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NADA TÃO PRÁTICO COMO UMA BOA TEORIA? RETORNOS DO ENSINO PROFISSIONAL NO INÍCIO DA CARREIRA

NOTHING AS PRACTICAL AS A GOOD THEORY? RETURNS TO VOCATIONAL SECODARY EDUCATION IN EARLY CAREER YEARS

2021

Universidade de Aveiro
2020

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NOTHING AS PRACTICAL AS A GOOD THEORY?

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Dissertation presented to the University of Aveiro to fulfil the necessary requirements to obtain the Master's degree in Economics, held under the scientific guidance of Doctor Hugo Casal Figueiredo, Assistant Professor in the Department of Economics, Management, Industrial Engineering and Tourism at the University of Aveiro.

FCT Fundação para a Ciência e a Tecnologia

I dedicate this dissertation to my mother, for the courage and support she has given me in all the challenges of life.

the jury

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acknowledgements

I thank all my family, especially my mother, for all the unconditional support, affection and understanding and for providing me with the best possible conditions to achieve my goals and dreams. I also thank my friends for the constant presence, friendship and help in reaching this stage.

I would like to thank the rest of my family, friends and colleagues for their support during this academic journey.

To all of them, a big thank you.

palavras-chave   Ensino profissional, retornos, retornos salariais, desigualdade salarial, transição para o mercado de trabalho.

resumo   Portugal alargou, recentemente, a escolaridade obrigatória até aos dezoito anos, numa tentativa de aumentar os níveis de escolaridade entre a população activa. Essa aposta coincidiu com o forte ressurgimento de cursos de educação secundária de orientação profissional, que agora representam quase metade das novas coortes de estudantes. Um número muito maior de diplomados do ensino médio enfrenta, portanto, a escolha de começar a trabalhar imediatamente após a escolaridade obrigatória e o de escolher uma via mais profissionalizante ou mais generalista. Esta dissertação estima e decompõe os retornos salariais associados à escolha de uma trajetória mais ou menos profissionalizante no ensino secundário. Analisamos, em particular, os salários associados às trajetórias educacionais orientadas para o profissional e as de orientação mais geral ao longo dos primeiros cinco anos de emprego. Depois de descrever cuidadosamente as mudanças institucionais associadas à reorientação profissional do sistema educacional desde 1983, usamos um conjunto de dados vinculados entre empregador-empregado que coleta informação referente a todos os assalariados do setor privado e não lucrativo recentemente diplomados por uma destas duas vias de ensino. Em linha com o debate sobre as vantagens ou perigos da especialização precoce, os nossos resultados sugerem que, controlando para um efeito de outras variáveis, um curso profissional está associado a salários mais baixos (1.21%) no início da carreira mas que demonstram uma tendência mais acelerada de crescimento (0.37%) com maiores níveis de experiência. Os resultados mostram também, contudo, que existe um nível de desigualdade salarial importante entre homens e mulheres (com as mulheres a ganhar menos 7,37% do que os homens) e que esta diferença é crescente com maiores níveis de experiência.

keywords   Vocational education; returns; earnings; wage inequality; labour market transition

abstract   Portugal has recently extended compulsory schooling until the age of eighteen, in an attempt to increase educational levels among the working population. This thought coincided with the strong resurgence of vocationally oriented secondary education courses, which now represent almost half of the new student cohorts. A much larger number of high school graduates therefore face the choice to start working immediately after compulsory education and to choose a more vocational or more general approach. This dissertation estimates and breaks down the wage returns associated with choosing a more or less vocational path in secondary education. We analysed, in particular, the salaries associated with educational trajectories oriented towards the vocational and those of more general orientation during the first five years of employment. After carefully describing the institutional changes associated with the vocational reorientation of the educational system since 1983, we use a data set linked between employer-employee that collects information regarding all private and non-profit employees recently graduated through one of these two education pathways. In line with the debate on the advantages or dangers of early specialization, our results suggest that, controlling for an effect of other variables, a vocational course is associated with lower wages (1.21%) at the beginning of the career which show a more accelerated growth trend (0.37%) with higher levels of experience. The results also show, however, that there is a significant level of wage inequality between men and women (with women earning 7.37% less than men) and that this difference is growing with higher levels of experience.

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ACRONYMS LIST

AIPW	Augmented Inverse Probability Weighted
ARA	Autonomous Region of Azores
ARM	Autonomous Region of Madeira
CET	Cursos de Especialização Tecnológica
CNE	Conselho Nacional da Educação
DGEEC	Direção-Geral de Estatísticas da Educação e Ciência
IALS	International Adult Literacy Survey
INE	Instituto Nacional de Estatística
ISCED	International Standard Classification of Education
NCDS	National Child Development Survey
NUTS	Nomenclatura das Unidades Territoriais para Fins Estatísticos
OECD	Organisation for Economic Co-operation and Development
UN	United Nations
QP	Quadros de Pessoal
TESP	Titulares de Diploma de Técnico Superior Profissional
UNESCO	United Nations Educational, Scientific and Cultural Organization

1. INTRODUCTION

Vocational courses were born as a response to a very explicit social calling, namely from more disadvantaged social groups, and as a way of responding to many concerns regarding the employability of specific youth groups (Azevedo, 2009). This type of education has gained considerable traction in Portugal in recent years. According to Azevedo (2010, 2014), studies in this area have accelerated since 1989, when vocational schools were created by a joint initiative of the Ministries of Education and Labour, under leadership of the Ministry of Education (Barbosa et al., 2019). In the late 70's, qualification-oriented education was almost non-existent and the one that existed was poorly organized and had no great expression in the number of students in the school system (Alves, Almeida, Fontoura, & Alves, 2001; Barbosa et al., 2019; Cunha, 1993). In the 80's, although in a poorly articulated manner, several pathways of vocational training emerged mainly at the secondary level (Pedroso, 1993). Technical-vocational and vocational courses were introduced in secondary schools (*Despacho Normativo n.º 194-A/83*, 1983) and vocational courses were created in vocational schools (Decreto-Lei nº 26/89 de 21 de janeiro, 1989). Nowadays, Portugal is again betting heavily on vocational education as an alternative to the more traditional educational path. In fact, current policy objectives point to an equitable division of secondary school students by the two paths (OECD, 2018), showing that around 50% of students (data from 2018) enrol in vocational secondary education, continuing to increase until today.

Portugal is one of the OECD countries with lower levels of education among the workforce (Alves, Centeno, & Novo, 2010; Hartog, Pereira, & Vieira, 2001; OCDE, 2012, cited by Sá et al., 2014) and one of the european countries where the education returns are higher, which means that skills are particularly valued in the portuguese labour market (Budria & Nunes, 2005; Pereira & Martins, 2002). With the implementation of vocational education, since 1983, the levels of education increased as more young people chose to enrol in courses that corresponded to their needs, consequently they did not abandon their studies, but obtained more and better qualifications for the labour market.

Vocational education can be understood as the solution to improve the opportunities of youths who lack the resources, skills or motivation to continue with traditional post-secondary education trajectories, but also provides useful skills to prepare youths for a smooth entry into the labour market (Eichhorst, Rodriguez-planas, Schmidl, & Zimmermann, 2015; Schmelzer & Schneider, 2019) by aligning initial education more

closely to particular vocations and tasks demanded. According to Barbosa et al. (2019), through the International Type of Education Classification (ISCED), UNESCO defines vocational education as a *"teaching designed primarily to enable participants to acquire practical skills, know-how and understanding necessary to work in a particular profession or trade or group of professions or trades".*

Nonetheless, there is a discussion between the benefits of taking a vocational path instead of a general path, mainly respecting the financial returns that each type of education can bring to the individual in the labour market. The European Center for the Development of Vocational Training (CEDEFOP, 2011) register a set of benefits at the macro, meso and micro levels of taking a vocational education path. It is assumed that at the macro level, higher economic growth, better labour market results, crime reduction, social cohesion, improved health and intergenerational benefits. At the meso level, the benefits include increases in firm performance and the productivity of employees, the inclusion of disadvantaged groups. Finally, some authors reveal that at the micro level, the benefits are greater employment opportunities, greater professional status, life satisfaction and individual motivation. Authors such as Bertocchi & Spagat (2004), Brunello & Rocco (2017), Golsteyn & Stenberg (2017), Hampf & Woessmann (2017), Hanushek, Schwerdt, Woerrmann, & Zhang (2017), Hartog et al. (2018) and Kreisman & Stange (2015) believe that, in the short term, vocational education is assumed to facilitate the transition from school to work, especially for young students who are less academically inclined. In the long term, however, vocational education entails the risk that the demand for the young students' particular skill decreases at a future point in time. General education, on the contrary, is assumed to reinforce the flexibility to find out new skills and to create individuals less sensitive to long term changes in labour demand. This could mean a favourable increase in future incomes or career opportunities over time. Meer (2007) cautions, however, that *"simply because those who are currently on the academic or general track [can] earn more than vocational students does not mean that shifting vocational students to those tracks would increase their income",* for instance it is just as reasonable that vocational graduates earn less because of unobservable characteristics that can be correlated with track choice as it is that vocational education is somehow diminishing their earnings potential. Through his results, the author realises those that are most suited to the technical track tend to gravitate towards that choice and are best off there. Depending on the professional track (technical or business tracks), vocational graduates can benefit from a greater salary than if they had shifted to a general education.

With that in mind, our aim in this dissertation is to estimate and decompose the earnings returns of choosing a more vocational-oriented path in high school. Education can be oriented differently depending on the country we are studying. For instance, in southern Europe, the US and the UK, modest shares of the student population attend vocational schools before age 18. In other European countries, such as Austria, Germany, Slovakia and the Netherlands, on the contrary, students are tracked as early as age 10 or 12 and complete apprenticeships at the secondary level (Golsteyn & Stenberg, 2017). Portugal is an interesting case-study in this regard, since is a country that in a few hears it managed to develop and improve its teaching and values related to education, from schooling rates to early dropout rates, resulting in a change in young students' minds. They realised that it would be beneficial to open other student paths to be able to keep up with the needs of young people and because and with this vision the vocational education has been developed to combat flaws that the old education was not able to combat so efficiently. Since 2009, school is mandatory until the age of 18 and students can decide at age 12 if they want a more practical- or theorical-oriented education. Our focus will be laid on young students who complete secondary education (Level III), we believe they already have the necessary characteristics to choose an academic path more suitable to their needs and also these students are closer to entering the labour market, since it is in our interest to understand how their types of education affect their future incomes.

The first five years are essential to the individual and to the company, as the individual gains more experience and knowledge. Those are equally years that give companies a disproportionate amount of information and knowledge regarding workers productivity and their ability to achieve objectives already established at the firm-level. We hope to find some kind of variance due to the difference that exist in both types of education and the way they are addressed to students, so we believe that exit effects that may already be visible in these first five years of professional experience, that is why we will focus our study between the years 2013 and 2017.

The dissertation is structured as follows. First we will discuss the multiple changes that happened in Portugal regarding the development of vocational education in schools and at the secondary level, also considering the path after secondary that young students take. Still within the literature review, we will focus on the returns of vocational secondary education and what happens to individuals that finish high school and enter the labour market with vocational courses. In the following sections, we present the

data used the econometric methodology as well. Then we derive and discuss our results and draw conclusions in the last section.

2. THE RESURGENCE OF VOCATIONAL EDUCATION IN PORTUGAL

2.1. Changes in Compulsory Education and the Growth of Vocational Secondary Education

Vocational secondary education began to gain traction in 1986, with the creation of the Basic Law of the Educational System, where was explained the importance of secondary education and the bases for vocational education and consequent vocational schools were programmed. This coincided with compulsory education being established until the 9th grade ("Decreto-Lei n.º 46/86 de 14 de outubro," 1986). In item "e", Art.9 of the Basic Law, the objective of secondary education overall was to provide labour market contacts and experiences, reinforcing the mechanisms of approximation between school, active life and community, stimulating the innovative and intervening function of school. In item "f" of the same article, the established aim was to *"encourage the orientation and vocational training of young people, through technical and technological preparation, with a view to entering the labour market"* (E. C. Martins & Martins, 2016). In spite of vocational education being regulated by this Basic Law, other important dispositions were structured in the Decree-law no286/89 August 29 ("Decreto-Lei nº286/89 de 29 de agosto," 1989). This included the curriculum plans for vocational schools of basic and secondary education, which were revoked later, with the creation of Decree-law nº 4/98 of January 8 (Decreto-Lei nº 4/98 de 8 de janeiro, 1998). This last decree clarified the legal nature of vocational schools. Since then, vocational education began to get closer to younger students. Decree-law nº115-A/98 (Decreto-Lei nº115-A/98, 1998) reorganized the existing courses and the new ones available, betting on a more targeted education for the labour market. In 2004, the guiding principles of organization and curricular management were established, as well as the assessment of learning at secondary school level in order to combat school failure and dropout, which is still high (around 40%, according with DGEEC data). These principles were eventually approved by Decree nº 550-C/2004 (Portaria nº550 C/2004 de 21 de maio, 2004), later revoked by Decree nº 797/2006 august 10 (Portaria 797/2006 de 10 de agosto, 2006).

Only in 2009, due to the revision of the Basic Law, did the completion of secondary education became mandatory. A National Qualifications Framework was equally established, grouping students according to their respective levels of education. This legal evolution in education (described in figure 1) allowed an improvement in the

dropout and education outcome rates and improved access to labour market and post-secondary education.
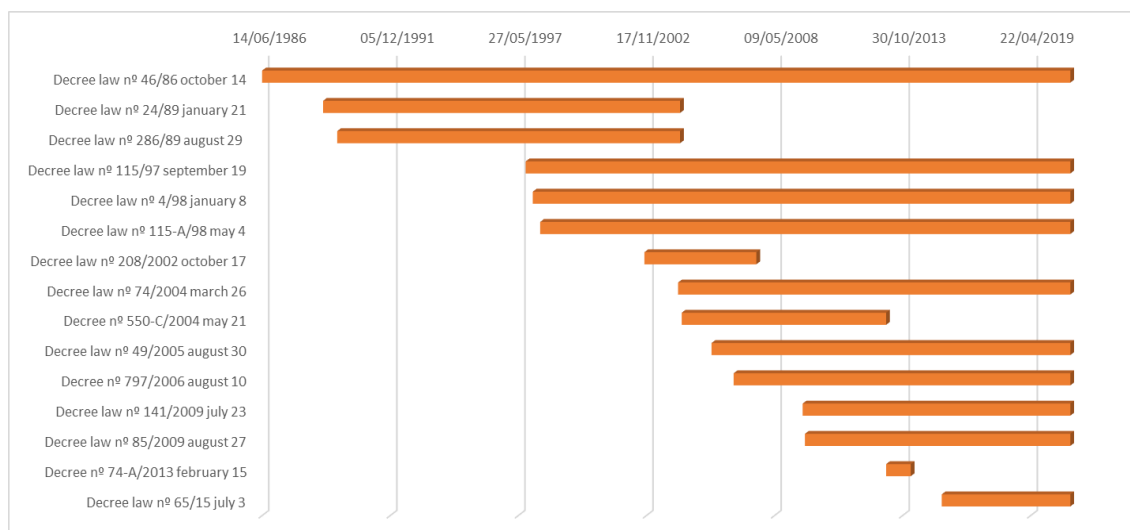
Figure 1.: Education legislative evolution since 1986.

Source: Own elaboration

Currently, the percentage of students attending vocational secondary education accounts for about 50% of the total number of students in the country. Over the years, the tendency to follow a vocational path has been increasing but, over the last four years, this growth trend has increased sharply. From 2014 to 2018, Martins (2019) explain that here has been a major shift in the take up of different learning methods as well as in student behaviours, because most of vocational secondary education students come from general primary education rather than from other alternative backgrounds, which has been relevant in determining the success rate of completion of vocational education. The success rate of completion of vocational education went from 53% to 63%, according to data revealed by Martins (2019). He states that this achievement was mainly due to the percentage of students who successfully completed the three years of vocational secondary education and not to the dropout rate, although it also decreased from 14% to 12%. According to DGEEC data, until the 2016/2017 school year, the completion rate of vocational education[1] has been increasing, being in that same year higher than general education, with 76.2% (Brederode Santos & Minguéns, 2018). In 2016/2017, 55 421 more students enrolled in secondary school than in 2007/2008. This 18% growth is mainly due to vocational courses, enrolled by another 44 492 (63%). In general courses, growth was 5.8%,

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[1] Not to be confused with the success rate of completion of vocational education which shows students who finish in the 3 years due. The completion rate represents the students who finish vocational secondary education, but who may have years deviations (1 or 2 years later).

corresponding to an additional 11 428 students. Considering the age group between 15 and 18 years as the ideal age to attend secondary level, we see that students who enrol in general education usually do not exceed the ideal age (27%), however this does not occur in vocational education where there are still many students who are over 17 years old (72%). The average age at which they finish secondary education also varies and we find that it is more common in vocational education for students to finish between ages of 18 and 19, a year longer than students who follow general education. Regarding the completion of vocational secondary education, comparing the different NUTS II regions, it appears that the percentage of students completing vocational education in three years is substantially lower in Algarve and Lisbon metropolitan area, compared to Alentejo, Center and North (Barbosa et al., 2019; Engrácia & Baptista, 2018; R. Martins, 2019).

The students' composition at secondary level has also changed (Educação, 2017). According with INE data, early dropout rate has been decreasing over time. It appears that in 2009, when mandatory education was established up to the age of 18, the dropout rate was 30.9% managing to decrease to 10.6% in 2019. According to DGEEC data, completion rate of general education remains high, showing the effectiveness of this type of education (in the school year 2017/2018 it was 74%). Nevertheless, the completion rate of vocational education, in spite of some fluctuations, it shows relevance with its 77.9% in 2017/2018. After the establishment of twelve mandatory schooling years, these rates show better results and tends to remain high. The students' profile is changing through the years, suffering more alterations especially after 2009, betting even more on education, on better scholar performance and the idea of early school dropout is vanishing. According to the Ministry of Education, in the last school year, 44% of students were able to complete high school without failing a single exam and also having positive results in national exams. *"The Ministry of Education points out that this is a "substantial increase", since 2017/2018 the percentage of the so-called direct paths of success in secondary education had remained at 37%."* (Viana, 2020).

These developments in Portuguese law and the move towards a more practical education helped to improve different types of teaching, raised interest in education and reduced dropout as we already seen for 2019 a dropout rate of 10.6%. The implementation of compulsory education, through the Basic Law, may have been the factor with the greatest impact for professional education to receive the necessary recognition, as it has led to a series of changes and improvements not only in

secondary education but also in professional courses and professional schools, proving until today, through the values presented above, that it is a relevant type of education for students, for society and for the economy of Portugal.

2.2. What happens after secondary education?

After high school it is expected that students, both general and vocational, choose one of several alternative paths: entering the labour market immediately, enrol in a non-tertiary post-secondary course as a transition to the labour market or further studies, or entering straight to tertiary-level studies. There are many choices that can be made, but which one do young Portuguese individuals choose and why?

As context, we observed in the previous section that the completion rate of secondary studies has been increasing in the past few years. In 2017/2018, it was around 80% for both general and vocational educations. Following this growth, students' expectations of finishing high school and proceeding towards further studies has been increasing. In the 2008/2009 school year, 75.6% of secondary students intended to pursue post-secondary studies, a statistic that has been growing until reaching, in 2016/2017, 81.5% (Fernandes, Duarte, & Castro, 2017). Consequently, the number of students taking post-secondary courses has been growing. Many young people, regardless of whether or not they were working, were already attending post-secondary courses in 2016 (72.5%). These data showed an increase of 5.2 percentage points compared to 2014. Most young people who were studying in 2017 came from general courses (61.6%) and 35% from vocational courses[2]. In line with the objectives of this latter type of education, with no surprises in post-secondary education, most young people were working and only ¼ of the young people were studying exclusively (Fernandes, Pereira, Cotrim, Duarte, & Castro, 2018). Within the group of students who finish secondary education by vocational path, only 18% go to universities or polytechnics, a still very low rate (R. Martins, 2019), compared to general education students who follow this path.

However, the percentage of young people with vocational courses who choose to study has been increasing. In 2016, the percentage of young people studying was around 27.4%, 4.5 p.p. more than in 2014, demonstrating that youths increasingly choose to enter studies (Fernandes, Pereira, & Santos, 2018). The young people from vocational

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[2] The remaining 3.4% of students enrolled in other courses and training offers irrelevant for our dissertation.

courses who were exclusively studying, showed, in addition, an over-representation among specific programs, with special emphasis on technological specialization courses (CET), technical higher vocational courses (TeSP) and polytechnic education. These young people give priority to training offers that allow them to deepen their professional area and obtaining a higher degree of qualification (Fernandes, Pereira, Cotrim, et al., 2018), but this choices can also be explained by the desire of a shorter human capital investment (Eichhorst et al., 2015) and an earlier entry into the labour market.

When we distinguish young students from the general and vocational education tracks, we see, therefore, that depending on the type of education, future decisions can be different. If for students of scientific-humanistic courses the main objective is to continue their studies (around 90% of students have this idea), for vocational courses, the objective is still quite divided between those who want to enter into labour market and those who want to continue their studies. Among the young, those who are already most active in the labour market are those in vocational courses. The possibility of finding a job and exercising their desired profession was what led most young people to continue their studies. Also, among young people in vocational courses who continued to study, they claim that they have done so mostly to facilitate integration into the labour market. For those who are already working, the main reason given to start working immediately was the need for financial independence (Fernandes et al., 2017; Fernandes, Pereira, Joana, & Castro, 2019; Fernandes, Pereira, & Santos, 2018). Also, if we look at young people who, in 2016, were exclusively working, more than half of those who had a vocational course were in this situation (46.9% working exclusively and 6.7% were working students), or did not study, but were looking for employment (16.2%). In 2017, these percentages increased to 51.4% of young workers and 14% of those who did not study but were looking for a job, which demonstrates the success of vocational courses in achieving their main objective of easily integrating their students into the labour market. On the contrary, if we regard young people in scientific-humanistic courses, less than 10% choose to be working exclusively.

The distribution of youth employment however, still displays a very similar distribution between the two types of education. Close to 15.4% of general graduates started working before finishing the course, 46.7% immediately after the end of the course and 38% six or more months after the end of the course. It should be noted, however, that there was an increase of 7.1 p.p. in the percentage of young people who started working immediately after the end of the course and a decrease of 3.6 p.p. in the

percentage of those who started working later, compared to 2014 (Fernandes, Pereira, Cotrim, et al., 2018). For vocational graduates, 10% started working before finishing the course, 51.6% immediately after the end of it, more 3 p.p. and 38.4% six or more months after the end of the course. This is evidence of the success and effectiveness of both types of courses in integrating young students in enterprises. In both tracks, the professional group with the greatest representativeness was "personnel from personal services, protection and security and salespeople" (25.6% among the scientific-humanistic graduates and 30.9% of those from vocational courses). In any case, young graduates of vocational courses were more heavily represented among "technicians and professionals of intermediate level" (13.4% compared to 5.9%). In addition, professions such as "farmers and agricultural, fisheries and forestry skilled workers", "industrial and construction operators" and "unskilled workers" have higher percentages among young people with vocational courses (1.3% compared to 0.9%; 20.6% compared to 17.1%; and 11.8% compared to 8%, respectively).

Based on this evidence, it appears education and career paths became more diverse over the last decade in Portugal. Depending on the objectives of the individuals, each type of course and educational path may therefore be efficient in fulfilling its mission of integrating students into the labour market or in higher studies. There is, however, a lack of evidence on the actual employment and earnings returns associated with this choice. We turn to that topic in the next section.

3. THE RETURNS TO VOCATIONAL AND GENERAL EDUCATION

3.1 Specialisation or Adaptability?

It is a fact that general education and vocational education have specific characteristics. General courses have their educational offer aimed at preparing the student with basic knowledge that can be used to learn many different occupations (Bertocchi & Spagat, 2004) and pursuing higher education or post-secondary courses. On the other side vocational courses contribute to the development of personal and professional skills for the exercise of a specific profession, favouring training offers that correspond to local and regional work needs (Azevedo, 2010; Barbosa et al., 2019; Bertocchi & Spagat, 2004).

The main advantage of vocational education is improving the qualification of future workers and encourage occupational insertion in the labour market, especially for those individuals who have left school with a very low level of formal education (Aguas, 2011). Also, bearing in mind the purpose of vocational courses, we showed in the last section that this type of education has encouraged many youths to continue their studies, bringing down the dropout rate (Azevedo, 2003, 2009, 2010, 2014; Eichhorst et al., 2015; Kulik, 1998).

For Portugal, this type of education was born to respond to high school dropout and the demotivation of young people (Azevedo, 2009, 2010, 2014). The National Report of Portugal, prepared for the 41st Session of UNESCO International Conference, pointed out, in its final recommendations, for secondary education that, in addition to *"bringing young people closer to active life and the world of work "*, was able to *"contribute to the development of the individual as a person and member of the community "* (UNESCO, 1998, p.131, cited by Azevedo, 2009, 2014). With the development of vocational education, Portugal, a country of late mass education, compared to the rest of Europe, manage to double the number of young people attending schools between 1985 and 1995 (Azevedo, 2003, 2009, 2010, 2014). According to Azevedo (2003, 2009, 2010, 2014), with the development of the education system and especially vocational education, young people who succeed in the job market had more success and better performances in the companies where they were installed, managing to put into practice the skills taught, because their teaching method is more practical, articulated with life contexts, capable of promoting social and professional integration), and mostly specific.

Vocational education also appears to accelerate school-labour market transition, making it easier for a young individual to find employment and be selected than a young individual with general education, which means that specific skills facilitate market entry and rapid workplace learning especially due to internships (Gamboa, 2014; Silva & Gamboa, 2014). The internships at the end of high school are also a strong point in favour of vocational education because they increase the adaptability and career development of young people as well as further employability. According to these authors, internships not only teach different skills that theoretical education, but also gives students the opportunity to face fears of entering the labour market.

Several commentators have argued, however, that the short term advantage of vocational versus general education, namely this smoother school-to-work transition, trades off with long term disadvantages, which are lower employment and/or lower wages (Bertocchi & Spagat, 2004; Brunello & Rocco, 2017; Hampf & Woessmann, 2017; Hanushek et al., 2017; Hartog et al., 2018; Kreisman & Stange, 2015). General skills have, by definition, no obvious link to a labour market niche. Golsteyn & Stenberg (2017) explain that in the short term, this may slow the transition from school to work, with a higher degree of job-hopping before the young individual finds his career path. They also explain that the long term annual earnings of individuals with general education may catch up to or exceed those of individuals with vocational education, through an example: *"if general skills reduce the costs of learning, the likelihood of receiving on-the-job-training will increase. This means that work experience (and possibly technological changes) could generate a long term relative skill advantage for individuals with general education. In addition, a risk associated with vocational education is that the demand for a specific skill may decline at some future point in time and diminish long term earnings returns."*. These reasons are the bulk of the argument mentioned above.

In addition, in the long term, some authors agree that vocational skills depreciate relatively quickly, and those individuals who possess them are less able to adapt to innovation and technical change than people endowed with a more academically oriented education and less likely to do some extra training in the future, which does not allow them to adapt (Bertocchi & Spagat, 2004; Brunello & Rocco, 2017; Hampf & Woessmann, 2017; Hanushek et al., 2017; Hartog et al., 2018; Kreisman & Stange, 2015) and improve skills in a changing economy. This means that a specific education can be very advantageous in the short term, in entering the labour market and apply learning into practice almost immediately, but in the long term, a more adaptable

education can bring new opportunities of career. Gustman & Steinmeier (1983), Meyer & Wise (1979) and Neuman & Ziderman (1999) examined the effects of secondary vocational education on the youths' future and found little or no economic benefit, which leads us to deepen this fact in the next subchapter.

3.2 Returns to Vocational Education?

Having covered both potential advantages and pitfalls of choosing vocational education, this section now looks at the relative employment and financial returns of such a choice.

First, there is evidence that returns to vocational education may be increasing over time. Mane (1999), for example, compares the short and medium term returns to vocational courses taken by students who graduated high school, in 1972, 1980, and 1992, and finds that these returns (both short and medium term returns) grew much higher after the 1970s, with a higher evidence for medium term. Along with Meer (2007) who used the same data set and approach, also find positive effects on salaries for vocational studies. These results may be related to the improvement of vocational courses, which led students to choose these courses, with their learning and skills being valued in the labour market.

This does not necessarily mean, however, that vocational degrees result in higher wages or better employment opportunities relative to more general degrees, particularly over the life-cycle. Regarding employability, Hanushek et al. (2017) show that individuals with general education tend to have more difficulties initially in the labour market, but in the long term they tend to have better job results than those in vocational education A number of other authors argue, indeed, that returns to vocational education tend to increase in the short term and decrease in the long term. Bertocchi & Spagat (2004), for example, use the ratio of vocational to general education as a measure of the stratification of the educational system and explain that this ratio increases first, and then decreases with the level of development and salary, exhibiting an inverted U-shape that reflects the complex interaction between economic and political factors, including aggregate salary growth, wealth inequality and political participation. Hartog et al. (2018), also confirmed the inverted U-shaped pattern, first the wage of vocational secondary graduates increases and then decreases.

Also, this pattern may change depending on the country and their institutional framework. For instance, Hanushek et al. (2017) explain that in the United States and

other countries without a noteworthy vocational education system, the employment probability of individuals with different types of education does not differ with age. Hotchkiss (1993) examined the first job after high school and concluded that the secondary vocational education in the United States *"was not effective in raising one's wage"*. But in European countries, the age employment pattern differs and sometimes quite significantly between individuals with general and vocational education. *"The pattern is most pronounced in the well-known apprenticeship countries of Denmark, Germany, and Switzerland. In these countries, the easier entry into the labour market is balanced by noticeably greater withdrawal at older ages."* (Hanushek et al., 2017). Hampf & Woessmann (2017) reveal a strong trade-off between early advantages and late disadvantages in employment for individuals with vocational education, depending on the country analysed, as well. Using Israeli data, Neuman & Ziderman (1999) find that for *"workers who had attended secondary school and did not proceed to higher education, only a small earnings difference was found between the vocational and academic streams"*. Therefore, we can see that these returns can fluctuate among countries.

Even if through this literary review we realised that individuals who have a vocational course may not have as many advantages in the long term, it does not mean that having a vocational education is necessarily disadvantageous. Brunello & Rocco (2017), for example, show persistent positive returns to vocational degrees. According with Eichhorst et al. (2015), youth completing school-based vocational education do as well (and sometimes better) than if they had instead remained in purely academic studies, especially when there is a match between the vocational training and the future occupation of employment. Equally, one should think of the correct counter-factual when analysing the returns to vocational degrees. Authors such as McCormick, Tuma, & Houser (1995), Tuma (1994) and Willis & Sherwin (1979), caution, indeed, that non-causal estimates of the returns to vocational education relative to general-based education will be downward biased, because vocational courses still are frequently intended for youth with lower motivation and ability than those who pursue general-based education, additionally, other concern arises due to different occupations requiring theoretical and practical skills. *"If youth self-select into different occupations based on their skills, evaluating the effectiveness of the different systems becomes a difficult task given that the employment patterns, payment structures, and union coverage in the occupations themselves may not be comparable."* (Eichhorst et al., 2015).

In this chapter, we discussed diverse arguments about the returns of vocational education on salaries of vocational graduates. Therefore, to summarize, vocational courses can bring positive returns on wages since it prepares individuals with practical skills useful in companies. Some authors demonstrate that these positive returns are only in a short term, and in a long term, general courses bring more positive returns to individuals, as prepare students with all kind of skills to adapt easily to different professional areas and future changes. However, others demonstrate the opposite, arguing that taking a vocational course never becomes a negative option because it brings skills that companies need in their workforce. With these arguments presented, will we understand what happens in Portugal? Are there positive returns or are the general courses more favourable in the labour market already in initial career years? Before answering such questions, the next chapter presents the data and methodology used in the study of these questions.

4. DATA AND DESCRIPTIVE STATISTICS

4.1. Educational Tracks and Sample Selection

In order to make further sense of our final sample, we analyse, with the help of figure 4, the likelihood of choosing different educational trajectories for the cohorts we are interested in, including the transition to higher education. We use data from INE and DGEEC for this purpose. In 2004, the number of students enrolled in Level I (primary education) was 267 742 with the great majority (255 766) proceeding to Level II. In 2009, around 31% of students still chose to abandon their studies, leaving only with a Level II of educational attainment (basic education). After the amendment of the Basic Law by Decree-Law No. 85/2009 of 27 August (Decreto-Lei nº. 85/2009 de 27 de agosto, 2009), in 2009/2010 the percentage of enrolled young students in secondary education (Level III) was higher than in the previous school years, registering a value of approximately 60% for the general education and about 31% for vocational education, which at this point was already beginning to gain more interest and adherence from young students.

To record changes in education after the amendment to the Basic Law for compulsory schooling up to the age of 18, we considered the 1994-1998 cohort. We assume that these individuals finished basic education by 2009 and enrolled in secondary education, which at the time was already mandatory. Since secondary education takes three years, these individuals should have completed their secondary studies at latest in the 2012/2013 academic year, considering a year of deviation. In 2009/2010, the number of students enrolled in secondary education was around five hundred thousand. With the implementation of compulsory education, in particular, the enrolment rate in this school year increased significantly, compared to the previous
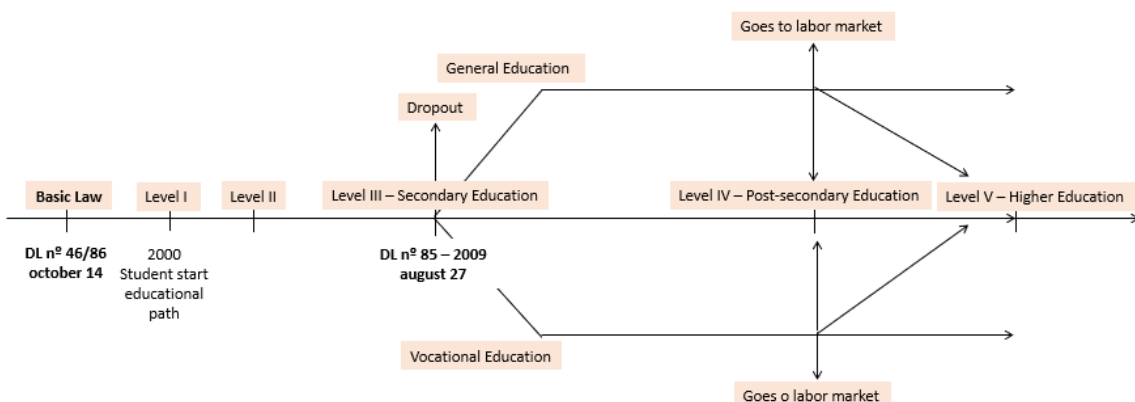
Figure 2.: Different paths that students can take during their education career.

Source: Own elaboration

school year. After this academic year, it tended to decrease somewhat, but remained constant from 2011/2012, within around four hundred thousand students (see figure 9 in the data Annex). This figure is also confirmed by the real school enrollment rate[3], which has reached a more evident positive trend since the 2010/2011 academic year.

Accompanying these data, the dropout rate showed signs of decreasing, from approximately 40% in 2009/2010 to 20.5% in 2012/2013 (year of completion of secondary education for individuals in our cohort) and 12.6% five years later.[4] The number of students entering vocational education (see figure 10 in the data Annex) began to grow from 2006/2007, with its greatest growth achieved between 2008 and 2009. More young people are enrolling in vocational education, as in 1994, the percentage of students who enrolled in vocational education was around 5%, and in the 2017/2018 academic year, that percentage approached 35%. In 2009/2010, approximately ninety four thousand students entered vocational education. In 2012/2013, the rate of completion of vocational education was higher (66.9%) than the rate of completion of general education (64.4%), and since 2010, the rate for vocational education has always proved to be higher than general education. In 2017/2018 these rates represented 77.9% and 74% respectively. At the end of three years in secondary education, the percentage of students going to the labour market is also higher among vocational education graduates relative to general education, as we already shown. In 2013/2014, the number of graduates from general secondary education who followed higher education studies was about 72% compared to 17% from vocational secondary education. Consider gender differences, the gap is almost nonexistent, for general education graduates, 84% of women and 83% of men proceed studies. Regarding vocational education graduates, the difference is between 17% for women and 20% for men (DGEEC, 2016).

With this backdrop, these aspects raise, however, problems of selection that add up to those we referred to regarding gender and the nature of work involvement (part-time vs. full-time). In particular, general education graduates in full-time employment, and women in particular, considering that their take-up of higher education is stronger than men is (according with DGEEC data from 2020, since 2009 the percentage of women enrolling in higher education is always superior to 55%, but for men this percentage fluctuates between 44% and 45%), may refer to a subset of individuals who were less able or less motivated to transition to higher education. It is unclear, however, whether

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[3] Percentage relationship between the number of students enrolled in a given cycle of studies, at the normal age for attending that cycle, and the resident population of the same age levels.

[4] Also considering Autonomous Regions of Azores and Madeira.

there are important innate ability or educational performance differences among students of both secondary tracks when entering secondary education (level III) as there is a growing percentage of vocational education graduates who enrol in higher or non-higher post-secondary education. Regarding these problems of selection, if the dropout rate is decreasing, it means that more young students do not leave school and enrol in secondary education and this could be related with some changes in students' choices between entering immediately in the labour market or proceeding with post-secondary education, leading to possible biases. We already mentioned in previous chapters that vocational education plays an important role in education rates, performance, completion of secondary education and in the dropout rate as well. For the mentioned years (2009/2010 to 2012/2013), in general secondary education the dropout rate was always higher (values above 20% in the three years) than vocational secondary education (values between 15% and 18%)[5], which could mean that vocational secondary education has almost the role of seeing young students to continuing their studies. We also recognize that, for the labor market, enter more vocational secondary graduates than general secondary graduates and to proceeding post-secondary studies it is the opposite. This fact suggests that could exist two general secondary graduates' subsets: the students considered "better", who prefer to follow studies and the "worst" who are not motivated or less capable, end up entering the labor market. In the second subset, perhaps the vocational education graduates have an advantage with their hard skills. These problems could lead to perhaps an under-valuation of vocational returns.

With these caveats in mind, our study is mainly related with the following question: *Even if possibly influenced by non-observable innate characteristics, which secondary education track provides higher earnings returns for those who choose to stop studying at level III?* We then intend to give a first approximation to the issue of whether a vocational path results in a positive and significant salary return for such a target group. As a complementary question we look at whether such differences remain stable or increase across the initial career progression of secondary education graduates.

4.2. Sample construction

As we have shown, education in Portugal has undergone significant changes in recent years. Not only has vocational education been gaining more interest among young

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[5] Not considering Autonomous Regions of Azores and Madeira.

students but legislative changes have allowed the decrease of dropout rates and increased school achievement. Our main purpose is to understand if taking a vocational course is beneficial in terms of salary and career development in initial career years. This focus in the initial career years is pragmatic. Considering the recent nature of the legislative changes, we are only able to access data about workers with up to five years of employment experience (after ending their secondary education studies). We are aware, however, that returns to both general and vocational degrees may differ significantly further down the life-cycle (see earlier section). There is, however, a lack of empirical words addressing the returns to vocational secondary studies, particularly after the most recent legislative change. This work wishes to be a first step in such a direction.

Our data was provided by DGEEC - Direção-Geral de Estatísticas de Educação e Ciência - from the Ministry of Education and by the Quadros de Pessoal (QP) dataset from the Ministry of Employment, Solidarity and Social Security. DGEEC is a *"central service of the direct administration of the State whose mission is to guarantee the production and statistical analysis of education and science, technically supporting the formulation of policies and strategic and operational planning, creating and ensuring the smooth functioning of the MEC[6]s' integrated information system, observing and globally evaluate the results obtained by the educational and scientific and technological systems"* (Decreto Regulamentar nº13/2012, 2012). The QP dataset is a longitudinal database that covers all employees of private sector companies and third sector organisations with at least one employee of legal working age. The Ministry of Employment, Solidarity and Social Security collect annually data, based on an inquiry that all businesses with employees must complete under legal obligation. Currently, the QP dataset gathers annual information in a reference month (October) for over 300.000 companies and three million workers of Portugal's population (10,28 million inhabitants according to Eurostat data from 2019). It contains detailed information on workers, including their gender, age, education, working hours and monthly earnings divided into various components. QP also provides company information such as geographic location, industry, and size. The data is provided by the employer in agreement with government regulations, which helps to restrict measurement errors[7]. However, this database does not include general government employees, overall employment in agriculture (non-business) and the population employed in self-employed activities or

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[6] Ministry of Education and Science.
[7] QP implies that the Ministry of Finance and unions have to confirm that employers are complying with the law, especially in terms of wages and actual hours worked. Individual data is published in a public place on the company's premises for the worker to confirm that the reported data is correct.

family-owned production units (Hartog et al., 2018) which can be a limitation. We use data between 2013 and 2017, restricted to the 1994-1998 birth cohort, which corresponds to that directly affected by the education reform.

In order to construct our sample, we consider several aspects, namely the different educational paths taken by the students during secondary education, choices made after secondary level regarding the continuation of studies or transition to the labour market as well as the timing of current legislation in order to construct relevant cohorts. We chose individuals who enrolled in either general or vocational education after 2009, the timing of the legislative change to twelve years of mandatory education. The educational attainment variable available in the QP dataset was changed by the MEE[8] in 2011, and it became possible to distinguish individuals who completed vocational and general secondary education. We select individuals with at least nineteen years of age in 2013, who therefore had possibly already completed their complete secondary studies under the new legal regime. Figure 2 depicts the choice of the relevant cohorts (horizontal) and respective age groups selected in each year (vertical) to ensure that criterion holds.

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[8] Ministry of Economy and Employment.

2013	2014	2015	2016	2017	
19	20	21	22	23	(2013 cohort)
	19	20	21	22	(2014 cohort)
		19	20	21	(2015 cohort)
			19	20	(2016 cohort)
				19	(2017 cohort)
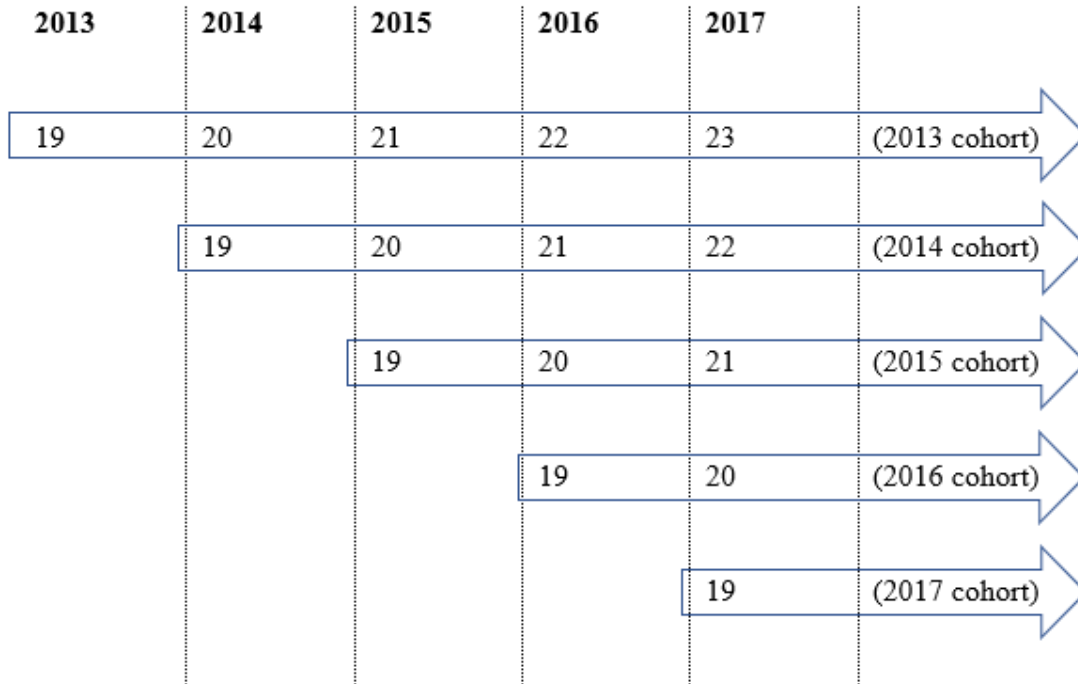
Figure 3.: Selection of the relevant cohorts (horizontal) and respective age groups selected in each year (vertical).

Source: Own elaboration

The dissertation will focus on estimating the different returns to early experience levels for vocational and general education. It should be clear from Figure 2 that the potential experience levels[9] of each cohort will vary but also that there will be graduates with similar experience levels across at least two cohorts (with the exception of the longest potential experience group of six years that only applies to the earliest cohort). It is possible that some cohorts have young people that finished the secondary education a year later than expected (or more). According with data from DGEEC (2019), in 2012/2013, 12% of the secondary students (both general and vocational graduates) had a one year deviation and 80% completed the secondary education in the planned three years. In 2014/2015 the same percentages applied. OECD data confirms these facts including the differences between the types of secondary education. In 2012/2013 and in 2015/2016 (two years after the theoretical duration) graduates from vocational education are higher than the ones with general education, but around 20% of students did not complete in three years (OECD, 2020) which still represents a large part of the students and brings some noise to the data.

Even with these limitations in mind, we implicitly assume, from now on, that respondents finish their secondary level studies in three years considering the high

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[9] Potential experience represents the age subtracted from the most common age to finish secondary school.

percentage of youth who complete their studies in the correct time. The choice of the 2013-2017 observation period also considers the changes in the QP code legislation after 2011, where vocational and general education were seen as different types of educational paths. Until 2011, the QP dataset did not distinguish between general and vocational education as a person with a vocational course would be in the same group sample as a person with general education. Our final sample includes 115.863 secondary education graduates aged between 19 and 23 already in full-time employment and with real earnings equal or above the equivalent to the country's hourly minimum wage[10]. We further exclude individuals with extreme hourly wages (outliers) considered as those with hourly wages 2.5 times above the 99th percentile. This results in the elimination of 160 individuals from the original sample, less than 0.1%.

Figure 3 describes the evolution of the overall number of secondary education graduates across time and gender, and it is noticeable a growth on both types of education and significant differences by gender. Graduates from general education are in a higher number than graduates from vocational education and the number of men is
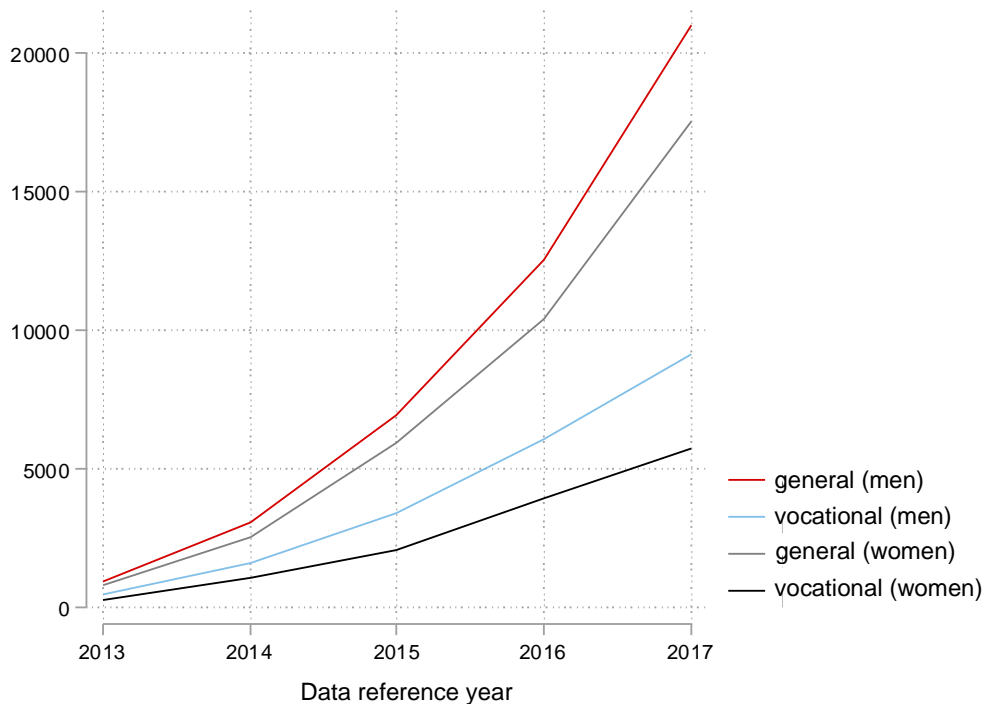
Figure 4.: Evolution of the overall number of secondary education graduates across time and gender.

Source: Quadros de Pessoal

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[10] This is calculated by dividing the lowest national minimum wage for the overall period (€485 in 2013) by the standard number of monthly working hours calculated as 40*(30/7). All cases in the initial dataset complied with this criterion.

higher in both types of education. The graphic shows, in any case, that the overall number of young workers with secondary education degrees from both tracks has been increasing consistently across time following the increase in the educational attainment levels of the young working population. It is equally clear, however, that the trend is still much stronger for general education graduates and that the take-up of vocational secondary education among these workers is clearly stronger among men.

Tables 1 and 2 describe the number of cases by year and potential labour market experience by type of secondary education. Table 3 shows the overall number of cases in the sample by year and potential experience. The tables show that, in 2013 only graduates with one year of potential experience exist. Throughout the years, however,

Table 1.: Number of cases of general education by year and potential experience.

Potential labour market experience	Data reference year					Total
	2013	2014	2015	2016	2017	
1	1,723	2,005	2,553	2,956	3,636	12,873
2	0	3,616	4,467	5,102	6,470	19,655
3	0	0	5,914	6,820	8,194	20,928
4	0	0	0	8,130	9,687	17,817
5	0	0	0	0	10,570	10,570
Total	1,723	5,621	12,934	23,008	38,557	81,843

Source: Quadros de Pessoal

Table 2.: Number of cases of vocational education by year and potential experience.

Potential labour market experience	Data reference year					Total
	2013	2014	2015	2016	2017	
1	774	995	1,165	1,371	1,557	5,862
2	0	1,716	1,888	2,360	2,628	8,592
3	0	0	2,496	2,873	3,179	8,548
4	0	0	0	3,440	3,624	7,064
5	0	0	0	0	3,954	3,954
Total	774	2,711	5,549	10,044	14,942	34,020

Source: Quadros de Pessoal

Table 3.: Number of cases by year and potential experience.

Data reference year	Potential labour market experience					Total
	1	2	3	4	5	
2013	2,497	0	0	0	0	2,497
2014	3,000	5,332	0	0	0	8,332
2015	3,718	6,355	8,410	0	0	18,483
2016	4,327	7,462	9,693	11,570	0	33,052
2017	5,193	9,098	11,373	13,311	14,524	53,499
Total	18,735	28,247	29,476	24,881	14,524	115,863

Source: Quadros de Pessoal

the number of graduates with more potential experience will increase allowing the analysis of such effect on earnings, controlling for year specific effects.

Within the same age segment, we exclude all individuals with lower educational attainment but equally a significant number of post-secondary or higher education graduates since those are not the focus of our research. The focus is to study individuals who have completed the obligatory twelve years of school and who immediately entered the job market, without pursuing further studies. We should consider, however, that the choice to continue to study may not be independent of the secondary education path taken, raising again problems of self-selection (choosing to enter the labour market immediately or continue to study). Similarly, such differences may interplay with the decision to work full- or part-time. Therefore, and also to avoid replication of individuals in the sample, that could have two jobs (both at part-time), we do exclude slightly more than a third of all graduates from general secondary education courses who are working part-time and close to 25% of graduates from vocational degrees who are also in that same situation.

4.3. Descriptive Statistics

This section presents the main descriptive statistics for graduates from the general and vocational tracks in our final sample. Table 4 shows that we consider 115 863 individuals, where 81 843 have a general education and 34 020 have a vocational education. General secondary education graduates (top table) earn, on average, around €4.65 per hour and per month around €805.67, which is higher than the minimum wage established in Portugal (Roberto, 2020). There is also a very significant range with the maximum wage being around €5 532 and the minimum around €466.23. About 46% of the individuals are women. Individuals, on average, have almost 3 years of potential experience (mostly by construction as explained). Consider now vocational secondary education graduates in the table below, they earn, on average, around €4.61 per hour and per month around €802.78, also higher than the minimum wage, but lower than general secondary education graduates. The percentage of women are about 39%, less than in general education (as expected). Sample participants have on average 21 years old.

Table 4.: Number of individuals in the sample by the type of education, earnings, gender and experience.

General Education

	Variables	N	Mean	Std. Dev.	Min	Max
hw_real	Hourly wage	81843	4.641847	1.558117	2.912978	31.98256
mw_real	Montlhy wage	81843	805.6694	272.0117	466.2287	5532.982
female	Female gender	81843	.456105	.4980725	0	1
exper	Potential experience	81843	2.921264	1.263894	1	5

Vocational Education

	Variables	N	Mean	Std. Dev.	Min	Max
hw_real	Hourly wage	34020	4.614871	1.491546	2.941056	31.86068
mw_real	Montlhy wage	34020	802.772	264.845	468.8124	5273.036
female	Female gender	34020	.3895356	.4876521	0	1
exper	Potential experience	34020	2.842916	1.260839	1	5

Source: Quadros de Pessoal

Table 5.: General information about our sample by the variables used in our calculations (detailed information about the variables in table 20 in the Annex).

Variables	N	Mean	Std. Dev.	Min	Max
ano	115,863	2016.094	1.045993	2013	2017
reg_dur	115,863	1.001856	.0430373	1	2
ctpro	115,863	32142.47	35748.35	17	99115
habil1	115,863	3	0	3	3
idade		20.89826	1.263496	19	23
nqual1	115,863	5.924601	1.248386	1	8
sitpro	115,863	3	0	3	3
industry	115,863	12.19663	7.708642	3	99

female	115,863	.4365587	.495961	0	1
tipo_contr~o	115,863	1.861612	.65435	1	4
mw_real	115,863	804.8186	269.9292	466.2287	5532.982
hw_real	115,863	4.633926	1.538911	2.912978	31.98256
lmw_real	115,863	6.654305	.2481101	6.144676	8.618483
lhw_real	115,863	1.49873	.2412054	1.069176	3.465191
region	115,863	202.7722	118.4915	100	600
fixterm	115,863	.9981444	.0430373	0	1
tenure	115,861	.6002796	.9159016	0	7
exper	115,863	2.898259	1.263496	1	5
expgrp	115,863	1.783512	1.47297	0	3
pt	115,863	0	0	0	0
ownership	115,863	1.796095	1.583138	1	5
firmsize	115,863	2.742187	1.088408	1	4
cnaef2d	115,863	0	0	0	0
isco08	115,854	78.27056	87.09235	11	610
esec	115,863	.2936226	.4554231	0	1
coorte	115,863	2.195481	1.178424	1	5
horas	115,863	173.4554	8.660501	150	338
isco	99,141	5.416346	1.664064	1	8
tmp_outl	115,863	12.5129	.5026383	11.34028	12.84713

Source: Quadros de Pessoal

Our main variables of interest are the educational qualifications and individuals' wages that will be evaluated by hour. What concerns us are the individuals who, in addition to only having secondary education, chose vocational or general education, so we generate a variable named *esec* where *esec=1* if individuals have vocational secondary education and *esec=0* if individuals have general secondary education. To generate the variable *esec*, we considered all types of vocational courses at secondary level which guarantee a secondary graduate diploma. In Portugal, these are divided into Professional Induction Courses (e.g. courses from the National Institute of Tourism Training); Complementary Secondary Education (11th year of schooling, former 7th of

the Lyceum), Secondary Technical Education, Secondary Technical Professional Education (Professional, specialization and Professional Technical courses or equivalent) and Courses from Professional Schools at Level III (accounting technician, graphic design technician, computer technician, electrical installation technician, sociocultural animator).

For the control variables, not only the ones related with individuals are important, but also the ones which are related with professional paths. Therefore, *Potencial Experience* and *Ano* are essential variables to fit the cohorts in the periods that we explained earlier. We also pay particular attention to gender (the variable *female)*. Among the variables related with the labour market, we highlight the professional position which concerns the occupational status, professional category and qualification level (*sitpro, ctpro, nqual*), seniority in the company (*tenure*), experience (*expgrp*), type of contract (*tipo_contrato*) and the type of labour duration (*reg_dur*). All help us to characterise the worker career track and compare their initial career trajectory.

The most common type of contract is fixed-term contract (69.53%) follow by the contract without term (32.10%). Most individuals, of both education types, work in full time: 65.82% represents general education and 74.39% vocational education.

For the *tenure* variable, there was a low number of years of individuals within the companies. The time interval used for this study is not very long, the period from 2013 to 2017 explain the trend of many individuals with few years in the company where they work. There may also be other factors to complement, such as changes of companies or employment status. The cohort show a strong tendency for one-year seniority, with many individuals that have not yet completed one year of seniority.

For this sample, the most common professions are in areas such Wholesale and Retail trade with 24.59%, Hotels and restaurants with 13.36% and Real estate, renting and business active with 16.77% (see table 14 in Annex). In Wholesale and Retail trade, 25.19% are general graduates and 23.14% are vocational graduates, in Hotels and restaurants, 13.27% are general graduates and 13.56% are vocational graduates and Real estate, renting and business active with 18.44% general graduates and 12.75% vocational graduates. It is clear that in Real estate, renting and business active have more graduates from general education than from vocational education, but 12.45% of the vocational graduates are in Manufacture of metals products, although for general graduates this area is not the most wanted.

For the type of firms where these individuals worked, the most common in our sample is large firms where 38,231 individuals (33%) are settled, but 25.44% of the sample are working in small firms, the second large percentage of it, and only 16.11% of individuals work in micro firms (see table 17 in Annex). Most individuals worked in national firms (79.61%) followed by national firms with a foreign participation and only 0.05% (about 60 individuals) worked in multinationals (see table 18 in Annex).

Most individuals in the sample belong to North, Lisbon and Center regions of Portugal with 46.40%, 26.84% and 23.72% respectively which support the fact that these regions are the focus of employability (see table 16 in Annex). Regions as Alentejo and Autonomous Regions of Azores and Madeira have the lowest percentages (4.20% and 0.32% respectively).

Our sample is constituted by more men than women (around 56% men and 44% women). In general education, men represent 54% compared to 46% of women. In vocational education, men are also more than women, with 61% to 39% respectively.

Regarding earnings differences between vocational and general education graduates, descriptive statistics demonstrate us that there is a very similar distribution for individuals with general and vocational education, but not so similar between genders
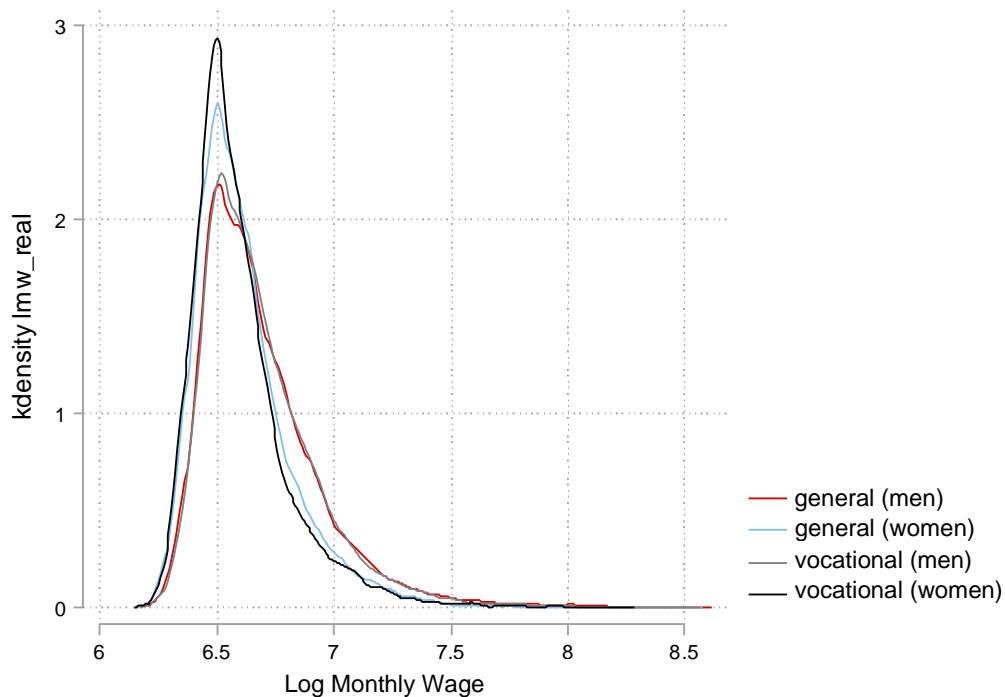
Figure 2.: Salary differences, by gender and by type of education.

Source: Quadros de Pessoal

(figure 5). Both groups of women have lower wages, especially women with vocational secondary education. Between the male gender, men with general secondary education have a little positive distinction between men with vocational secondary education. Nevertheless, overall, men earn more than women.

Our main focus, however, is demonstrated in figure 6. This depicts the evolution of wages of individual by level of experience. According to this graphic, as the potencial experience increase, wages also tend to increase. Men earn more than women which is a common finding. Women with a general secondary education start earning more than women with a vocational secondary education, and as the potential experience increase, that tendency is maintained. For men, however, this increase is steeper for those with a vocational secondary education. The next section provides more careful calculation of this premium and describes the methodology adopted for such a purpose.
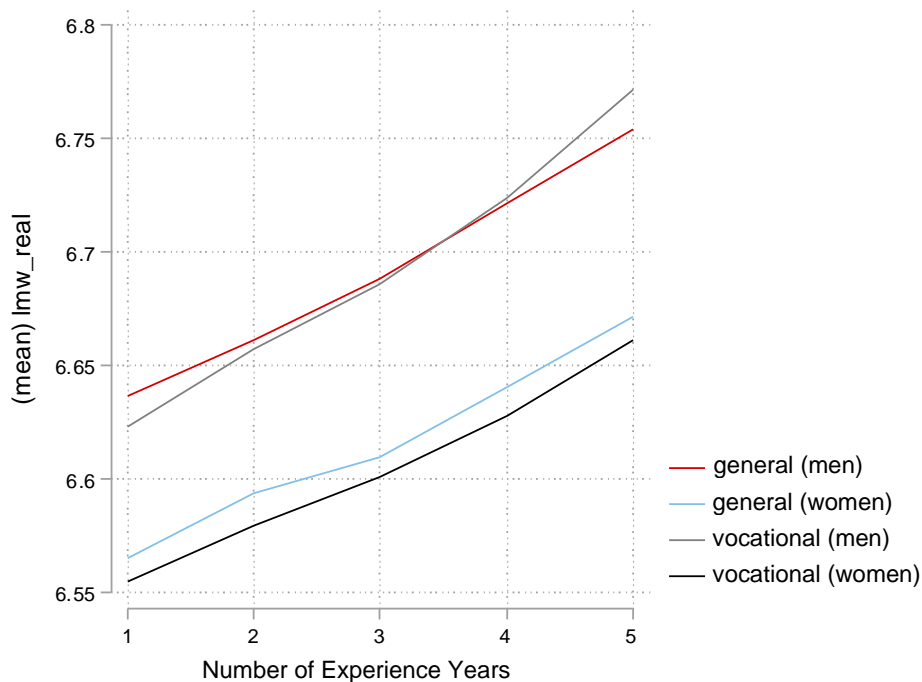
Figure 3.: Evolution of wages by level of experience.

Source: Quadros de Pessoal

5. METHODOLOGY

Our main objective is to estimate individuals' immediate financial returns (soon after graduation) but also their earnings trajectories during their early career years. We ask the following research questions:

Q1: Does a path in vocational education result in a positive and significant salary premium?

Q2: Do returns to experience in early career years differ between graduates from both tracks?

Q3: Do returns to vocational secondary education differ significantly by gender?

Q4: How can we explain (decompose) gender earning differentials across early career years for both general and vocational secondary education graduates?

Our preferred method, for the first three questions, will focus on the impact of vocational versus general education types on earnings trajectories over the first five years of potential experience in the labour market. Similarly to Hampf & Woessmann, (2017) and Hanushek et al. (2017), our baseline model is a difference-in-differences approach that compares the income patterns of workers of the two educational tracks:

(1) $lhw\_real_i = \alpha_0 + \alpha_1 exper_i + \alpha_2 exper_i^2 + \beta_1 voc_i + \beta_2 voc_i * exper_i + X_i\gamma + \mu_t + \epsilon_i$

, where, lhw_real_i is the log of the real hourly wage of individual *i*; experience ($exper_i$) and its square capture the potential experience pattern in the labour market; voc_i is an indicator for vocational (as opposed to general) education type in secondary education; *X* is a vector of control variables including gender, tenure, professional category and type of employment contract, μ_t are year fixed effects. We further estimate separate models by gender as well as specific interaction terms for gender as in:

(2) $lhw\_real_i = \alpha_0 + \alpha_1 exper_i + \alpha_2 exper_i^2 + \beta_1 voc_i + \beta_2 voc_i * exper_i + \delta_1 female_i + \delta_2 female_i * exper_i + \delta_3 female_i * voc_i * + \delta_4 female_i * voc_i * exper_i + X_i\gamma + \mu_t + \epsilon_i$

In order to answer the research questions above (Q1, Q2 and Q3), our coefficient of interest is β_2, which captures the differential impact of vocational relative to general

education on wages with each year of potential experience. In addition, β_1 captures the initial wage impact of vocational relative to general education.

Why focus on the first five career years? Such initial transition into employment is essential to the individual and to the company, as a significant part of future productivity is shaped at this stage, both through firm-specific training but equally the accumulation of specific knowledge and experience on the part of workers. Those are equally years that give companies a disproportionate amount of information and knowledge regarding workers future productivity and their ability to achieve objectives already established at the firm-level (Skirbekk, 2004). We expect differences between vocational and general education graduates not only because of the results of the previous studies made by the authors we already analysed - some argue the existence in a long term of positive differences for individuals with general education and others that argue there is not much salary or career variation between types of education -, but also from what we already verified in our own descriptive data analysis, as we moved from 2013 to 2017. We were already able to see that the wages of both education types were, on average, converging despite some initial disadvantage by vocational education graduates. Theoretically, it is unclear in which direction should returns to experience evolve for both types of education. On the one hand, if general education allows greater adaptation to a wider set of professions over time, returns are highly dependent on the existence of opportunities for adequate specific training and knowledge accumulation opportunities to allow individuals to stand out in the company. On the other hand, if vocational education has a more practical orientation, then it is likely that the learned content adapts more quickly to the individual's job making it adapt faster and perhaps grow faster in the company. We believe that these effects may already be visible in these first five years of potential experience but equally that such period allows, in principle, for the compensation of the initial lack of "practical" knowledge on the part of general education graduates.

We use a cross section model but also include quadratic variables because we assume that the data, even across these first initial years, may not be linear with potentially decreasing returns to experience over time. Some variables have logarithms to minimize the problems of heteroscedasticity and allow the analysis to interpret values in terms of elasticities, namely the variables related with the earnings of individuals: lhw_real_{it}.

The last question, Q4, focuses on wage inequality between genders (observed in figure 6) and for this matter, the most common approach is to estimate the wage gap using

regression models and then apply variants of the Blinder-Oaxaca decomposition method. We initially estimated ordinary least squares regressions (OLS) for log real earnings, separately for gender g (men and women) as well as in a separate exercise for general and vocational education. The OLS regressions include further coefficients for each year of experience as well as other control variables. Those differences are then decomposed in two sections. The Blinder-Oaxaca decomposition method is applied to measure the impact of several variables to the gender wage difference (Blinder, 1973; Oaxaca, 1973) either as *endowment* or *return* effects. Similarly to Triventi (2013) we apply the 'two-fold' decomposition, which divides sex-based differences in mean lhw_real_i into a part that can be explained by group characteristics (the 'endowments effect') and a part that cannot be explained by these variables, for instance, as in being in different industries, having different professions, different levels of tenure or being in different regions. This unexplained part refers to differences in the prices attributed to such characteristics across the two groups. According with Jann (2008), we consider two groups, *A* and *B*, the outcome variable lhw_real_{it} and a set of control variables. The mean outcome difference is:

$$R = E\left(lhw_{real_A}\right) - E(lhw_{real_B})$$

, where $E(lhw\_real)$ denotes the expected value of the outcome variables, explained by the differences of the group characteristics. Based on the linear model:

$$Y_i = X_i'\beta_i + \epsilon_i, \qquad E(\epsilon_i) = 0 \ i \in (A,B)$$

, where *X* is a vector including the control variables and a constant, β contains the slant factors and the intercept, and ϵ is the error. The imply outcome difference can be stated as the difference in the linear estimate at the group-specific means of the regressors. Considering this point, to perform the Blinder-Oaxaca decomposition, it is necessary to use a non-discriminatory coefficient vector that to define the contribution of differences in characteristics, so β^* is the non-discriminatory coefficient vector and the difference in results can be written as:

$$R = [E(X_A) - E(X_B)]'\beta^* + [(X_A)'(\beta_A - \beta_B)]$$

, where the first component of the equation is the part of the result differential that is "explained", while the second component corresponds to the "unexplained" part.

This decomposition allows us to understand, precisely, what happen to each individuals' wages, depending on their gender and type of education and it would be discussed in the next chapter, along with the difference-in-differences approach.

6. RESULTS

6.1 Differences in Returns to Vocational Education and Experience

We will begin the description of the models used. This subchapter describes the difference-in-differences approach, where the relationship of hourly wages between the main variables is observed, without the control variables and then we start adding them, in order to understand if the biggest impact is only due to the main variables or if the existence of other characteristics (the control variables) have any impact on wages. In the following subchapter, we get to the Blinder-Oaxaca decomposition to describe the interaction of hourly wages for each type of education by gender.

Our results in table 6 indicate that there is indeed a higher probability, initially, for vocational secondary education graduates to earn more than general graduates. First, without resorting to control variables, we tried to analyse what happened to wages only with the relationship between the two main variables: type of education and potential experience, and we realised that, with the evolution of professional experience, individuals are more likely to see their earnings rise over the years (with rising, if marginally, slopes). We realize that over these initial career years, however, vocational education graduates tend to see their salaries increase faster than general education graduates. All variables included in the model are statistically significant at 1% levels. The data shows that every additional year of potential experience appears to result in a wage increase of approximately 1.60%. That increase, however, is 0.44% higher in the case of vocational education graduates, despite a lower average value.

Table 6.: Earnings Regressions: Model 1 – no controls

Source	SS	df	MS			
Model	144.989096	4	36.2472739	Number of obs	=	115,863
Residual	6595.86505	115,858	.056930597	F(4, 115858)	=	636.69
				Prob > F	=	0.0000
				R-squared	=	0.0215
Total	6740.85415	115,862	.058180026	Adj R-squared	=	0.0215
				Root MSE	=	.2386

lhw_real	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
exper	.0160447	.0027325	5.87	0.000	.0106891	.0214003
exper2	.0017782	.0004476	3.97	0.000	.0009009	.0026555
voc	-.0144926	.0038214	-3.79	0.000	-.0219824	-.0070028
did1	.0043579	.0012204	3.57	0.000	.001966	.0067498
_cons	1.435071	.0038372	373.99	0.000	1.42755	1.442592

Source: Quadros de Pessoal. Note: (p-value <0.01; p-value <0.05; p-value <0.1). For the meanings of the variables, see table 20, in Annex.

In table 7, we added control variables related with tenure in the same firm, type of contract, country region, gender and type of firm, as these can have additional expected influence on earnings. It is clear that individuals with indefinite contracts have higher hourly wages (an increase of 1.97%), and the same happen for individuals who are from Lisbon and Tagus Valley (an increase of 6.27%) and for individuals who work in large firms (an increase of 5.73%). We also start to see differences in the main variables and how the control variables can change the influence of these main variables. Most relevant variables remain statistically significant. The returns to additional years of experience remain positive if considerably lower due to the inclusion of tenure in the same firm, potentially correlated with such years of experience. The faster return of experience among vocational education graduates is slightly reduced but remains at 0.37% per additional year of experience.

Table 7.: Earnings Regressions: Model 1 – full controls

Source	SS	df	MS			
Model	811.04332	18	45.0579622	Number of obs	=	115,861
Residual	5929.79452	115,842	.051188641	F(18, 115842)	=	880.23
				Prob > F	=	0.0000
				R-squared	=	0.1203
				Adj R-squared	=	0.1202
Total	6740.83784	115,860	.05180889	Root MSE	=	.22625

lhw_real	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
exper	.0100547	.0026118	3.85	0.000	.0049356	.0151739
exper2	.0018669	.0004274	4.37	0.000	.0010293	.0027046
voc	-.0121317	.0036285	-3.34	0.001	-.0192435	-.00502
did1	.0036593	.0011576	3.16	0.002	.0013904	.0059283
tenure	.0143851	.0017347	8.29	0.000	.0109852	.0177851
tenure2	.0002889	.0005439	0.53	0.595	-.0007771	.0013549
noterm	-.0055606	.0054766	-1.02	0.310	-.0162946	.0051733
term	.0103142	.0053888	1.91	0.056	-.0002477	.020876
indeterm	.0197048	.0057513	3.43	0.001	.0084324	.0309772
undefined	0	(omitted)				
north	-.0288547	.0117498	-2.46	0.014	-.051884	-.0058254
center	.0102578	.0118018	0.87	0.385	-.0128735	.0333891
ltv	.0627244	.0117758	5.33	0.000	.0882762	.1355038
alentejo	.017251	.0121506	1.42	0.156	-.005639	.041066
algarve	.11189	.012048	9.29	0.000	.0882762	.1355038
islands	0	(omitted)				
foreign	.0709521	.0019345	36.68	0.000	.0671605	.0747436
medium	.0455749	.0017168	26.55	0.000	.04221	.0489398
large	.0573324	.0018235	31.44	0.000	.0537584	.0609065
female	-.0736811	.001346	-54.74	0.000	-.0763192	-.0710431
_cons	1.413956	.0133676	105.78	0.000	1.387755	1.440156

Source: Quadros de Pessoal. Note: (p-value <0.01; p-value <0.05; p-value <0.1). For the meanings of the variables, see table 20, in Annex.

6.2 Gender Differences

In table 8, further interaction terms (variables *did2*, *did3* and *did4)* were added and represent the interactions between types of education and gender, gender and potential experience and between gender, types of education and potential experience, respectively (see model 2). In addition to the direction and significance of control variables that mostly remain, our main interest is in this interaction between gender, potential experience and the choice of vocational education in secondary education.

Table 8.: Earnings Regressions: Model 2 – full controls and addition of interaction terms did2, did3 and did4.

Source	SS	df	MS			
Model	877.390389	25	35.0956156	Number of obs	=	115,861
				F(25, 115835)	=	693.33
Residual	5863.44745	115,835	.050618962	Prob > F	=	0.0000
				R-squared	=	0.1302
				Adj R-squared	=	0.1300
Total	6740.83784	115,860	.05180889	Root MSE	=	.22499

lhw_real	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
exper	.0118251	.0028097	4.21	0.000	.0063181	.0173322
exper2	.0001518	.0004517	0.34	0.737	-.0007335	.0010372
voc	-.0132793	.0046884	-2.83	0.005	-.0224684	-.0040901
did1	.0052603	.0015002	3.51	0.000	.00232	.0082006
did2	.0080583	.0073498	1.10	0.273	-.0063472	.0224637
did3	-.0037718	.0012497	-3.02	0.003	-.0062213	-.0013223
did4	-.0049949	.0023442	-2.13	0.033	-.0095896	-.0004002
tenure	.0140262	.0017252	8.13	0.000	.0106449	.0174076
tenure2	.0004063	.0005409	0.75	0.453	-.0006539	.0014665
noterm	-.0095996	.005448	-1.76	0.078	-.0202777	.0010784
term	.0073026	.0053598	1.36	0.173	-.0032026	.0178077
indeterm	.0168918	.0057205	2.95	0.003	.0056798	.0281039
undefined	0	(omitted)				
north	-.0296282	.0116849	-2.54	0.011	-.0525304	-.0067261
center	.0094489	.0117365	0.81	0.421	-.0135544	.0324523
ltv	.0614241	.0117106	5.25	0.000	.0384714	.0843768
alentejo	.0165821	.0120833	1.37	0.170	-.0071011	.0402652
algarve	.1094486	.0119812	9.14	0.000	.0859656	.1329315
islands	0	(omitted)				
foreign	.0697558	.0019241	36.25	0.000	.0659847	.073527
medium	.0444346	.0017077	26.02	0.000	.0410874	.0477817
large	.0557834	.0018137	30.75	0.000	.0522283	.0593386
female	-.0605232	.0039832	-15.19	0.000	-.06833	-.0527163
a14	.0234794	.0052148	4.50	0.000	.0132586	.0337003
a15	.0269238	.0050065	5.38	0.000	.0171112	.0367364
a16	.0549077	.0049518	11.09	0.000	.0452022	.0646131
a17	.0888831	.0049026	18.13	0.000	.079274	.0984921
_cons	1.367363	.0138854	98.47	0.000	1.340148	1.394579

Source: Quadros de Pessoal. Note: (p-value <0.01; p-value <0.05; p-value <0.1). For the meanings of the variables, see table 20, in Annex.

What is striking is that female graduates from vocational courses appear to be penalised both on average (relative to choosing a general course) (did3), but equally through lower returns to additional years of experience relative to men that have chosen such a vocational path (did4, even if only significant at 5%). This does confirm and reinforce somewhat the results visible in the descriptive analysis of such differences. The analysis also confirms the advantages associated with tenure, permanent contracts, larger and foreign firms as well as the job being located in the capital region. Equally, year dummies appear to show increasing wages throughout time which is in line with improving economic conditions during this period.

Table 9.: Earnings Regressions: Model 1 – men analysis.

Source	SS	df	MS			
Model	422.220549	21	20.1057404	Number of obs	=	65,281
Residual	3876.22173	65,259	.059397504	F(21, 65259)	=	338.49
				Prob > F	=	0.0000
				R-squared	=	0.0982
Total	4298.44227	65,280	.065846236	Adj R-squared	=	0.0979
				Root MSE	=	.24372

lhw_real	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
exper	.0096708	.0039679	2.44	0.015	.0018942	.0174474
exper2	.0004248	.0006505	0.65	0.514	-.0008502	.0016999
voc	-.0145233	.0050832	-2.86	0.004	-.0244865	-.0045601
did1	.0050833	.0016258	3.13	0.002	.0018968	.0082699
tenure	.0238151	.0024772	9.61	0.000	.0189598	.0286704
tenure2	-.0004549	.0007757	-0.59	0.558	-.0019752	.0010654
noterm	-.0013107	.0078247	-0.17	0.867	-.0166471	.0140258
term	.0175908	.0077105	2.28	0.023	.0024782	.0327033
indeterm	.0309418	.0082105	3.77	0.000	.0148491	.0470344
undefined	0	(omitted)				
north	.0082299	.0191779	0.43	0.668	-.0293587	.0458186
center	.0547789	.0192391	2.85	0.004	.0170702	.0924875
ltv	.0940382	.0192176	4.89	0.000	.0563717	.1317047
alentejo	.0619038	.0196913	3.14	0.002	.0233089	.1004987
algarve	.1343168	.0196015	6.85	0.000	.0958979	.1727358
islands	0	(omitted)				
foreign	.0574514	.0027726	20.72	0.000	.0520171	.0628858
medium	.0591237	.002449	24.14	0.000	.0543236	.0639237
large	.0669989	.0026674	25.12	0.000	.0617707	.0722271
a14	.0206977	.0075356	2.75	0.006	.005928	.0354674
a15	.024083	.0072271	3.33	0.001	.0099179	.0382482
a16	.0466278	.007148	6.52	0.000	.0326177	.0606378
a17	.0807307	.0070762	11.41	0.000	.0668614	.0946
_cons	1.32049	.0218347	60.48	0.000	1.277694	1.363286

Source: Quadros de Pessoal. Note: (p-value <0.01; p-value <0.05; p-value <0.1). For the meanings of the variables, see table 20, in Annex.

In table 9, we estimate again model 1, but now only for men, with 65,281 individuals. It is clear that men with indefinite contracts have higher hourly wages (an increase of 3.09%) than men with other types of contract, in Algarve are the ones who earn more

comparing with other country regions (an increase of 13.43%), and also men who work in large firms earn more (6.70%) than men in medium firms. It is also clear that in year dummies, throughout time men tend to earn more. Comparing the characteristics that have the most impact on men hourly wages, Algarve is the one who stands out.

Table 10.: Earnings Regressions: Model 1 – women analysis.

Source	SS	df	MS			
Model	337.96219	21	16.0934376	Number of obs	=	50,580
				F(21, 50558)	=	413.61
Residual	1967.19465	50,558	.038909661	Prob > F	=	0.0000
				R-squared	=	0.1466
				Adj R-squared	=	0.1463
Total	2305.15684	50,579	.045575374	Root MSE	=	.19726

lhw_real	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
exper	.0105465	.003676	2.87	0.004	.0033415	.0177516
exper2	-.0001614	.000601	-0.27	0.788	-.0013394	.0010166
voc	-.0049235	.0049713	-0.99	0.322	-.0146673	.0048203
did1	.0005502	.001581	0.35	0.728	-.0025485	.0036489
tenure	.0006738	.0023063	0.29	0.770	-.0038466	.0051942
tenure2	.0015815	.0007239	2.18	0.029	.0001627	.0030004
noterm	-.0205915	.0072758	-2.83	0.005	-.0348521	-.0063308
term	-.0075345	.007143	-1.05	0.292	-.0215348	.0064659
indeterm	-.0034227	.0076479	-0.45	0.654	-.0184128	.0115673
undefined	0	(omitted)				
north	-.0368373	.0044647	-8.25	0.000	-.0455881	-.0280865
center	-.008312	.0047056	-1.77	0.077	-.017535	.0009109
ltv	.0597949	.0046226	12.94	0.000	.0507347	.0688552
alentejo	0	(omitted)				
algarve	.1157143	.0055556	20.83	0.000	.1048252	.1266034
islands	.021264	.0142393	1.49	0.135	-.0066452	.0491733
foreign	.0845914	.0025636	33.00	0.000	.0795666	.0896161
medium	.0244921	.0022873	10.71	0.000	.020009	.0289752
large	.0436092	.0023565	18.51	0.000	.0389903	.048228
a14	.0264078	.0069086	3.82	0.000	.0128668	.0399488
a15	.0301905	.0066412	4.55	0.000	.0171737	.0432074
a16	.0658802	.0065691	10.03	0.000	.0530048	.0787557
a17	.0999732	.0065047	15.37	0.000	.0872236	.1127227
_cons	1.327589	.0105509	125.83	0.000	1.306909	1.348269

Source: Quadros de Pessoal. Note: (p-value <0.01; p-value <0.05; p-value <0.1). For the meanings of the variables, see table 20, in Annex.

In table 10 we provide estimates only for women with 50,580 individuals. It is visible that returns to experience levels are higher for men with vocational courses relative to the pooled estimations. We observe that no type of contract has positive impacts to women's hourly wages, but like men, belonging to Algarve and working in large firms brings higher hourly wages (11.57% and 4.36% respectively), and also throughout time, women tend to earn more. Comparing the characteristics that have the most

impact, one more time is the country region the one who benefits the most women hourly wages.

The impact of the control variables overall is higher for men than for women, except with the year dummies where throughout time, women see their hourly wages having a more positive impact than men. Concerning the interaction term *did1*, men with vocational courses see their hourly wages increase more than men with general courses, but the same do not happen for women from vocational education. The main variables - potential experience, type of education – and the tenure effect have a higher impact in men salaries than in women.

6.3 Decomposition Analyses

As we explained earlier, one of our research questions is about trying to understand the earnings gap between men and women regarding both types of education (general and vocational) across early career years. In the previous section, we also looked at differences in the returns to variables included in the model, across all potential experience years included in the calculations.
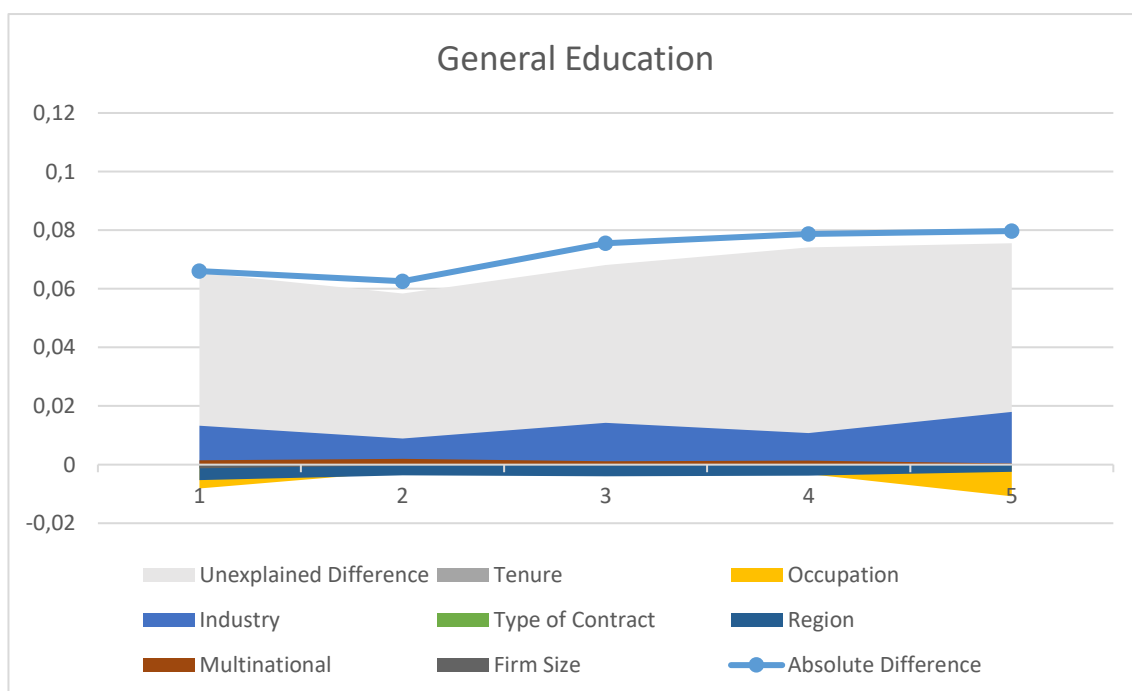

Figure 4.: Absolute difference and unexplained difference for general education and the impact characteristics.
Source: Quadros de Pessoal

In order to distinguish between what we referred previously as endowment and return or price effects, we performed a Oaxaca-Blinder decomposition of gender earnings

gaps for each year of potential experience. We did that separately for general as well as vocational secondary education graduates. In figures 7 and 8, the blue line represents the total wage gap, the grey area represents the part not explained by differences in control variables summarised in tables 11 and 12, and the remaining areas the parts explained by different endowments regarding the control variables. For general education, over the first five years of professional experience, the endowment and unexplained differences had a slow and not very significant growth.
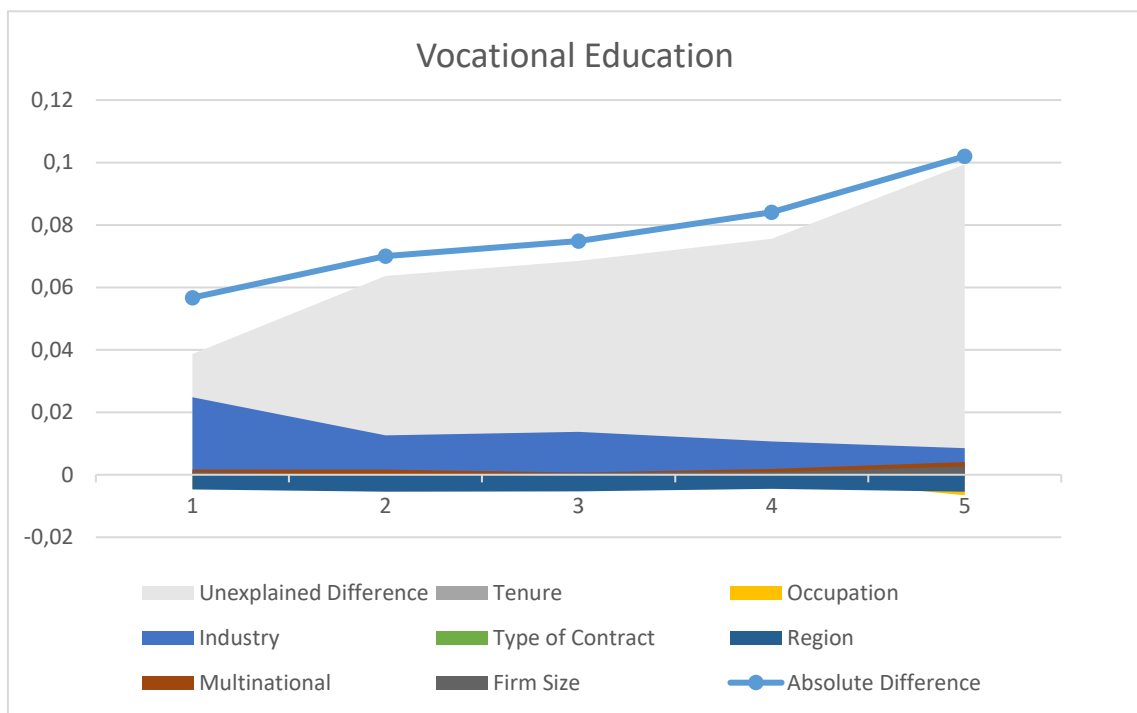

Figure 5.: Absolute difference and unexplained difference for vocational education and the impact characteristics.
Source: Quadros de Pessoal

Whilst most of the earnings gap is unexplained, different allocation of men and women across industries still account for a significant share of earnings differences. Placement across the occupational hierarchy less so and indeed it appears even to benefit women as experience levels increase. The impact of the different endowment effects is visible in table 11.

Table 11.: Impact of different characteristics on gender wage inequality for general education.

Potential Experience	General Education				
	1	2	3	4	5
Absolute Difference	0,066044	0,062571	0,075555	0,07871	0,079708
Unexplained Difference	0,065542	0,058371	0,0681	0,074108	0,075549
Explained Difference:					
Tenure	0,000337	-1,6E-05	3,05E-05	7,62E-05	-0,00057
Occupation	-0,00815	-0,0023	-0,00348	-0,00322	-0,01081
Industry	0,013271	0,008862	0,014314	0,010808	0,017994
Type of Contract	0,000132	-0,00037	-0,00029	-0,00047	-0,00022
Region	-0,00528	-0,0037	-0,00398	-0,00376	-0,00248
Multinational	0,00146	0,001973	0,001174	0,001344	0,000381
Firm Size	-0,00127	-0,00026	-0,00032	-0,00018	-0,00013
Wage Gap (%)	0,068274	0,06457	0,078482	0,08189	0,082971

Source: Quadros de Pessoal

In the case of vocational education, however, there is clearly a significant growing trend with experience. Gender wage gaps at the beginning of a career are smaller, but over the years, this inequality increases. Furthermore, what we observed was that, in the immediate transition to employment a larger share is explained by differences in endowments. Again here, industry seems to play an important role as does firm ownership as experience levels increase (namely multinational firms). The unexplained component of inequality, in turn, rises considerably with experience pointing out to an important research area in explaining the disadvantages of women choosing to enrol in vocational education. Such unexplained gap can, in principle, be accounted by unobserved characteristics associated with firm or women choices or actual discrimination in career progression within firms or within specific professional areas.

Regarding observable characteristics, table 12 makes clear that not only industry but also multinational firms and firm size are important variables. In this case, for vocational education, the impact of the variables listed in table 12 has a trend very distinct from the impact in the wage gap of individuals from general education. We observed a decrease in time of the impact of these variables, what help us conclude that the ability to explain the growing difference is smaller over time, which brings us to the main conclusion that we present at the beginning of this sub-chapter.

Table 12.: Impact of different characteristics on gender wage inequality for vocational education.

	Vocational Education				
Potential Experience	1	2	3	4	5
Absolute Difference	0,056718	0,07004	0,074893	0,084068	0,101985
Unexplained Difference	0,038653	0,063699	0,068479	0,075516	0,0994
Explained Difference:					
Tenure	-5,8E-05	0,001395	0,000946	0,000766	0,00023
Occupation	-0,00451	-0,00345	-0,00445	-0,00058	-0,00657
Industry	0,024822	0,012593	0,013705	0,010713	0,008483
Type of Contract	3,5E-05	-0,00031	9,84E-05	-0,00051	-0,00085
Region	-0,00471	-0,00543	-0,00532	-0,00447	-0,00542
Multinational	0,001621	0,001605	0,000695	0,001857	0,00407
Firm Size	0,000863	-5,9E-05	0,000742	0,000782	0,002641
Wage Gap (%)	0,058357	0,072551	0,077769	0,087703	0,107366

Source: Quadros de Pessoal

7. DISCUSSION AND CONCLUSION

Our focus in this dissertation was to understand the outcomes associated with choosing vocational secondary education in Portugal, namely if it is beneficial for graduates' professional future to choose this type of education or not. We look in particular to the period after a major reform that change the education overview because implemented the compulsory education up to secondary education enhancing education rates, and also improved the vocational courses and their access, allowing young students to choose courses that best suited their needs. We came across many different authors and realised that depending on the country and the way in which education is organised, vocational education can have a different impact than general education. Vocational education graduates are very likely in the short term to get a job and consequently a better salary than general education graduates, but in the long term there may be cases where general education graduates can progress more in their careers or earn more than their graduates of vocational education. In Portugal, this tendency can be a little different considering our results, we observed that some salaries throughout the first five career years tended to increase, for instance from men with vocational secondary education. In our case, in addition to the analysis of these topics in early careers, we also separated it considering the gender of individuals.

After describing the results in the previous chapter, we now provide further interpretation. We realised that initially, general education graduates are more likely to have higher salaries, but over the 5 years studied, vocational secondary education graduates tend to earn more. This trend only applies to men, however. Women with general education always end up with higher salaries than women with vocational education. We also found that men tend to earn much more than women because the gender wage gap is still visible in the country. Overall, without control variables, having a vocational course decreases the individual' salaries in 1.45% at the beginning of the career, but with potential experience their salary can increase 0.44% per year. With control variables, having a vocational course decreases the individual' salaries in 1.21% at the beginning of the career, but with potential experience their salary can increase by 0.37% per year. The wage inequality is also present, with women earning less 7.37% than men (approximated values).

It is also clear from the results that potential experience is a variable with a strong impact on the hourly wages of individuals. It is equally clear that women tend to earn less than men. According to estimates, the variable shows a negative impact on hourly wages by 7.37%. In Portugal, wage inequality between genders is still quite evident,

despite persistent attempts to achieve equal pay, women earn on average 16.7% less than men (CITE, 2020), with regard to basic monthly earnings, but the difference wage is even more pronounced when considering the average monthly gain.

The variable on whether individuals completed a vocational education is one of the most relevant for this study, however. We have shown that, in relation to general education, vocational education generates an initial and slight disadvantage in hourly wages (1.45% without and 1.21% with control variables both observed in model 1) that is compensated through steeper returns to initial experience for men with a vocational secondary education degree. Clearly, however, this variable has a much greater negative impact for women. In Portugal, this fact may be partly associated with the choice of vocational courses, with men choosing mostly courses such as Electrical Installation Technician, Mechanical Technician or Computer Technician. Wages are higher because demand is high for the existing supply. Women, in turn, still tend to take courses such as Accounting Technician, Tourism Technician, Commercial Technician or Sociocultural Animator who compete with higher degree courses (post-secondary courses and even academic education courses) which makes companies often choose to employ or even pay more to those who have a higher level, which may be a possible explanation for these results. What happens in Portugal is that the courses that women choose, influence the level of income that they will earn in the future and, culturally, the areas of study with better paid jobs, such as technological and scientific areas, are still connected with the male sex and more frequented by men. Our study did not include this area in the decomposition, but for further studies it would be interesting to analyse this aspect.

We should highlight, however, that such differences were likely to be captured, at least in part, by the different distribution of male and female graduates across industries and occupations. Gender inequality in the careers of vocational education graduates appears to happen within jobs and organisations as well as resulting simply from different choices of courses and areas of study. One indication that this may be the case concerns the estimates regarding the return attributed to tenure. Tenure shows a great and significant impact for men (for both tracks). Nevertheless, on women it is not statistically significant. It is also relevant that tenure does not appear to be a major component of endowment effects in the decomposition of gender earnings gaps that we have performed in the last section. This does suggest much greater difficulties of women to progress within firms for similar employment spells. Equally, contracts of indeterminate duration do carry a significant earnings premium but only for men.

Differences are not statistically significant for women. Also, endless contracts do not result in significant penalties for men, but, for women, reduce the impact on wages by 2.06%. The location premium associated with jobs being located in Lisbon is also much higher for me. All these aspects covered here appear to suggest that gender career discrimination exists in parts of the labour market relevant to general and vocational education graduates but appears to be penalizing the latter much more. This is an important research dimension for future work. What is the Portuguese reality regarding the employment of female vocational education graduates? What type of contract do companies make more according to the type of education of individuals (either vocational or general education) and why? What determines greater returns to tenure in the case of men and which direct or indirect mechanisms of discrimination are at play?

On the opposite direction but equally reinforcing the importance of career organization within firms, *foreign* companies appear to have a greater positive impact for women (close to 8.5% premium in the case of graduates from both tracks). It is also interesting to analyse that women integrated in foreign companies are more likely to have higher salaries than men, but in large and medium companies the opposite happens. What are the mechanisms that provide women greater premiums in foreign companies? Are national companies less friendly to women? These are possible questions for future studies.

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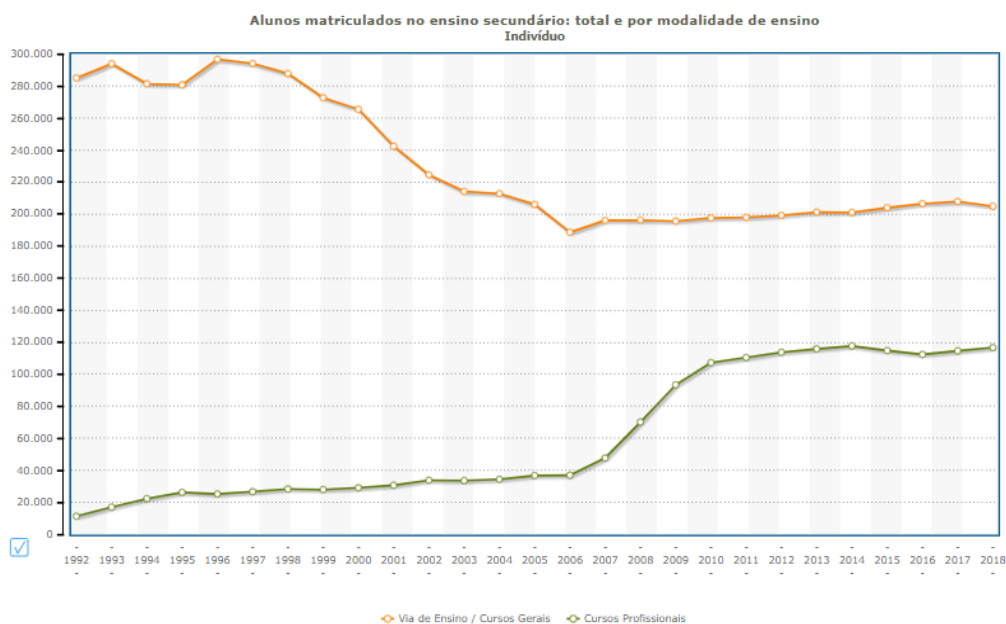
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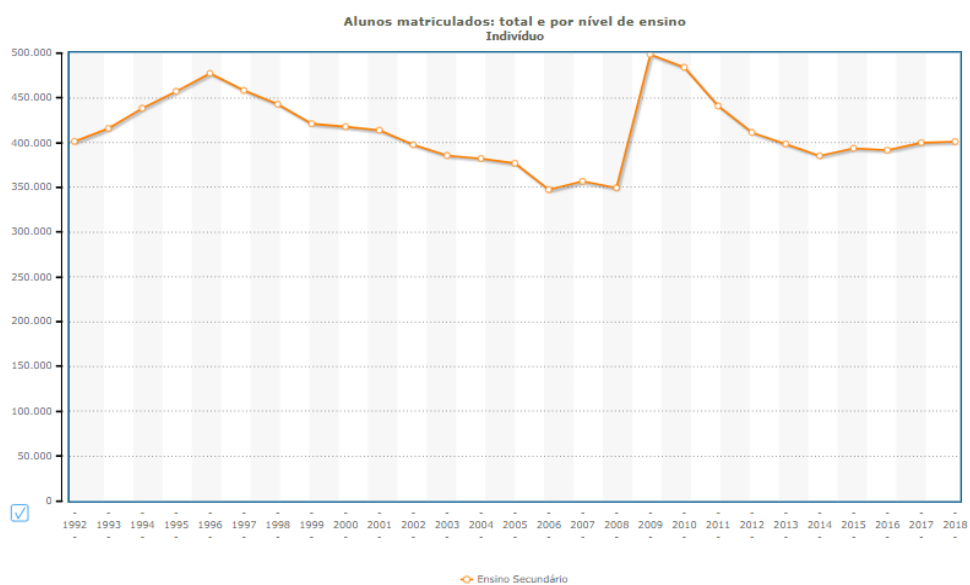
Figure 9.: Enrolled students: total and by level of education.

Source: PORDATA (DGEEC Data)

Figure 10.: Students enrolled in secondary education by type of education.

Source: PORDATA (DGEEC Data)

Table 13.: Individuals with full and part-time jobs, by type of education.

	= 1 part-time job		
esec	0	1	Total
General SE	81,843	42,509	124,352
	65.82	34.18	100.00
Vocational SE	34,020	11,713	45,733
	74.39	25.61	100.00
Total	115,863	54,222	170,085
	68.12	31.88	100.00

Source: Quadros de Pessoal

Table 14.: Individuals in different types of industry classification.

ESTABS = ISIC Rev. 3 Industry Classification	Freq.	Percent	Cum.
food, bev, tob.	3,740	3.23	3.23
textiles, dressing, leather	11,249	9.71	12.94
wood, cork, paper, no furniture	2,215	1.91	14.85
manufacture of non-metallic products	4,231	3.65	18.50
manufacture of metals products	10,287	8.88	27.38
manufacturing of furniture, and manuf.	2,121	1.83	29.21
electricity, gas and water supply	107	0.09	29.30
construction	4,523	3.90	33.21
wholesale and retail trade; repair of vehicles	28,490	24.59	57.79
hotels and restaurants	15,474	13.36	71.15
transport, storage, and communications	2,195	1.89	73.04
post and telecommunications	512	0.44	73.49
financial intermediation	520	0.45	73.94
real estate, renting and business active	19,431	16.77	90.71
education	777	0.67	91.38
health and social work	6,132	5.29	96.67
other community, social and personal	3,319	2.86	99.53
residual	540	0.47	100.00
Total	115,863	100.00	

Source: Quadros de Pessoal

Table 15.: Individuals by type of contract: noterm, term, indeterm and other.

Type of contract	Freq.	Percent	Cum.
Contract: without term	32,101	27.71	27.71
Contract: with term	69,525	60.01	87.71
Contract: indeterm time	12,407	10.71	98.42
Contract: other	1,830	1.58	100.00
Total	115,863	100.00	

Source: Quadros de Pessoal

Table 16.: Individuals by establishment location.

Location – I Establishment, NUTT II	Freq.	Percent	Cum.
North Coast	53,760	46.40	46.40
Center Coast	23,722	20.47	66.87
Lisbon	26,839	23.16	90.04
Alentejo	4,868	4.20	94.24
Algarve	6,299	5.44	99.68
ARA and ARM	375	0.32	100.00
Total	115,863	100.00	

Source: Quadros de Pessoal

Table 17.: Individuals by type of firm size.

Categories of Firm size	Freq.	Percent	Cum.
Micro	19,311	16.67	16.67
Small	29,480	25.44	42.11
Medium	28,841	24.89	67.00
Large	38,231	33.00	100.00
Total	115,863	100.00	

Source: Quadros de Pessoal

Table 18.: Individuals by type of ownership. .

Ownership type	Freq.	Percent	Cum.
National	92,236	79.61	79.61
Multinational	60	0.05	79.66
Public	658	0.57	80.23
Nat. with public participation	774	0.67	80.90
Nat. with foreign participation	22,135	19.10	100.00
Total	115,863	100.00	

Source: Quadros de Pessoal

Table 19.: Relevant literature

AUTHOR	OBJECTIVE	PLACE / TIME / SAMPLE	METHODOLOGY / METHODS OF ESTIMATING RETURNS	VARIABLES RELATED TO RETURNS	RESULTS
(AGUAS, 2011)	Expand the analysis of the effect of schooling on income from work by including variables that capture vocational education.	Brazil; 2007; Individuals between 25 and 55 years old, residents of one of the ten brazilian metropolitan regions, and who would be more likely to benefit from the effects of these courses: 56 thousand observations from PNAD (Pesquisa Nacional por Amostra de Domicílios).	Human capital theory Mincer's contribution (1974) with the income equation: $\log W_i = f(s_i x_i z_i) + u_i, i = 1,2,\dots,n$; Estimation by the OLS method; Selectivity effects by Heckman method (1979).	Dependent Variable: Individual income; Independent Variables: Education measure, Individual characteristics, Experience, Position in occupation and sector of activity, Hourly wage of main job.	Vocational education is an important explanatory factor in earnings. In particular, the effect is highest when the course attended has a higher degree of educational demand and teaching structure. However, it appears that such an impact is valid for individuals who managed to complete the study stage and work, or have already worked, in the area in which they graduated. One possible explanation is specific human capital.
(BERTOCCHI & SPAGAT, 2004)	Study the relationship between the combination of these two types of education and the evolution of societies, both from an economic and socio-political point of view.	1950-1991; Secondary level of 149 countries according to UNESCO data.	$\frac{V}{G} = (7.67 * 10^{-5})GDP - (5.21 * 10^{-9})GDP^2$, relationship that remains in time series and cross section.	Dependent Variable: $\frac{V}{G}$: Ratio between vocacional and general education; Independent Variables: General secondary education, Vocational secondary education, Income and wealth, Educational system, Individual preferences, Individual lives.	Relationship increases first and then decreases with the level of development and income, exhibiting an inverted U-shape that reflects the complex interaction between economic and political forces, including aggregate income growth, wealth inequality and political participation.
(BRUNELLO & ROCCO, 2017)	Realise whether the alleged advantages of professional education on entering the labour market become disadvantages as workers age and	United Kingdom; NCDS Database; Individuals between 23 and 55 years old.	Fixed-effects and AIPW methods. AIPW it is a GMM estimator (generalized method of moments). It combines a treatment and a result model; $Y_{ia} = \beta_0 +$	Dependent Variables: Employment, Real net earnings; Independent Variables: Education type, Age, Measures of individual ability,	A vocational course facilitates entry into the job market by putting the learned content into practice more quickly. Although, over time, having a professional education is not as beneficial as having a general

	accumulate experience in the labour market.		$\sum_s^4 \beta_s T_{is} + \sum_{a=1}^5 \gamma_\alpha A_{ia} + \delta X_i + \sum_{s=1}^4 \sum_{a=1}^5 \pi_{as} T_s A_a + \emptyset AGE_i X_i \rho HP_{qa} + u_i + \varepsilon_{ia}$	Individual fixed effect, Level of general education, Level of vocational education, Individual education choices, Employability, Education level, Real earnings.	education, this ability never becomes a disadvantage.
(GOLSTEYN & STENBERG, 2017)	This study compares the earnings trajectories over the life course associated with vocational and general education.	Sweden; 2011; Individuals with 48-56 years old - 1955-1963 cohort; Upper Secondary School Application Records from 1971-1979.	OLS regression: $Y_{ijt} = \alpha + \beta X_{ijt} + f_j + \gamma D_{ijt} + \varepsilon_{ij}$; Model consider individuals' differences in social background and ability.	Dependent Variable: Annual labour earnings; Independent Variables: Individuals characteristics, Upper secondary track, Individual GPA.	The descriptive earnings patterns indicate support for both hypotheses (1) - vocational skills enhance relative short-term earnings - and (2) - general skills enhance relative long-term earnings. The support holds when controlling for GPA and family fixed effects and also when considering enrolment in further education and fertility decisions.
(HAMPF & WOESSMANN, 2017)	This article provides new evidence to understand whether the orientation of education throughout the life cycle is still relevant today.	Dataset from PIAAC; 2011-2012; 16 European Union countries.	Difference-in-differences model, developed in Hanushek et al. (2017): $E_i = \alpha_0 + \alpha_1 A_1 + \alpha_2 A_i^2 + \beta_1 G_i + \beta_2 G_i * A_i + X_{i\gamma} + \mu_c + \epsilon_i.$	Dependent Variable: Individual Professional Situation; Independent Variable: Type of education, Age, Impact of general and/or professional education, Years of education, Country fixed effects, Country.	Exist a strong trade-off between early advantages and late disadvantages in employment for individuals with vocational education. But there is strong heterogeneity depending on the specific institutional structure of schooling and work-based training in a country.
(HANUSHEK ET AL., 2016)	Test the commitment of professional education in improving the transition between school and work.	Microdata from 18 IALS countries; German microcensus and austrian administrative data.	A difference-of-differences approach was used to compare employment rates at different ages for workers with general and vocational education. Linear probability model: $emp_i = \alpha_0 + \alpha_1 age_i + \alpha_2 age_i^2 + \beta_1 \cdot gen_i + \beta_2 \cdot gen_i \cdot age_i + X_i \cdot \gamma + \varepsilon_i.$	Dependent Variable: Individual is employed Independent Variables: Type of Education; Age; Years of schooling; Fixed effects of countries; Annual salary.	Individuals with general education tend to have more difficulties initially in the labour market, but in the long term they tend to have better job results than those in vocational education. However, estimates vary widely between countries.
(HARTOG, RAPOSO, REIS, ET	Comparison between general education and professional education	Portugal; 6.3 million of individuals born between 1951-	OLS Estimation; Selectivity bias (model): $Y_{it} = \alpha_1 Vocational_{it} +$	Dependent Variables: Outcomes, Hourly wage; Independent Variables:	Graduates from vocational secondary education have about 5% lower wage rates than

| (AL., 2018) | with remuneration in the labour market. Realizing whether having a general course yields more than a professional course, or not. | 1995; QP dataset. | $\alpha_2 X_i + \epsilon_i$. Specification1: $Logwage_{ift} = \eta_1 Vocational_i + \eta_2 male_i + \beta_1 age_{it} + \beta_2 age_{it}^2 + \beta_3 tenure_{it} + \beta_4 tenure_{it}^2 + \gamma log firmsize_{ft} + \emptyset_t + \theta_f + \epsilon_{ift}$; Specification2 (Gelbach, 2016) without firm fixed effect; Specification3 (Gelbach, 2016) with firm and workers fixed effects. | Date of birth,, Year of entry into secondary school, Type of education, Fixed costs of the company, Fixed costs of the worker, Workers of general or professional education in high-wage companies, Individual characteristics, Tenure, Firm size. | graduates with general secondary education as their highest degree. Wage gap at the beginning increases and then tends to decrease, confirming a U-shaped pattern. |
| (MEER, 2007) | Examine claims that students on a vocational track would benefit from a more academically rigorous education. | 12 144 individuals; National Education Longitudinal Survey data; 1992 and 2000 waves. | Multinomial logit selection model described in (Bourguignon et al. 2004): $Y_i = X\beta_i + \mu_i,$ $S_j^* = Z\delta_j + \eta_j,$ $j = 1 \dots M.$ | Dependent Variables: Log income, Individual subscript; Independent Variables: Individuals characteristics, Variables along with socioeconomic status, General track, Academic track, Technical track, Business track. | Evidence is found for comparative advantage in tracking. Those on the technical track are not likely to earn more had they chosen differently. Students on a general or non-college-preparatory track are likely to benefit from at least some technical education. The evidence points to comparative advantage in track selection: those on the technical track are best off there, and those on the academic track are best off following that path. The average student on the business track is, for the most part, better served by focusing on more general education. |

Source: Own elaboration

Table 20.: Description of the variables relevant to the study.

VARIABLE NAME	DESCRIPTION
ANO	Data reference year.
REG_DUR	Work Duration Regime.
CTPRO	Professional Category.
HABIL1	Education Levels (1 digit). Provide all the individuals with secondary education.
IDADE	Individuals age.
NQUAL1	Qualifications Levels (1 digit).
SITPRO	Professional situation.
INDUSTRY	Individuals industry classification.
FEMALE	Individuals gender (1=female).
TIPO_CONTRATO	Individuals type of contract: fixterm (or term), noterm and indeterm time.
MW_REAL	Monthly wage (real): by worker; multiple jobs.
HW_REAL	Actual hourly wage.
LMW_REAL	Log Monthly wage (real): by worker; multiple jobs.
LHW_REAL	Log real hourly wage.
REGION	Division of Portugal by regions: North Coast, Center Coast, Lisbon and Tejo Valley, Alentejo, Algarve and Islands (Madeira and Azores).
FIXTERM	Individuals with a fix term contract.
TENURE	Individual seniority in the company.
EXPER	Potential labour market experience.
EXPGRP	Categorical experience, 3, 3-10, etc.
PT	pt=1 part-time job.
OWNERSHIP	Type of ownership.
FIRMSIZE	Type of firm: foreign, large, medium, small and micro firm.
CNAEF2D	Individual National Classification of the Education and Training Areas (2 digits).
ISCO08	Individual Standard Classification of Occupations 1988.
ESEC	Secondary education.
COORTE	Groups of individuals with the same characteristics (in this case age).
HORAS	Individual's working hours (extra and normal).
ISCO	Individual Standard Classification of Occupations.
TMP_OUTL	Elimination of outliers: it was considered that those with salaries above 2.5 times the 99th percentile would be outliers, that is, the first salary was calculated for which there is only 1% higher salaries

Source: Own elaboration