and variables

3.3.1 Data source

Comprehensive information regarding the data source is provided in the introductory chapter, specifically in Section 1.2.1. The original sample used in this research encompassed 9,275 students, but given the specific aim of the research, attention was paid to students in their final year of secondary compulsory education and students enrolled in high school. In the results section, we mention the specific sample we considered in estimating our models.

3.3.2 Variables

Outcome variables: Labour market expectations

To investigate whether there are gender differences in labour market expectations, we considered three dependent variables of salary expectations: own starting salary and peak salary (salary at 35-40 years old) with a university diploma and a reservation wage.

Students were asked to state their expected salaries in different scenarios. First, they had to provide an estimate of their own starting salary with a university diploma through the following question: 'With a college degree, what do you think would be your monthly salary?'. Additionally, they were required to state their own expected peak salary, assuming they earned a university degree, through the following question: 'When you are 35-40 years old, what do you think your monthly salary will be with a college degree? (euros/month)'. These two measures were collected from students across all education levels.

The remaining dependent variable was exclusively collected from students in the last year of high school. Students were asked the question 'What is the minimum monthly salary you would ask for a job if you had a university degree?' to obtain information on reservation wages.

[26] Unemployed individuals (Caliendo et al., 2017) and recent graduates (Orazem et al., 2003; Van Ophem et al., 2011).

We inquired about monthly earnings rather than hourly or yearly rates because the former are customary in Spain's labour market. Individuals typically evaluate the adequacy of their salary based on this monthly time frame. Although adolescents may have a general sense of what individuals around them earn per month, they are less likely to have insight into annual salaries stipulated in employment contracts. Dominitz and Manski (1996) showed that American students from high school and college undergraduates tended to answer of the above question based on the assumption that they would be employed full time employment. Although we did not specify whether students should report their expected earnings for a full-time job or a part-time job, we assumed that they would opt for the latter. Students' answers were recorded in open-text fields, which provided us with an accurate estimation. Before conducting the estimation, we transformed the wage variables into the natural logarithm (ln) of the perceived salary.

Figures 3.1-3.3 show the combined density graph for each dependent variable, providing an initial visual impression of the expected earnings distribution by gender. Generally, all the figures indicated a difference in average expected earnings between boys and girls. The density curves showed few overlaps, suggesting dissimilarities in the earnings distribution between boys and girls. Furthermore, the peak of the girls' and boys' density curves appeared to be quite similar for own expected peak salary and reservation wages (Figures 3.2 - 3.3). For own expected initial salary, the girls' density curve appeared to be located on the left-hand side, whereas the boys' density curve appeared to be located on the right-hand side. Thus, on average, boys tended to have slightly higher expected earnings than girls within this dataset. The tails of both density curves extended to lower (higher) expected earnings, indicating that there were individuals with relatively low (high) earnings between both boys and girls. However, the tails of the density curve appeared to be different in Figure 3.1. Specifically, in Figure 1 (expected initial salary), the tail of the boys' density curve appeared to extend further, suggesting that there might have been more boys with extremely high expected earnings compared to girls. The combined density graph created an overall visual impression of the expected earnings distribution by gender. Because the expected earnings gap might be influenced by variables like individual and family characteristics, labour market aspirations or personality traits among others, further statistical analysis are needed to draw a conclusion.

Figures 3.1 - 3.3
Combined density graphs: Three outcome variables

Figure 3.1

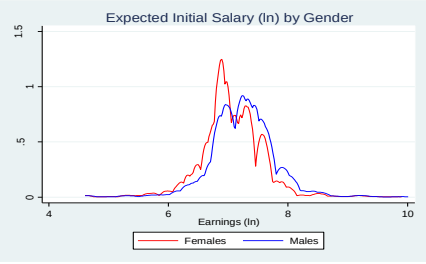


Figure 3.2

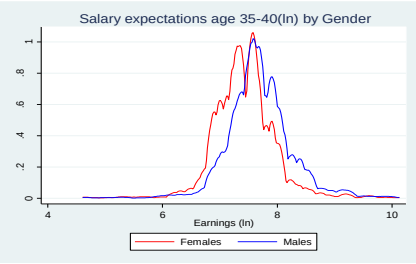
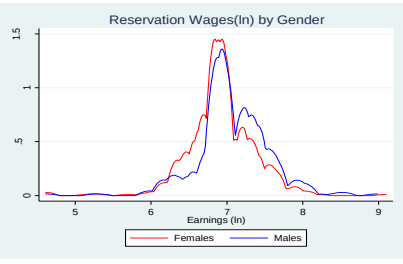


Figure 3.3



Notes: Own elaboration

In line with the existing literature on the labour market, the top panel of Table 3.1 reveals a large gender gap in wage expectations (in both starting salary and peak salary). Boys expected to receive higher starting salaries than girls, with the difference being around 20 log points. Regarding peak salary, the gap was widening, with the difference being around 26 log points. Regarding reservation wages, the gender

gap was still persistent. What seems to emerge from this is that girls not only tended to exhibit lower salary expectations but were also willing to accept a job for the lowest wage rate.

Explanatory variables

MRM: Previous studies showed that there were systematic differences between females and males from this perspective. To capture the dimension of gender role models, we asked students to respond in an open-text field about the following question: 'If you had the opportunity to live someone's life, from a professional point of view, whose life would you choose?'. Students were required to provide a name. Their answers ranged from direct role models (parents, siblings, teachers) to more distant role models (successful and famous people) from a wide variety of fields. We constructed an indicator of gender role models as follows: (1) feminine, (2) masculine, (3) no role models, (4) missing, (5) I don't know, (6) no gender role model. Subsequently, we created a dummy variable that took 1 if students reported that they had an MRM and 0 otherwise. The descriptive statistics (Table 3.1) showed that there was a propensity for boys to have an MRM.

Stereotypes: To measure sexism's impact on future labour market outcomes, we used an index (it was difficult to capture the attitude with only one word or phrase) that combined students' responses to four questions: (1) In a household, the man should work and not the woman; (2) The fact that a man earns more money than a woman is justified; (3) In case of childbirth, it is the woman who should stop working and not the man; and (4) The two members of the couple do not have to divide the housework by 50%. The elicited responses were rated on a four-point Likert scale (never, sometimes, often, and always). Large gender differences were found for all the items used in the construction of this index, indicating a tendency for boys to hold more traditional gender role beliefs (Table 3.1). Our sexism measure mainly captured female and male attributions within the home context (housework and childcare), this measure might in some way be related to benevolent sexism (i.e. protection and help provided by males, which in turn encourage females to adhere to traditional gender roles).

Control variables

In addition to our variables of interest (MRM and stereotypes), we incorporated a diverse range of variables in our analysis. Many of these factors are significant in the expected and observed gender wage gap in the labour and economics of education literature. Because previous studies have already identified some of the sources of and the nature of the gender wage gap, we divided our set of control variables into six groups that we expected to provide additional explanations for the gender gap in wage expectations: (a) base-line variables mainly accounted for differences in individual and family characteristics; (b) educational profile variables were related to cognitive abilities or school dropout intentions among others; (c) labour market aspirations were related to occupations and sectors in which respondents expected to be employed upon graduation; (d) risk preference and personality illustrated students' characteristics; (e) skills reflected students' self-perception of their abilities in different contexts; and (f) life goal aspirations reflected how girls and boys defined success.

a) Individual and family characteristics

In the survey, students were required to provide information on their individual and family characteristics. The following characteristics were considered: number of siblings, birth order, parents' education level (whether the mother or father has a tertiary education degree), parents' labour status, and parents' financial support (whether parents provide weekly financial support to their children).

Panel (b) of Table 3.1 presents the descriptive statistics of individual and family characteristics. On average, in our sample, each student had 1.4 siblings (SD ± 1.1), and there was a preponderance of

students with both parents employed, accounting for 87.4% of the sample (SD ± 3.3). Regarding parental education level, adolescents reported that only 10% of both parents had a tertiary education. More than half of the sample was represented by firstborns, 35% was represented by second-borns, and only 12.5% was represented by third-borns or higher. Additionally, in our survey, individuals were asked whether their parents provide them weekly financial support with their expenses. Around one-quarter of the sample stated that they did not receive support.

b) Educational profile variables

We collected data regarding individuals' educational aspects, like the field of study, cognitive abilities, and dropout intentions.

The field of study[27]*:* Students enrolled in the last years of compulsory secondary education were asked about the field of study they expected to focus on in post-compulsory secondary education. A variable with four different options was created: (1) arts, (2) science and technology, (3) humanities and social sciences, (4) lower vocational training (VT). This measure was specially employed in estimations conducted with a sample restricted to students enrolled in the last years of compulsory secondary education and high school. High school students were asked about their current field of study and requested to choose from (1) arts, (2) science and technology, (3) humanities and social sciences. We assume that they had already selected the options in line with their academic interests and occupational preferences. Thus, when our analysis focused exclusively on high school students, the version with three categories were employed.

Cognitive abilities: We controlled for a set of cognitive abilities. These variables were self-reported grades in mathematics and languages (Catalan and foreign languages). These grades were based on a five-point ordinal scale (E, D, C, B, A), where E was the minimum grade and A was the maximum. E stood for failure, D stood for sufficient, C stood for good, B stood for very good, and A stood for excellent. The descriptive statistics showed a gender gap in cognitive abilities; boys performed slightly better in mathematics, whereas girls performed better in languages.

Dropout intentions: We included a variable related to school dropout, which we considered to be a valuable indicator of students' academic aspirations. The variable captured whether students would consider leaving school if offered a long-term job opportunity. To explore this further, we asked the following question:

> *Suppose that at the end of this academic year, you are offered a job with a long-term contract, which fits with your current level of education. What is the monthly salary you would require to take this job and leave your studies?*
>
> *a. I would not take this job.*
> *b. I should be paid _____ €/month.*

School dropouts were coded as 1, and 0 otherwise. According to Table 3.1, around half of the respondents (46%) intended to drop out of school if offered a long-term job. Additionally, we observed clear differences regarding dropout intentions by gender: boys were 23% more likely to leave school for a long-term job than girls.

[27] Every country has a well-designed educational system with different stages, and Spain is no exception. The educational system in Spain consists of six years of primary education, followed by four years of compulsory secondary education. At the age of 16, once students finish compulsory secondary education, they must decide between VT or high school. High school education includes preparation for enrolling in a university degree. High schools offer three different profiles to prepare students accordingly.

c) Labour market aspirations

The data showed that different factors like the activity sector, industry, occupation, and type of employee determine earnings. It is well-known that the highest salaries are in science, technology, engineering and mathematics (STEM) careers, and the lowest are in non-STEM careers. Further, an individual's salary depends on whether they are occupying a position that requires high skills (e.g. management or leadership skills) or middle or low skills. In our survey, we had several measures of students' labour market aspirations, such as occupational, employee, and sector aspirations. We found these variables particularly interesting because they revealed whether students were well-informed about the future returns in different scenarios.

Sector aspirations: Students were asked to respond to 'When you finish studying and find a job, in which sector do you think you are most likely to end up working?', by selecting one out of eight options: (1) agriculture; (2) other non-qualified services (security guard among others); (3) other qualified services (education, health, and so on); (4) commercial sector; (5) construction; (6) tourism; (7) industry; and (8) I don't know.

Employee aspirations: To measure the type of employee aspirations, students were asked to respond to 'In the future, I would like to?' by selecting one out of four options that suited them best (1) Have my own business, (2) Work in a private company, (3) Work in the public sector, and (4) I don't know.

Occupational aspirations: Additionally, respondents were asked about jobs they would like to do in the future in an open-text field. We classified all the jobs and constructed an ordinal measure of occupational rank. Based on this, we assigned (1) high-skill jobs, (2) low-skill jobs, and (3) middle-skill jobs.

Free-riding: The last labour measure we considered in our analysis was related to 'free-riding', which was measured using a standard question where individuals chose between working for a salary of 1.000€ or receiving financial aid for the same amount of money.

As expected, girls and boys differed substantially in their labour market aspirations (Table 3.1). In comparison with boys, a higher share of girls aspired to work in female-dominated jobs, which are commonly known for their lower pay. For instance, 61% of girls aspired to work in sectors such as education, health, or sales, whereas this was the case for only 33.6% of boys. Conversely, only 8% of girls aspired to professional jobs in the industrial sector, compared to 26% of boys. Regarding sector aspirations, we observed significant differences between boys and girls in our sample. A large share of boys were more likely to aspire to be business owners or to work in the private sector (58% of boys compared to 44% of girls). Conversely, boys were less inclined to aspire to be employees in the public sector (17% of boys compared to 25% of girls). Taken together, our outcomes resembled students' expectations in the administrative data as well as the observed pieces of evidence in adulthood (OECD, 2015; OECD, 2019; Schweitzer et al., 2014).

d) Risk preferences and personality

Risk preference: To investigate whether systematic differences in personality traits or individuals' risk preference can affect the gender gap in salary expectations, we also considered a set of control variables. Individuals with higher levels of risk aversion are more inclined to consider jobs with lower earnings risk (Bonin et al., 2007), to be more likely to be sorted into occupations with lower earnings risk, and to be more likely to pursue careers in the public sector (Bellante and Link, 1981; Pfeifer, 2011). We believed that individuals' risk preference was essential to incorporate in our analysis because individuals have different behaviours in regard to investment, educational, and occupational choices. In the survey, we asked students about their preferred payment schemes to measure their willingness to take risks. This particular measure had four categories based on different salary structures: (1) fixed salary (1,200€); (2)

fixed salary (1,000€) + 400€ variable; (3) fixed salary (800€) + 800€ variable; and (4) fixed salary (600€) + 1,200€ variable. This was an ordinal variable ranking behaviours from risk-averse behaviour to risk-seeking behaviour. In the regression analysis, we incorporated the third category, 'moderate risk', and the fourth category, 'high risk', to test whether individuals with risk-seeking behaviour expect higher earnings. Dummy variables were created for these two variables. In our sample, risk preference varied systematically by gender. Boys were, on average, more willing to take risks than girls, although the difference between the genders was not extremely large. We believed that including these variables in the decomposition could help explain gender differences in wage expectations.

Overconfidence: Findings from the recent literature suggest that individuals' confidence in their own abilities is an important factor in determining their expected earnings. Generally, individuals tend to be overconfident about their own abilities (Croson and Gneezy, 2009). At the same time, significant gender differences in confidence have been observed, with men being more overconfident than women (Barber and Odean, 2001; Briel et al., 2020; Dahlbom et al., 2011*)*. Our measure of overconfidence differed from the measures Reuben et al. (2017) and Briel et al. (2020) used. Whereas Reuben et al. (2017) measured overconfidence by comparing students' subjective probability of being ranked first in a mathematical task with their true probability of being ranked first, Briel et al.'s (2020) overconfidence measure was directly related to wage expectations. Our measure, meanwhile, was directly related to students' abilities, which were presumably more closely related to own abilities. In the survey, students were asked,

According to my abilities/intelligence, I consider that:

a. *My grades are better than I expected. (underconfidence)*
b. *My grades are worse than I expected. (overconfidence)*
c. *They are what I expected. (neutral)*

We interpreted the first category of this variable as a measure of underconfidence, we interpreted the second category as a measure of overconfidence, and we interpreted the last category as neutral. The descriptive statistics showed important gender differences in overconfidence. Boys were more overconfident in their abilities than girls (51.1% of boys compared to 43.6% of girls). Our descriptive findings aligned with previous the literature on (over-)confidence (Briel et al., 2020; Dahlbom et al., 2011; Reuben et al., 2017).

Nervous: Among the previous control variables, we incorporated an indicator of personality traits. Our indicator differed from the measures previously used in the gender pay gap literature. Instead of measuring the Big Five personality traits, our sample included a variable that captured specific personality characteristics, particularly an indicator measuring stress. Highly qualified jobs or jobs with high responsibility are linked to higher earnings, but they also present high stress levels. Thus, nervous individuals might choose careers with low stress levels, leading them to expect lower earnings. These individuals may prioritise other factors like comfort or job stability over financial returns. In the survey, students were asked a battery of questions such as: 'The exams make me nervous/I get nervous when the teachers ask me in the classroom'. We used a four-point Likert scale with responses ranging from 1 (never) to 4 (always). From these two questions, we created an indicator of stress. In our sample, we observed systematic differences by gender; in particular, girls tended to experience higher levels of stress than boys (Table 3.1).

Table 3.1
Descriptive statistics for the outcome and explanatory variables differentiating by gender

	Overall		Girl		Boy	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Outcome variables						
Labour market expectations						
Expectations initial salary (ln)	7.142	0.543	7.055	0.526	7.247	0.544
Salary expectations age 35-40 (ln)	7.560	0.569	7.442	0.536	7.701	0.575
Reservation wage (ln)	6.978	0.465	6.921	0.450	7.072	0.476
Explanatory variables						
Panel (a): Gender role model and stereotypes						
Gender role model						
MRM	0.594	0.491	0.421	0.493	0.817	0.387
Sexism: composed by						
In a household it is preferable for the man to work and not the woman						
Strongly disagree	0.749	0.433	0.793	0.405	0.697	0.459
Somewhat disagree	0.143	0.350	0.118	0.322	0.174	0.379
Somewhat agree	0.078	0.269	0.067	0.250	0.092	0.289
Strongly agree	0.027	0.164	0.021	0.143	0.036	0.186
The fact that a man earns more money than a woman is justified						
Strongly disagree	0.828	0.376	0.891	0.311	0.753	0.431
Somewhat disagree	0.093	0.291	0.062	0.242	0.130	0.337
Somewhat agree	0.048	0.215	0.026	0.161	0.074	0.263
Strongly agree	0.029	0.168	0.019	0.137	0.040	0.198
In case of a birth, it is the woman who should stop working and not the man						
Strongly disagree	0.468	0.499	0.492	0.500	0.439	0.496
Somewhat disagree	0.193	0.395	0.187	0.390	0.200	0.400
Somewhat agree	0.196	0.397	0.185	0.388	0.209	0.407
Strongly agree	0.141	0.348	0.134	0.340	0.149	0.356
The two members of the couple do not have to divide the housework at 50%						
Strongly agree	0.773	0.418	0.868	0.337	0.658	0.474
Somewhat agree	0.127	0.333	0.068	0.252	0.197	0.398
Somewhat disagree	0.052	0.223	0.029	0.170	0.080	0.271
Strongly disagree	0.046	0.211	0.032	0.177	0.063	0.244
Control variables						
Panel (b): individual and family characteristics						
Number of siblings	1.400	1.100	1.431	1.124	1.363	1.068
Birth order						
1st Born	0.519	0.499	0.509	0.499	0.531	0.499
2nd Born	0.354	0.478	0.359	0.479	0.349	0.476
3rd Born or >	0.125	0.331	0.131	0.337	0.119	0.323
Parents' university level						
Both without university level	0.691	0.461	0.696	0.459	0.685	0.464
Father no mother yes	0.136	0.342	0.134	0.341	0.138	0.345
Father yes mother no	0.068	0.252	0.068	0.252	0.068	0.252
Both with university level	0.103	0.304	0.100	0.300	0.107	0.309
Parents' labour status						
Both employed	0.874	0.330	0.871	0.334	0.878	0.326
Father employed mother unemployed	0.065	0.247	0.064	0.246	0.066	0.248
Father unemployed mother employed	0.047	0.213	0.052	0.223	0.042	0.200
Both unemployed	0.011	0.108	0.010	0.103	0.013	0.113
Weekly economic allocation	0.737	0.440	0.739	0.438	0.734	0.441
Panel (c): educational variables						
Grade level						
9th grade (3er ESO)	0.061	0.240	0.059	0.237	0.063	0.244
10th grade (4rt ESO)	0.493	0.499	0.463	0.498	0.528	0.499

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Table 3.1 (continued)

	Overall		Girl		Boy	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
11th grade (1er BATX)	0.298	0.457	0.317	0.465	0.275	0.447
12th grade (2on BATX)	0.146	0.353	0.159	0.366	0.132	0.338
Type of study						
Arts	0.057	0.232	0.071	0.258	0.039	0.194
Science and technology	0.382	0.486	0.317	0.465	0.460	0.498
Humanities and social sciences	0.362	0.480	0.446	0.497	0.261	0.439
Lower vocational training	0.197	0.398	0.164	0.370	0.238	0.425
Dropout for a long-term job	0.457	0.498	0.352	0.477	0.580	0.493
Panel (d): labour market aspirations						
Sector aspirations						
Agriculture	0.016	0.129	0.010	0.100	0.025	0.156
Other non-qualified services	0.024	00.153	0.013	0.117	0.036	0.186
Other qualified services	0.415	0.492	0.530	0.499	0.279	0.448
Commercial sector	0.070	0.255	0.080	0.272	0.057	0.233
Construction	0.022	0.149	0.008	0.093	0.039	0.195
Tourism	0.071	0.257	0.081	0.274	0.058	0.235
Industry	0.159	0.365	0.076	0.266	0.256	0.437
I don't know	0.219	0.413	0.196	0.397	0.245	0.430
Employee aspirations						
Business owner	0.240	0.427	0.215	0.411	0.269	0.443
Private employee	0.263	0.440	0.223	0.416	0.310	0.462
Public employee	0.214	0.410	0.250	0.433	0.172	0.378
I don't know	0.281	0.449	0.310	0.462	0.247	0.431
Occupational aspirations						
High-skill job	0.677	0.467	0.744	0.436	0.597	0.490
Low-skill job	0.117	0.321	0.098	0.298	0.138	0.345
Middle-skill job	0.205	0.403	0.156	0.363	0.263	0.440
Free-riding						
Working for a salary of 1K€	0.762	0.425	0.805	0.395	0.710	0.453
Receiving an aid of 1K€	0.237	0.425	0.194	0.395	0.289	0.453
Panel (e): risk preference and personality						
Moderate risk	0.112	0.315	0.090	0.286	0.138	0.345
High risk	0.099	0.299	0.090	0.287	0.110	0.313
Nervous: composed by						
I get nervous when the teachers ask me in classroom						
Never	0.288	0.453	0.214	0.410	0.378	0.484
Sometimes	0.445	0.497	0.445	0.497	0.445	0.497
Often	0.166	0.372	0.203	0.402	0.123	0.328
Always	0.098	0.298	0.137	0.344	0.052	0.223
The exams get me nervous						
Never	0.112	0.316	0.049	0.217	0.188	0.390
Sometimes	0.474	0.499	0.429	0.495	0.528	0.499
Often	0.246	0.430	0.295	0.456	0.187	0.390
Always	0.166	0.372	0.224	0.417	0.096	0.295
Panel (f): skills						
Skill grades						
My grades are better than I expected	0.097	0.296	0.103	0.305	0.088	0.284
My grades are worse than I expected	0.470	0.499	0.436	0.496	0.511	0.499
They are what I expected	0.432	0.495	0.459	0.498	0.399	0.489
Self-perceived competence						
Math skills	6.414	2.298	5.974	2.274	6.941	2.215
Verbal skills	7.172	1.811	7.238	1.765	7.093	1.861
Social skills	7.694	1.956	7.730	1.922	7.651	1.995
Commercial skills	7.293	1.841	7.273	1.792	7.317	1.898
Effort skills	6.901	2.174	7.071	2.051	6.697	2.296
Comprehension skills	7.674	1.777	7.821	1.729	7.497	1.816
Panel (g): life goal aspiration						
Being famous	0.038	0.192	0.028	0.167	0.049	0.217

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Table 3.1 (continued)

	Overall		Girl		Boy	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Being useful to society	0.128	0.334	0.147	0.355	0.104	0.306
Having a great deal of money	0.160	0.366	0.107	0.310	0.222	0.416
Creating my own family	0.237	0.425	0.230	0.420	0.247	0.431
Live with enough time	0.211	0.408	0.225	0.417	0.194	0.395
Having social recognition	0.045	0.208	0.048	0.215	0.042	0.200
Having a good prof. car.	0.178	0.382	0.211	0.408	0.138	0.345

Notes: Own elaboration

e) Skills

Findings from the recent literature suggest that abilities are important for labour market performance. Regarding students' self-concept, in the survey, there were six questions aimed at obtaining information related to mathematical, verbal, social, commercial, effort, and comprehension skills (Table 3.1). The literature has found a significant confidence gap between genders, with males having a better perception of their own abilities (Bibeault, 2019). This tends to have an impact on labour market outcomes. For instance, mathematical ability is one of the best abilities for predicting wages (Taubman and Wales, 1973). Our skills variables are measured on a fairly common 1-10 scale from poor to excellent. According to the descriptive statistics, it was obvious that there was a huge discrepancy in boys' and girls' mathematical abilities. For some reason, boys tended to better perceive their mathematical ability than girls. We expected students with higher mathematical skills to exhibit better ambition in terms of future incomes. The bottom panel of Table 3.1 shows their descriptive statistics.

f) Life goal aspirations

Females' and males' life goal aspirations might be different. Indeed, prior research documented that while females place emphasis on non-pecuniary aspects, apparently, they value family more than power. Meanwhile, males value pecuniary aspects (Jackson et al., 1992; Lips and Lawson, 2009; Zafar, 2013). Therefore, gender differences in life goal aspirations might partially explain the gender gap in expected earnings. To measure life goal aspirations, students were asked to respond to the question 'In your opinion, what would be a successful life for you?' by selecting one out of the following seven-point Likert scale responses: (1) Creating my own family, (2) Being able to live with enough time for myself, (3) Being famous, (4) Being useful to society, (5) Having great deal of money, (6) Having social recognition, and (7) Having a good professional career. Table 3.1 presents the descriptive statistics. The responses revealed that life aspirations differed between girls and boys. Around 22% of boys aspired to greater pecuniary success versus only 11% of girls. At the same time, significantly more girls aspired to be useful to society and to have a good professional career. For example, 21% of girls aspired to a good professional career versus only 14% of boys do so. What seems to emerge from this is the fact that even from adolescence, girls and boys have a distinct set of life aspirations.

3.4 Empirical model

In this section, we conduct a comprehensive review of the methodologies generally employed in the literature to quantify various factors' contribution to the gender wage gap. Following this, the theoretical perspective of the regression model and decomposition method used in this study are discussed.

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3.4.1 Critical review of the empirically related literature

Earnings distribution in the related literature have been studied through various decomposition methods, from parametric methods (Blinder, 1973; Juhn et al., 1993; Machado and Mata, 2001; Oaxaca, 1973), through semi-parametric methods (DiNardo et al., 1996) to non-parametric methods (Ñopo, 2008).

The conventional approach to investigating the gender pay gap in labour economics involves the widely adopted Blinder-Oaxaca decomposition. This method consists of decomposing the gap into two components: the explained component, which indicates that the gap is due to differences in observed characteristics between genders, and the unexplained component, which hints at potential discrimination or unobserved variables (for further insights, see Subsection 3.4.3). Generally, the standard Blinder-Oaxaca method assumes linearity and zero-conditional mean. More recently, various extensions have been proposed: for example, decomposing the gender wage gap with distributional statistics other than the mean, such as quantiles, the variance, or the Gini coefficient (Fortin, 2011)[28]. Kassenboehmer and Sinning (2014) in the United States and Töpfer (2017) in Italy[29] employed an extension of the classical decomposition tool based on unconditional quantile regression (UQR)[30]. After decomposing the gender pay gap, they found a highly unexplained component, similar to the standard Blinder-Oaxaca. The authors attributed their outcomes to heterogeneity in the data. Meara et al. (2019) used a different dataset: used the United States Current Population Survey. Even though their main focus was not on studying wage decomposition, they still observed that this modern version of Blinder-Oaxaca revealed a significant proportion of unexplained components. As mentioned earlier, this unexplained component may reflect discrimination, the effect of unobserved factors, or both. Previous studies used administrative data to conduct decomposition techniques. These studies' sample limitations might explain the highly unexplained component found in them, such as the impossibility of controlling for factors that are generally difficult to capture like skills, personality traits, risk preference, stereotypes, or gender role model. The high unexplained component and heterogeneity within samples prompted criticism of the Blinder-Oaxaca decomposition method in the empirical literature, suggesting that it may not be ideal.

Several researchers argued that Blinder-Oaxaca decomposition fails to recognise gender differences in the supports and is only informative about the average unexplained difference in wages. It is incapable of assigning the true part of the gender gap that is due to discrimination. Consequently, because of the drawbacks and limitations of the Blinder-Oaxaca decomposition, researchers have recently shifted towards other decomposition techniques. Ñopo (2008) highlighted the parametric method's limitations when studying the differences between two comparative groups. The author proposed an alternative method, specifically a non-parametric technique (propensity score matching [PSM]), to test the drivers of wage disparity between males and females using data from Peru spanning 1986–1999. This modern technique involves selecting two similar subsamples (males and females) to overcome the issue of common support in the Blinder-Oaxaca decomposition. Additionally, it divides the gender wage gap into four additive components, effectively addressing the distribution of unexplained pay differences. Applying the non-parametric method, Djurdjevic and Radyakin (2007) used microdata from the Swiss Labour Force Participation to investigate the gender wage gap in Switzerland over 1996-2003, paying special attention to differences in the common support. Frölich (2007) applied PSM to study the gender wage gap in a sample of British college graduates, identifying the subject of degrees as a significant variable in explaining wage differences between males and females. Analogously, Meara et al. (2019) aimed to address the heterogeneity issue in the traditional method. Therefore, they measured the gender

[28] Fortin (2011) exposed a detailed explanation of the classical Oaxaca-Blinder decomposition, and further exposed the extensions of the standard method.

[29] Both used administrative data. Kassenboehmer and Sinning (2014) analysis are based on Panel Study of Income Dynamics (PSID) data, while Töpfer (2017) used ISFOL PLUS (Participation, Labor, Unemployment Survey).

[30] Unconditional quantile regression (UQR) is a straightforward approach in the sense that allows for unconditional mean interpretation.

wage gap in the United States using several matching techniques. These studies collectively opted for PSM to overcome the support and heterogeneity problem and provide detailed information about the unexplained component. However, like the majority of techniques, PSM is not without its limitations. Ñopo (2008), argued that only discrete variables should be used, and the number of covariates in the sample should be limited to avoid inconsistent results.

Nevertheless, implementing PSM poses certain challenges because it requires a decision on two critical aspects during model estimation: (1) model choice – instead of using a linear probability model, either a probit or a logit model must be used; and 2) choice of variable – greater attention must be focused on the variables to be included in the propensity score model. The implementation of PSM requires careful consideration of the variable. The matching strategy builds on the conditional independence assumption (CIA), requiring that outcome variable(s) be independent of treatment conditional on the propensity score (Caliendo and Kopeinig, 2008)[31]. When studying the gender pay gap, non-gender-related variables must be included in the PSM to satisfy the CIA assumption. However, in the prevalent empirical literature where PSM is employed, there is a notable oversight in its implementation. Many studies have included gender-related variables like occupation, industry, and degree of study (Frölich, 2007; Meara et al., 2019), thereby violating the CIA assumption. In situations like this, the typical approach would involve first matching on non-gender-related variables (X) using PSM and conducting a regression analysis on gender-related variables within the matched sample. Surprisingly, in the empirical literature on the gender wage gap, none of the above studies, as far as we are aware, have followed these steps in this particular research domain.

Fisher et al. (2022) used data from US farmworkers to estimate the gender wage gap, employing both parametric and non-parametric methods. The results from both methods revealed a striking similarity: female farmworkers earned on average, 5% (based on decomposition outcome) or 6% (based on matching outcome) less than their male counterparts. This suggests that these methods provide a comprehensive perspective on the gender wage gaps well as distinct advantages. Whereas the Blinder-Oaxaca method allows for the quantification of the contribution of different groups of factors to the gender wage gap, PSM addresses the distribution of unexplained differences. Therefore, when studying the gender wage gap, it is vital to consider the research question and the available data to select the appropriate method.

3.4.2 Regression

To examine the potential effect of our variables of interest, MRM and stereotypes, on students' beliefs regarding future earnings, we employ the OLS model. Specifically, we conduct wage regressions with the following form:

$$W_{\tau ij} = \alpha + \beta Girl_{ij} + \delta MRM_{ij} + \gamma Stereotypes_{ij} + \rho X_{ij} + \lambda_j + \varepsilon_{ij} \quad (1)$$

In this equation, W represents the logarithm of expected and reservation wages of student *i* at $\tau = t_0$ or $\tau = t_1$, where t_0 and t_1 denote the wages that a student in 2016 expects to earn immediately after graduation; and at age 35-40, respectively. The subscript *j* refers to the school where student *i* is studying. We use three outcome variables as specified in Section 3.3. $Girl_i$ is a dummy equal to one if *i* is a girl; MRM_i is one of our key variables, representing i's career referents, and it is a dummy variable representing

[31] Caliendo and Kopeinig (2008) offered practical guidance for implementing the popular PSM technique.

whether the student has an MRM; $Stereotypes_i$ is i's sexist attitudes. X_i is a vector of control variables capturing a broad set of student characteristics, individual and family characteristics, cognitive abilities, skills, risk preference, personality, and life goal aspirations as well as variables capturing different labour market aspirations (see Section 3.3 for detailed information). λ_j represents the school fixed effects, and ε_i is the error term. We conducted 13 regressions for each outcome variable, not only for the full sample but also separately for girls and boys, allowing us to examine potential heterogeneous effects among genders.

3.4.3 Decomposition

Gender differences in human capital, gender segregation, gender discrimination, and socio-economic background, as well as work-life balance and the behaviours of firms, play important roles in explaining why females earn considerably less than males. A serious concern in estimating the gender wage gap is the unobserved characteristics of young people that may cause segregation and inequalities in the labour market. In this regard, variables such as gender role models, stereotypes, labour market aspirations, abilities, individual and family characteristics, skills, and personality might play a crucial role. The omission of these types of variables might lead to inconsistent estimates of the gender wage gap. Because of data limitations, past researchers were forced to focus mainly on differences in pay in adulthood or to control for a limited number of factors. Fortunately, with our data, we could account for the above variables.

As observed in the critical review of the literature, economists have developed several methodologies to study labour-market outcomes by groups (gender, race, etc.). Although the non-parametric method has gained popularity in studies, the violation of the CIA is prevalent in the majority of them, including those examining gender-related issues. Because our aim in this study was to identify and quantify potential determinants of the gender gap in wage expectations, we opted for the classic Blinder-Oaxaca decomposition method. In particular, estimated separate regressions for boys and girls:

$$W_{ib} = \beta_B X_i + \varepsilon_i \quad (2)$$

$$W_{ig} = \beta_G X_i + \varepsilon_i \quad (3)$$

where W_i is the (ln) of the outcome variable of student *i*, X_i is a vector of explanatory variables containing – apart from our key variables, namely, MRM and stereotypes – a broad set of measures like individual and family characteristics, labour market aspirations, and cognitive and self-perceived abilities, as well as variables capturing life aspirations (see Section 3.3.2 for further information). This standard tool assumes that our outcome variable 'W' is linearly related to the covariates 'X'. While β is a vector of the estimated coefficients for gender {(B)oy, (G)irl}, ε_i is an individual error term. The average difference in expected wages between boys and girls can then be expressed as follows:

$$\bar{W}_B - \bar{W}_G = \underbrace{[\,(\bar{X}_B - \bar{X}_G)\beta_B\,]}_{\text{explained}} + \underbrace{[\,(\beta_B - \beta_G)\bar{X}_G\,]}_{\text{unexplained}} \quad (4)$$

As the equation above illustrates, the standard practice consists of decomposing the observed average gender gap into two parts: the first part is the *explained component*, which can be attributed to differences in endowments (characteristics or skills) between the two groups. The second part is the *unexplained component,* which not only can be attributed to discrimination but may also result from the

influence of unobserved variables. The unexplained component can be further divided into two parts: boys' advantages and girls' disadvantages. The result of the decomposition will generally depend on the researcher's choice of reference coefficients. In the previous literature on labour market discrimination, it was usually believed that one of the two groups under study (e.g. women/girls or ethnic people) were subject to discrimination. In these circumstances, the reference coefficients were generally taken from a group that was assumed not to be disadvantaged. For this reason, Equation 4 is expressed from the viewpoint of boys.

This technique was used to not only compute the aggregate decomposition of the gender gap in wage expectations but also carry out the detailed decomposition that allowed us to observe each measure's contribution to the gap.

3.5 Results

Career choice, the field of study, or occupation have commonly been acknowledged to be essential determinants of the gender gap in expected earnings, though their expected power in the gender gap is rather poor. Further, they represent only one part of the overall picture. As mentioned in the above section, we controlled for a large set of explanatory variables that we selected based on economic reasoning and prior evidence on the gender gap's drivers. It was not our aim to report the results of all the controls used; our focus was on MRM and stereotypes. Estimations for expected starting salary and peak salary were conducted with students enrolled in the final year of secondary compulsory education and high school. However, because of data constraints, the estimations of reservation wages were conducted exclusively with students enrolled in the last year of high school.

We first discuss the results of our estimations for expected earnings (Section 3.5.1), followed by the decomposition of the gender gap at the mean (Section 3.5.2).

3.5.1 OLS estimates

In this study, three different outcome variables were used (see Subsection 3.3.2 for further details). For each outcome variable, we ran 13 regressions. Tables 3.2 - 3.4 present the estimates of the regressions.

All OLS estimations followed a similar pattern. In Column 1, we included girls as a dummy variable without considering further controls. In Columns 2-4, we included our key variables, namely, MRM and stereotypes. Each block first illustrates the estimates for the full sample, and then separate regressions for girls and boys are shown. In Columns 5-7, we added a set of labour market aspiration variables to the previous measures. Additionally, in Columns 8-10, we included both the explanatory and control variables - except for cognitive abilities - described in Subsection 3.3.2. Finally, because we wanted to see whether cognitive abilities have an effect on outcome variables, in Columns 11-13, we added to the previous estimation a set of cognitive ability variables, specifically mathematics, language, and foreign language test scores.

Starting salary and peak salary

Tables 3.2 and 3.3 present the estimates from our regression models. In this section, we test two different outcome variables: students' own expected starting salary (Table 3.2) after completing a university degree and salary at age 35-40 years old (Table 3.3) after completing a university degree.

The estimates of Column (1) (from the top panel of Tables 3.2 and 3.3) suggested that girls expected to earn less than boys upon graduation at both points in time. While the raw gender gap in own expected initial salaries was about 18.9%, the gap in expected salary at age 35-40 appeared slightly larger at 25.7%, being both highly statistically significant in the specification excluding further controls. The

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raw gap we estimated here was in line with findings from other studies on the gender gap in expected starting salaries (18.4% in Kiessling et al., 2019, and 17.2% in Briel et al., 2020).

We systematically introduced groups of control variables in Columns (2), (5), (8), and (11). These were estimates for the full sample. After controlling for our key variables along with an extensive set of explanatory variables, the gender gap in starting salary decreased by roughly 5 percentage points to 14.3%, while the gap in peak salary decreased by around 6 percentage points to 20% (see Column 11 of Tables 3.2 and 3.3). However, a significant gender gap in both expected earnings persisted, remaining statistically significant at the 1% level. These gender gaps indicated that the relative difference in anticipated wages between boys and girls would persist even in the absence of any gender-related disparities in MRM, stereotypes, and observable endowments. In Germany, Frick (2016) documented a gender gap in expected starting salaries of 12.6% after controlling for a set of variables, suggesting a comparable size to our findings.

MRM and stereotypes contributed to reducing the gender gap in both starting and peak salaries; the magnitude of the coefficient of 'Girl' underwent an important reduction, indicating that part of the gender gap could be accounted for by these factors. With the inclusion of these factors, the gender gap narrowed by roughly 20% for own expected starting salary (from a 'Girl' coefficient of 0.1888 to 0.1511), and around 15% for peak salary (from a 'Girl' coefficient of 0.2569 to 0.2174). In contrast, the effect of labour market aspirations and other explanatory variables was relatively modest, reducing the gender gap by roughly 1.6 percentage points for starting salary and 3 percentage points for peak salary. Surprisingly, when cognitive abilities were included in Column (11), the gap in both periods increased slightly. This suggested that cognitive abilities, instead of reducing the gender gap, contributed to its widening. As anticipated, the coefficient for 'Girls' was consistently negative and highly statistically significant across all estimates (without and with additional controls), confirming the presence of a gender gap. Even though our variables of interest, joined with the control variables, were essential to our understanding of gender differences in expected earnings, they were only one part of the story.

Regarding the coefficient estimate of MRM and stereotypes in Tables 3.2 and 3.3, for the full sample, we found that having an MRM positively affected both expected starting salary and peak salary, with and without additional controls. The exception was the final results for own expected starting salary (see Columns 8 and 11 of Table 3.2). Even though we did not find many statistically significant effects at the conventional level in this particular context, we observed a clear positive effect[32].

A positive relation between MRM and expected earnings might not be surprising given the general trend of higher earnings for males. Furthermore, as we discuss in Section 3.5.2, it is insightful to note that MRM contributed to explaining part of the gender gap in own expected earnings. Regarding sexism, the coefficients revealed that a higher level of gender stereotypes translates into a higher own expected initial salary for all estimations. As more controls were added, the coefficient estimate grew smaller, but it was still positive and statistically significant at a 1% level. For own expected salary at 35-40, this tendency was persistent only when other further controls were not included (see Column [2] of Table 3.3). These findings were not surprising given recent research in occupational gender stereotypes showing that children tend to aspire towards, choose, and be more interested in same gender occupations (Becky, 2002; Beede et al., 2011; Hayes et al., 2018). These behaviours may lead them to form their expected earnings. Furthermore, our stereotype measure mainly captured female and male attributions at home (housework and childcare). Thus, even among adolescents, it was observed that an unequal distribution of tasks at home (a higher share of females doing unpaid work) tended to effect on expected earnings. The literature has confirmed that the traditional attitudes towards household work and maternal

[32] The absence of a statistically significant effect was presumably due to the fewer observations in our sample.

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Table 3.2
OLS regressions of log expected own starting salary

	Expectations initial salary												
	without cognitive abilities							with cognitive abilities					
	Full sample	Full sample	Girl	Boy	Full sample	Girl	Boy	Full sample	Girl	Boy	Full sample	Girl	Boy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Girl (base:Boy)	-0.1888***	-0.1511***			-0.1444***			-0.1350***			-0.1428***		
	(0.0132)	(0.0151)			(0.0171)			(0.0199)			(0.0201)		
A. Gender role model and stereotypes													
MRM		0.0588***	0.0300	0.1168***	0.0342**	0.0102	0.0920***	0.0250	0.0025	0.0765**	0.0243	0.0005	0.0755**
		(0.0149)	(0.0187)	(0.0248)	(0.0160)	(0.0198)	(0.0278)	(0.0172)	(0.0207)	(0.0318)	(0.0172)	(0.0207)	(0.0317)
Sexism		0.0147***	0.0125***	0.0177***	0.0134***	0.0124***	0.0163***	0.0102***	0.0059	0.0158***	0.0103***	0.0055	0.0161***
		(0.0028)	(0.0041)	(0.0038)	(0.0030)	(0.0045)	(0.0041)	(0.0034)	(0.0051)	(0.0048)	(0.0034)	(0.0051)	(0.0048)
B. Labour market aspirations													
Free-riding					0.0930***	0.1092***	0.0695***	0.0789***	0.1064***	0.0434	0.0813***	0.1076***	0.0477*
					(0.0177)	(0.0253)	(0.0252)	(0.0194)	(0.0272)	(0.0284)	(0.0194)	(0.0273)	(0.0283)
Private employee (base: Business owner)					0.0164	0.0446	-0.0101	0.0156	0.0379	-0.0107	0.0153	0.0357	-0.0086
					(0.0203)	(0.0290)	(0.0291)	(0.0218)	(0.0307)	(0.0318)	(0.0218)	(0.0307)	(0.0318)
Public employee					-0.1068***	-0.0910***	-0.1194***	-0.0979***	-0.0828***	-0.1122***	-0.0971***	-0.0846***	-0.1073***
					(0.0218)	(0.0284)	(0.0352)	(0.0238)	(0.0306)	(0.0395)	(0.0238)	(0.0306)	(0.0394)
I don't know					-0.1080***	-0.0911***	-0.1153***	-0.0761***	-0.0685**	-0.0762**	-0.0754***	-0.0661**	-0.0776**
					(0.0207)	(0.0278)	(0.0318)	(0.0228)	(0.0302)	(0.0357)	(0.0228)	(0.0302)	(0.0357)
Low-skill (base: High-skill)					0.0153	0.0211	0.0122	0.0126	0.0307	0.0075	0.0185	0.0337	0.0180
					(0.0256)	(0.0362)	(0.0376)	(0.0286)	(0.0405)	(0.0425)	(0.0287)	(0.0406)	(0.0426)
Middle-skill					-0.0435**	-0.0387	-0.0561**	-0.0143	-0.0290	-0.0406	-0.0092	-0.0186	-0.0354
					(0.0189)	(0.0275)	(0.0269)	(0.0212)	(0.0300)	(0.0316)	(0.0212)	(0.0302)	(0.0316)
Other non-qualified services (base: Agriculture)					0.0035	-0.1092	0.0803	0.0661	-0.0751	0.1696	0.0678	-0.0985	0.1773
					(0.0780)	(0.1378)	(0.0970)	(0.0862)	(0.1505)	(0.1086)	(0.0865)	(0.1530)	(0.1083)
Other qualified services					-0.0083	-0.1267	0.0371	0.0210	-0.0695	0.0751	0.0208	-0.0924	0.0714
					(0.0615)	(0.1081)	(0.0772)	(0.0676)	(0.1175)	(0.0854)	(0.0680)	(0.1207)	(0.0852)

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Table 3.2 (continued)

	Expectations initial salary												
	without cognitive abilities							with cognitive abilities					
	Full sample	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Commercial sector					-0.0929	-0.2604**	0.0385	-0.0340	-0.1520	0.0775	-0.0330	-0.1770	0.0809
					(0.0665)	(0.1129)	(0.0881)	(0.0733)	(0.1236)	(0.0975)	(0.0737)	(0.1267)	(0.0971)
Construction					-0.0477	0.1086	-0.0422	-0.0295	0.2898*	-0.0526	-0.0202	0.2684	-0.0375
					(0.0777)	(0.1517)	(0.0936)	(0.0856)	(0.1638)	(0.1046)	(0.0860)	(0.1656)	(0.1047)
Tourism					-0.1009	-0.1894*	-0.0678	-0.0670	-0.1261	-0.0341	-0.0647	-0.1539	-0.0219
					(0.0670)	(0.1137)	(0.0882)	(0.0736)	(0.1242)	(0.0973)	(0.0740)	(0.1273)	(0.0970)
Industry					-0.0266	-0.1732	0.0486	0.0018	-0.1246	0.0934	0.0032	-0.1463	0.0968
					(0.0628)	(0.1128)	(0.0775)	(0.0687)	(0.1219)	(0.0855)	(0.0691)	(0.1250)	(0.0852)
I don't know					-0.0594	-0.1951*	0.0197	-0.0046	-0.1220	0.0881	0.0002	-0.1416	0.0925
					(0.0625)	(0.1099)	(0.0784)	(0.0687)	(0.1195)	(0.0869)	(0.0691)	(0.1226)	(0.0866)
Observations	6,637	6,166	3,395	2,771	5,364	2,967	2,397	4,355	2,460	1,895	4,335	2,447	1,888
School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MRM and stereotypes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labour market expectations	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remaining controls	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Numbers in parentheses represent standard errors. Significance levels are denoted as ***1%, **5%, *10%. All specifications control for individual and family characteristics, educational variables, skills, life goal aspirations, risk preferences, and personality variables. Estimations were conducted with students enrolled in the final year of secondary compulsory education and high school.

Table 3.3
OLS regressions of log expected own salary at 35-40

	Salary expectations 35-40												
					without cognitive abilities						with cognitive abilities		
	Full sample	Full sample	Girl	Boy	Full sample	Girl	Boy	Full sample	Girl	Boy	Full sample	Girl	Boy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Girl (base:Boy)	-0.2569***	-0.2174***			-0.2158***			-0.1876***			-0.2001***		
	(0.0138)	(0.0157)			(0.0178)			(0.0207)			(0.0208)		
A. Gender role model and stereotypes													
MRM		0.0741***	0.0402**	0.1356***	0.0556***	0.0350*	0.1020***	0.0446**	0.0410*	0.0525	0.0405**	0.0348*	0.0517
		(0.0155)	(0.0189)	(0.0265)	(0.0167)	(0.0200)	(0.0299)	(0.0179)	(0.0213)	(0.0338)	(0.0178)	(0.0211)	(0.0338)
Sexism		0.0057**	0.0056	0.0073*	0.0044	0.0049	0.0068	0.0031	-0.0022	0.0087*	0.0034	-0.0022	0.0087*
		(0.0029)	(0.0042)	(0.0041)	(0.0031)	(0.0046)	(0.0045)	(0.0036)	(0.0053)	(0.0051)	(0.0035)	(0.0053)	(0.0051)
B. Labour market aspirations													
Free-riding					0.0656***	0.0936***	0.0324	0.0532***	0.1073***	-0.0053	0.0490**	0.0976***	-0.0048
					(0.0185)	(0.0257)	(0.0273)	(0.0202)	(0.0281)	(0.0302)	(0.0201)	(0.0279)	(0.0302)
Private employee (base: Business owner)					-0.0217	0.0455	-0.0896***	-0.0316	0.0097	-0.0864**	-0.0336	0.0066	-0.0865**
					(0.0212)	(0.0294)	(0.0314)	(0.0227)	(0.0316)	(0.0339)	(0.0226)	(0.0313)	(0.0339)
Public employee					-0.1483***	-0.0944***	-0.2138***	-0.1303***	-0.0999***	-0.1751***	-0.1262***	-0.0956***	-0.1724***
					(0.0227)	(0.0288)	(0.0377)	(0.0246)	(0.0314)	(0.0417)	(0.0245)	(0.0311)	(0.0417)
I don't know					-0.1373***	-0.0826***	-0.1973***	-0.1113***	-0.0894***	-0.1444***	-0.1172***	-0.0954***	-0.1472***
					(0.0216)	(0.0282)	(0.0341)	(0.0236)	(0.0310)	(0.0378)	(0.0235)	(0.0307)	(0.0378)
Low-skill (base: High-skill)					0.0062	0.0013	0.0050	0.0129	0.0115	0.0298	0.0218	0.0149	0.0439
					(0.0268)	(0.0370)	(0.0405)	(0.0298)	(0.0421)	(0.0449)	(0.0298)	(0.0417)	(0.0451)
Middle-skill					-0.0511***	-0.0169	-0.0864***	-0.0301	-0.0233	-0.0594*	-0.0268	-0.0231	-0.0525
					(0.0197)	(0.0279)	(0.0289)	(0.0220)	(0.0309)	(0.0334)	(0.0219)	(0.0308)	(0.0335)
Other non-qualified services (base: Agriculture)					0.0544	0.0651	0.0850	0.0587	0.0407	0.1311	0.0611	0.0108	0.1424
					(0.0817)	(0.1413)	(0.1042)	(0.0897)	(0.1545)	(0.1153)	(0.0896)	(0.1557)	(0.1153)
Other qualified services					0.0626	0.0043	0.1135	0.0797	0.0383	0.1408	0.0767	0.0096	0.1374
					(0.0647)	(0.1117)	(0.0832)	(0.0706)	(0.1207)	(0.0912)	(0.0707)	(0.1227)	(0.0911)
Commercial sector					-0.0864	-0.1364	-0.0620	-0.0517	-0.0781	-0.0127	-0.0650	-0.1271	-0.0062
					(0.0699)	(0.1166)	(0.0953)	(0.0765)	(0.1269)	(0.1045)	(0.0765)	(0.1288)	(0.1044)
Construction					0.0158	0.2023	0.0040	0.0153	0.2068	0.0359	0.0272	0.1819	0.0569
					(0.0818)	(0.1554)	(0.1011)	(0.0898)	(0.1681)	(0.1122)	(0.0898)	(0.1684)	(0.1125)
Tourism					-0.0343	-0.0702	-0.0026	-0.0172	-0.0286	0.0341	-0.0225	-0.0689	0.0394
					(0.0704)	(0.1174)	(0.0951)	(0.0767)	(0.1276)	(0.1038)	(0.0768)	(0.1296)	(0.1037)

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Table 3.3 (continued)

	Salary expectations 35-40												
	without cognitive abilities							with cognitive abilities					
	Full sample	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Industry					0.0531	0.0149	0.0840	0.0692	0.0205	0.1424	0.0709	-0.0046	0.1508*
					(0.0661)	(0.1166)	(0.0836)	(0.0717)	(0.1252)	(0.0913)	(0.0718)	(0.1272)	(0.0912)
I don't know					0.0065	-0.0465	0.0556	0.0294	-0.0232	0.1098	0.0364	-0.0425	0.1162
					(0.0657)	(0.1135)	(0.0845)	(0.0717)	(0.1227)	(0.0927)	(0.0718)	(0.1247)	(0.0927)
Observations	6,563	6,099	3,373	2,726	5,310	2,951	2,359	4,320	2,450	1,870	4,300	2,437	1,863
School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MRM and stereotypes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labour market expectations	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remaining controls	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Numbers in parentheses represent standard errors. Significance levels are denoted as ***1%, **5%, *10%. All specifications control for individual and family characteristics, educational variables, skills, life goal aspirations, risk preferences, and personality variables. Estimations were conducted with students enrolled in the final year of secondary compulsory education and high school.

employment tend to increase the wage gap. Specifically, women earn lower wages when they spend more time doing housework (Hersch and Stratton, 1997); moreover, they experience a reduction in pay after childbirth, known as the 'child penalty' (Angelov et al., 2016; De Quinto et al., 2021[33]).

When labour market aspiration variables were included in the full sample, some coefficients were noteworthy. Generally, those who preferred to receive aid from the government (free-riders) had a positive and significant impact on both expected initial and peak salary, whereas those working as a public employee had a negative and significant impact on both expected initial and peak salary. This pattern was maintained with further controls (Columns 5, 8, and 11). For instance, when considering all the controls (Column 11), the estimates suggested that those students who preferred to receive aid from the government expected initial earnings to be around 8% higher and earnings at age 35–40 to be roughly 5% higher, compared to students willing to work for a salary of 1.000€. These findings indicated that the former valued their abilities/skills more and were unwilling to work for a low income. This might be the base for forming their expected earnings, and in turn, determining their reservation wages. We believe that this behaviour might have two opposite directions. Those adolescents who value their abilities more would set higher reservation wages. They might ask for higher wages in the labour market. At the same time, we believe that this behaviour might be detrimental to their future labour market outcomes because students who set higher reservation wages would be unwilling to enter the labour market for a low salary. This behaviour might increase the share of young people who are not in employment, education, or training (NEET). In Spain, government benefits are much lower than salaries in the labour market, and adolescents are a disadvantaged group in terms of the former. Thus, it would be fruitful to determine whether government benefits for a similar amount of salary in the labour market would have a positive or a negative effect on future earnings. Turning to the estimates, we observed that students expecting to work as a public employee expected initial earnings (peak salary) to be 9.7% (12.6%) lower than those expected by students expected to become the business owners, as Column (11) shows. This finding is in line with what a recent study found for realised starting salaries (Frick, 2016). In sharp contrast to the literature on labour market outcomes during adulthood, in our study, labour market variables (sector aspirations, occupational aspirations and the remaining categories of employee aspirations) had no statistically significant impact or only a modest impact on both expected earnings.

The remaining columns of Tables 3.2 and 3.3 display the estimates obtained from separate analyses for boys and girls, revealing some heterogeneous effects across genders. The observed patterns of our key variables lacked consistency across both expected earnings measures. Regarding the effect of gender role models, boys with an MRM showed higher own expected salaries. Meanwhile, for girls, the coefficients were not statistically significant at the conventional level. For peak salary, there were some heterogeneous effects among genders; boys and girls with an MRM showed higher expected peak salary, but the effect seemed to be more pronounced in boys. When introducing groups of control variables, the coefficients became smaller and lost significance, especially in the case of boys. Despite the lack of statistical significance, this pattern persists. The last findings confirmed the hypothesised positive relationship between MRM and expected earnings for girls. This result contrasted with those of Gibson (2010), who showed that females have consistently lower wage expectations regardless of their career referents' gender.

Regarding our second variable of interest, the estimate in Columns 3 and 4 of Table 3.2 revealed small gender differences in the effect of gender stereotypes in own expected initial salary. An increase in gender stereotypes increased the estimated initial salary by 1.8% among boys and around 1.3% among girls. When additional control variables were included in the subsequent estimations, the coefficient

[33] In Spain, De Quinto et al (2021) used data from Social Security records, revealing that for females, having a child was associated with an 11.4% reduction in earnings in the year following the first childbirth. This gap widened reaching 28% in the long run.

estimates of the gender stereotypes changed slightly for boys, becoming somewhat smaller but still statistically significant at a 1% level. However, for girls, the estimates turned statistically insignificant. These results were not surprising because it has been shown in the literature that in comparison with girls (females), boys (males) consistently tend to score higher in hostile sexism[34] (Vandenbossche et al., 2018). Furthermore, some recent research not only stressed the importance of reducing sexist attitudes (Becker et al., 2014) but also highlighted behavioural interventions that aim to reduce sexism in adolescents (Kilmartin et al., 2015; Sanz-Barbero et al., 2022). In Table 3.3, we did not observe evidence that gender stereotypes have a potential impact on peak salary, both with and without additional controls (except for some mild and positive effects in the case of boys).

Examining labour market aspiration factors for both expected earnings from the perspective of gender-separate analysis, we observed that more boys aspired to be business owners (an employment status). In contrast, girls who preferred to receive aid from the government expected a higher income return. The evidence presented in Tables 3.1, 3.2, and 3.3 collectively suggest not only that female and male students differ in the average level of MRM, stereotypes, and labour market aspirations, but also that these variables affect their expected initial salary and peak salary differently.

The effects for the remaining control variables, although not reported here, indicated that cognitive abilities were found to be irrelevant in both expected earnings, aligning with recent evidence in developed countries (see Hartog and Diaz-Serrano, 2013, for an extensive review of the literature). Regarding individual characteristics, a higher number of siblings translated into higher expected salaries, whereas individuals with a higher birth order translated to lower expected salaries. This last finding was consistent with the birth order literature consisting of adult samples (Black et al., 2005; Kantarevic and Mechoulan, 2006). Contrary to our expectations, the field of study showed distinct patterns in both expected earnings. Specifically, students in lower VT and science and technology showed higher expected initial earnings compared to their counterparts who were studying arts. However, for peak salary, none of these fields had a statistically significant effect at a conventional level. Further, when exploring risk preference measures, it was observed that high risk positively affected both expected initial salary and peak salary for boys. but not for girls. These results contrasted with recent studies that did not find that risk preference to contribute to expected salaries (Kiessling et al., 2019; Reuben et al., 2017). The literature has shown that mathematical ability is one of the best abilities for predicting wages (Taubman and Wales, 1973). Contrary to our expectations, mathematics skills did not have any effect on either of the expected earnings. However, we observed that commercial skills exerted a positive effect on both expected earnings. In the gender-separate analysis, commercial skills were highly statistically significant in the case of girls, but not of boys. Taken collectively, some of our findings are in line with the dominant picture of the literature.

Reservation wages

Table 3.4 offers an overview of the effect of our key variables on reservation wages. As expected, girls consistently showed significantly lower reservation wages than boys, with the difference being equal to 14.8% and statistically significant at a 1% level in the specification excluding additional controls (Column 1). The inclusion of MRM and stereotypes in the model led to a substantial reduction in the gender gap in reservation wages: decreased by 4.7 percentage points to 10.1% (Column 2). Consistent with our earlier findings for own future salaries, our key variables - MRM and stereotypes - contributed significantly to

[34] Glick and Fiske (1996) distinguished between the two types of sexism: benevolent sexism (BS) and hostile sexism (HS). While BS is related to sexist positive attitudes towards females (i.e. protection and help provided by males that encourage females to follow traditional gender roles), HS is related to negative stereotypes towards females (the 'male dominance position' implies that females are inferior or subordinated to males).

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Table 3.4
OLS regressions of log reservation wages

	Reservation wages												
	without cognitive abilities							with cognitive abilities					
	Full sample	Full sample	Girl	Boy	Full sample	Girl	Boy	Full sample	Girl	Boy	Full sample	Girl	Boy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Girl (base:Boy)	-0.1475***	-0.1010**			-0.0835*			-0.0757			-0.0871*		
	(0.0374)	(0.0411)			(0.0430)			(0.0513)			(0.0519)		
A. Gender role model and stereotypes													
MRM		0.0446	0.0290	0.0149	0.0329	0.0073	0.0333	0.0282	0.0110	0.0792	0.0186	-0.0010	0.0155
		(0.0405)	(0.0457)	(0.0865)	(0.0407)	(0.0454)	(0.0932)	(0.0451)	(0.0502)	(0.1234)	(0.0455)	(0.0509)	(0.1281)
Sexism		0.0193**	0.0192*	0.0254*	0.0218**	0.0236**	0.0249*	0.0145	0.0167	0.0280	0.0137	0.0101	0.0322*
		(0.0085)	(0.0110)	(0.0141)	(0.0086)	(0.0111)	(0.0145)	(0.0098)	(0.0135)	(0.0170)	(0.0098)	(0.0139)	(0.0172)
B. Labour market aspirations													
Free-riding					0.1540***	0.1700***	0.1297*	0.1826***	0.2068***	0.1840**	0.1852***	0.1991***	0.2007**
					(0.0436)	(0.0571)	(0.0762)	(0.0484)	(0.0655)	(0.0909)	(0.0490)	(0.0659)	(0.0921)
Private employee (base: Business owner)					0.0159	-0.0215	0.0009	0.0076	-0.0157	0.0013	0.0130	-0.0137	0.0013
					(0.0514)	(0.0673)	(0.0876)	(0.0565)	(0.0739)	(0.1070)	(0.0566)	(0.0745)	(0.1071)
Public employee					-0.0514	-0.0744	-0.1358	-0.0376	-0.0858	-0.0640	-0.0186	-0.0617	-0.0306
					(0.0561)	(0.0680)	(0.1105)	(0.0635)	(0.0761)	(0.1460)	(0.0636)	(0.0761)	(0.1488)
I don't know					-0.0734	-0.0761	-0.1638	-0.0507	-0.0663	-0.1062	-0.0531	-0.0697	-0.1165
					(0.0553)	(0.0691)	(0.1034)	(0.0625)	(0.0778)	(0.1362)	(0.0627)	(0.0777)	(0.1371)
Low-skill (base: High-skill)					-0.1102	0.0604	-0.2604	-0.0169	0.0949	-0.1948	-0.0392	0.0265	-0.2115
					(0.0996)	(0.1283)	(0.1760)	(0.1030)	(0.1293)	(0.1983)	(0.1051)	(0.1348)	(0.1996)
Middle-skill					-0.0596	-0.0424	-0.0790	-0.0566	-0.0592	-0.0310	-0.0720	-0.0727	-0.0515
					(0.0487)	(0.0606)	(0.0928)	(0.0521)	(0.0665)	(0.1093)	(0.0523)	(0.0673)	(0.1102)
Other non-qualified services (base: Agriculture)					0.4577**	0.0351	0.9506**	0.4168*	-0.1102	1.0269**	0.4497*	-0.1186	1.0847**
					(0.2216)	(0.2794)	(0.3914)	(0.2329)	(0.3005)	(0.4350)	(0.2321)	(0.2995)	(0.4361)
Other qualified services					0.1955	-0.0936	0.5493***	0.1873	-0.2652	0.7242***	0.1966	-0.2970	0.7390***
					(0.1250)	(0.1608)	(0.2106)	(0.1443)	(0.1930)	(0.2514)	(0.1436)	(0.1916)	(0.2520)
Commercial sector					0.0847	-0.2479	0.5052**	0.1493	-0.3634	0.8314***	0.1638	-0.3903*	0.8359***
					(0.1452)	(0.1877)	(0.2507)	(0.1657)	(0.2217)	(0.2948)	(0.1651)	(0.2203)	(0.2953)

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Table 3.4 (continued)

	Reservation wages												
					without cognitive abilities						with cognitive abilities		
	Full sample	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**	**Full sample**	**Girl**	**Boy**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Construction					-0.2914		-0.1736	-0.4151*		0.0628	-0.3764*		0.1009
					(0.2127)		(0.3041)	(0.2256)		(0.3446)	(0.2254)		(0.3491)
Tourism					0.2188	-0.1449	0.7970***	0.1868	-0.3958*	1.0559***	0.2015	-0.4104*	1.0216***
					(0.1411)	(0.1762)	(0.2587)	(0.1625)	(0.2104)	(0.3069)	(0.1618)	(0.2091)	(0.3089)
Industry					0.2410*	-0.0130	0.5895***	0.1817	-0.2039	0.7438***	0.1935	-0.2264	0.7837***
					(0.1298)	(0.1724)	(0.2147)	(0.1479)	(0.2019)	(0.2589)	(0.1473)	(0.2007)	(0.2605)
I don't know					0.1359	-0.1409	0.4697**	0.2002	-0.2782	0.7335***	0.2260	-0.2659	0.7457***
Observations	695	659	408	251	607	380	227	550	342	208	544	337	207
School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MRM and stereotypes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labour market expectations	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remaining controls	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes*:* Numbers in parentheses represent standard errors. Significance levels are denoted as ***1%, **5%, *10%. All specifications control for individual and family characteristics, educational variables, skills, life goal aspirations, risk preferences, and personality variables. Estimations were conducted exclusively with students enrolled in the last year of high school.

narrowing the gender gap in reservation wages compared to the rich set of variables capturing labour market aspirations, abilities, or individual and family characteristics. In subsequent estimations, while the magnitude of the coefficients for 'Girl' decreased slightly, the significance of the coefficient underwent important changes. As more groups of control variables were subsequently added, the coefficients lost significance until they turned statistically insignificant (Column 8)[35]. With the inclusion of cognitive abilities measures – the last block of control variables – the coefficient for 'Girl' turned statistically significant, but the effects were mild, only reaching a 10% significance level (Column 11). To elaborate, girls showed 8.7% lower reservation wages than boys. Interestingly, this last finding aligned with the gender gap in reservation wages during adulthood that was observed in a previous study (Caliendo, 2017). These results indicate that even after considering this comprehensive set of factors, there is still a significant gender gap in reservation wages. Even though our key measures, along with the rich set of control variables, played an essential role in our understanding of gender differences in reservation wages, they provide only partial insights.

Regarding the coefficient estimates of gender role models and stereotypes in Column (2), we observed that while having an MRM did not influence reservation wages, stereotypes had a positive and significant effect. Thus, a higher level of sexism translated into higher reservation wages. Because we are interested in the gender effect, Columns (3) and (4) of Table 3.4 display the estimates obtained from separate regressions in the boys' and girls' subsamples. Contrary to our expectations, no discernible gender role model pattern emerged for both genders. However, we observed a mild effect for sexism, specifically, for both boys and girls, a higher level of stereotypes translated into higher reservation wages. The coefficient estimates were slightly higher for boys. In the remaining columns of Table 3.4, we subsequently added groups of control variables. Depending on the groups, the effects of our variables of interest varied considerably. The coefficient estimates changed their significance. Even though some coefficients lost significance, certain patterns become evident. Specifically, when all the control variables were included in the three last columns of Table 3.4, the estimates still showed that boys with sexist attitudes showed higher reservation wages than girls.

The results regarding labour market aspirations revealed several important findings. While occupational aspirations and employment status were found to be irrelevant, the estimates of free-riding and sector aspiration were found to be highly statistically significant. For free-riding, we did find a significant effect for the full sample as well as for boys and girls, suggesting that those who preferred a government benefits over working for a similar amount of money tended to show higher reservation wages. This finding confirmed our statements in the previous subsection, where the starting salary and peak salary were estimated. Thus, these results indicated that if the amount of government benefit is equal to the salary in the market, this is likely to affect both the formation of reservation wages and the expected earnings. This in turn might have a persistent effect on future outcomes (i.e. income). For the variable picking students' sector aspiration in this context, the effects were very strong for one gender but weak or not statistically significant for the other gender. We found a significant effect for boys, both with and without further controls. Boys expected higher reservation wages in all other sectors compared to the agricultural sector.

When the full set of available control variables (not illustrated in the table) were included in the model, the estimates indicated that the field of study, personality traits, measures of risk preference and cognitive abilities were irrelevant. Individual characteristics, life aspirations, and skills, for the most part, were statistically insignificant. The exceptions were 'second-born' for individual characteristics, 'being

[35] The lack of a statistically significant effect at the conventional level may be attributed to the relatively smaller size of our sample.

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useful for society' for life aspirations, and 'effort skills' for skills, where each variable was associated with lower reservation wages, specifically for girls.

3.5.2 Decomposition of the gender gap at the mean

Previous sections indicated the extent to which girls and boys differ in their MRM and stereotypes and illustrated the effect of our key variables on expected earnings and reservation wages. In this section, we use Blinder-Oaxaca decompositions to study the extent to which our variables of interest along with other control variables contribute to the gender gap. This decomposition method measures the share of the expected earnings gap that can be attributed to differences in observed characteristics between boys and girls (explained part) as well as the share that can be attributed to differences in the structure of boys' and girls' expected earnings (unexplained part). We report both the explained and unexplained part, which sums up the total gap in expected earnings, defined as the mean difference between boys and girls. Our Blinder-Oaxaca decomposition of the mean uses all the explanatory and control variables in this study, but only those variables which are statistically significant are illustrated in the tables.

Starting salary and peak salary

Table 3.5 displays the results of the Blinder-Oaxaca decomposition of expected own starting salaries and peak salaries at the mean. Focusing on the decomposition results for expected own initial salary (Column 1 of Table 3.5), the estimates revealed that 11.8 percentage points of the overall gender gap of 19.9% could be assigned to differences in observed endowments (characteristics or skills) between boys and girls. Meanwhile, 8.1 percentage points of the gap could not be explained and were mainly assigned to differences in the structure of boys' and girls' expected earnings. This indicated that differences in the composition of both genders could explain 59% of the gender gap in expected own initial salaries. Therefore, even our rich set of variables could not fully explain the gender gap. Our explained part was slightly higher than the explained part found in Briel et al. (2020), where their explained component was 50%. For peak salaries (Column 4), the share of the explained part decreased slightly but remained the main component. In this context, the rich set of covariates explained around 58% of the gender gap.

Overall, the outcomes of the detailed decomposition in panel (b) showed that MRM, stereotypes and labour market aspirations collectively explained 45.9% of the explained gap in expected initial earnings. Meanwhile, in the case of peak salaries, the share was slightly lower because gender stereotypes did not contribute to explaining the gap and the individual contribution of factors underwent a slight change. Nevertheless, the group of covariates still explained 37.7% of the explained gap. The results illustrated that MRM was the covariate that predominantly contributed to the gender gap in both expected earnings. Specifically, 2.5 percentage points of the gender gap in initial salary could be attributed to the difference in MRM (see Column 1 of Table 3.5). In relative terms, roughly 13% of the overall gender gap (or 21% of the explained gap) in expected own initial salary was due to a higher propensity of boys towards same gender role models. For peak salaries, gender differences in MRM contribute 3.8 percentage points to the gender gap, corresponding to 14% of the overall gap or 24% of the explained gap. Regarding stereotypes, roughly 1 percentage point of the gap in own initial salary could be attributed to gender differences in stereotypes, corresponding to roughly 5% of the explained gap. Both our data and the literature showed that boys (males) score higher in sexism, particularly in benevolent sexism. The decomposition results suggested that a part of the gender gap in expected initial salaries could be attributed to boys tending to have more sexist attitudes than girls. These results were not surprising, because both descriptive statistics and regression models showed heterogeneous effects among genders.

Table 3.5
Blinder-Oaxaca decomposition at the mean of expected own initial salary and own salary at 35-40

	Expectations Initial Salary		Salary Expectations age 35-40	
	Decompo.	Relative impact (%)	Decompo.	Relative impact (%)
	(1)	(2)	(3)	(4)
	a) Aggregate Decomposition			
Mean of Boys	7.2566***		7.7134***	
	(0.0119)		(0.0128)	
Mean of Girls	7.0572***		7.4445***	
	(0.0103)		(0.0104)	
Gender Gap	0.1994***		0.2689***	
	(0.0157)		(0.0165)	
Explained Part	0.1181***	59,23	0.1548***	57,57
	(0.0112)		(0.0119)	
Unexplained Part	0.0813***	40,77	0.1140***	42,39
	(0.0120)		(0.0121)	
	b) Contributions of Covariates to the Explained Part			
Gender role model and stereotypes				
MRM	0.0253***	12,69	0.0377***	14,02
	(0.0064)		(0.0066)	
Sexism	0.0095***	4,76	0.0049	
	(0.0030)		(0.0030)	
Risk preference and personality				
Nervous	0.0123**	6,17	0.0284***	10,56
	(0.0055)		(0.0057)	
Moderate risk	0.0006		0.0046**	1,71
	(0.0016)		(0.0019)	
High risk	0.0010		0.0025*	0,93
	(0.0008)		(0.0013)	
Educational variables				
Dropout of school for work	0.0111***	5,57	0.0089**	3,31
	(0.0036)		(0.0037)	
Science and technology	0.0166***	8,32	0.0061	
	(0.0061)		(0.0065)	
Lower VT	0.0093**	4,66	-0.0005	
	(0.0039)		(0.0040)	
Labour market aspirations				
Free-riding	0.0072***	3,61	0.0045**	1,67
	(0.0019)		(0.0018)	
Employee aspirations				
Public employee	0.0080***	4,01	0.0098***	3,64
	(0.0023)		(0.0026)	
I don't know	0.0042**	2,11	0.0063***	2,34
	(0.0017)		(0.0020)	
Individual characteristics				
Number of siblings	-0.0039**	-1,96	-0.0040**	-1,49
	(0.0017)		(0.0017)	
Life goal aspiration				
Be useful for the society	0.0018*	0,90	0.0006	
	(0.0010)		(0.0010)	
Having a great deal of money	0.0021		0.0087***	3,24
	(0.0029)		(0.0031)	
Educational variables				
Foreign language	-0.0008		-0.0029*	-1,08
	(0.0016)		(0.0018)	
	c) Contributions of Covariates to the Unexplained Part			
Individual and family characteristics				
Number of siblings	-0.0412*	-20,66	-0.0615**	-22,87
	(0.0240)		(0.0266)	

Table 3.5 (continued)

	Expectations Initial Salary		**Salary Expectations age 35-40**	
	Decompo.	**Relative impact (%)**	**Decompo.**	**Relative impact (%)**
	(1)	(2)	(3)	(4)
Father employed mother unemployed	-0.0088**	-4,41	-0.0041	
	(0.0038)		(0.0042)	
Risk preference and personality				
Nervous	0.0123**	6,17	-0.0143	
	(0.0055)		(0.0567)	
Skills				
Commercial skills	-0.2272***	-113,94	-0.0714	
	(0.0870)		(0.0906)	
Effort skills	0.1073*	53,81	-0.0085	
	(0.0589)		(0.0596)	
School	-0.4656***	-233,50	-0.7102***	-264,11
	(0.1190)		(0.1298)	
Labour market expectations				
Free-riding	-0.0137*	-6,87	-0.0231***	-8,59
	(0.0083)		(0.0088)	
Sector aspirations				
Other non-qualified services	0.0059*	2,96	0.0037	
	(0.0031)		(0.0032)	
Commercial sector	0.0157*	7,87	0.0067	
	(0.0086)		(0.0091)	
Industry	0.0410**	20,56	0.0308	
	(0.0187)		(0.0202)	
I don't know	0.0407*	20,41	0.0285	
	(0.0214)		(0.0225)	
Employee aspirations				
Private employee	-0.0136		-0.0283**	-10,52
	(0.0122)		(0.0131)	
Educational variables				
Cognitive ab. worse than I expected	0.0623**	31,24	0.0349	
	(0.0298)		(0.0324)	
Life aspirations				
Being famous	0.0083**	4,16	0.0054	
	(0.0034)		(0.0038)	
Observations	4,335		4,300	

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. The boy coefficient vector is used as the reference. Decompositions were conducted with students enrolled in the final year of secondary compulsory education and high school.

Compared to the previous group, educational variables made up a somewhat smaller share of around 19%, with most of the gender gap in expected initial salary was explained by the field of study (13%) rather than dropping out of school for work (5.5%). More specifically, we observed that if girls chose science and technology, the gender gap in initial salary would decrease by 8.3%. As Subsection 3.3.2 shows, a higher share of boys expressed their intention to apply to science and technology programmes (fields with higher-paying jobs). Meanwhile, girls were more likely to apply to arts, humanities and social sciences programmes (fields with the lowest-paying jobs). This finding aligned with Briel et al. (2020), who found that differential sorting into the field of study offered a major explanation of the gender gap in expected earnings. In contrast, the field of study did not contribute to explaining the gender gap in expected peak salary.

Our personality variable, nervous, explained only 6.2% of the boy-girl difference in expected own initial salaries. Nevertheless, this share rose to 10.6% once we decomposed expected own salaries at 35-40. Finally, the set of life aspirations measures had only a small effect on reducing the gender gap in

expected peak salaries. This suggested that if girls would aspire to make a great deal of money, the gender gap would be reduced by 3.2% (Column 4). This result was in line with recent findings in the literature (Briel et al., 2020; Zafar, 2013), showing that females consider non-pecuniary aspects when searching for a job, whereas males are strongly driven by pecuniary aspects. Interestingly, for expected peak salary (but not initial expected salary), the number of siblings had a small impact on increasing the gender gap.

The results in panel (c) of Table 3.5 indicated how much of the gender gap could be attributed to gender differences in the impact of a covariate on expected earnings. From the rich set of explanatory variables that were included, only the gender differences in the coefficient of a few variables had a statistically significant effect on the unexplained gap. For expected initial salary, we found that the coefficients of commercial and effort skills had opposite effects. In particular, we observed a negative coefficient of commercial skills, indicating that a unit increase in the mean level of commercial skills had a larger positive effect on the mean expected initial salary of girls than of boys, (see Column 1 of the bottom panel of Table 3.5). This indicated a reduction in the gender gap. For expected peak salary, both measures were irrelevant. However, we observed that gender differences in free-riding had a negative effect on the unexplained gap, which was statistically significant at the 1% level. This result suggests that if we raise the mean level of free-riding in a unit, this would more positively affect the mean expected peak salary of girls than boys (Column 4).

Reservation wages

Table 3.6 presents the results of the Blinder-Oaxaca decomposition of the gender gap in reservation wages.

The estimates of the aggregated decomposition in panel (a) showed that the explained part was largely dominant in explaining the gender gap in reservation wages. More specifically, the estimates in (Column 1 in the top panel of Table 3.6) indicated that 9 percentage points of the overall gender gap of 13.3% was due to differences in observed endowments between boys and girls. Thus, the striking result was that we were able to explain roughly 67.9% of the gap, and interestingly, no statistically significant gender gap remained.

Regarding the detailed decomposition in panel (b), the results indicated that the individual contribution of only two variables primarily explained gender gap in reservation wages: dropout intentions and free-riding. Dropout intentions was the most important covariate. Specifically, 2.1 percentage points of the gender gap in reservation wages were due to differences in dropout intentions between boys and girls, which in relative terms corresponded to roughly 16% of the overall gender gap or around 24% of the explained gap. Again, gender differences in free-riding contributed 1.7 percentage points to the gender gap in reservation wages, which corresponded to 10% of the overall gap. As the previous section, these covariates also played a role in explaining gender differences in own expected and peak salary, although their contribution was comparatively smaller. Contrary to our expectations, the individual contribution of MRM and stereotypes was not statistically significant. In this context, even though the coefficients of our key variables lacked statistical significance at the conventional level, we observed a similar pattern in the contribution of MRM. Differences in the field of study, sexism, personality, and employee aspirations were found to be irrelevant in this context.

Panel (c) of Table 3.6 shows the covariates' individual contribution to the unexplained part. In comparison with own expected initial and peak salary, in this context, we observed similar but also different covariates influencing the formation of reservation wages. The coefficients of the bottom panel of the table reported several important findings. The coefficients of skills (verbal, effort, and social) showed opposite effects. In particular, a negative coefficient of verbal skills was observed, indicating that

Table 3.6
Blinder-Oaxaca decomposition at the mean of reservation wages

Reservation Wages		
	Decomposition	**Relative impact (%)**
	(1)	**(2)**
Mean of Boys	7.0742***	
	(0.0333)	
Mean of Girls	6.9411***	
	(0.0220)	
Gender Gap	0.1332***	
	(0.0399)	
Explained Part	0.0904***	67,87
	(0.0347)	
Unexplained Part	0.0428	32,13
	(0.0306)	
b) Contributions of Covariates to the Explained Part		
Gender role model and stereotypes		
MRM	0.0195	
	(0.0161)	
Sexism	0.0084	
	(0.0070)	
Educational variables		
Dropout of school for work	0.0213**	15,99
	(0.0094)	
Labour market aspirations		
Free-riding	0.0136*	10,21
	(0.0077)	
c) Contributions of Covariates to the Unexplained Part		
Skills		
Verbal skills	-0.4339**	-325,75
	(0.1975)	
Effort skills	0.3005**	225,60
	(0.1309)	
Social skills	0.3433*	257,73
	(0.2073)	
Labour market expectations		
Sector aspirations		
Other non-qualified services	0.0129*	9,68
	(0.0066)	
Other qualified services	0.5011***	376,20
	(0.1161)	
Commercial sector	0.0685***	51,43
	(0.0196)	
Tourism	0.0942***	70,72
	(0.0236)	
Industry	0.2684***	201,50
	(0.0720)	
I don't know	0.0912***	68,47
	(0.0257)	
Educational variables		
Catalan language	0.3254**	244,29
	(0.1458)	
Observations	544	

Notes*:* Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. Decomposition was conducted exclusively with students enrolled in the last year of high school.

a unit increase in the mean level of verbal skills had a larger positive effect on the mean reservation wages of girls than of boys (see Column 1 of the bottom panel of Table 3.6). Interestingly, the gender difference in the coefficient of the sector aspiration had a positive effect on the unexplained gap. This is highly statistically significant, suggesting that this variable contributed to widening the gap.

3.6 Conclusions

Much of the literature on the gender gap in wage expectations indicates that even before they enter the labour market, girls (females) forecast lower wages than boys (males). Typically, gender differences in the field of study, career choice, or occupation are important drivers of the gender gap in own expected earnings. At the same time, they are just one part of the whole story. MRM's and stereotypes' effect on expected earnings and reservation wages have received little scholarly attention. Based on rich survey data on compulsory secondary education and high school education in Catalonia, Spain, we analyse (1) the role of MRM and stereotypes in shaping expected earnings and reservation wages of students; (2) the gender gap in reservation wages as well as the gender gap in own expected earnings for two different periods (initial salary and salary at 35-40); and (3) quantify the contribution of our variables of interest to the gender gap. Even though gender role models and stereotypes are receiving more attention in economics literature, as far as we are aware, previous empirical studies analysing this issue are virtually non-existent.

We estimate an OLS model and observe that girls have consistently lower wage expectations than boys. This gender gap is highly statistically significant and large in the majority of the scenarios studied, indicating that students have well-formed expectations even before college enrolment. We estimate for girls' dummy without controls. The raw gender gap is found to be about 18.9% for expected own initial salaries, 25.7% for salary at 35-40, and 14.8% for reservation wages. The raw gap we estimate here is broadly in line with recent research trends (Briel et al., 2020; Kiessling et al., 2019). Moreover, our results indicate that MRM and stereotypes lead to a larger reduction of gender differences in expected earnings and reservation wages than the rich set of variables capturing labour market aspirations, abilities, or individual and family characteristics. Our results further illustrate that MRM has a positive effect on both expected earnings; however, this correlation does not extend to reservation wages. As hypothesised, girls with an MRM exhibit higher expected peak salary, although their expectations are lower compared to boys. Regarding our second variable of interest, the results generally reveal a positive relationship between sexist attitudes and outcome variables, particularly in the context of own expected initial salary. For the remaining scenarios, the relationship provides some hints but lacks a consistent pattern. When we estimate separately for boys and girls, this relationship holds true only for boys: an increase in sexism increases the estimated salary among boys. For girls, in the majority of the cases, the coefficients are not statistically significant. This is in line with the literature on hostile sexism (Glick and Hilt, 2001; Vandenbossche et al., 2018), which shows that boys score higher in sexism. Collectively these outcomes suggest that differences in MRM contribute partly to the observed gender gap in expected starting and peak salary.

Finally, our Blinder-Oaxaca decomposition indicates that a large part of the gender gap in expected earnings and reservation wages can be attributed to differences in observed endowments (characteristics and skills) between adolescent girls and boys. To contextualize, the explained parts of these gender gaps range between 58% and 68%. In comparison with previous studies in developed countries examining students' expected salaries (Briel et al., 2020; Bonnard and Giret, 2016), we report a larger and significant explained part of the gender gap in both expected earnings due to MRM's

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contribution. More specifically, the detailed decomposition indicates that gender differences in an MRM - specifically, a higher propensity of boys to choose same gender role models - emerge as the most important covariate in explaining the gender gaps. The values range between 12% and 14% of the overall gender gap (equivalent to 21% and 24% of the explained gap). Notably, MRM does not contribute in explain the gender gap in the same proportion across all the scenarios studied. This final results corroborate the direct and indirect evidence in the literature (Jackson et al., 1992; Major and Konar, 1984; McFarlin et al., 1989).

Finally, although we do not find that gender gaps are attributable to differences in stereotypes, except in the case of expected own initial salary, we believe that this finding does matter because the amount of initial salary has important consequences for future outcomes. Like Becker et al. (2014), our results suggest the importance of reducing sexist attitudes among adolescents. Kilmartin et al.'s (2015) and Sanz Barbero et al.'s (2022) studies provide some examples of behavioural interventions whose main goal was reducing sexism in both boys and girls. Sector aspirations, occupational aspirations, life aspirations, and skills are all found to be irrelevant in all the scenarios studied. The exception is 'having a great deal of money' in the case of expected own salary at 35-40, a measure of life aspirations. In this particular context, the gender gap is attributed to differences in this variable. Our results about pecuniary aspects reinforce the recent literature (Briel et al., 2020; Zafar, 2013), which has shown considerable gender differences: boys give special importance to pecuniary outcomes when searching for a job, whereas non-pecuniary outcomes hold significant importance for girls. Conversely, our results show that gender differences in free-riding and dropout intentions contribute to the gender gap in both expected earnings and reservation wages. While these two covariates account for a substantial part of the overall gender gap in reservation wages, their combined contribution to the gender gap in expected wages is much lower than MRM's individual contribution.

Alternative estimations and decompositions that include cognitive abilities (mathematics, Catalan, and foreign test scores) show that (1) cognitive abilities do not have an effect on expected wages or reservation wages, and (2) gender differences in cognitive abilities do not contribute to explaining gaps. Our results are not very surprising because recent evidence on wage expectations shows that cognitive abilities do not contribute to the formation of expected earnings (Schweri et al., 2011).

This research has several limitations. First, it exclusively relies on data from adolescents enrolled in secondary compulsory education and high school in Catalonia, Spain. Although the findings offer valuable insights, there is a clear need to replicate our study at different education levels and on a larger scale (different regions, countries) to make better policy recommendations. Second, we have a rich dataset containing information regarding student's educational expectations, life (career) aspirations, gender role models, or stereotypes. However, we believe that questions about labour force participation (e.g. length of time out of the labour market) would have been useful, particularly considering the existing literature on the gender wage gap, where career breaks for family reasons have been found to be an important covariate in explaining the gap. Additionally, this is a cross-sectional study. In Spain, Alonso-Borrego and Romero-Medina (2016) showed that during their later academic years, students' wage expectations do not match observed wages, but their expectations do become more realistic. There is definitely, a need for longitudinal studies to examine, on the one hand, whether boys and girls update their expectations and, on the other hand, whether earnings expectations match with realised wages. There are limited studies in these areas that use panel data (Webbink and Hartog, 2004) in the Netherlands.

Our findings help us partially understand why females have systematically lower wage expectations. If we want to reduce the gender gap in expected earnings, we should focus on the gender

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role model and stereotypes. Currently, in Spain, there are several family-friendly policies (e.g equal duration of maternity and paternity leave; state aid for working women with children under three years of age). Nonetheless, there is still a low rate of participation of females in the labour force, which might serve as an example for adolescents at the moment of their formation of wage expectations. Furthermore, there is a salary transparency issue in the private sector. A common trend is that job postings are made without listed salaries, resulting in students lacking a benchmark salary and potentially referring to salaries from their close environments. These findings indicate the necessity of providing students with accurate information.

On interesting approach would be for educational policymakers to provide students with comprehensive salary date across various sectors, occupations, or educational levels. This could be integrated into career programmes. By providing students with accurate information of salaries in a gender-neutral manner, this initiative may probably help reduce the gender gap in expected earnings and reservation wages.

Another direction may be to integrate feminine role models into motivational and educational programmes within schools, as well as in media representations. This approach can be achieved by (1) designing initiative that showcase the achievement of successful women across diverse fields (e.g. inviting successful women as guest speakers in schools), (2) creating mentorship programmes that are inclusive of all genders, (3) increasing the visibility of successful women in media representations. Multiple agents must be involved to address gender role models and stereotypes. If gender role models and stereotypes are malleable, programmes promoting feminine role models might help girls internalize that achieving a good salary and a successful career is possible as a female and with a feminine role model.

According to the World Economic Forum (WEF, 2023) it may take 169 years to close the economic gender gap. Despite some progress in recent decades, the gender gap among adults has narrowed slowly (Blau and Kahn, 2017). These pieces of evidence underscore the need for polices that accelerate the closure of the gender gap. As was shown by our results, gender differences in expected earnings and gender role models are evident in the early years of schooling. Therefore, further research should shed some more light on the gender gap.

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CHAPTER 4

Can the Gender Role Model Explain the Gender Gap in Entrepreneurial Intentions Among Adolescent Students?

Abstract: Gender role models have been recognised as significant drivers in shaping occupation and career preferences in the theoretical literature. However, empirical research analysing this topic is rather scant. This study takes the first step towards filling this gap. Herein, we distinguished between three types of gender role models, inspirational (feminine, masculine, or none), paternal, and maternal, and studied their role as determinants of entrepreneurial intentions (EIs) and the gender gap in EIs. Our empirical analysis relied on data collected through a survey conducted among students in secondary compulsory education in Catalonia (Spain). The results indicated that EIs are positively related to gender role models. Furthermore, the gender of the role model has different effects on EIs for boys and girls. The decomposition method revealed that differences in observed endowments between boys and girls entirely explain the gender gap in EIs. Blinder-Oaxaca decomposition of the mean showed that between 40% and 46% of the gender gap in EIs is attributable to a higher tendency towards masculine role models among boys. The results might be beneficial for policymakers and educators seeking to promote gender equality and foster entrepreneurial aspirations among adolescents.

Keywords: gender gap, entrepreneurial intention (EI), gender role model, Blinder-Oaxaca decomposition, adolescents.

4.1 Introduction

In today's society, a notable disparity exists in how entrepreneurship is viewed through the lens of gender. For instance, when both genders are asked to name five successful entrepreneurs, very few came up with a female name. This disparity reflects the prevailing cultural notion that entrepreneurship is primarily perceived as a male-dominated field, which aligns closely with the observable reality. Recent empirical studies – although not those that have directly focused on entrepreneurship – have indicated that from very early ages, children prefer stereotyped jobs (e.g. Chambers et al., 2018; Francis, 2002; Franken, 1983) and show a preference for jobs traditionally associated with their own gender (Hayes et al., 2018). This is not surprising, because younger generations consistently observe traditional gender roles in their environments (family, school, or media), where women are often associated with caregiving and homemaking, whereas men are seen as primary breadwinners working in prestigious jobs. Growing up with such role models reinforces the belief that women possess distinct traits, skills, and roles in society compared to men, affecting the development of attitudes towards entrepreneurship.

In this paper, we do not focus on entrepreneurship realisations but on entrepreneurial intentions (EI) in a sample of secondary compulsory education students. This is an important variable because according to the Theory of Planned Behaviour (TPB) that Ajzen (1991) developed, intentions represent the initial stage preceding behaviour. Abundant literature in a wide variety of fields supports this theory. In the entrepreneurial literature, intentions have been the central focus of extensive research. Studies concerned with the mechanisms behind EIs, have typically been centred on the influence of individual characteristics, family backgrounds, gender issues, and entrepreneurial education programmes. Most recently, the effect of role models has been explored (e.g. Amofah and Saladrigues, 2022, in Spain; Kickul et al., 2008, in the United States).

We believe that studying EIs in youth is essential because adolescents' preferences are more malleable at this stage. The existing literature offers some hints about this topic. Entrepreneurship education programmes and the entrepreneurial support that universities provide might play an important role in shaping EIs among university students (e.g. Schröder and Schmitt-Rodermund, 2006, in Germany; Souitaris et al., 2007, across United Kingdom and France). For instance, in a sample of British students, those who participated in at least one entrepreneurship module exhibited higher EIs (Galloway and Brown, 2002).

Individuals frequently draw inspiration from other's behaviours and opinions when making decisions, including decisions about their career choices (e.g. entrepreneurship) (Krumboltz et al., 1976). In this regard, some limited empirical literature has reported links between role models and entrepreneurship. Recent research revealed that more than 50% of a sample of Dutch were inspired by 'others' not only at the initial stage of deciding to become an entrepreneur but also afterward (Bosma et al., 2012)[36]. This result suggests that role models are important in shaping EIs. These role models can take various forms, ranging from relatives and peers to renowned figures like Steve Jobs, Oprah Winfrey, or Bill Gates. Family role models have been the primary focus of research (e.g. Chlosta et al., 2010; Schmitt-Rodermund, 2004). More recently, peer role models and entrepreneurship activity in neighbourhoods have been studied (e.g. Andersson and Larsson, 2016; Gianetti and Simonov, 2010; Nanda and Sorensen, 2009). Although these approaches have their merits, they do not provide us with

[36] By using a sample of Dutch entrepreneurs, the authors observed how important a priori exposure to role models was for attitudes towards entrepreneurship. Over 50% of entrepreneurs acknowledged that having a role model was not only important before the start-up decision but also after.

detailed insights into gender role models' (GRMs) influence on EIs. This aspect is the focal point of the current paper.

Empirical studies have consistently measured the gender gap in entrepreneurship and reports on it have been published in Western countries. This gap persists across various sample types (university students or adults), methodologies, and control variables (Adamus et al., 2021; Minniti et al., 2004; Santos et al., 2016). A meta-analysis of 30 studies by Haus et al. (2013), which used both adolescent and adult samples, concluded that EIs are significantly higher for males than for females. The underrepresentation of females in entrepreneurship has been seen as a notable loss of untapped potential and a missed opportunity for economic growth and development. In response, policymakers have actively explored strategies to promote entrepreneurship among underrepresented groups, with gender issues occupying a central position in their endeavours (Sheikh et al., 2002). Despite the growing body of literature on female entrepreneurship and the implementation of several policy approaches (e.g. non-repayable grants or subsidies, training, coaching, and monitoring) at the national, regional, or local levels aiming to boost entrepreneurship among females[37], the share of businesswomen remains relatively low. Considering this evidence, in this paper, we hypothesise that the GRM, whether inspirational or parental, may explain the gender gap in EIs.

Even though the determinants of EIs have been extensively explored, limited empirical research has been devoted to quantifying these determinants' specific contributions to the gender gap in EIs. To the best of our knowledge, this paper is the first to analyse the effect of GRMs, either inspirational or paternal, on EIs. More specifically, in this paper, we examine GRMs' effect on EIs and quantify their contribution to explaining the gender gap in EIs. To carry out this study, we use a rich dataset constructed from a survey conducted in 2016 in secondary education schools in Catalonia (Spain). Our final sample is made up of 9,275 adolescents aged 15-18. In this study, attention was directed towards distinct groups of students. While our estimations are conducted with all groups within the dataset, in the decomposition, we employed three different models (Models 1 to 3 reflect the gradual restriction of the sample based on students' inclination towards higher education)[38]. The reason behind this approach is that a large share of self-employed people do not have tertiary education (Laviada et al., 2022).

The results offer an interesting picture of GRMs' effect on students' EIs. EIs are positively associated with having a masculine role model (MRM). To elaborate, gender-separate analysis indicates that girls with an MRM exhibit higher EIs, whereas no significant effect is observed for boys. Moving to decomposition at the mean, Models 1 and 2 indicate that differences in observed characteristics between boys and girls entirely explain the gender gap in EIs. In Model 3[39], although the explained part is slightly reduced, it still constitutes 78% of the overall gender gap. This explained component stands out in contrast to the existing entrepreneurship literature, where the explained part represents less than 20% (Bönte and Piegeler, 2013)[40]. This discrepancy might be attributed to the fact that we account for a rich set of variables, which are generally difficult to observe in administrative data. Our detailed decomposition suggests that gender differences in MRM contribute significantly to the overall gender gap, accounting for between 40% and 46% of the gap. These findings offer valuable insights for

[37] See the Organisations for Economic Co-operation and Development (OECD, 2004) for an executive summary of background reports and Peters (2017) for a report containing data from 30 European countries.

[38] Each model represents a unique combination of educational stages. Model 1 contains all the grade levels, specifically the last year of compulsory secondary education, lower vocational training, and high school; Model 2 contains lower vocational training and the last year of secondary compulsory education; and Model 3 contains lower vocational training with students enrolled in the last year of secondary compulsory education who expressed their intention of enrolling in such training).

[39] The sample is restricted to students who present a low inclination towards higher education.

[40] Bönte and Piegeler (2013) employed Blinder-Oaxaca decomposition to quantify several factors' contribution to the gender gap in latent and nascent entrepreneurship. These stages are considered slightly different from the EIs.

policymakers and educators seeking to promote gender equality and foster entrepreneurial aspirations among teenagers.

Following this introduction, this paper is structured into five additional sections: Section 4.2 presents a conceptual framework for understanding how gender stereotypes affect occupational choice. Section 4.3 conducts a review of the entrepreneurial literature focused on adult EIs, including students, from a gender perspective. Section 4.4 presents the data used in this study, and Section 4.5 describes the empirical methodology. In Section 4.6, first, we present the results of the relationship between EIs and explanatory variables. Second, we carry out Blinder-Oaxaca decomposition for three different scenarios. In Section 4.7, we discuss the results, propose ideas for future research, and conclude the paper.

4.2 Conceptual framework: Gender stereotypes and career choice

Since childhood, human beings have been brought up and educated in surroundings containing gender stereotypes (e.g. 'girls are better at reading, and boys are better at math and science'; 'women are natural nurturers, and men are natural leaders'; 'men do not cry because they are powerful', 'a man is a defender and a fearless fighter, whereas a woman is dependent on a man, weak, and full of fear'; 'girls are interested in fashion and the arts, whereas boys like video games and sports'). According to the European Commission (2009), gender stereotypes encompass cultural and social attitudes towards traditionally defined 'male' or 'female' roles and functions. Research on gender stereotypes, previously referred to as sex stereotypes or sex role stereotypes, has constituted a substantial and consistently growing body of work. They have been widely studied in the field of psychology through experimental and empirical analysis. Eagly and Steffen (1984), Eagly et. al (2000), Gupta et al. (2008) have made notable contributions on the topic. More recently this area of study has found popularity in the field of economics (Arceo-Gomez and Campos-Vazquez, 2019; Gupta et al., 2009; Li et al., 2024; Powell et al., 2002).

Commonly held beliefs align with the recent literature concerning specific perceptions and expectations about the traits of women and men (e.g. Ellemers, 2018; López-Sáez and Lisbona, 2009; Lueptow, 1984). For instance, by using a sample of American university students, Lueptow et al. (1995) conducted a 17-year longitudinal study (six waves from 1974 to 1991) testing students' perception of 21 personality traits, whether they are 'typical males' or 'typical females'. The most frequent descriptions of the male stereotypes were authoritative, athletic, aggressive, domineering, competitive, adventurous, self-confident, and decisive. In the literature, these descriptions are generally associated with agentic attributes. The most frequent descriptions of the female stereotypes were being concerned about the well-being of others and being sympathetic, talkative, affectionate, romantic, obedient, creative, timid, and friendly[41]. These are communal attributes. In their study, Lueptow et al. (1995) not only observed stability in gender stereotypes but also found a slight increase in sex-typing and gender differentiation.

Several characteristics traditionally associated with stereotypical male traits, such as competitiveness, risk-taking preference, and dominance, are often recognised as valuable traits in entrepreneurs (Berge et al., 2015; Brandstätter, 1997; Lee-Ross, 2015; Sexton and Bowman, 1985; Vaaramo et al., 2023). Analogously, Chen (1998) revealed that in comparison with non-founders (managers), business founders exhibited stronger entrepreneurial self-efficacy (ESE) and risk-taking.

[41] In the literature, female stereotypes have often been characterised as communal, whereas male stereotypes have often been associated with agentic traits (e.g. Eagly and Steffen, 1984; Eagly et. al., 2000; Eddleston and Powell, 2008). Abele et al. (2008) introduced an operationalisation of agentic and communal attributes across multiple countries, including the United States, France, Germany, Italy, and Poland. Their research findings showed that agentic attributes tend to be associated with masculinity, whereas communal attributes tend to be associated with femininity.

There is a widespread belief that certain occupations have long-standing gender associations. When people are asked to associate occupations with gender, such as 'nurse' and 'mechanic', a prevalent tendency emerges where 'nurse' is generally linked with females and 'mechanic' with males. In this context, both genders often believe that individuals must predominantly exhibit either masculine or feminine characteristics to be suitable for a specific job.

Extensive research has concentrated on examining how these gender stereotypes affect individuals' decisions regarding their professional careers. From this perspective, stereotypical beliefs underscore an association between particular occupational roles and genders (Wilbourn and Kee, 2010). According to Gottfredson's (1981) theory on the development of occupational aspirations, young children typically hold positive perceptions of all the occupations they are familiar with. However, as they mature, they gradually incorporate specific criteria that enable them to engage in more critical assessments of job self-compatibility, resulting in more differentiated occupational preferences. From an earlier age, both boys and girls internalise occupational stereotypes. Early research on the perception of jobs as predominantly 'masculine' or 'feminine' has uncovered evidence of sex-role stereotyping across various age groups. This stereotyping has been observed in children as young as six years old (Hewitt, 1975) in the Netherlands, in high school students (Ramaci et al., 2017) in Italy, in college students (Shinar, 1975) in the United States, and even in adults (Albrecht et al., 1977; Aros et. al., 1998) in the United States. Children are quite skilled at categorising occupations as either 'feminine' or 'masculine'. These categorisations closely match classifications made by adults (Beggs and Doolittle, 1993; Hartung et al., 2005).

In the United Kingdom, Miller and Budd (1999) investigated the extent to which boys and girls, aged eight, 12, and 16 held beliefs about the gender association of different occupations. They asked the children to indicate who they believed was more likely to perform ('men', 'women', or 'both') each of 21 different occupations. Their results revealed that the youngest children exhibited significantly more stereotypical beliefs about which individuals should perform specific jobs compared to the older children. Additionally, in general, boys displayed a higher degree of gender stereotyping regarding the appropriateness of occupations than girls. Miller and Hayward's (2006) results aligned with the patterns documented in Miller and Budd research (1999) and numerous other studies dating back to the 1970s[42]. Their study revealed that the degree to which occupations are perceived as gender stereotyped is one of the most significant factors influencing career choices. The cumulative evidence suggests that growing up in an environment where such stereotypes are prevalent can indeed influence individuals in the development of their attitudes towards various career choices.

Regarding gender stereotypes related to entrepreneurial skills, there has long been a prevailing cultural stereotype that men are more entrepreneurial than women. This aligns with the observable reality that entrepreneurship is a male-dominated field, as the latest report by Global Entrepreneurship Monitor (GEM, 2023) indicated. A discourse analysis of 81 research articles by Ahl (2006) compared words associated with masculinity to those linked with entrepreneurship, further highlighting that entrepreneurship is a male gender concept. These stereotypes play a role in reinforcing the belief that specific, often stereotypically masculine, are necessary for success in entrepreneurship. This in turn can lead to the perception that women do not fit the traditional image of entrepreneurs (Ahl, 2006; Buttner and Rosen, 1988; Fagenson and Marcus, 1991). It should, therefore, not be surprising that females may

[42] Several empirical studies also supported the notion that children tend to prefer stereotyped jobs (see Chambers et al., 2018; Franken, 1983) and have a preference for jobs traditionally associated with their own gender (Hayes et al., 2018).

be less likely to aspire to or be engaged in entrepreneurial activities, contributing to the gender gap in entrepreneurship.

Gender stereotypes influence both men's and women's occupational choices, ultimately leading to occupation segregation. However, the consequences of these stereotypes tend to be more adverse for women, who often face limitations in terms of earnings, participation in certain occupations, and prestige or status associated with their chosen careers. The negative effects of these stereotypes on women's labour market outcomes have been well-documented in the literature (e.g. Anker, 1998; Cejka and Eagly, 1999).

4.3 Literature review

4.3.1 Entrepreneurial intentions

In the entrepreneurial literature, extensive research has focused on individuals' EIs, which represent the initial stage preceding behaviour (Ajzen, 1991). The literature on adults is abundant, and recently, the youth entrepreneurial literature has attracted a considerable amount of attention among researchers and policymakers because adolescents constitute a fundamental source of potential future entrepreneurs. Generally, these literature stream have made substantial contributions to identifying key determinants that influence individuals in their pursuit of entrepreneurship. They are centred on the influence of individual-level factors such as the big five personality traits, (ESE), and risky behaviours (e.g. Barbosa et al., 2007; Schmitt-Rodermund, 2004). Furthermore, scholars have explored factors like age (Hatak et al., 2015), gender (Haus et al., 2013), human capital variables (Fitzsimmons and Douglas, 2011), social media (Barrera-Verdugo and Villarroel-Villarroel, 2022), entrepreneurial education programs (Galloway and Brown, 2002; Schröder and Schmitt-Rodermund, 2006; Souitaris et al., 2007), and regional environment dimensions (Kibler, 2013). More recently, role models have started to be explored (Bosma et al., 2012; Nowiński and Haddoud, 2019; Scherer et al., 1989a; Van Auken et al., 2006).

A growing body of research has examined the drivers behind EIs from a gender perspective, exploring factors like entrepreneurial education (Bae et al., 2014; Nowinski et al., 2019; Westhead and Solesvik, 2016), parental entrepreneurial role models (Matthews and Moser, 1996), stereotypes (Gupta et al., 2008), and antecedents of EIs[43] (Adamus et al., 2021; Haus et al., 2013; Kickul et al., 2008; Wilson et al., 2009; Zhao et al., 2005). Briefly, these studies have explored how gender moderates the emerging relationships. Some studies have indicated that the effects differ by gender, whereas others have reported no significant differences across the two groups.

Specifically, the literature indicates that young adult females, including adolescent females, have both lower ESE and lower EIs (Chen et al., 1998; Wilson et al., 2007). Kickul et al. (2008) went a step further by linking gender with ESE and EIs, among other factors. They found a direct relationship between self-efficacy and EIs, with a stronger effect for girls than for boys. In contrast, Zhao et al. (2005) found that ESE does not play a mediating role in gender; rather gender has a direct effect on EIs. In the context of entrepreneurial education, research provides mixed evidence about which gender benefits more. It has been shown that males benefit more than females (Westhead and Solesvik, 2016). Another study indicated that despite males exhibiting higher EIs, females seem to benefit more from entrepreneurship education (Nowinski et al., 2019; Packham et al., 2010). Individuals from an entrepreneurial family background show higher levels of EIs (interest in small firm ownership), particularly this effect is more pronounced among males than females (Matthews and Moser, 1996).

[43] Antecedents of EIs, incorporate a set of beliefs related to EIs from the perspective of the TPB. The most typical factors studied are perceived behavioural control, subjective norm, attitude towards entrepreneurship, or ESE.

Stereotypes have recently received some attention in the literature. In an experimental study Gupta et al. (2008) manipulated the activation of masculine stereotypes related to entrepreneurship. Their findings revealed that men reported stronger EIs than women when no stereotypical information was provided. However, this gender gap was no longer observed when entrepreneurship was presented in a gender-neutral manner.

Substantial empirical research in the EI field has incorporated gender as a dummy variable and treated it as an additional demographic variable to control with (Fitzsimmons and Douglas, 2011; Hatak et al., 2015; Kibler, 2013; Lee et al., 2011; Von Graevenitz et al., 2010). Collectively, these studies have not explicitly mentioned or focused on gender effects in their research. Other researchers have investigated the relationship between gender and EIs (e.g., Adamus et al., 2021; Crant, 1996; Díaz-García and Jiménez-Moreno, 2009; Kolvereid, 1996; Santos et al., 2016; Wilson et al., 2007; Zellweger et al., 2011; Zhao et al., 2005). Some of these researchers have found both a direct effect of gender on EIs and of gender differences on EIs. For example, a meta-analysis of 30 studies (Haus et al., 2013), encompassing both adolescent and adult samples, concluded that the average EIs are higher for males than for females. Their conclusion was drawn by using gender as a dummy variable (coding male = 0 and female = 1). Zhao et al. (2005) documented a similar trend in a sample of American university students. Other studies, in contrast, found no significant gender effect on EIs (Schmitt-Rodermund, 2004), leading them to exclude gender from their analysis.

In existing empirical studies, in general, more men expressed their intention to become self-employed at rates around or above 15% (e.g. 10% in Kourilsky et al., 1998; 23.6% in Santos et al., 2016; and 16.4% in Sánchez-Cañizares and Fuentes-García, 2010). The persistent gender gap documented in the literature was typically derived from descriptive statistics, mainly means (Crant, 1996; Gupta et al., 2008; Kourilsky et al., 1998), t-test results (Adamus et al., 2021), ANOVA tests (Santos et al., 2016), or correlation matrices (Shinnar et al., 2018).

In these studies, gender was mainly used as an independent variable; it was rarely used to conduct gender-separate analysis. We identified only one empirical study where gender was used as a dependent variable (Sánchez-Escobedo et al., 2014).

Parallel to these strands of research, recent empirical studies in the entrepreneurship literature offered insights into the determinants of the gender gap in self-employment (Leoni and Falk, 2010) as well as the determinants of the gender gap in latent and nascent entrepreneurship (Adachi and Hisada, 2017; Bönte and Piegeler, 2013)[44]. However, empirical studies specifically examining the determinants of the gender gap in EIs are virtually non-existent.

4.3.2 Role model in entrepreneurship

An exhaustive exploration has been undertaken to examine the existing literature on GRMs in entrepreneurship. However, to the best of our knowledge, this strand of research appears to be virtually non-existent. There is a notable absence of a dedicated section in the current study addressing this topic.

Conversely, within the entrepreneurship literature, proposed links between role models and EIs/realisation have gained attention. Nevertheless, research on the subject remains somewhat limited. Three growing areas of empirical research provide insights into role models' influence on individuals' EIs/realisation: (1) parental role model (e.g. Amofah and Saladrigues, 2022; Kickul et al., 2008; Schmitt-Rodermund, 2004); (2) peer role model (e.g. Djankov et al., 2006; Falck et al., 2010; Nanda and Sorensen,

[44] While Leoni and Falk (2010), examined the contribution of the field of study to the gender gap in entrepreneurship, Adachi and Hisada (2017) focused on family and employment-related variables, and Bönte and Piegeler (2013) considered competitiveness and risk-taking.

2009); and (3) a strong entrepreneurship activity in the region (e.g. Andersson and Larsson, 2016; Lafuente et al., 2007; Gianetti and Simonov, 2010). Research in this field has mostly explored role models' combined effect without distinguishing between masculine and feminine influences. There are, however, some exceptions to GRM where distinctions have been made between paternal and maternal role models (Chlosta et al., 2010, in Germany and Hoffmann et al., 2015, in Denmark).

4.3.3 Our contributions

A common pattern in the previous economics literature exploring individuals' EIs was that a substantial body of empirical studies largely focused on the underlying factors motivating or encouraging individuals to pursue an entrepreneurial career. More specifically, heightened levels of ESE, a propensity for risk-taking, exposure to entrepreneurial education programmes, the presence of a parental entrepreneurial role model, or being male are associated with higher levels of EIs. Whereas the bulk of the literature has analysed the impact of individual characteristics, gender, and education programmes, among others on EIs. This paper moves one step away from the most conventional studies exploring for the first time the impact of GRMs (parent entrepreneurial role model and inspirational role model) on EIs. We think this is relevant because GRMs have gained recognition as significant factors in shaping occupation and career choices in the literature.

A common feature in the previous literature was that researchers remain somewhat limited in their ability to examine the gender effect on EIs. Few empirical studies provided an alternative approach beyond considering gender as an independent variable. They mainly treated gender as another demographic variable to control for, without giving much importance to the gender effect or examining the moderating effect of gender. In this paper, we attempt to fill this gap. Our research addresses, for the first time the determinants of the gender gap in EIs. To the best of our knowledge, evidence on them is virtually non-existent in the literature.

We believe our study also makes some other essential contributions to the entrepreneurship literature. Numerous empirical studies on EIs mainly focused on samples of adults or young adults (university students). However, exploring samples of non-university students and students with low interest in higher education is appealing on its own, because a high percentage of entrepreneurs do not have university-level (Laviada et. al., 2022). We believe this is an interesting approach because policy interventions at young ages can be effective and because career expectations and aspirations begin to be formed in the adolescent years (Low et al., 2005). This paper offers a wider view of the determinants of the gender gap in EIs by considering three different samples, specifically distinguishing between students' interest in pursuing higher education and students with no interest in pursuing higher education at all. In the empirical model, we control for educational and labour market aspirations, skills, or job characteristics, in addition to the commonly used individual characteristics.

4.4 The data and variables

In this section, we first discuss the source of our data and then describe the measures used in the study.

4.4.1 Data collection

In the introductory chapter, particularly in Section 1.2.1, the source of the dataset was explained in detail. The initial sample in this study consisted of 9,275 students. However, to achieve the specific objectives of this study, attention was paid to distinct groups of students.

We examined the role of GRMs as predictors of EIs as well as the gender gap in EIs and its determinants. OLS estimations were conducted with all groups within the dataset. The decomposition method was conducted with three different samples of students: Model 1 consisting of all grade levels, specifically the last year of compulsory secondary education, lower vocational training (VT), and high school; Model 2 consisting of lower VT and the last year of secondary compulsory education; and Model 3 consisting of lower VT and students enrolled in the last year of secondary compulsory education who expressed their intentions of enrolling in lower VT. The size of the sample depended on the specific model utilised. Each model represented a unique combination of educational stages. Model 1 to Model 3 reflected the gradual restriction of the sample based on students' inclination towards higher education. The rationale for employing these three models stemmed from the fact that many successful entrepreneurs do not hold university degrees. This approach enabled us to conduct an in-depth examination of factors contributing to the gender gap across diverse educational backgrounds.

4.4.2 Measures

In the following, we provide detailed information on both outcome and explanatory variables.

Outcome variable

Entrepreneurial career intention: This variable covered whether students have the intention to become entrepreneurs. The EI variable was constructed by asking of the following question: 'In the future, would you like to (1) work in a private company; (2) work in the public sector (civil servant); (3) have your own business; or (4) I do not know yet'. Respondents could only pick one answer. A dummy variable was created for self-employed people, where '1' represented yes and '0' represented no. This approach has already been used in different studies. Verheul et al. (2012) used a similar approach for EI but with an adult sample.

Explanatory variables

Because we wanted to determine whether priori exposure to GRMs affects both the decision to be self-employed and the gender gap in EIs, we used two measures of GRMs: (1) inspirational role model and (2) family role model.

Inspirational role model: With regard to inspirational role models, we asked students to respond in an open-text field to the following statement: 'If you had the opportunity to live someone's life, from a professional point of view, whose life would you choose?' The answers ranged from direct role models (parents, siblings, teachers) to more distant role models (successful and famous people) from a wide variety of fields, including entrepreneurs (e.g. Steve Jobs, Bill Gates, Mark Zuckerberg, and Marta Ortega). Students' answers were coded into three GRM categories: (1) feminine role model, (2) MRM, and (3) no role models.

Parent entrepreneurial role model: Prior research has shown that the parental role model produces mixed results for individuals' EIs. Some researchers found that self-employed parents strongly affect EIs (Amofah and Saladrigues, 2022; Kickul et al., 2008), but others found no evidence on this (Hatak et al., 2015). Students were asked to report their parents' occupation (separately for mothers and fathers) by choosing one of eight possible categories: 1 = Working private employee; 2 = Working public employee; 3 = Business owner; 4 = Doesn't work, housekeeping; 5 = Doesn't work, unemployed; 6 = Doesn't work, retired; 7 = Doesn't work, impaired; 8 = I don't know. For each parent, we created a dummy

variable, which took a value of 1 if the respondent reported having a mother (father) who was self-employed, and 0 otherwise.

Control variables

In addition to these two types of GRMs, we controlled for a diverse range of variables in our analysis. These variables encompassed individual and family characteristics, educational variables, labour market aspirations, job characteristics, risk preference, and skills. Some of these variables have been previously examined individually in the adult literature (e.g. Barbosa et al., 2007; Nowiński and Haddoud, 2019; Verheul et al., 2012).

Individual and family characteristics: We incorporated several variables related to respondents' individual and family characteristics. These included the number of siblings (continuous variable), place of birth (Catalonia = 1, abroad = 0), maternal education level (university level: yes = 1, no = 0), and paternal education level (university level: yes = 1, no = 0).

Educational variables: In this group of variables, we included cognitive abilities (capturing test scores), university expectations, and dropping out for a long-term job. Regarding test scores, we created an ordinal variable from 1 to 5 (E, D, C, B, A) that contained the average grades obtained in compulsory secondary education. We acknowledged that university and non-university students may exhibit different EIs, so we used students' university expectations to measure their effect on EIs. As part of the survey, students were asked about their expected higher education level. We created a dummy variable, with university expectations coded as 1 and non-university aspirations coded as 0. Building upon recent reports and studies, we expected to see lower EIs among those who expect to obtain a university degree. Finally, we accounted for students' dropout intentions, which we believed could be a good measure of students' EIs. This indicator was particularly interesting because it illustrated students' attitudes towards education. Several successful entrepreneurs have dropped out of the educational system. Respondents were put in the hypothetical situation of leaving school for a long-term contract (they had to provide the salary for which they were willing to make the transition) or not taking the contract. Dropout was coded as 1, and not taking the contract was coded as 0.

Labour market aspirations: To measure sector aspiration, students were asked to respond to the question 'When you finish studying and find a job, in which sector do you think you are most likely to end up working?', by selecting one out of the following: (1) other qualified services, (2) agriculture, (3) other non-qualified services (security guard among others), (4) commercial sector, (5) construction, (6) tourism, (7) industry, and (8) I don't know.

Job characteristics: To measure job characteristics, we also asked students about the specific qualities they considered most important in a job. A list of 11 job characteristics was presented: (1) flexible schedule, (2) social utility, (3) good salary, (4) social relations, (5) creative, (6) long term contract, (7) working autonomously, (8) education match, (9) no physical effort, (10) no pressure, (11) well socially considered. Students were asked to indicate three characteristics they considered important from the given list. These variables resulted in binary variables, where a value of 1 indicated that a particular job characteristic was chosen as important, whereas a value of 0 indicated otherwise. Instead of controlling for all these measures, we employed the tetrachoric method to reduce dimensionality. Through this process, we were able to reduce the 11 job characteristics to just three (see Table 4.1 for the correlations between the original and created measures). Factor 1 encompassed job characteristics related to creativity, autonomy, and the absence of physical effort and pressure. Factor 2 encompassed job characteristics related to social utility and relations. Factor 3 encompassed job characteristics related to a flexible

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schedule, well social consideration, and a good salary. All of these contributed positively to factor 3. However, education match contributed negatively to factor 3.

Table 4.1
Tetrachoric: Correlations between job characteristics and variables generated

	Factor 1	Factor 2	Factor 3
Creative	**0.645**	0.01	0.153
Working autonomously	**0.646**	-0.178	-0.029
No physical effort	**0.478**	-0.187	0.092
No pressure	**0.477**	-0.302	0.222
Social relations	0.357	**0.432**	0.271
Social utility	0.372	**0.393**	0.021
Flexible schedule	0.329	-0.184	**0.512**
Well socially considered	0.242	0.299	**0.351**
Good salary	-0.001	-0.164	**0.179**
Education match	0.341	-0.075	**-0.589**
Long-term contract	0.000	0.000	0.000

Notes: Own elaboration of tetrachoric correlation

Risk preference: Several empirical studies have demonstrated the influence of risk preference on the decision to pursue self-employment (e.g. Afandi and Kermani, 2015; Barbosa et al., 2007). In our study, we measured students' risk preferences. This variable had four categories based on different salary structures: (1) fixed salary (1,200€); (2) fixed salary (1,000€) + 400€ variable; (3) fixed salary (800€) + 800€ variable; and (4) fixed salary (600€) + 1,200€ variable. This was an ordinal variable ranking behaviours from risk-averse to risk-seeking. From this variable, we created a dummy variable where students exhibiting risk-averse behaviour were assigned a score of 0 (corresponding to category 1) and those exhibiting risk-seeking behaviour were assigned a score of 1 (corresponding to categories 2, 3, and 4).

Skills: The literature widely acknowledges that skills play an essential role in self-employment. They significantly influence an individual's decision to pursue entrepreneurship. Various skills, such as financial skills, and skill variety have been identified as influential factors in motivating individuals to choose entrepreneurship as a career path or have been found to be present in entrepreneurs (Aldén et al., 2017; Krieger et al., 2022; Llados-Masllorens and Ruiz-Dotras, 2022). A recent empirical study indicated that women are generally more likely to underestimate their skills compared to men (Lindeman et al., 1995). In the survey, students were asked to rate their self-perceived abilities, in mathematical, commercial, and effort skills. These variables were measured on a commonly used 1-10 scale, ranging from poor to excellent.

4.5 Empirical method

In this section, we start by conducting the bivariate descriptive analysis, specifically the t-test. Then, we conduct the regression and decomposition analysis.

4.5.1 Descriptive statistics

First, bivariate descriptive analyses using the students' t-tests were conducted to examine the significance of the mean differences between males and females in the sample. Specifically, a t-test was performed to compare the levels of EIs between the two genders. The null hypothesis being tested was that the means for the entrepreneurship variable 'i' were equal for both girls and boys in the sample. Additionally, we investigated the differences in GRMs (inspirational role models and parent entrepreneurial role models) and a set of control variables between girls and boys. Here, we aimed to determine whether there were significant mean differences in the observed endowments between the two genders.

4.5.2 Regression

To identify the effect of our variables of interest (GRM) on EIs in a sample of adolescent students, we chose to estimate a linear model. Econometrically, we estimated ordinary least squares (OLS) for the full sample. The equation took the following form:

$$EI_{ij} = \alpha + \beta_1 IRM_{ij} + \beta_2 PERM_{ij} + \beta_3 MERM_{ij} + \delta X_{ij} + \gamma F_{ij} + \lambda_j + \varepsilon_{ij} \quad (1)$$

where EI_{ij} is our outcome variable, and denotes entrepreneurial intentions by individual *i*, which is equal to 1 if individuals express their intentions to be a business owner, and 0 otherwise. The subscript *j* refers to the school where the student *i* is studying. In equation (1), our variables of interest contains a set of GRM-related variables: (*1) inspirational role model* IRM_{ij} was a variable with three different categories – whether the student had a feminine role model, MRM, or no role model; and (*2) family entrepreneurial role model* contained two variables – the maternal role model $MERM_{ij}$, and the paternal role model $PERM_{ij}$. At the moment of the estimation, we considered the interaction between maternal and paternal entrepreneurial role models. The matrix X_{ij} – contains a set of individual-level control variables such as individual characteristics, educational variables, labour market expectations, skills, job characteristics, or risk preference. The matrix F_{ij} contains a set of family characteristics, specifically parents' education level. λ_j represents the school fixed effects[45] and ε_{ij} is the error term. Separate regressions for girls and boys were conducted following the same model specification as in equation (1) to examine potential heterogeneous effects among genders.

Because the EI variable is binary, it may be argued that the linear model is inappropriate and that we should have used non-linear probability models instead (probit/logit frameworks). However, the literature has shown that the estimated marginal effect from the non-linear model is very close to the coefficient estimates (Falck et al., 2010; Markussen and Røed, 2017). We compared the results with linear and non-linear models, which followed a similar pattern (they are available upon request). In this context, we were not interested in marginal effects. Thus, for simplicity, we used linear regression.

4.5.3 Decomposition technique

Linear regression analysis can provide insight into the determinants of EIs. However, in this study, we had a specific interest in quantifying the contribution of GRMs to the gender gap in EIs. For this purpose, we aimed to use Blinder-Oaxaca decomposition, a widely used method in studying gaps.

The decomposition technique has gained increasing attention in the economics literature, including in the field of entrepreneurship. Blinder-Oaxaca decomposition is a common decomposition

[45] School fixed effects allows us to account for both peer effects and unobserved school heterogeneity.

technique in the literature and is frequently employed to analyse labour market outcomes among demographic groups, such as gender, race, or ethnic groups (e.g. Briel et al., 2020; Caliendo et al., 2017). Regardless of the type of outcome variables used (binary, categorical, or continuous), this technique has been found to be a valuable tool for quantifying the contribution of endowments in any outcome variables: employed or unemployed; education level (high school diploma, bachelor's degrees, etc.); or earnings. Blinder-Oaxaca decomposition consists of decomposing the outcome variable between groups into explained and unexplained components. Thus, this method allowed us to estimate what share of the total average gender gap in EIs could be attributed to differences in observed characteristics or associated with differences in estimated coefficients. This technique consisted of estimating separate regression for boys and girls:

$$EI_{ib} = \beta_B X_i + \varepsilon_i \quad (2)$$

$$EI_{ig} = \beta_G X_i + \varepsilon_i \quad (3)$$

where EI_i is the expected average of entrepreneurial intentions of student i and X_i is a set of explanatory variables. Beyond the GRM variables, a broad set of individual-level characteristics and family characteristics were considered (see Section 4.2 for further information). β is a vector of the estimated coefficients for gender {(B)oy, (G)irl}, whereas ε_i is an individual error term. Thus, the average difference in EIs between boys and girls can be expressed as follows:

$$\overline{EI}_B - \overline{EI}_G = [\underbrace{(\bar{X}_B - \bar{X}_G)\beta_B}_{\text{explained}}] + [\underbrace{(\beta_B - \beta_G)\bar{X}_G}_{\text{unexplained}}] \quad (4)$$

where $\overline{EI}_B - \overline{EI}_G$ represent the average gender gap in EIs. As mentioned earlier, the standard practice involves decomposing the observed average gender gap into two components: explained and unexplained parts. In this context, the first term on the left-hand side represents differences in observed endowments (skills, characteristics) between the two groups, specifically boys and girls. The second term reflects the portion of the gap that cannot be explained by the observed factors, which may be attributed to unobserved factors, or discrimination. In this study, Blinder-Oaxaca decomposition was utilised to compute both the aggregate decomposition of the gender gap in EIs and the detailed decomposition. The latter enabled us to observe the contribution of each covariate to the gap.

Nevertheless, the Blinder-Oaxaca decomposition has several limitations. Recent empirical studies on the gender pay gap have found a large 'unexplained component', which has been attributed to heterogeneity in the sample (Kassenboehmer and Sinning, 2016; Töpfer, 2017). Therefore, when heterogeneity is a concern, matching techniques can provide a valuable alternative. Ideally, will be to use propensity score matching (PSM), where individuals with similar characteristics are compared. However, the implementation of PSM requires careful consideration of the date.

Specifically, this method relies on the conditional independence assumption (CIA), which necessitates the selection of variables that do not influence either the treatment assignment or the outcome variable(s). In our context, we focused on non-gender-related variables that satisfied this condition. Nevertheless, after performing the matching and subsequent regressions, we observed a loss of many observations. In relation to our key variable, 'gender role model', most of the categories had

insufficient observations. Despite the popularity of PSM, the violation of the CIA is prevalent in the majority of studies, including those examining gender-related issues. Consequently, considering the aim of our paper and the fact that we had a rich set of variables, we considered Blinder-Oaxaca decomposition to be the most suitable.

4.6 Empirical analysis

In this section, we start by conducting bivariate descriptive analyses. Specifically, we carry out the t-test. Next, we conduct linear regression by estimating three different models to identify the determinants of EIs, with specific emphasis on GRMs (inspirational role model and parental role model). Additionally, to quantify the contribution of GRM-related variables, among other factors, to the gender gap in EIs, we apply decomposition methods to three different samples.

4.6.1 Descriptive statistics

First, a t-test was conducted to examine mean gender differences in all the dependent and independent variables used in this study. Table 4.2 presents the mean and standard deviations of the variables separately for girls and boys. The t-test results are reported in the last column of the table. As expected, the results indicated that adolescent girls reported lower EIs (30.8%) compared to adolescent boys (36.5%), a difference of roughly 6%. This difference was statistically significant at the 1% level. The gender gap observed in this paper was consistent with the existing literature, although it was less pronounced than previously observed (e.g. consider the 10% reported in Kourilsky et al., 1998, or the 16.4% reported in Sánchez-Cañizares and Fuentes-García, 2010).

A careful examination of the results in Table 4.2 revealed that significant gender differences were observed in the majority of the factors included in our model. However, it is worth noting that only a few variables, commercial skills and individual and family characteristics (specifically, the two first categories of the number of siblings and parents' university level), did not show significant differences between boys and girls.

Some salient aspects of the data were derived from the mean characteristics. First, the inspirational role model variables differed significantly between girls and boys: while feminine role models were much more predominant for girls (M = 0.090) than for boys (M = 0.010), MRMs were much more common for boys (M = 0.383) than for girls (M = 0.089). These results suggested a tendency towards same gender role models. This tendency has been previously observed in the literature (Lockwood, 2006; Sumner and Brown, 1996).

Second, significant disparities were observed in sector aspirations between boys and girls. Specifically, girls were more likely to indicate that they intended to work in the commercial sector (9.1% vs 6.9% for boys) and tourism sector (8.5% vs 6.6% for boys). Conversely, boys were much more likely to indicate that they intended to work in the agriculture, construction, or industry sector. In the case of the industry sector, the mean difference = -0.205, $p < 0.001$).

Third, regarding the risk preference of students, it was found that boys had significantly higher average scores for risk-seeking behaviour compared to girls. This finding was in line with the general expectation that boys exhibit more risk-seeking behaviour: on average, boys had a risk-seeking behaviour score that was 3% higher than that of girls.

Finally, when considering self-perceived competence, it was found that girls reported lower math skills (mean difference = -0.809, $p < 0.001$) and higher effort skills (mean difference = 0.354, $p < 0.001$) compared to boys. However, no statistically significant difference was observed between boys and girls

Table 4.2
Means, standard deviations and t-test by gender

	Girl		Boy		Diff. of means	Test statistic
	Mean	**SD**	**Mean**	**SD**		
			Outcome variable			
Labour market expectations						
Entrepreneurial intentions	0.308	0.461	0.365	0.481	-0.057***	-4.705
			Explanatory variables			
Panel (a): GRM						
Inspirational role model						
Feminine role model	0.090	0.286	0.010	0.101	0.080***	17.597
MRM	0.089	0.284	0.383	0.486	-0.294***	-35.978
No role model	0.549	0.497	0.347	0.476	0.202***	19.923
Parental entrepreneurial role model						
Father business owner	0.190	0.392	0.162	0.369	0.027***	3.445
Mother business owner	0.124	0.330	0.101	0.301	0.023***	3.492
Panel (b): individual and family characteristics						
Number of siblings						
Without siblings	0.110	0.312	0.112	0.316	-0.003	-0.458
1 sibling	0.437	0.496	0.444	0.497	-0.007	-0.699
2 siblings	0.150	0.358	0.134	0.341	0.016**	2.196
3 siblings	0.127	0.333	0.103	0.304	0.024***	3.591
Place of birth						
Catalonia	0.820	0.383	0.837	0.369	-0.016*	-1.945
Parents' university level						
Father university	0.134	0.341	0.136	0.342	-0.001	-0.182
Mother university	0.183	0.387	0.185	0.388	-0.001	-0.143
Panel (c): educational variables						
Cognitive abilities						
Grades						
1	0.021	0.145	0.036	0.188	-0.015***	-4.277
2	0.283	0.45	0.364	0.481	-0.080***	-8.308
3	0.275	0.447	0.314	0.464	-0.038***	4.059
4	0.338	0.473	0.234	0.423	0.104***	11.142
5	0.081	0.273	0.052	0.221	0.029***	5.689
University expectations	0.614	0.487	0.469	0.499	0.144***	14.109
Dropout for a long-term job	0.339	0.474	0.521	0.499	-0.181***	-17.974
Panel (d): labour market aspirations						
Sector aspirations						
Other qualified services	0.548	0.497	0.281	0.449	0.266***	25.645
Agriculture	0.010	0.099	0.031	0.173	-0.021***	-6.790
Other non-qualified services	0.015	0.120	0.041	0.199	-0.027***	-7.493
Commercial sector	0.091	0.288	0.069	0.254	0.022***	3.754
Construction	0.008	0.088	0.037	0.189	-0.029***	-9.269
Tourism	0.085	0.279	0.066	0.248	0.019***	3.273
Industry	0.075	0.263	0.279	0.449	-0.205***	-25.724
I don't know	0.169	0.375	0.195	0.396	-0.026***	-3.145
Panel (e): Job characteristics						
Factor 1	0.737	0.332	0.743	0.339	-0.005	-0.759
Factor 2	*-0.043*	0.359	-0.125	0.332	0.082***	11.328
Factor 3	*0.231*	0.436	0.266	0.425	-0.035***	-3.939
Panel (f): Skills						
Self-perceived competence						
Math skills	6.074	2.180	6.883	2.073	-0.809***	-18.305
Commercial skills	7.213	1.707	7.211	1.794	-0.009	-0.237
Effort skills	7.099	1.919	6.745	2.113	0.354***	8.458
Panel (g): Risk preference	0.577	0.494	0.608	0.488	-0.031***	-3.040

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. These estimates are for the full sample.

in terms of commercial skills. On average, both boys and girls reported the same level of commercial skills.

In general, significant gender differences were observed in the majority of the measures included in our model. However, it is important to note that these differences may not necessarily indicate the contributing factors to gender gap in EIs. Therefore, further methods, such as regression and decomposition methods, are necessary to better understand and analyse the factors that explain the gender gap. These additional methods will provide deeper insights into the relationships among variables and help identify the key drivers influencing EIs.

4.6.2 Regression

To analyse factors influencing EIs in a sample of adolescents, we conducted OLS estimations[46]. Because our dependent variable was binary, it could be argued that the appropriate estimations would be non-linear probability models (probit/logit frameworks). However marginal effects provided similar results as linear regression. Because we were not interested in marginal effects, linear regressions were employed. In all models, we used a dummy for EIs as the dependent variable. We estimated three different models, and Table 4.3 reports the results. We first estimated the model considering girls' dummy variables without considering the variables of interest and further controls (Model 1). In the next step, we added our variables of interest: GRM variables – inspirational role model and the interaction effects between paternal and maternal role models (Model 2). Finally, the subsequent estimation contained, apart from the key variables, the set of control variables – individual and family characteristics, educational variables, labour market aspirations, skills, job characteristics, and risk preference (Model 3). Because we were interested in gender effect, we ran regression analysis for adolescent girls and boys separately to investigate whether there were heterogeneous effects among gender (regressions of columns 2 and 5 were followed by gender separate analysis).

As expected, when we included gender as a dummy variable in our analysis (Model 1), we observed a gender gap of approximately 6%, which was statistically significant at 1% level. Specifically, adolescent girls in our sample exhibited lower EIs compared to adolescent boys. Subsequently, we examined the effects of our variables of interest (Model 2). In this context, the gender effect slightly decreased. Finally, we investigated the effects of all variables (Model 3), which included individual and family characteristics, sector aspirations, and risk preferences. In this model, the gender effect lost statistical significance. This suggested that once we accounted for this comprehensive set of factors, the gender gap effect disappear. However, this does not mean that the gender gap do not exist; rather, it indicates that the gender gap is explained by the variables we controlled for. These results might be supported in the decomposition analysis, in the sense that the gender gap in EIs might be fully explained by differences in observed characteristics between boys and girls.

Regarding the GRM-related variables, our findings indicated that having a career reference has a positive and statistically significant impact on EIs. These findings were in line with earlier studies on role model among both university students (Nowiński and Haddoud, 2019; Scherer et al., 1989a; Van Auken et al., 2006) and adult entrepreneurs (Bosma et al., 2012). Further, the gender of the inspirational role

[46] The variables employed in this analysis could raise concerns about multicollinearity. Therefore, before testing the research hypotheses, we checked for potential multicollinearity problems by computing the variance inflation factors. Although they are not reported here, the values indicated that the issue was not a matter of concern.

Table 4.3
EI and gender role model: pooled and gender-specific OLS estimations

	Entrepreneurial intentions						
	Model 1	**Model 2**			**Model 3**		
	Full sample	**Full sample**	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Girl (base: boy)	-0.057***	-0.043***			0.010		
	(0.012)	(0.013)			(0.015)		
Inspirational role model							
MRM (base: feminine)		0.066**	-0.003	0.120***	0.072**	0.017	0.104***
		(0.030)	(0.093)	(0.037)	(0.030)	(0.094)	(0.037)
No role model		0.025	-0.027	0.027	0.049*	0.003	0.054*
		(0.028)	(0.094)	(0.029)	(0.028)	(0.094)	(0.029)
Parental role model							
Father (no) Mother (yes)		0.052**	0.022	0.079**	0.045*	0.009	0.078**
		(0.025)	(0.037)	(0.033)	(0.024)	(0.036)	(0.033)
Father (yes) Mother (no)		0.089***	0.103***	0.078***	0.088***	0.101***	0.075***
		(0.018)	(0.026)	(0.024)	(0.018)	(0.026)	(0.024)
Father (yes) Mother (yes)		0.124***	0.153***	0.101***	0.123***	0.154***	0.098***
		(0.026)	(0.038)	(0.035)	(0.025)	(0.037)	(0.034)
Parents' university level							
Father (no) Mother (yes)					-0.014	-0.033	-0.001
					(0.019)	(0.028)	(0.027)
Father (yes) Mother (no)					0.045*	0.004	0.084**
					(0.025)	(0.036)	(0.036)
Father (yes) Mother (yes)					-0.013	-0.054*	0.029
					(0.022)	(0.032)	(0.031)
Number of siblings							
1 sibling (base: 0 siblings)					0.011	0.008	0.013
					(0.019)	(0.027)	(0.027)
2 siblings					0.018	0.042	-0.006
					(0.023)	(0.033)	(0.031)
3 siblings					0.043*	0.077**	0.015
					(0.024)	(0.036)	(0.033)
Place of birth							
Catalonia					-0.041**	-0.032	-0.047**
					(0.0169)	(0.0250)	(0.0230)
Educational variables							
University expectations					-0.028*	-0.039*	-0.013
					(0.015)	(0.021)	(0.021)
Grades					-0.029***	-0.044***	-0.015
					(0.008)	(0.011)	(0.011)
Dropout for a long-term job					0.018	0.008	0.037**
					(0.013)	(0.019)	(0.018)
Sector aspirations							
Agriculture (base: other qualified services)					0.243***	0.230***	0.206***
					(0.043)	(0.052)	(0.079)
Other non-qualified services					-0.085**	-0.065	-0.177**
					(0.036)	(0.044)	(0.071)
Commercial sector					0.129***	0.109***	0.145***
					(0.023)	(0.037)	(0.029)
Construction					0.148***	0.109**	0.257***
					(0.039)	(0.046)	(0.088)

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Table 4.3 (continued)

	Entrepreneurial intentions						
	Model 1	**Model 2**			**Model 3**		
	Full sample	**Full sample**	**Boy**	**Girl**	**Full sample**	**Boy**	**Girl**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tourism					0.129***	0.105***	0.139***
					(0.024)	(0.038)	(0.030)
Industry					0.0668***	0.0685***	0.0242
					(0.0177)	(0.0232)	(0.0304)
I don't know					0.141***	0.098***	0.186***
					(0.019)	(0.028)	(0.027)
					(0.013)	(0.019)	(0.018)
Skills							
Math skills					0.009***	0.012***	0.007*
					(0.003)	(0.004)	(0.004)
Commercial skills					0.023***	0.029***	0.017***
					(0.004)	(0.005)	(0.005)
Effort skills					-0.008**	0.001	-0.018***
					(0.003)	(0.004)	(0.005)
Job characteristics							
Factor 1					0.192***	0.225***	0.157***
					(0.018)	(0.025)	(0.025)
Factor 2					-0.091***	-0.109***	-0.072***
					(0.017)	(0.025)	(0.023)
Factor 3					0.020	0.052***	-0.006
					(0.013)	(0.019)	(0.018)
Grade level							
11th grade (base: last year of secondary compulsory education)					-0.015	-0.019	-0.012
					(0.016)	(0.025)	(0.022)
12th grade					-0.045**	-0.046	-0.043*
					(0.019)	(0.030)	(0.026)
1st Lower VT					-0.004	-0.005	-0.008
					(0.022)	(0.028)	(0.034)
2nd Lower VT					-0.067***	-0.055	-0.076**
					(0.025)	(0.035)	(0.035)
Observations	6,061	6,061	3,010	3,051	5,755	2,860	2,895

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. Estimations were conducted with all groups within the dataset.

model appeared to have different effects on adolescent boys and girls. These effects remained consistent and significant when analysing the overall sample as well as when conducting separate analyses for boys and girls. In other words, regardless of whether we analysed the entire sample or examined boys and girls separately, having a career reference positively influenced the intention to pursue entrepreneurship. In Model 2, where only the variables of interest were considered, we observed that compared to a feminine role model, having an MRM had a positive and statistically significant impact on EIs (column 2). Specifically, an MRM encouraged adolescent girls to have higher EIs (column 4). Previous studies – which did not focus on entrepreneurship – revealed that in comparison with males, females were more likely to choose opposite-sex role models (Wohlford et al., 2004). A similar pattern was observed for boys, although the effect was not statistically significant (column 3). These findings remained consistent when we controlled for all variables (Model 3), indicating the stability of the observed effects. For instance, adolescent girls who had an MRM, in comparison with those who had a feminine role model, exhibited 10% higher EIs. These results provided robust evidence for the positive influence of GRMs

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and underscored the importance of considering gender-specific effects when examining EIs. Thus, these findings contributed to filling the gap in the entrepreneurship literature.

Regarding parent entrepreneurial role models, our findings indicated that having at least one parent who was a business owner positively influences adolescents' EIs. These findings aligned with those of the existing literature (Amofah and Saladrigues, 2022; Kickul et al., 2008), which documented that having a self-employed parent increases the likelihood of the offspring becoming self-employed. In previous studies, in the context of entrepreneurial realisation, a parent-child gender match was documented (Hoffmann et al., 2015). In our study, we also accounted for both maternal and paternal entrepreneurial role models. The estimates revealed that when only the mother is self-employed, there is a significant and positive effect on EIs for girls, but not for boys. Meanwhile, when only the father is self-employed, both adolescent girls and boys are positively influenced, with a higher effect observed for boys. In the entrepreneurial literature, a similar tendency was documented (Zelekha, 2021)[47]. Furthermore, when both parents of a student were self-employed, compared to students whose parents had different employment situations, we once again found a significant and positive effect on EIs (significant at 1% level). Notably, the effect was much higher for adolescent boys, suggesting a greater inclination towards entrepreneurship among them. Taken together, these findings highlight the importance of parent entrepreneurial role models in fostering individuals' EIs and indicated that the gender of the parental role model has a heterogeneous effect on their offspring, putting boys at an advantage.

Regarding the control variables, our findings suggested that individuals born in Catalonia are less likely to pursue entrepreneurship. Furthermore, our analysis revealed that individuals with risk-seeking behaviour exhibit higher EIs. This effect was slightly stronger for adolescent boys compared to adolescent girls. This finding aligned with those of previous studies conducted by Barbosa et al. (2007) on university students and Afandi and Kermani (2015) on adults. These studies also found that risk preference positively influences EIs, and a greater impact is observed among males.

Turning to educational-related variables, we observed that grades and expectations for university education had a negative effect on EIs for adolescent boys. These results were not surprising because a large share of self-employed people do not have tertiary education (e.g. Lavida et al., 2022). At the same time, we found that commercial skills and math skills had a positive effect on EIs, with statistical significance at the 1% level. In contrast, the effect of effort skills was negative (column 5). These effects indicated heterogeneity between genders. Specifically, the positive impact of commercial skills was more pronounced for boys compared to girls.

Regarding job characteristics measures, our results indicated that factor 1, related to autonomy and creativity, had a positive and highly statistically significant effect on EIs. This result was not surprising because, in the entrepreneurship literature, the desire for autonomy and creativity is among the most relevant entrepreneurial attributes (Bönte and Piegeler, 2013; Kirby, 2004). Conversely, factor 2 had a negative effect. Generally, the effect was much stronger in the case of boys.

Viewed as a whole, our estimates suggested that inspirational role models and parent entrepreneurial role models significantly influence students' EIs. Additionally, the gender of their role models has heterogeneous effects on boys and girls. Thus, these results offer valuable insights to policymakers and educators.

[47] Zelekha (2021) studied the gender gap in entrepreneurship in Israel, focusing on a sample of adults. The author found that the paternal entrepreneurial role model had a greater effect on participants' offspring than maternal entrepreneurial role models. The effect was stronger for boys than for girls.

4.6.3 Decomposition of the gender gap

To investigate the relevance of the GRM in explaining the gender gap in EIs among a sample of adolescents, we conducted Blinder–Oaxaca decomposition analyses. These analyses were based on the same control variables considered in our OLS estimations presented in the previous section (Table 4.3). Table 4.4 reports the decomposition analyses results: panel (a) contains the results of the aggregate decomposition, panel (b) contains the detailed contributions of the most significant covariates to the explained part, while panel (c) contains the detailed contributions of the most significant covariates to the unexplained part. One might argue that students who want to enrol in lower VT may be very different from those who aspire to higher education. Students who want to enrol in college may not be interested in self-employment at all. Therefore, in this context, we considered three different samples: the decomposition in Model 1 was carried out by considering all the grade levels available in our database. The sample in Model 2 was restricted to the students enrolled in the lower VT and students enrolled in the last year of secondary compulsory education. Finally, Model 3 contained the vocational intent sample. In this way, we wanted to observe whether the gender gap in EIs differs depending on the educational intent. Therefore, three different values were reported for the gender gap in EIs.

The estimates in panel (a) of the full sample (Model 1) revealed that 36.4% of adolescent boys had EIs, but only 30.5% of adolescent girls had EIs. This implies a difference of 5.9%. These findings aligned with earlier findings about adolescents' and adults' EIs, where males (boys) tended to have a higher preference for self-employment compared to females (girls) (e.g. see a meta-analysis of 30 studies in Haus et al., 2013). The results for the remaining samples showed a similar tendency, however the share of mean EIs of boys and girls and gender gaps were slightly higher. In the decomposition of Model 2, 38.2% of adolescent boys and 31% of adolescent girls had EIs, resulting in a difference of 7.2%. An interesting finding was that the EIs increased to 40.7% (boys) and 32.1% (girls) when the sample was restricted to students who wanted to enrol or were enrolled in lower VT. As we expected, the gender gap in EIs differed slightly depending on the educational intent. We observed higher EIs and a higher gender gap in EIs among students who did not intend to enrol in higher education (Model 3). These results reinforced and corroborated the existing evidence that around 60% of self-employed people are not highly educated (Laviada et. al., 2022). The results may provide useful insights into areas that may require further attention and could guide policymakers in developing appropriate interventions and programmes.

The estimates in panel (a) revealed that the gender gap in EIs was fully explained (more than 100%) by differences in observed characteristics between boys and girls in the case of Model 1 (full sample) and Model 2 (lower VT and last year of secondary compulsory education). Therefore, if boys and girls had similar characteristics, the gap would be reversed, putting boys at a disadvantage. When the sample was restricted to students enrolled or wanting to enrol in VT (Model 3), roughly 78% of the gender gap was attributed to gender differences in observed characteristics. In this specific context, the estimates revealed that 6.7 percentage points of the overall gender gap of 8.6% can be attributed to differences in observed characteristics between boys and girls. Even though, the gender gap was not fully explained in this sample, the explained part was still large.

The unexplained component was statistically insignificant as a whole in all the samples considered, indicating that no significant gender gap remains. This suggest that almost the full gap is explained by the observed variables. Generally, in the entrepreneurship literature, specifically latent entrepreneurship, the explained component represents less than 20% of the gender gap (Bönte and Piegeler, 2013). In situations when the unexplained component is too big (higher than 60-70%), it is considered a heterogeneity problem. Therefore, Blinder–Oaxaca decomposition has been criticised for

not being a suitable technique for studying gender gaps (Meara et al., 2020). However, in the present paper, our results might not generate this concern.

One interesting question is whether differences in GRM variables contribute to explaining the gender gap in EIs and to what extent they do so. To quantify the contribution of explanatory variables, including the GRM, a detailed Blinder–Oaxaca decomposition was performed. Panel (b) of the Table 4.4 presents the results of this decomposition. A closer look at the estimates revealed that the gender gap in EIs was mainly driven by the gender difference in MRMs, which was observed in the three samples studied. The contribution of gender differences in MRMs ranged from 40% to 46% of the overall gender gap. Thus, roughly half of the gender gap could be explained by boys' and girls' different selections of their career references. For instance, in the case of the decomposition of Model 1 (full sample), 2.4 percentage points of the gender gap could be attributed to the difference in MRMs; in relative terms, this was about 40% of the overall gender gap. The gender gap in EIs was due to a tendency of boys to choose the same gender role model. A possible explanation for this is that individuals not only choose their role models along gender lines (Lockwood, 2006; Sumner and Brown, 1996) but also aspire to and work in jobs traditionally associated with their own sex (Beede et al., 2011; Chambers et al., 2018). Additionally, we reported the contribution of gender differences in the absence of role models, which seemed to be negative. For example, if the distribution of this particular variable was identical for girls and boys, the gender gap in EIs would be increased by 19.5%-26.7%.

The second largest contributor to the gender gap appeared to be a gender difference in sector aspirations. Regardless of the sample used, the results of the decomposition analysis indicated that more than one-third of the gender gap in EIs could be explained by boys' and girls' different selections of their sector. If the distribution of sector aspirations was identical for both adolescent girls and boys, the gender gap in EIs would be reduced (30%-34%). As shown in the previous section (for descriptive statistics, see Table 4.2), girls aspired to work in the tourism and commercial sectors. Boys, in contrast, aspired to work in sectors like industry, construction, and agriculture.

Divergence in skills and job characteristics were found to be significant contributors to gender gap in EIs in all the models studied. Skills captured students' self-perceived competence in math, commercial, and effort skills, whereas job characteristics captured students' specific job qualities. Gender differences in skills contributed between 1.1 and 1.5 percentage points to the gender gap, which in relative terms corresponded to 13.6%-20.1% of the overall gap, depending on the sample. In other words, if the distribution of skills was identical for girls and boys, the gender gap in EIs would be reduced. These findings were not surprising because in the literature has shown that girls (females) often have lower self-confidence and a lower perception of their own abilities than boys (males) (Bibeault, 2019; Lindeman et al., 1995). In their study, Dahlbom et al. (2011) used a sample of Swedish high school students to show that whereas girls tend to be underconfident with respect to their mathematics performance, boys are actually overconfident. The contribution of gender differences to the three factors of job characteristics seemed to be smaller than the previous measures (8.2%-15.9%). Contrary to our expectations, gender differences in risk preference could explain a negligible portion of the gender gap in EIs (significant only in Model 1), and these effects were much lower than those in the existing literature (5.6% vs. 9%) (Bönte and Piegeler, 2013). Finally, the remaining control variables like parental role models and individual and family characteristics were not relevant in any of the samples. Notably, both paternal and maternal entrepreneurial role models were significant drivers of EIs, however, when we applied the Blinder–Oaxaca decomposition to explore the gender gap in EIs, the contribution of this variable to explaining,

Table 4.4
Gender gap in EI: aggregate and detailed Blinder-Oaxaca decomposition

	Entrepreneurial intentions					
	Model 1		Model 2		Model 3	
	Decomp.	Relative impact (%)	Decomp.	Relative impact (%)	Decomp.	Relative impact (%)
a) Aggregate decomposition						
Mean of boys	0.364***		0.382***		0.407***	
	(0.009)		(0.011)		(0.015)	
Mean of girls	0.305***		0.310***		0.321***	
	(0.009)		(0.011)		(0.016)	
Gender gap	0.059***		0.072***		0.086***	
	(0.012)		(0.016)		(0.022)	
Explained	0.071***	119.66	0.075***	103.18	0.067***	77.66
	(0.009)		(0.011)		(0.017)	
Unexplained	-0.012		-0.002		0.019	
	(0.015)		(0.019)		(0.026)	
b) Contributions of Covariates to the Explaining Part						
Inspirational role model						
MRM	0.024**	40.17	0.033***	45.92	0.037**	42.82
	(0.009)		(0.012)		(0.017)	
No role model	-0.012*	-19.49	-0.019**	-25.73	-0.021*	-26.74
	(0.006)		(0.008)		(0.011)	
Sector aspirations	0.020***	33.90	0.022***	30.29	0.029**	33.80
	(0.005)		(0.007)		(0.012)	
Educational variables	0.017***	28.31	0.016***	22.41	0.005	
	(0.003)		(0.004)		(0.004)	
Skills	0.011***	18.47	0.015***	20.06	0.012**	13.66
	(0.003)		(0.0038)		(0.005)	
Job characteristics	0.009***	15.93	0.008***	11.48	0.007*	8.22
	(0.003)		(0.003)		(0.004)	
Risk preference	0.003***	5.59	0.002		0.000	
	(0.001)		(0.002)		(0.002)	
Parental role model	0.001		-0.001		0.001	
	(0.001)		(0.001)		(0.002)	
Family characteristics	-0.001		-0.002		0.001	
	(0.001)		(0.002)		(0.00)	
Individual characteristics	-0.001		0.001		-0.002	
	(0.002)		(0.002)		(0.004)	
b) Contributions of Covariates to the Unexplaining Part						
Skills	0.238***		0.301***		0.293**	
	(0.064)		(0.082)		(0.104)	
Job characteristics	0.061**		0.079**		0.144***	
	(0.027)		(0.035)		(0.049)	
Individual characteristics	-0.001		0.001		0.190**	
	(0.001)		(0.002)		(0.077)	

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Table 4.4 (continued)

Family characteristics	-0.001	-0.001	-0.037*
	(0.001)	(0.001)	(0.02)
Observations	5,755	3,560	1,916

Notes: Numbers in parentheses are standard errors. *** 1%, ** 5%, * 10%. The decomposition method was conducted with three different samples of students: Model 1 (contains all the grade levels, specifically the last year of compulsory secondary education, lower VT, and high school), Model 2 (includes lower VT and the last year of secondary compulsory education), meanwhile Model 3 (includes lower VT joint with those students enrolled in the last year of secondary compulsory education who expressed their intentions of enrolling in lower VT).

this gap was non-existent. OLS and Blinder–Oaxaca decomposition are two different methodologies. Generally, the decomposition method aims to explain differences in means between groups (in our case between adolescent boys and girls). The lack of contribution of the parental entrepreneurial role model to the gender gap do not need to rise a concern. A variable that is a significant driver of EI does not automatically have to be a contributor to the gender gap in EI. This might be because other factors play a more substantial role in creating the observed gender gap, and indeed, this is what we observed.

The comparison of the different samples studied revealed two main findings. First, substantial differences were observed in the results of decomposition across the various samples. The decomposition of the full sample (Model 1) provided an overview of the average gender gap in EIs. However, when we further investigated the decomposition by subsample, we found that the average gender gap was even higher, particularly among students who were enrolled in or expressed an interest in lower VT. Second, it is noteworthy that differences in GRMs, specifically MRMs, played a significant role in explaining a larger portion of the gender gap in EIs compared to differences in other observed endowments like sector aspirations, educational variables, risk preference, and job characteristics.

4.7 Conclusion

There is bountiful empirical research on EIs in the economics literature. However, very little attention has been paid to topics beyond the effect of the traditional predictors on EIs. Internal factors, such as individual and family characteristics, and external factors, such as entrepreneurship education programmes, are important drivers of EIs. Gender has also been found to be an essential predictor of EIs. Research on both adolescents and adults consistently shows significant gender differences in EIs, with females often finding themselves at a disadvantage. However, empirical studies focusing on the determinants of the gender gap in EIs are virtually non-existent. To better understand individuals' EIs, it is important to move away from the most conventional empirical studies. In this paper, we attempt to do so. The aims of this research are twofold: first, to investigate the impact of GRM-related variables, specifically inspirational role models and parent entrepreneurial role models, on EIs; second, to examine the determinants of the gender gap in EIs of Spanish adolescents. Using a unique dataset, we account for relevant factors, many of which previous empirical studies have not considered.

Our regression analysis suggests that EIs are positively related to GRMs. This effect remains generally significant even after we conduct separate estimations for adolescent boys and girls. We find a significant positive association between having an MRM and EIs for girls, but not for boys. Furthermore, we find that the gender of the parental role model has heterogeneous effects on the offspring, suggesting that the gender role model fosters EIs differently for each gender. These results indicate that adolescent boys seem to have an advantage in this area. Our estimations emphasise the importance of career references for adolescents, which are associated with higher levels of EIs. The gender of adolescents' role

model seems to play a crucial role. The presence of gender-specific role models influence EIs differently for boys and girls. Among the control variables, math skills, commercial skills, and job characteristics measures (which are related to autonomy and creativity) are positive and highly significant in explaining EIs. For risky behaviour, we find a similar tendency as the previous ones, which is in line with previous studies conducted by Barbosa et al. (2007) on university students and by Afandi and Kermani (2015) on adults. However, the gender effect becomes insignificant when controlling for the set of control variables, suggesting that the effect disappears when these variables are considered. This does not mean that the gender gap does not exist; rather, it indicates that the gender gap is explained by the variables we controlled for. This result is corroborated by the decomposition method, which shows that the gender gap in EIs is fully explained by differences in observed endowments between adolescent boys and girls.

The entrepreneurship literature has focused on studying the gender gap in latent and nascent entrepreneurship, often employing the Blinder–Oaxaca decomposition method (Bönte and Piegeler, 2013). This study finds that the differences in observed characteristics between boys and girls only explains a portion of the gender gap (typically less than 20%). In this paper, we decompose the gender gap in EIs in three different samples for the very first time. We find that in two of the samples (Models 1 and 2), the gap is fully explained by differences in observed characteristics, indicating that if adolescent boys and girls had similar characteristics, the gap would be reversed. However, when we restrict the sample to students who present low interest in pursuing tertiary education, the differences in observed characteristics explain roughly 78% of the gap, which is still substantial. The results of the detailed decomposition analysis suggest that gender differences in MRMs contribute significantly to the gender gap in EIs. We observe that around half of the gender gap can be explained by adolescent boys' and girls' different selections of the gender of their career reference. Hence, our results emphasise the importance of GRMs and their influence on shaping EIs.

Additionally, our analysis reveals that gender differences in sector aspirations, math skills, risky preferences, and job characteristics (factor 2) play a significant role in explaining the gender gap in EIs, although their contribution is relatively small compared to MRMs. Regarding risky behaviour, the results suggest that gender differences in risk preference explain only a negligible portion of the gender gap in EIs. The effect size of risk preference in explaining the gender gap is relatively lower than in previous studies: 5.9% compared to 9% (Bönte and Piegeler, 2013).

Admittedly, like all the studies in the literature, the current study is subject to certain limitations, however, these limitations provide opportunities for future research. First, this study was conducted using a sample of Catalan students representing the northeast region of Spain. Although this region is located in Western Europe, the results of this research are dependent on specific cultural conditions and regional location and may not be readily generalised to other countries. Therefore, we encourage future researchers to examine whether similar patterns emerge in other geographical locations in more detail.

Second, like many studies in the literature, this paper focuses on students' intentions rather than entrepreneurs' behaviours. However, it is essential to acknowledge that intentions may not necessarily translate into actual future behaviours. For instance, individuals might express a preference for self-employment in the survey, but they may choose a totally different occupation or career path. This concern is a common issue in the literature. In cognitive psychology, intentions are generally considered a reliable predictor of behaviour (TPB). In the literature, there is no other accurate way to measure attitudes towards entrepreneurship, so empirically, individuals' intentions are often considered one of the best predictors of action. There is evidence supporting the idea that intentions are translated into later behaviour. Schoon and Duckworth (2012) found an association between EIs assessed at age 16 and

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subsequent employment as an entrepreneur at age 34. Consequently, in this study, adolescent EIs are viewed as a reliable source of information.

Third, one might ask whether GRMs remain stable over adolescents' life span or whether they change as adolescents progress through different life stages, acquire new experiences, and are exposed to public interventions. During childhood and early adolescence, individuals' role models might be from their close environment, such as family members or teachers. However, once the individuals grow up, their role models may expand to include more distant figures such as successful people and industry leaders. Given that our study uses cross-sectional data, we are not able to capture potential changes in individuals' GRMs over time. Nonetheless, further research could examine GRMs and EIs by using longitudinal data.

The above findings underscore the importance of considering a comprehensive set of factors when measuring both the drivers of EIs and the determinants of the gender gap in EIs. Gender differences in sector aspirations, education variables, skills, job characteristics, and risky preferences do contribute to the gender gap in EIs, but their individual effects are relatively small compared to the contribution of MRMs. In terms of policy implications, simply, increasing girls' EIs by adding more MRMs or reducing boys' EIs with more feminine role models is not a solution. Instead, a more effective approach is to incorporate feminine role models into motivational and education programmes within schools as well as in media representations. The goal is no to reduce boys' EIs but to help girls internalize that self-employment can be a viable career option for girls and with a feminine role model. This approach can be achieved by (1) designing initiative that showcase the achievement of outstanding women across diverse fields (e.g. inviting successful women as guest speakers in schools, holding informative sessions or talks about successful women, and creating motivational programmes that highlight the successes of outstanding women to encourage girls in their pursuit of non-traditional career), (2) increasing the visibility of successful women in media representations. For instance, Porter and Serra (2020) conducted a field experiment aimed at boosting women's participation in economics, documenting that exposure to successful females in the field increased females' students' likelihood of majoring in economics by 8 percentage points. It would be interesting to see such an experiment in the field of entrepreneurship, and its effect.

The results of this study may be appropriate for designing and implementing entrepreneurship courses and initiatives. For instance, entrepreneurship education can be incorporate into school curricula. In Spain, a subject related with entrepreneurship called 'Empresa e iniciativa emprendedora' is included in both lower and upper VT curricula. Another direction may be to integrate entrepreneurship courses in secondary compulsory education, ensuring that knowledge reaches all students. It is impossible to have an entrepreneurial parent for everyone, but education programmes offering exposure to an entrepreneurial role model from an earlier age could shape the EIs of individuals without entrepreneurial parents. Scherer et. al. (1989b) proposed a similar pathway. Additionally, career planning workshops, could be developed with the goal of fostering non-stereotypic attitudes about careers, encouraging the perception of occupations as being open to both women and men. Policymakers and educators aiming to promote gender equality and foster EIs among adolescents should consider aspects such as gender, educational expectations and GRMs while designing and implementing entrepreneurship educational courses and initiatives.

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CHAPTER 5

General Conclusions, Future Research, and Personal Reflections

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General conclusions, future research, and personal reflections

Empirical studies focused on gender differences in the economics literature are not new, but the integration of gender into economic analysis has gained more prominence in recent decades. Previous studies have mostly studied gender differences in various disciplines, including sociology and psychology. However, studies within the economics literature have often relied on samples comprising university students or the adult population. It is vital to go one step further and examine gender differences before students make their most important educational choices, such as self-selecting into different fields and levels of education. These kinds of examinations are crucial, because gender educational segregation affects career and field choices, which in turn affect future outcomes. Despite the abundant literature addressing gender differences across various domains, including education, salary, and occupation, in Western countries, empirical evidence focused on understanding the determinants of the gender gap is virtually non-existent. Therefore, we attempt to fill this vacuum through the present dissertation.

This thesis comprises three distinct empirical studies presented in separate chapters and unified by a common aim. We delve deeply into the multifaceted aspects of gender differences in school outcomes, and our central emphasis is on dimensions such as educational expectations/aspirations, occupational aspirations, and salary expectations among other measures. A sample of adolescents in Catalonia, Spain, is used to conduct the research.

This dissertation makes noteworthy contributions to the literature on gender studies, birth order, the economics of education, and labour economics in several key aspects. First, from an economic perspective, we empirically analyse the birth order effect across a wide spectrum of cognitive abilities, personality traits, parental involvement, and life expectations (e.g. salary expectations, occupational aspirations, and educational expectations/aspirations), aiming to identify why first-born children tend to have an idiosyncratic advantage among younger siblings (Chapter 2). Second, we explore novel factors that can shape students' salary expectations and occupational aspirations. Moreover, we extend the traditional analysis of the gender gap by shedding light on its drivers (Chapters 3 and 4). The contributions of this thesis are made possible through the utilisation of a rich data source pertaining to students in the last year of secondary compulsory education and post-compulsory secondary education (high school and lower vocational training). Specifically, we gather information across a large variety of dimensions, including individual and family characteristics, personality traits, career references, and stereotypes, which have often been overlooked in previous empirical studies – probably because of lack of access to a large representative dataset. While our sample is not random, it is quite representative of the broader population of Catalan students in secondary education. Despite this, we may plausibly assume that the schools' decision to participate in the survey is random.

The findings obtained from the empirical studies have already been described in detail in each chapter. Given that the primary focus of the dissertation is on gender differences, we want to emphasise some of them from a gender perspective. Generally, the findings illustrate heterogeneous effects among genders, a prevalent pattern across all the empirical studies we conducted. In Chapter 2, where the birth order effect and its drivers are studied, we document differences between boys and girls. For instance, for cognitive abilities, we find that, compared to the firstborn, last-born girls are 20 percentage points less likely to have a grade of A or B in math, while this figure is 13.2 percentage points for boys. In Chapters 3 and 4, where salary expectations and occupational aspirations are explored, substantial gender differences emerge. Specifically, we find robust evidence of a gender gap in expected earnings and EIs, with girls often finding themselves at a disadvantage. Additionally, we identify drivers of the issues we study. In the first empirical study (Chapter 2), when we explored the potential drivers of the persistent

birth-order pattern, we observed that there exists birth-order pattern in the type of personality traits, habits, and non-cognitive abilities. In the last two empirical studies, the decomposition technique illustrates that the gender gap is largely explained by the covariates we consider. More specifically, gender differences in MRMs emerge as the most important covariate in explaining the gender gaps.

While significant progress has been made in understanding gender differences in school outcomes and labour market expectations, it is essential to acknowledge the limitations of this thesis. The limitations mainly pertain to the dataset. Though we address specific limitations in each chapter, we aim to highlight certain aspects that can be generalised to the entire thesis. First, the data has been collected from Catalonia, a northeast region of Spain, and from students enrolled in specific education levels. Thus, careful consideration is required before our results' generalisation to other contexts. It would be useful to replicate our studies to see whether the findings can be applied to diverse education levels and populations (different regions and countries).

Second, this thesis relies on a cross-sectional sample to study gender differences in school outcomes. Gender differences might evolve over different stages of adolescence. Our data, unfortunately, does not capture changes over time. There is a definitely need for longitudinal studies to determine whether gender differences evolve because of dynamic changes (e.g. exposure to new information, personal development, and personal experiences).

Third, the data used in this study rely on self-reported information from individuals, which might generate concern among researchers regarding the data's potential subjectivity. Self-reported data might not always accurately reflect the truth. Socially desirable bias is one of the potential reasons for this. For instance, students might express aspirations they believe are expected or valued by society rather than their true aspirations or beliefs. An alternative approach to mitigate this concern would be to use observed or objective measures, such as official records. However, the measures employed in this study are generally impossible to collect from official records. Nonetheless, where feasible, official records should be incorporated. For example, in the analysis, self-reported test scores are used; however, to reduce biases associated with self-reporting, collecting information through official records (academic records) could have been a viable alternative. Incorporating some objective measures in the estimations could enhance the findings' robustness and validity.

Finally, this thesis studied gender differences in school outcomes through the exploration of a wide variety of students' expectations/aspirations. In the cognitive psychology literature, intentions are often considered the primary stage of behaviour and, therefore, one of the best predictors of action. However, researchers have expressed concern that adolescents might not accurately predict their future outcomes or that their expectations/aspirations might change over time. For instance, in the labour literature, a close correspondence between students' expectations and future outcomes has been documented (Schoon and Duckworth, 2012; Webbink and Hartog, 2004). It is crucial to acknowledge that expectations/aspirations are complex phenomena shaped by various factors such as economic conditions, including whether the country is experiencing an economic recession or growth. Studies have shown that the economic cycle tends to affect students' expectations/aspirations for their future outcomes[48]. When the survey was conducted, Spain was facing economic growth, which could have

[48] For instance, by using a sample of college students in the United States, Lench and Bench (2014) studied whether economic indicators predicted students' expectations from their personal futures (likelihood of getting a divorce, of being unhappy in their career, and of living past age 60) before, during and after the economic recession (2007-2010). They documented that the overall condition of the national economy influenced college students' expectations from their personal futures tend to be closely influenced by the overall condition of the national economy.

positively affected adolescents' expectations/aspirations. Replicating this empirical analysis under different economic conditions would be interesting to ascertain whether gender differences in school outcomes widen or narrow. During an economic recession, students become less optimistic about their future outcomes. One interesting line of research is to see whether the economic environment might affect girls much more than boys. The gender differences found in this dissertation may be different under economic recession conditions.

As a corollary, it is noteworthy to mention that in the course of this fascinating exploration, a discernible pattern has surfaced, revealing gender differences in school and labour market expectations during adolescence. These findings have important implications, particularly for policymakers and practitioners engaged in designing targeted interventions or tailored education programmes. We believe it is crucial to acknowledge and actively address the gender dimension to formulate effective interventions, ultimately contributing to a more inclusive environment, a more progressive society, and more equitable opportunities for all students. These policy implications align with global initiatives aimed at fostering equality, such as the fifth goal of the U.N. ('Achieve gender equality and empower all women and girls'), or the European Commission action for equality ('The Gender Equality Strategy 2020-2025'). The World Economic Forum publishes the 'Global Gender Gap Report' annually to tracking the progress of countries' efforts to close gender gaps across several dimensions.

This thesis has shown that there is still room for studying gender differences in school outcomes and labour market expectations. In particular, exploring the potential drivers of the birth order effect as well as reducing the gender gap in expected earnings and EI would be beneficial. We plan to broaden and deepen our research agenda on gender differences. Numerous areas deserve attention from an economic perspective, but our primary interest lies in delving into the gender gap in political participation, occupational gender segregation (examining the gender gap in positions of power and leadership in the workplace), and educational gender segregation (focusing on the gender gap in the science, technology, engineering, and mathematics fields). It is vital to study these issues from an early stage, even before students make self-selections in college, to understand the drivers of gender gaps and design effective policies and education programmes that contribute to enhancing gender equality.

As we conclude this dissertation, it feels fitting to offer a personal reflection on the transformative research journey I have undertaken. Pursuing this PhD has not only enriched my comprehension of the subject matter but also presented diverse challenges. From the very beginning, I have heard that walking this path is akin to climbing one of the highest mountains. Initially, I may not have paid much heed to that analogy, but as the thesis progressed, its accuracy became abundantly clear.

The period making the inception of this thesis was filled with excitement, curiosity, determination, and a hint of nervousness. Obstacles emerged during the process. Balancing the demands of the thesis, my teaching responsibilities, and my personal commitments demanded meticulous time management, unwavering consistency, and self-discipline. There were days when progress seemed elusive. These were days filled with research and analyses that led nowhere, with hypotheses that were left unconfirmed, and with frustrating errors. Sometimes, the PhD imposter syndrome reared its head, prompting the realisation that it was crucial to address my skill deficiencies. The moments of uncertainty, however, were counterbalanced by the unwavering support of my academic advisor and my family. These challenging days were mitigated by moments of elation, when new paths were discovered and advancements were made in terms of compiling the relevant literature, writing small sections, obtaining definitive results, or closing chapters.

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I am sharing this personal reflection not just to offer insights into the research process but to resonate with people who aspire to undertake or are already on this demanding and rewarding odyssey of academic exploration.

In closing, I express my profound gratitude for the countless opportunities this dissertation has afforded me. Throughout this academic journey, I have improved academically and personally. The lessons I have learned will undoubtedly shape my future endeavours. I hope this research serves as a stepping stone, inspiring further studies on gender differences across diverse outcomes and fostering greater inclusion of the gender perspective in interventions' and programmes' design and implementation.

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