

---

THE EFFECTS OF SKILL MISMATCH AND EDUCATIONAL MIS-  
MATCH ON EARNINGS OF PORTUGUESE HIGHER EDUCATION  
GRADUATES

**Adriana Rua Inácio**

---

Dissertation  
Master in Economics

---

Supervised by  
**Pedro Luís Marques Correia da Silva**  
**Ricardo Oliveira Braga Moreira Biscaia**

---

2023

## Acknowledgements

“Happiness is only real when shared”. So, I share with you my joy for the end of an era and the start of the most crucial stage of my life. I express my love and gratitude to everyone who accompanied me during this journey and supported me in the good and bad times. Thank you for being with me, no matter how and no matter what.

I thank my supervisors, Pedro Luís and Ricardo Biscaia, for all their support, patience, and guidance. Without you, this would not be possible. I want to acknowledge the importance of your presence in my life during my Master’s degree. You were like my second parents; you pushed me beyond what I thought I could do and made me better. Thank you for all the knowledge and insights; they were highly relevant to me and to this investigation. I am also thankful for showing me the world of research and being my number one supporter in taking a PhD in Economics. Thank you for always believing in me. Hopefully, we will work together in the four years ahead.

I am grateful to CIPES for being my second home. Also, I am thankful for all the wonderful and insightful people I have met there. These are connections to never forget.

I thank my parents, who constantly maintain their humility and simplicity and remind me where I came from, especially my mother who tries endlessly to remind me that there is nothing without hard work. I am highly grateful for helping me through my insecurities and pushing me forward. Thank you for everything that you do for me.

I am grateful to my three closest friends, António, Catarina and Luís, for being present in almost all of the moments of this journey. You were the ones who saw me at the bottom and helped me rise to the top. Thank you for your patience and love in coping with my anxious, stressed and insecure self. With extreme tenderness, I say you will never leave my heart, no matter which path life takes us.

A huge thanks to my colleagues and friends at FEP for sharing and living this experience with me. I wish you all the biggest success.

**Acknowledges:** Funding for this research was provided by FCT – Foundation for Science and Technology (Portugal) under the projects Ref. PTDC/CEDEDG/5530/2020/01.

**Abstract:**

Higher education provides individuals with competencies/skills capable of levelling up the country's economy, making it more productive, efficient and competitive. Higher education becomes an essential asset to an individual portfolio of investments. Nevertheless, phenomena like overeducation, undereducation, overskilling and underskilling are often seen in the labour market. The present dissertation aims to study the potential effects of skill mismatch and educational mismatch on individual earnings of two cohorts of graduate students in Portugal, namely graduates of 2016/2017 and 2020/2021. The data is relative to Portugal and comes from the *Eurograduate Survey 2022* initiative. Starting with Probit and OLS models to find the educational and skill mismatch determinants, respectively, and applying the skill and educational mismatch variables in a mincerian earnings equation, using a diverse set of control variables, the impact of both mismatches on earnings is observed. Findings reveal that an overeducated worker has a 12.54% penalty on earnings relative to a worker with the same education level but in a job requiring that level of education. A worker who becomes totally overskilled (100%) sees his earnings decrease by 10.68%. This latter impact is reduced to 7.44% when controlled for educational mismatches.

**JEL codes:** I26; J24; J31

**Keywords:** skill mismatch, educational mismatch, higher education, earnings, graduate labour markets

## **Resumo:**

Os indivíduos que ingressam no Ensino Superior adquirem competências/*skills* capazes de contribuir para evolução da economia de um país, tornando-a mais produtiva, eficiente e competitiva. Deste modo, a educação ao nível superior tem vindo a tornar-se um ativo essencial nos portefólios de investimento pessoais. Contudo, ainda é frequente observar no mercado de trabalho fenómenos como sobreeducação e subeducação, tanto ao nível das competências como ao da educação. O principal objetivo da presente dissertação é investigar os efeitos potenciais dos desencontros ao nível educacional e das competências nos salários de dois grupos de diplomados portugueses – diplomados de 2016/2017 e 2020/2021. Os dados utilizados são relativos a Portugal e provêm da iniciativa *Eurograduate Survey 2022*. A começar por modelos econométricos, *Probit* e *OLS*, para encontrar os fatores que determinam os desajustes a nível educacional e das competências, respetivamente, e aplicando as variáveis dos desajustes numa equação minceriana, utilizando um conjunto diverso de variáveis de controlo, o impacto destes desajustes nos salários dos diplomados é observado. Os resultados revelam que um trabalhador sobrequalificado recebe menos 12.54% do que um trabalhador com o mesmo nível de educação empregado num trabalho que requer esse nível. Um trabalhador que se torne totalmente sobrequalificado ao nível das competências observa uma redução ao seu salário de 10.68%, um impacto que se reduz para 7.44% quando controlado para os desajustes ao nível da educação.

**Códigos JEL:** I26; J24; J31

**Palavras-chave:** desencontro de competências, desencontro educacional, ensino superior, salários, mercado de trabalho dos diplomados

## Index of contents

|                                                     |    |
|-----------------------------------------------------|----|
| Introduction .....                                  | 1  |
| 1.1. Theories of Human Capital .....                | 5  |
| 1.2. Empirical results on the literature.....       | 8  |
| 1.3. Types of mismatches and their measurement..... | 11 |
| 2. Data and Descriptives .....                      | 16 |
| 2.1. Data.....                                      | 16 |
| 2.2. Sample descriptives.....                       | 18 |
| 3. Methodology .....                                | 22 |
| 3.1. Measurement of mismatch .....                  | 22 |
| 3.1.1. Educational mismatch .....                   | 22 |
| 3.1.2. Skill mismatch.....                          | 23 |
| 3.2. The determinants of the mismatches .....       | 26 |
| 3.3. The effects of the mismatches on earnings..... | 28 |
| 4. Analysis .....                                   | 29 |
| 4.1. Descriptive Analysis.....                      | 29 |
| 4.2.1. Determinants of the mismatches .....         | 38 |
| 4.2.2. Impact of the mismatches on earnings .....   | 44 |
| 5. Conclusions.....                                 | 50 |
| Appendix.....                                       | 53 |
| References.....                                     | 56 |
| Annexes.....                                        | 60 |

## Index of tables

|                                                                                                                                                 |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 1 – Percentage of graduate coverage by type of institution per cohort.....                                                                | 18 |
| Table 2 – Samples for both mismatches .....                                                                                                     | 18 |
| Table 3 – Graduate distribution by gender, citizenship, degree, type of institution and cohort (shares).....                                    | 19 |
| Table 4 – Graduates’ distribution by field of study and gender (shares).....                                                                    | 20 |
| Table 5 – Graduates’ distribution by type of employment, country of work and cohort (shares) .....                                              | 21 |
| Table 6 – Twelve competencies of the <i>Eurograduate Survey 2022</i> .....                                                                      | 24 |
| Table 7 – Educational mismatch distribution by cohort (shares) .....                                                                            | 29 |
| Table 8 – Descriptive statistics of underskilling and overskilling variables by cohort.....                                                     | 30 |
| Table 9 – Statistical descriptives for age and the studies related variables.....                                                               | 32 |
| Table 10 – Statistical descriptives for employment related variables by cohort.....                                                             | 34 |
| Table 11 – Probit model for overeducation (outcome) – average marginal effects .....                                                            | 39 |
| Table 12 – OLS regression for the determinants of overskilling .....                                                                            | 42 |
| Table 13 – OLS regression for the determinants of underskilling .....                                                                           | 43 |
| Table 14 – Mincerian equation of the effects of educational mismatch and skill mismatch on earnings.....                                        | 45 |
| Table 15 – Mincerian equation of the effects of educational mismatch and skill mismatch on earnings (eleventh regression of the Table 14) ..... | 46 |

## Index of figures

|                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------|----|
| Figure 1 - The three modules of <i>Eurograduate Survey 2022</i> .....                                             | 17 |
| Figure 2 – Categorization of actual and required level of education and computation of the mismatch measure ..... | 23 |
| Figure 3 – Possible differences between own and required skill level.....                                         | 25 |
| Figure 4 – Presence of educational mismatches in the three levels of education .....                              | 29 |
| Figure 5 – Average intensities of underskilling and overskilling by level of education.....                       | 30 |
| Figure 6 – Average intensity of underskilling and overskilling by the educational mismatch categories.....        | 31 |
| Figure 7 – Higher education GPA distribution by level of education.....                                           | 33 |
| Figure 8 – Gross monthly earnings (Wage) by cohort.....                                                           | 35 |
| Figure 9 – Number of employers of the firm (right) and type of employment contract (left) .....                   | 36 |
| Figure 10 – Share of graduates by business sector .....                                                           | 37 |
| Figure 11 – Share of graduates by occupation .....                                                                | 37 |
| Figure 12 – Distribution of graduates by the district of their higher education institution .....                 | 38 |

## Introduction

Education is the base for a free society, and at an individual level, it becomes the source of better life opportunities and freedom to choose the desired future. More precisely, higher education provides individuals with competencies/skills capable of levelling up the country's economy, making it more productive, efficient and competitive. However, for education to realize its full potential, the labour market must absorb the majority of qualified individuals, match them with the right jobs, and give them the right opportunities for self-development and economic growth. In the case of Portugal, this issue is very relevant as the country has one of the most qualified generations of all time (INE, 2023). Nevertheless, the Portuguese economy remains unproductive relative to other European countries (Eurostat, 2023a), unable to use valuable resources efficiently - higher educated individuals.

The motivation of this dissertation begins with the last question, specifically in the relationship between recent graduates and the labour market, i.e., the interaction between supply of higher education graduates and the demand for qualified workers. Young individuals help to shape a country's future so that the articulation between them and the labour market is highly relevant. Higher education has become an essential asset to an individual portfolio of investments due to new demand in the labour market and the associated returns, i.e., higher earnings or better job positions (Becker, 1993). Nevertheless, phenomena like overeducation, undereducation, overskilling and underskilling are often seen in the labour market. In Portugal, the rapid massification of higher education in the last two decades resulted in a mismatch between the skills or education of the worker and the job requirements, increasing the above-mentioned phenomena in an already unproductive economy (Marques et al., 2021; Figueiredo et al., 2015).

Since, as Mincer (1993) pointed out, an individual earnings profile is a representation of its human capital investments accumulated, if the obtained education and skills acquired do not match the job requirements, the earnings of the individual do not reflect his potential productivity. Kiker et al. (1997) study on the existence of overeducation and undereducation of Portuguese workers supports the idea that earnings depend not only on educational mismatch but also on skill mismatch.

Therefore, the research questions of this investigation are: To what extent do educational and skill mismatches exist among Portuguese higher education graduates? What are their determinants? And, what is the effect of mismatches on the earnings of Portuguese higher



education graduates? The primary aim is to study the potential impact of skill mismatch and educational mismatch on individual earnings of two cohorts of graduate students in Portugal, graduates of 2016/2017 and 2020/2021. In this way, the study analyses graduates five years and one year after completing their degree, which can give insight into the evolution of the abovementioned potential effects and, thus, observe Portugal's performance on the matter. This is important considering that a mismatch between one's skills/education and job requirements results in an inefficient allocation of human resources in the labour market causing lower productivity, less profit to firms, lower earnings and individual dissatisfaction, and therefore an overall burden in the country's macroeconomic indicators.

To pursue this goal, data from the *Eurograduate Survey 2022* initiative will be used – a European Commission project aimed to track graduates' lives one year and five years after graduation, in which the author has participated in its implementation and treatment of data. The survey consists of a representative questionnaire that gives more comprehensive and comparable data on higher education graduates, including, for example, information on socio-demographics, labour market situation, skill levels self-assessment and reasons for mismatch, job satisfaction, social integration, democratic and academic values. Portugal covered all three modules, ISCED 5, 6 and 7<sup>1</sup>, and cohorts of 2016/2017 and 2020/2021 graduates. Therefore, data for this study will be only relative to Portugal.

To know if skill mismatch exists in the Portuguese labour market and at what level, graduates were asked to self-evaluate the skills required for their current job to their current skills. Additionally, to know if there is an educational mismatch, a question was asked about what level of education is usually required to perform the job. Based on these questions, it will be possible to see the existence or not of the two types of mismatches and also observe their determinants.

Starting with Probit and OLS models to know the determinants of the educational and skill mismatches, respectively, and then applying the skill and educational mismatch variables in a mincerian earnings equation, it will be possible to see the impact of skill and educational

---

<sup>1</sup> ISCED refers to the International Standard Classification of Education. The levels 5, 6 and 7 correspond to, respectively: short-cycle tertiary education, bachelor's or equivalent level and master's or equivalent level. In Portugal, they are, respectively, translated into: Curso Técnico Superior Profissional (CTeSP); Licenciatura (3 anos) ou equivalente; Licenciatura (5 anos), Mestrado, Mestrado Integrado ou equivalentes (European Commission, 2023; Unesco, 2011).

mismatches on earnings of the Portuguese higher education graduates. The *Eurograduate Survey 2022* also allows the use of diverse control variables to estimate better such impact, such as age, sex, education level and field of study.

Findings on the determinants of the mismatches reveal that employment characteristics are the main explanatory factors of the phenomena but also characteristics related to the degree itself, such as the field of study or the engagement in extracurricular activities. For example, having a full-time job decreases the likelihood of being overeducated and the intensity of overskilling. Also, engaging in international experiences or doing voluntary activities during the degree reduces the probability of being overeducated.

Regarding the impact on earnings, findings suggest a negative impact of overeducation and overskilling, a positive effect of undereducation and no significant impact of under-skilling. An overeducated worker earns less 12.54% on average than a worker with the same education level, who took the same degree in the same higher education institution, that is in the same occupation and business sector (*ceteris paribus*), but whose job requires that level of education. A worker who becomes totally overskilled sees his earnings decrease by 10.68% on average, and such impact is reduced to 7.44% when controlled for educational mismatches.

Although overeducation is a very studied topic in the literature, this dissertation adds essential information to the Portuguese context. Portugal has a well-known problem regarding graduates' transition to the labour market. We often see young, qualified people migrate to other European countries in search of better jobs and life conditions, and, at the same time, it is recurrent to observe a lack of qualified workers in the Portuguese labour market.

This investigation can be a point of starting to observe the situation of Portuguese graduates in the labour market and then help institutions retain young talent by creating or renewing jobs that correspond to their education and skills. Also, higher education institutions may have to become more aligned with what the labour market currently demands. To allocate better qualified workers to qualified jobs or create more qualified jobs for the growing number of qualified workers, all the institutions involved must come together to find long-lasting solutions to this problem in Portugal.

The present dissertation is structured as follows. The next section encompasses theoretical models that explain mismatches in the labour market and wage premiums, empirical

findings about the subject, relevant concepts, and their possible measures. The second section introduces the data and some sample descriptives. The third section entails the methodology, which explains the construction of the variables and presents the econometric models used. The regression analysis and discussion of results are presented in section four. The fifth section presents the conclusions.

## 1. Literature review

### 1.1. Theories of Human Capital

Education at all levels allows an individual to acquire new knowledge and skills, which is why investments in education are considered investments in human capital (Becker, 1993). The theory of human capital by Gary Becker (1993) views education as an investment: individuals' investments have direct and indirect costs, and they will only invest if their profit outruns the costs; so, individuals invest in education because they will have higher returns: it increases their productivity and, for that, they receive better salaries, i.e., individuals who invest in higher qualifications, are relatively compensated in the labour market. Additionally, employers also benefit from this because more productive workers contribute to the firm's overall productivity of the firm and raise profits.

Along with Becker, Jacob Mincer was another vital contributor to the concept of investment in human capital. Mincer (1993) refers to investments in people as time-consuming. Precisely, schooling reduces the span of working life and earnings because the more time one spends on schooling, the less time one will have to work in a specific lifetime. In marginal terms, "the cost of currently postponing earnings by one year is much more significant than the present cost of reducing earnings by one year" (Mincer, 1993, p.9). In 1960, Mincer showed that college graduates earned 50% more than high school graduates (Murphy & Welch, 1989), emphasising the higher returns on higher education. However, higher education attainment will only be fruitful if future earnings highly cover the incurred costs.

One popular metric for measuring the benefits of undertaking higher education is the "returns on education". This indicator measures the difference in percentage points between the students' wage with or without a further educational level. A widely notorious method to calculate returns on education is Jacob Mincer's (1974) earnings function, which briefly consists of a log-linear regression where wages are the dependent variable. For example, if years of schooling is one independent variable, its coefficient is the rate of return of one additional year in school. This equation can differ in its specifications according to one's subject of study (Psacharopoulos, 1994; Polachek, 2003; Polachek, 2002).

Returns on higher education can be determined as an interaction of supply and demand in the labour market (Murphy & Welch, 1989). As higher education is seen as a more significant investment, for its higher returns, more people will want to obtain higher qualifications

and, in turn, as competition increases (due to the increase in the supply of qualified workers), the returns on education decline (Freeman, 1976). When the supply of qualified workers outruns demand, it can result in overeducation because the surplus of higher qualified workers ends up in jobs that do not require that level of education or become unemployed. Murphy & Welch (1989) found that falling wage premiums in America in the 70's between high school and college students coincided with the highest annual growth in the percentage of workers with a college degree in the antecedent years. On the demand side of labour markets, knowledge-based economies and upgrading technological changes increase demand for new skills and qualified workers, which can lead to skill and educational mismatches if supply does not respond at the same rate. In the short term, specific skills can become unnecessary (skill obsolescence) (McGuinness et al., 2018); however, in the long run, it can lead to massive investments in higher education and, thus, a surplus of higher qualified workers, resulting in overskilling and overqualification (Marques et al., 2021).

As opposed to human capital theories, market and credentialist perspectives on the role of education in earnings inequality appeared in the 70's during the period of falling wage premiums in America (Teixeira, 2007). That period has brought some implausibility to human capital theories since it questioned the role of education in enhancing individuals' productivity and earnings which led to an insurgence of opposing theories.

Signalling theory often points out that there is imperfect/hidden information to employers about job applicants, so hiring is an investment decision because it is made under uncertainty (Spence, 1973). To reduce this uncertainty, employers and employees must rely on signals such as education (level). The problem arises when the same signal cannot distinguish an unproductive individual from a productive one. Because these signals have costs, a productive individual will only acquire a signal if the compensation is bigger than that of an unproductive one. If not, he is not inclined to incur more costs (Spence, 1973; Rholing, 1986; Teixeira, 2007; Shields & Hernandez, 2020).

This shows us that, in the limit, this theory considers that individuals are born with specific capabilities and productivity, and, therefore, education has no role in enhancing or raising them, and it is just a signal to get the job and to reduce uncertainty in the labour market (Rholing, 1986; Teixeira, 2007; Shields & Hernandez, 2020). At the time, this was a major criticism of Human Capital theories that shook down its credibility and relevance. Nevertheless, with an empirical strategy, various authors and Mincer himself tried and succeeded

in maintaining the robustness of Human Capital theory, albeit considering that education could indeed have a signalling effect (Teixeira, 2007).

On the other hand, credentialist perspectives emerge within the sociology of education and believe that education itself does not produce entirely the skills necessary to succeed in the labour market (Walters, 2004). Collins (1979) pioneered credentialism theory and emphasises that having the required educational credentials for a particular job does not imply having the right skills to perform the job. The author states that employers hire workers based on their credentials, undermining their effective skills, which results in unskilled, seemingly qualified workers in better job positions with an earning wage premium. This gives an insight into the apparent education/job match but rather unproductive firm (economy) and how higher education expansion can contribute to underemployment or misallocation of graduates and, consequently, diminishing returns on education (Livingstone, 1998; Walter, 2004). Mincer (1993, p.1) also mentioned that "school is neither the only nor necessarily the most important training ground for shaping market productivities", highlighting the importance of knowledge acquired on-the-job training and on other human capital investments after school to explain differentials on earnings.

Another perspective opposed to Human Capital theory is the assignment theory by Michael Sattinger (1993), which proposes a distribution of earnings influenced by both the supply and demand side of the labour market, in which earnings do not depend solely on individual characteristics of workers but also on characteristics of the jobs. Labour market phenomena arise because there is an allocation problem of assigning heterogeneous workers to jobs with different complexity, where the optimal match would be allocating the most competent workers to the most complex jobs and the less skilled to less skilled demanding jobs. Hence, for example, if there is a lack of complex jobs to assign to "competent workers", these will, presumably, choose a job below their level, and overeducation appears as underutilisation of their skills. An important feature of this theory is that an educational mismatch implies a skill mismatch (Sattinger, 1993; Allen & van der Velden, 2001; Allen & De Weert, 2007).

Besides from theories on Human Capital, it is also relevant to mention the distinction between soft and hard skills and the recent importance given to the former in the literature. Albeit these definitions are not consensus, hard skills are often considered as cognitive skills,

the technical knowledge linked to “academic intelligence”, whereas soft skills are non-cognitive skills, often related to social skills and personal traits (Schulz, 2008; Teng et al., 2019). Balcar (2016) considers that a range of cognitive abilities are more connected with some soft skills than hard skills, such as problem-solving or organising information. Schulz (2008) explains that the definition of soft skills differs depending on the context because a particular skill can be a hard skill (must know) in one area and a soft skill in another (necessary but not mandatory). For example, in certain fields of study, such as STEM<sup>2</sup>, since they demand very technical knowledge, soft skills like communication skills are viewed as a complement. However, in fields like Services or Arts, where communication or creativity plays a more important role, these soft skills become the hard skills (“the must know”).

Soft skills are being recognized as being equally important to educational achievement and professional success as hard skills (Koch et al., 2014), and as the labour market evolves to become more digital and automated, multi-skilled graduates are demanded (Teng et al., 2019), which emphasizes the relevance of soft skills because hard skills are no longer the only attribute necessary to compete in the labour market (Schulz, 2008). Both types of skills increase an individual’s productivity and guarantee success in the labour market (Balcar, 2016), but typically, the highlight is on hard skills. The point is that hard skills can be translated onto an individual’s credentials/qualification, they are easily measured by achievement tests and present a relative faster development (easily trained). On the contrary, soft skills development is slow, its measurement is difficult due to their subjective nature and, hence, it is not possible to stamp them on a piece of paper (Balcar, 2016). Because of these characteristics of soft skills and their underevaluation, mismatches can occur in the labour market in the sense that a graduate can have the necessary technical knowledge (hard skills) required for a particular job but lack the soft skills to succeed in that job or even apply the knowledge he owns. That is why equal importance should be given to soft skills, either in their development or teaching and job requirements.

## **1.2. Empirical results on the literature**

There is extensive literature about returns to education and overeducation and little about overskilling relative to the former. For starters, the returns to education are well-established

---

<sup>2</sup> Science, Technology, Engineering and Mathematics.

and documented. In 1960, Jacob Mincer showed that college graduates earned 50% more than high school graduates (Murphy & Welch, 1989). Murphy & Welch (1989) studied the wage premiums in America from 1964 to 1987, focusing on the fluctuations of the premiums in the considered time. The findings were consistent with the decline in the 70's. In short, in 1963, college graduates earned 47% more than high schoolers, and the wage premium rose steadily up until the 70's, when it declined until 1980, and then it rose sharply from 1980 onwards to higher levels than in 1963. An important finding was that the decline in the 70's coincided with a higher growth of college graduates, which is consonant with the idea that a rise in competition or even the massification of higher education leads to a fall in the returns to education due to supply outrunning demand and, additionally, leading to phenomena like overeducation.

When in the presence of overeducation and undereducation, overeducated workers tend to earn more than those with an adequate level of education performing the same job. However, they earn less than those with the same education level performing the job that requires that level of education. On the other side, undereducated workers earn less than workers with an adequate level of education when performing the same job yet earn more than the same education level workers working in a job that requires that level of education (Kiker et al., 1997; Green & McIntosh, 2007).

Kiker et al. (1997) estimated the determinants and impact on earnings of over and undereducation. The findings showed that the likelihood of being overeducated (undereducated) relative to having adequate education decreases (increases) with the years on the job and labour market experience. Impact on earnings was what was expected; being overeducated (undereducated) has a negative (positive) effect on earnings relative to being matched. However, using years of overeducation, undereducation and required education, the coefficients inverted their signal, i.e., one additional year of overeducation (undereducation) has a positive (negative) effect on earnings. This can be explained, as the authors state, by the possibility of these phenomena being transitory as the various forms of human capital can be substituted, so that, for example, overeducated workers can substitute their education for lack of experience and, hence, improve in their job year after year and gain the possibility of job mobility to a job that corresponds to their education level, which is consistent with the decreasing probability of being overeducated rather than adequately educated when one has more years on the job and labour market experience.



Literature on overskilling and underskilling is scarce compared to the existent one about over and undereducation. There is some evidence on studies to the importance of unobserved skill variables when estimating the returns to education, measured in terms of qualifications, which suggests the relevancy of including skill measures or more direct skill measures. Juhn et al. (1993) and Ingram et al. (2003) studied the wage inequalities in America from 1964 to 1989 and post the 70's up until 2000, respectively, and found that wage inequalities were mainly due to unobserved (e.g., competencies) and observed (e.g., education/credential) skill dimensions. However, within the same education group, unobserved variables contributed the most to wage inequality, suggesting that formal education as the only proxy for skill does not give insightful results.

Allen & van der Velden (2001) observed if educational mismatches implied skill mismatches, an implication of the assignment theory<sup>3</sup>, and the impact of both on earnings. To measure skill mismatch, they resorted to measures of skill utilization and skill deficit<sup>4</sup>, overeducation and undereducation counterparts, respectively, if the former statement was true. When estimated separately, the results indicated that overeducation had a negative effect on wages, undereducation had a positive effect (smaller than for overeducation), skill underutilization (overskilling) had a negative effect, and skill deficits had no impact whatsoever. Nevertheless, the most important finding was that when each mismatch was controlled for the other, it was found that, although both mismatches had statistical significance, the effect of skill underutilization fell by half, and the overeducation effect remained identical, suggesting that skill mismatches do little to account for educational mismatches. Also, the relative impact of the mismatches on earnings is higher for educational mismatches, whereas skill mismatches have a relatively strong negative effect on job satisfaction and a relatively strong positive effect on the search for another job.

Green & McIntosh (2007) and Allen & De Weert (2007) performed similar studies and found similar results. Green & McIntosh (2007) found a statistically significant positive relationship between overqualification and overskilling but with a weak coefficient, with only half of the overqualified workers reported being overskilled and the remaining having the

---

<sup>3</sup> The assumption is that if an individual is overeducated, he is not entirely using his skills and knowledge; therefore, being overeducated would mean being overskilled too.

<sup>4</sup> The questions used to measure skill utilization and skill deficit were the following, respectively: "My current job offers me sufficient scope to use my knowledge and skill" and "I would perform better in my current job if I possessed additional knowledge and skills". The data was from a questionnaire for the project 'Higher Education and Graduate Employment in Europe' in 1998.

appropriate skills (“the apparent overqualified”). Underqualification and underskilling seem to have no relationship. In estimating the impact of the mismatches on earnings, the effect of the mismatches was expected, although relative to skill mismatches, only the overskilling variable had a statistically significant impact. Controlling for skill mismatch in the earnings equation diminished the impact of overqualification and underqualification on earnings, but the decrease was not significant. Hence, overqualified workers still earned relatively less, which is a possible demonstration that skill underutilization is not a significant cause for the impact of overqualification, and a low level of unobserved skills and abilities could be a possible reason.

Allen & De Weert (2007)<sup>5</sup> divided skill mismatch into skill use and skill shortage and considered vertical and horizontal educational mismatches. Their study revealed, as expected, that undereducated or horizontally and vertically matched graduates reported high levels of skill use. In contrast, overeducated graduates or horizontally mismatched graduates showed low levels of skill use. Skill shortages reported to be more prevalent in undereducated or horizontally mismatched graduates. Despite these conclusions, their estimations for the impact on earnings show that being overeducated has a highly statistically significant negative effect, whereas skill mismatches showed a less dramatic effect. Indeed, skill shortages and skill use were only statistically significant in two of the five countries. These results showed that although educational and skill mismatches are somewhat related, they are not dependent on one another but are distinct phenomena. Other effects on wages captured by these three studies, consistent with the literature, were that workers’ experience has positive effects and having a temporary contract, family responsibilities (for example, children) or being a woman has negative effects.

### **1.3. Types of mismatches and their measurement**

As mentioned earlier, labour market frictions can be of various forms, and the literature presents a wide variety of definitions of skill mismatch and educational mismatch. It is consensual that the two concepts differ in their nature, but they are always somewhat correlated.

Skill mismatch can be defined as an incompatibility between the employee’s skills and the skills required for a particular job (Handel, 2003; Brunello & Wruuck, 2019). In addition,

---

<sup>5</sup> The study was done for five countries, namely, Germany, Japan, Netherlands, Spain and United Kingdom. However, the conclusions presented here are the aggregated results.

Allen & De Weert (2007) and Allen & van der Velden (2001) describe skill mismatch as a misalignment between acquired and required skills. However, it can have a broader meaning. Cedefop (2014) defines skill mismatch as the situation where the level or type of skills available does not correspond to labour market needs, which makes the term skill mismatch almost an “umbrella brand”, i.e., all other types of mismatches emerge from this concept. Eurostat (2016) also takes an identical definition but divides it into “at macro level” and “at micro level”, in which the Cedefop (2014) definition is at macro level and the strands of mismatches, for example, vertical or horizontal, either measured in terms of skills (abilities) or credentials, are at micro level. Brunello & Wruuck (2019) make the same division yet with a slightly different meaning: at macro level, they define skill mismatch the same way but add the sub-optimal match between qualifications or skills offered and required (previously, this was at micro level); at micro level, skill mismatch is only the incompatibility between the skills workers have and skills required for their job.

Guvenen et al. (2020) state that skill mismatch measures the difference between the portfolio of skills a job requires and the individual’s portfolio of abilities to learn those required skills. Here, the authors distinguish abilities from skills, in which the former is fixed, and the latter is cumulative and depends on the former, i.e., an individual has certain abilities (fixed) that allow him to learn and develop specific skills; therefore, the mismatches occur between the abilities of the individual and the skills required for the job. This is an interesting distinction, rarely used (to my current knowledge), that seems to support signalling theory in the sense that it takes abilities as an intrinsic characteristic of the individual not capable of being developed, but, on another note, it resonates as well with Human Capital theory because, although ability is fixed, skills are not, and therefore are capable of being acquired and developed through education or on-the-job training, for example. This distinction is good for explaining why workers with the same observed skills or education perform differently in different jobs, which is a research question of the authors’ study.

On the other hand, educational mismatch is the most commonly used term to identify labour market mismatches in the literature, mainly due to earlier research on the relationship between education and labour market outcomes because the proxy used to acknowledge education was the length of educational attainment (Sgobbi & Sulleman, 2012). According to Sloane & Mavromaras (2020), educational mismatch refers to when the years of schooling of a worker do not correspond to those a certain job demands. For Allen & De Weert (2007)

and Allen & van der Velden (2001), the educational mismatch occurs when workers are working below or above their education level. Nevertheless, these authors emphasise, implicitly, that an educational mismatch is indirectly a skill mismatch because education contributes to the skill development of the workers. Hence, the education level reflects the skills acquired, but what made them distinguish both mismatches was to question the extent to which education mismatches imply skill (ability) mismatches.

In essence, the definitions will always depend on the authors choice or on how the mismatch is manifested, measured, perceived and their determinants. Mismatches can be described as vertical, horizontal, obsolescence, gaps and shortages. Vertical mismatches are measured in terms of overeducation, undereducation, overskilling and underskilling, in which the level of education or skills is higher or lower than required (Cedefop, 2014; McGuinness et al., 2018). Horizontal mismatches are related to performing a job not related to the main field of study (McGuinness et al., 2018; Rudakov et al., 2022) or can be defined as a match between the level of skills/education with a mismatch in the type of skills/education (Cedefop, 2014).

Regarding obsolescence, shortages and gaps, these appear to be associated only with skills in the literature. Skill obsolescence translates into skills no longer useful or demanded in the labour market, but it can also be due to skill deterioration, atrophy, and wear on the individual side (Cedefop, 2014; McGuinness et al., 2018). Skill shortages, at the economy level, mean that skill supply is not sufficient for labour market demands (Cedefop, 2014); at firm level, it happens when employers do not find qualified workers with the required skills to fill job positions (McGuinness et al., 2018; Brunello & Wruuck, 2019); at individual level, for Allen & De Weert (2007) it can be a negative discrepancy between own and required competencies, the same as being underskilled. Finally, skill gaps are situations where the workforce does not have sufficient skills levels to meet firms' requirements, even if it has the right qualifications and, in this way, it will not be able to perform the job adequately (Cedefop, 2014; McGuinness et al., 2018; Brunello & Wruuck, 2019). This can be a case of lousy signalling or credentialism.

For this investigation, it is relevant to understand the concepts of overeducation, undereducation, overskilling and underskilling because they will be measured with the educational and skill mismatch and posteriorly estimate their impacts on graduate earnings. According

to Sloane & Mavromaras (2020) and Cedefop (2014), overskilling happens when an individual does not fully use acquired skills and abilities in the current job. To Allen & De Weert (2007) and Green & McIntosh (2007), overskilling is denominated as underutilisation of skills, meaning the same as before.

On the other hand, overeducation is seen as an individual that has completed more years of education than the current job requires, and it can also be called as overschooling (Leuven & Oosterbeek, 2011; Cedefop, 2014; Sloane & Mavromaras, 2020). For instance, Rudakov et al. (2022) define overeducation as a situation where graduates work in non-graduate jobs; however, this can be redundant because a graduate can work in a graduate job and still be overeducated. Allen & De Weert (2007) and Allen & van der Velden (2001) take the level of education to define overeducation, so an overeducated worker is one with a higher level of education than required. Some authors, namely Cedefop (2014), Sloane & Mavromaras (2020) and Marques et al. (2021), distinguish overeducation from overqualification, in which the former is measured in years of schooling and the latter in levels of qualification, hence, an overqualified individual is one with a higher-level qualification than is required for the job. This distinction holds the premise that an overqualified individual is also overeducated but being overeducated does not necessarily mean being overqualified. It is important to know that in the literature on overeducation and overskilling, the term overeducation is mostly used when comparing high school graduates with college graduates because the measure “years of schooling” is common to both. However, even when measured with qualification level, the term used to describe the mismatch depends on the authors choice, and one seldom sees the term overqualification.

Relatively to undereducation and underskilling, the former can be defined as having fewer years of education or a lower level of education than the job requirements and the latter as an individual’s lack of skills to perform the current job at acceptable standards (Cedefop, 2010; Sloane & Mavromaras, 2020), in which to Allen & van der Velden (2001) and Allen & De Weert (2007) is denominated as skill deficit and skill shortage, respectively.

These phenomena were not (and still are not) always visible and easy to measure. There can be different measurement approaches depending on the type of mismatch (McGuinness et al., 2018). Overeducation and undereducation can be measured by the subjective, empirical or job evaluation methods (Cedefop, 2010; Leuven & Oosterbeek, 2011). The subjective method is based on the perceptions of the worker and entails two subjective approaches, in

which the worker self-evaluates the required level of qualification “to get the job” and “to do the job” and is then compared to his highest education level. These two subjective approaches are meant to catch a credential effect (“to get the job”) and a skill effect (“to do the job”), but it will depend on how the question is asked. For example, in their studies, Allen & van der Velden (2001) and Allen & De Weert (2007), use this distinction to separate educational from skill mismatch. This method has the advantage of being easily computed on survey data; however, it is exposed to subjective bias that can result in under or overestimation of the phenomenon (McGuinness, 2006; McGuinness et al., 2018).

The empirical or realized matches method relies on pre-existing data, more precisely, on estimates of the mean or modal required level of qualification within an occupation, and, thus, it is observed if the worker’s highest education level is above or below. Although it is a great method to apply on micro datasets, it does not provide information on skill requirements, and, as the mean or modal is calculated on pre-existing data, it may not reflect newer requests on the level of qualification. The job evaluation or job analysis method consists of classifying occupation requirements by experts, which has higher incurred costs and can also lead to subjective evaluations (Leuven & Oosterbeek, 2011; McGuinness et al., 2018).

On the other hand, overskilling and underskilling are typically measured through the subjective method, recurring on scale-response questions to compare the skills utilized on the job and the current skills of the worker, discriminated in various skills or not. It is also exposed to subjective bias but is considered a more precise measure to assess skill level than overeducation and undereducation because it can differentiate the level of skills acquired through formal education or on the job, which overeducation measures can not (Figueiredo et al., 2015; McGuinness et al., 2018).

## 2. Data and Descriptives

### 2.1. Data

The data used for this analysis is from the *Eurograduate Survey 2022* project, part of the European Graduate Tracking Initiative (EGTI) of the European Commission. The EGTI aims for comparable data and improvement of graduate tracking measures among European Union countries to contribute to the objectives of the European Education Area (EEA) initiative, fostering suitable investments in education and helping in education-related decision-making (European Commission, 2021). In order to achieve its goals, EGTI has conducted the project Eurograduate Pilot Survey in which the first European pilot survey on higher education graduates was initiated in 2018 by eight European countries<sup>6</sup> – *Eurograduate 2018* – and in 2022, the second pilot was launched in seventeen European countries<sup>7</sup> – *Eurograduate 2022* – and is intended to surpass the obstacles encountered in the former. The initiative aims to be repeated every four years at a European level, and the next *Eurograduate Survey* is already scheduled for 2026 and will be launched in 25 countries.

The *Eurograduate Survey 2022* consists of a questionnaire organized into three modules (A, B and C) and divided into six sections – Education History, Work, Competencies, Regional Mobility, EU module, and Personal Social Background (see Figure 1). The organization of the survey information in modules is only for countries to have the option to choose which modules they want to address, i.e., module A comprises crucial information about graduates, and it is mandatory for all countries; module B and C encompasses recommended and social values information, respectively, and so they are optional. Portugal addressed all three modules.

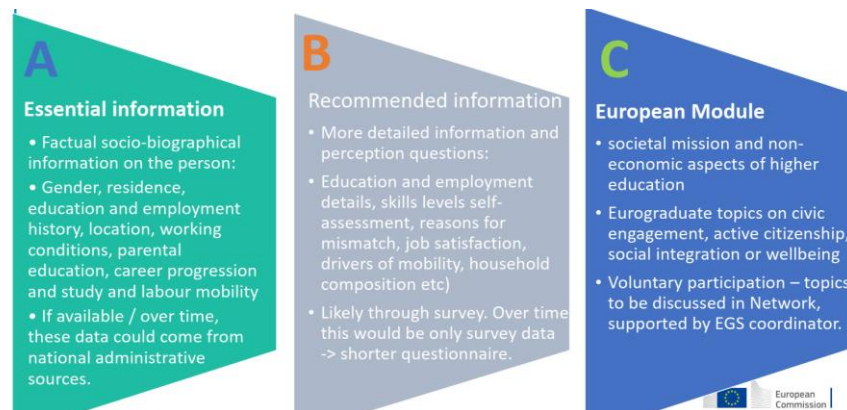
In the Table A.1. of the annexes, there are some examples of questions within each section of the questionnaire, namely the questions that are used to extract the data for this dissertation. As one can see, the *Eurograduate Survey 2022* is a complete (and extensive) questionnaire aiming at more complete and rich information not only on graduate tracking but also on personal information on societal values and socio-demographics.

---

<sup>6</sup> Austria, Czechia, Germany, Greece, Croatia, Lithuania, Malta and Norway.

<sup>7</sup> Austria, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Germany, Greece, Hungary, Italy, Latvia, Malta, Norway, Portugal, Romania, Slovakia and Slovenia.

**Figure 1 - The three modules of *Eurograduate Survey 2022***



Source: European Commission

The target groups of the *Eurograduate Survey 2022* were graduates who completed their degree in 2016/2017 and in 2020/2021, five years and one year after completion, from all types of Higher Education institutions, except the ones in which graduates are paid<sup>8</sup>. The ISCED's covered were ISCED 5, 6 and 7, although not all countries covered ISCED 5.

The data for this study is only relative to Portugal and covers both cohorts and ISCED 5, 6 and 7. The project was proposed by Direção Geral de Estatísticas da Educação e Ciência (DGEEC), financed by the European Commission' Directorate General for Education and Culture (DGEAC) and conducted by a team (the author included) from Centro de Investigação de Políticas do Ensino Superior (CIPES), a sub-contractor of DGEEC for the project. The questionnaire was centralized, i.e., the same for every higher education institution. However, the data collection was decentralized, i.e., each institution was contacted primarily by the Portuguese *Eurograduate Survey 2022* team for clarifications about the project and graduate contact possible procedures and, if they accepted to join the project, their only tasks were to disclose the project and to contact their graduates, with the means available, to respond the questionnaire, sending them an invitation with an individual and unique link for response.

Approximately 78 Portuguese higher education institutions have participated, 35 public and 43 private, although this number increases if we count the respective departments of each. It corresponds to almost all the higher education system in Portugal, where the 3.33%

<sup>8</sup> For example, in Portugal, Instituto Universitário Militar is a Higher Education institution that fully supports the training for military officers and sergeants from Forças Armadas (FFAA) and Guarda Nacional Republicana (GNR). Hence, was omitted.



for cohort 2016/2017 and the 3.50% for cohort 2020/2021 that did not participate represent small higher education institutions. The Table 1 displays the percentage of graduate coverage by type of institution in each cohort, and it is observable that 100% of the graduates from public institutions were covered. Graduates not covered come from private higher education institutions, in which the majority are from private polytechnics.

**Table 1** – Percentage of graduate coverage by type of institution per cohort

| <b>Type of Institution</b> | <b>Universe</b> | <b>Graduates Covered</b> | <b>% of Coverage</b> |
|----------------------------|-----------------|--------------------------|----------------------|
| <b>2016-2017</b>           |                 |                          |                      |
| Public Universities        | 32,675          | 32,675                   | 100.00%              |
| Public Polytechnics        | 21,983          | 21,983                   | 100.00%              |
| Private Universities       | 8,863           | 8,195                    | 92.46%               |
| Private Polytechnics       | 3,716           | 2,148                    | 57.80%               |
| <b>Total</b>               | <b>67,237</b>   | <b>65,001</b>            | <b>96.67%</b>        |
| <b>2020-2021</b>           |                 |                          |                      |
| Public Universities        | 37,163          | 37,163                   | 100.00%              |
| Public Polytechnics        | 26,319          | 26,319                   | 100.00%              |
| Private Universities       | 11,441          | 10,662                   | 93.19%               |
| Private Polytechnics       | 5,974           | 3,922                    | 65.65%               |
| <b>Total</b>               | <b>80,897</b>   | <b>78,066</b>            | <b>96.50%</b>        |

In the Table 2 we can observe the reach of the *Eurograduate Survey 2022*. In total, 18,280 graduates responded validly to the questionnaire. For this study, the initial sample would be the employed graduates, regardless of the type of employment, and that would account for 13,607 responses. However, after checking for non-missing answers to all the questions from where the data is extracted, the sample is reduced to 8,064 graduates.

**Table 2** – Samples for both mismatches

|                                            | <b>2016/2017</b>  | <b>2020/2021</b>  | <b>Total</b>    |
|--------------------------------------------|-------------------|-------------------|-----------------|
| <b>Valid responses</b>                     | 7,453             | 10,827            | 18,280          |
| <b>Initial sample – employed graduates</b> | 6,509             | 7,098             | 13,607          |
| <b>Final sample</b>                        | 3,399<br>(42.15%) | 4,665<br>(57.85%) | 8,064<br>(100%) |

## 2.2. Sample descriptives

This section presents the descriptive statistics of the sample used in the analysis. The Table 3 shows the graduates' distribution by gender, citizenship, completed degree and type of higher education institution. In total, females account for 60.71% of the graduate workers;

91.18% of the graduates have Portuguese citizenship, while 8.82% have citizenship from another country.

Very few graduates (2.78%) completed a CTeSP degree (ISCED 5), and the high majority has completed a Bachelor's (ISCED 6) or a Master's degree (ISCED 7), around 51.91% and 45.31%, respectively. This corresponds to the completed degree level in that cohort and, at the same time, to the highest education level of the graduate. Some graduates, especially from cohort 2016/2017, could have enrolled in another higher education programme and obtained another education level, most likely higher. So, the completed level in the respective cohort would not correspond to their highest level of education. Although *Eurograduate Survey 2022* allowed the update to current times of the graduates' education level, all the graduates that had an update were erased from the sample because most of the variables that are used in the study refer to the degree level completed in the year of the cohort and not to the posterior education level completed<sup>9</sup>. Around 1,816 observations were erased.

Additionally, approximately 84% of the sample graduated from a public higher education institution, where nearly 60% of them came from a public university. Graduates from private institutions account for around 16% of the sample.

**Table 3** – Graduate distribution by gender, citizenship, degree, type of institution and cohort (shares)

|                                          | 2016\2017 | 2020\2021 | Total   |
|------------------------------------------|-----------|-----------|---------|
|                                          | (Share)   | (Share)   | (Share) |
| <b>Female</b>                            | 59.31     | 61.74     | 60.71   |
| <b>Portuguese</b>                        | 92.56     | 90.18     | 91.18   |
| <b>Degree level</b>                      |           |           |         |
| CTeSP (ISCED 5)                          | 2.47      | 3.00      | 2.78    |
| Bachelor (ISCED 6)                       | 51.31     | 52.35     | 51.91   |
| Master (ISCED 7)                         | 46.22     | 44.65     | 45.31   |
| <b>Higher education institution type</b> |           |           |         |
| Public university                        | 48.96     | 49.30     | 49.16   |
| Public non-university                    | 37.16     | 33.48     | 35.03   |
| Private university                       | 10.80     | 12.82     | 11.97   |
| Private non-university                   | 3.08      | 4.40      | 3.84    |
| <b>Total</b>                             | 100       | 100       | 100     |
|                                          | (3,399)   | (4,665)   | (8,064) |

<sup>9</sup> For example, the degree average final grade refers to the degree finished in the cohort year, and there is no way to know the final grade of the other education level (in case there is one).

The graduate distribution by field of study is represented in the Table 4. The fields of study that concentrate more graduates are Business and Administration and Engineering, Manufacturing and Construction, contributing to 40% of the sample, approximately. Following these two fields, the Social Sciences is the third most populated field, concentrating almost 10% of the graduates. Education Science, Humanities and Architecture are the least populated fields with less than 2% of graduates.

Among females, the field of Business and Administration is the one that concentrates more female graduates, followed by Health and Social Sciences. Regarding males, 34.66% choose a degree in Engineering, and 19.48% hold a degree in Business, accounting for almost 55% of the male graduate sample. We can see that, for example, fields of study such as Engineering and ICT are more prevalent among males than females, whereas holding a degree in Health or Psychology is more frequent among females rather than males.

**Table 4** – Graduates’ distribution by field of study and gender (shares)

|                                              | <b>Male<br/>(Share)</b> | <b>Female<br/>(Share)</b> | <b>Total<br/>(Share)</b> |
|----------------------------------------------|-------------------------|---------------------------|--------------------------|
| <b>Eurograduate fields of study:</b>         |                         |                           |                          |
| Generic programmes and qualifications (...)  | 0.00                    | 0.02                      | 0.01                     |
| Education Science                            | 1.10                    | 2.39                      | 1.88                     |
| Teacher Training                             | 1.52                    | 2.76                      | 2.27                     |
| Arts                                         | 4.61                    | 5.66                      | 5.25                     |
| Humanities                                   | 1.41                    | 1.16                      | 1.26                     |
| Languages                                    | 0.88                    | 3.13                      | 2.24                     |
| Social sciences, journalism and information  | 7.07                    | 10.80                     | 9.34                     |
| Psychology                                   | 1.04                    | 4.43                      | 3.10                     |
| Business and administration                  | 19.48                   | 20.00                     | 19.79                    |
| Law                                          | 2.97                    | 3.98                      | 3.58                     |
| Natural sciences, mathematics and statistics | 4.86                    | 5.82                      | 5.44                     |
| ICT                                          | 4.89                    | 1.06                      | 2.57                     |
| Engineering, manufacturing, construction     | 34.66                   | 9.36                      | 19.30                    |
| Architecture and town planning               | 1.67                    | 1.82                      | 1.76                     |
| Agriculture, forestry, fisheries, veterinary | 1.99                    | 2.27                      | 2.16                     |
| Medicine, Dental Studies                     | 1.82                    | 3.35                      | 2.75                     |
| Health                                       | 3.66                    | 11.00                     | 8.11                     |
| Pharmacy                                     | 1.04                    | 2.74                      | 2.07                     |
| Welfare                                      | 0.41                    | 3.98                      | 2.58                     |
| Services                                     | 4.92                    | 4.27                      | 4.53                     |
| <b>Total</b>                                 | 100<br>(3,168)          | 100<br>(4,896)            | 100<br>(8,064)           |

Another feature of the graduates' sample is that 98.24% of them are solely employed, and very few graduates reported being merely self-employed simultaneously, as represented in the Table 5. In addition, 89.30% have a job in Portugal. Differences between cohorts are not very significant.

**Table 5** – Graduates' distribution by type of employment, country of work and cohort (shares)

|                           | <b>2016\2017</b> | <b>2020\2021</b> | <b>Total</b>   |
|---------------------------|------------------|------------------|----------------|
|                           | <b>(Share)</b>   | <b>(Share)</b>   | <b>(Share)</b> |
| <b>Type of employment</b> |                  |                  |                |
| Employed                  | 98.06            | 98.37            | 98.24          |
| Self-employed             | 0.38             | 0.62             | 0.52           |
| Both                      | 1.56             | 1.01             | 1.24           |
| <b>Portugal</b>           | 87.23            | 90.87            | 89.30          |
| <b>Total</b>              | 100              | 100              | 100            |
|                           | (3,399)          | (4,665)          | (8,964)        |

### **3. Methodology**

The methodology adopted in this dissertation will answer two research questions:

- To what extent do educational and skill mismatches exist among Portuguese higher education graduates? What are their determinants?
- What is the effect of mismatches on the earnings of Portuguese higher education graduates?

To answer the first question, the educational and skill mismatch measures are needed to be defined and constructed, which is the scope of sections 3.1.1. and 3.1.2. . Then, to know their determinants, econometric regressions will be used as defined in section 3.2.. The answer to the second question relies on a Mincerian earnings equation defined in section 3.3. using the aforementioned educational and skill mismatch measures.

#### **3.1. Measurement of mismatch**

##### **3.1.1. Educational mismatch**

To ascertain for educational mismatch, two questions are used and combined. Graduates were asked the degree level obtained in the year of the correspondent cohort, and the options were: ISCED 5, ISCED 6 and ISCED 7. Then, graduates had to answer the following question: “What level of education is usually required to perform this job?”, in which the answer options were:

- Lower than higher education
- Short cycle higher education (ISCED 5)
- Bachelor or equivalent degree (ISCED 6)
- Master or equivalent degree (ISCED 7)
- Doctorate/PhD (ISCED 8)

Therefore, a graduate is considered to be overeducated if the level of education required to perform the job is lower than the one completed in that cohort; undereducated if the level of education required to perform the job is higher than the one completed in that cohort; and adequately matched if the level of education required to perform the job is equal to the one completed in that cohort. For example, a graduate with a completed Master’s degree and in a job requiring a Bachelor degree is considered overeducated.

More precisely, the measure of educational mismatch was defined as the difference between the actual level and the required level of education. The Figure 2 presents the categorization (in brackets) of the two variables used to measure the mismatch and how the measure of mismatch was computed. A difference of zero means a match between actual and required education, therefore an adequate level of education for the job, and a positive or a negative difference indicates a mismatch. The positive difference means that the actual level of education is above the one required for the job – overeducation – and the negative difference means the opposite – undereducation. According to the values of the difference, the educational mismatch variable is then categorized into the three levels mentioned: adequate education, overeducation and undereducation.

**Figure 2** – Categorization of actual and required level of education and computation of the mismatch measure

|                             |                                 | Actual level of education |             |             |             |
|-----------------------------|---------------------------------|---------------------------|-------------|-------------|-------------|
|                             |                                 | (difference)              | ISCED 5 (5) | ISCED 6 (6) | ISCED 7 (7) |
| Required level of education | Lower than higher education (4) |                           | 1           | 2           | 3           |
|                             | ISCED 5 (5)                     |                           | 0           | 1           | 2           |
|                             | ISCED 6 (6)                     |                           | -1          | 0           | 1           |
|                             | ISCED 7 (7)                     |                           | -2          | -1          | 0           |
|                             | ISCED 8 (8)                     |                           | -3          | -2          | -1          |

Overeducated

Adequate education

Undereducated

Source: Own elaboration

### 3.1.2. Skill mismatch

The skill mismatch measure used in the dissertation relies on the part of the questionnaire that asks graduates to rate twelve competencies individually regarding their current level and

on the level the current job requires. The twelve competencies are presented in the Table 6. The graduate rated each competence on a scale from one to seven, with 1 representing “Very Low” and 7 “Very High”.

**Table 6** – Twelve competencies of the *Eurograduate Survey 2022*

|    |                                                                                                                                                                         |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a) | Mastery of your own field or discipline                                                                                                                                 |
| b) | Analytical thinking                                                                                                                                                     |
| c) | Ability to rapidly acquire new knowledge                                                                                                                                |
| d) | Ability to coordinate activities                                                                                                                                        |
| e) | Ability to work productively with others                                                                                                                                |
| f) | Ability to make your meaning clear to others                                                                                                                            |
| g) | Ability for applied use of information and communication technologies (ICT, e.g., text processing, working with tables, retrieve information from the internet, e-mail) |
| h) | Ability for advanced use of information and communication technologies (ICT, e.g., programming, syntax in statistical software)                                         |
| i) | Ability to come up with new ideas and solutions                                                                                                                         |
| j) | Willingness to question your own and others’ ideas                                                                                                                      |
| k) | Ability to present products, ideas or reports to an audience                                                                                                            |
| l) | Ability to write and speak in a foreign language                                                                                                                        |

Although graduates were presented with these twelve competencies, not all were included in the construction of the skill mismatch measure. The reason for the exclusion was that the competencies’ importance or relevancy differs from one another, and the selection process was as follows. When first running the log of earnings regression with the measures of underskilling and overskilling, including all twelve competencies, they revealed not being statistically significant and with a coefficient sign incompatible with the literature. To check the consistency of the measures, they were substituted for the individual skill level differences (the core of the measures as will be explained below), and it was observed that only five<sup>10</sup> of the twelve competencies were statistically significant, therefore revealing the unequal importance among them. For that matter, only those five competencies were considered for constructing the variables in question. In the Table A.1., in the appendix, the results that led to the five competencies selection are displayed.

<sup>10</sup> These five competencies are: “Ability to rapidly acquire new knowledge” (c), “Ability to make your meaning clear to others” (f), “Willingness to question your own and others’ ideas” (j), “Ability to present products, ideas or reports to an audience” (k) and “Ability to write and speak in a foreign language” (l).

Moving on to the construction of the measure itself, let us consider the difference between the own and required level in which a respondent is considered underskilled in a given competence if that difference is below -1, overskilled if it is above 1, adequately matched if it is between or equal to -1 and 1. For example, consider a graduate that rates the skill b) “Analytical thinking” with 5 for his level. This means that if he evaluates the level of “Analytical thinking” required to perform his job in 7, he is considered underskilled because his skill level is below the required, i.e., the level difference is below -1. If the graduate evaluated the latter in 2, he would be considered overskilled since the level difference is above 1. The same logic follows for the adequately matched within the abovementioned interval. The Figure 3 shows the possible differences.

**Figure 3** – Possible differences between own and required skill level

|                      |   | Own skill level |    |    |    |    |    |   |   |
|----------------------|---|-----------------|----|----|----|----|----|---|---|
|                      |   | -               |    |    |    |    |    |   |   |
|                      |   |                 | 1  | 2  | 3  | 4  | 5  | 6 | 7 |
| Required skill level | 1 | 0               | 1  | 2  | 3  | 4  | 5  | 6 | 7 |
|                      | 2 | -1              | 0  | 1  | 2  | 3  | 4  | 5 | 6 |
|                      | 3 | -2              | -1 | 0  | 1  | 2  | 3  | 4 | 5 |
|                      | 4 | -3              | -2 | -1 | 0  | 1  | 2  | 3 | 4 |
|                      | 5 | -4              | -3 | -2 | -1 | 0  | 1  | 2 | 3 |
|                      | 6 | -5              | -4 | -3 | -2 | -1 | 0  | 1 | 2 |
|                      | 7 | -6              | -5 | -4 | -3 | -2 | -1 | 0 | 1 |

Underskilled  
Adequately skilled  
Overskilled

Source: Own elaboration

Following Allen & De Weert (2007), a margin of one scale point was considered to define graduates with the adequate skill level for the job to account for the time gap between their response and the present analysis of the data because it could have been an improvement in this period in graduate level of competencies or the characteristics of the job. Also, it serves to adjust the self-assessment of skills in case of a slightly low or high self-judgement of one’s abilities.



The next step to compute the skill mismatch measure was to separately calculate the percentage of skills in which each graduate was considered underskilled or overskilled, and the discrete variable constructed gives us somewhat the extent to which one is underskilled or overskilled (see Allen & De Weert (2007)). In other words, it measures the intensity of being underskilled or overskilled. For instance, consider a graduate who reported being underskilled in one of the five competencies, overskilled in two, and adequately match in the remaining two. Hence, the skill mismatch measure of underskilling would have a value of 0.2 and the one for overskilling would have a value of 0.4.

### 3.2. The determinants of the mismatches

Different approaches were followed to ascertain for the determinants of the mismatches for the educational mismatch and skill mismatch. A binary choice model – the probit model – was used for the educational mismatch. The outcome considers a binary variable in which 1 represents “Overeducation” and 0 “Adequate education”. The undereducated graduates, about 310, were excluded from the analysis due to very low observations. Therefore, the probit model will give us the probabilities of being overeducated relative to being adequately educated depending on a set of explanatory variables. It is structured in the following way.

The dependent variable  $Y$  is binary, and the model is:

$$(1) Y_i = \beta_0 + \sum_{k=1}^K \beta_k X_k + \varepsilon$$

with the probability of  $Y_i = 1$ , conditioned to a set of explanatory variables  $X_K$ , being equal to the standard normal cumulative density function  $\Phi(\cdot)$  represented in equation (2).

$$(2) P(Y_i = 1 | X_1, X_2, \dots, X_k) = \Phi(\beta_0 + \sum_{k=1}^K \beta_k X_k) = \int_{-\infty}^{\beta_0 + \sum_{k=1}^K \beta_k X_k} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}t^2} dt$$

Accordingly, the dependent binary variable in the model is ‘Overeducation’, with 1 representing overeducation and 0 representing adequate education. Hence, equation (1) will be as follows:

$$(3) \text{Overeducation}_{i,t} = \alpha + \rho_1 \text{hegpa}_{i,t} + \rho_2 \text{hsgpa}_{i,t} + \sum_{k=1}^K \beta_k X_k + \delta_t + \gamma_j + \sigma_i,$$

where  $i$  denotes the individual,  $j$  the higher education institution and  $t$  the cohort.

The variables *hegpa* and *hsgpa* are the grade point averages of the last finished higher education degree and before entering a higher education institution (high school), respectively. These two variables will measure, at best, the level of acquired skills and innate ability, respectively, i.e., higher education GPA would be a proxy for acquired skills and a certain level of specialized knowledge, whereas, the high school GPA, which corresponds to the last three years of secondary school and it is determinant to access higher education, would be a proxy of somewhat innate ability or general ability because, during the period that is determined, the knowledge that students acquire is on a general level and, maybe, closer to explain the unobserved factors of ability or skills of a graduate (see Green & McIntosh, 2007)<sup>11</sup>. The hypothesis here is that the high school GPA would have a higher impact on determining skill mismatch than on educational mismatch.

$X_k$  represents a vector of control variables for individual characteristics (sex, age), characteristics held by the graduate during the higher education degree (field of study, enrolment status, international experience, internships or work placements, voluntary activities, paid labour, work experience before the degree) as they can be determinant in the process of developing competencies during the degree and employment characteristics (more than one job, size of the firm/organization, type of contract, first job, part or full-time worker, type of employment, years in current employment, months in employment after graduation, business sector and occupation);  $\delta_t$  is cohort fixed effects,  $\gamma_j$  is the district of the higher education institution fixed effects and  $\sigma_i$  is country of work fixed effects.

Since the measures of underskilling and overskilling are continuous variables, the model is OLS with the abovementioned explanatory variables and fixed effects. The regressions are as follows.

$$(4) \text{Underskilling}_{i,t} = \alpha + \beta_1 \text{hegpa}_{i,t} + \beta_2 \text{hsgpa}_{i,t} + \sum_{k=1}^K \beta_k X_k + \delta_t + \gamma_j + \sigma_i,$$

---

<sup>11</sup> The authors use the achievements in Math (for example, A-level) as an indicator of general ability or, for example, problem-solving skills.

$$(5) \text{Overskilling}_{i,t} = \alpha + \beta_1 \text{hegpa}_{i,t} + \beta_2 \text{hsgpa}_{i,t} + \sum_{k=1}^K \beta_k X_k + \delta_t + \gamma_j + \sigma_i .$$

### 3.3. The effects of the mismatches on earnings

An adaptation of the notorious Jacob Mincer's (1974) earnings function will be used to study the effects of the mismatches on the Portuguese graduates' earnings. It consists of a log-linear regression where wages are the dependent variable. There will be individual regressions for each mismatch and one with both. This decision is to observe first the individual effects of each mismatch on earnings and then the effects of both simultaneously. The regressions will be as follows.

$$(6) \log(w_{i,t}) = \alpha + \text{educmismatch}_{i,t} + \sum_{k=1}^K \beta_k X_k + \delta_t + \gamma_j + \sigma_i ,$$

$$(7) \log(w_{i,t}) = \alpha + \text{underskilling}_{i,t} + \text{overskilling}_{i,t} + \sum_{k=1}^K \beta_k X_k + \delta_t + \gamma_j + \sigma_i ,$$

$$(8) \log(w_{i,t}) = \alpha + \text{educmismatch}_{i,t} + \text{underskilling}_{i,t} + \text{overskilling}_{i,t} + \sum_{k=1}^K \beta_k X_k + \delta_t + \gamma_j + \sigma_i ,$$

where  $i$  denotes the individual,  $j$  the higher education institution,  $t$  the cohort and  $w_{i,t}$  the gross monthly earnings of individual  $i$  from cohort  $t$ .  $\text{Educmismatch}_{i,t}$  consists in a categorical variable with the three categories defined in section 3.1.1., in which “1” represents undereducation, “2” an adequate level of education and “3” overeducation. The  $\text{underskilling}_{i,t}$  and  $\text{overskilling}_{i,t}$  variables were defined in section 3.1.2..  $\sum_{k=1}^K \beta_k X_k$  is a set of control variables, already defined, but also includes the  $\text{hegpa}_{i,t}$  and  $\text{hsgpa}_{i,t}$  and quadratic terms for age, years in current employment and months in employment after graduation.  $\delta_t$ ,  $\gamma_j$  and  $\sigma_i$  are the same fixed effects as before. The description of the variables included in regressions (3) to (8) is displayed in the Table A.2., in the appendix.

## 4. Analysis

### 4.1. Descriptive Analysis

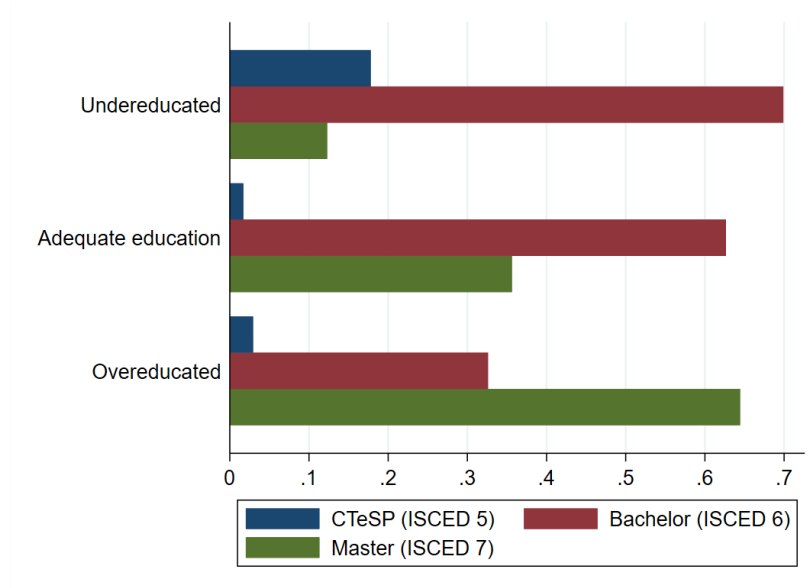
This section presents the statistical descriptives of the variables included in the regressions, except for those already presented in section 2.2.. The Table 7 shows the graduates distribution by educational mismatch and cohort. Almost 60% of the graduates have adequate education for their job, 36.69% possess an education level higher than the one that is required for their job, and 3.83% have a lower education level than required. The differences between cohorts are not very substantial.

**Table 7** – Educational mismatch distribution by cohort (shares)

|                           | 2016\2017<br>(Share) | 2020\2021<br>(Share) | Total<br>(Share) |
|---------------------------|----------------------|----------------------|------------------|
| <b>Undereducated</b>      | 4.71                 | 3.19                 | 3.83             |
| <b>Adequate education</b> | 58.40                | 60.26                | 59.47            |
| <b>Overeducated</b>       | 36.89                | 36.55                | 36.69            |
| <b>Total</b>              | 100<br>(3,399)       | 100<br>(4,665)       | 100<br>(8,064)   |

There are differences among the levels of education regarding the presence of educational mismatches, which are displayed in the Figure 4.

**Figure 4** – Presence of educational mismatches in the three levels of education



Source: *Eurograduate Survey 2022*. Own elaboration.

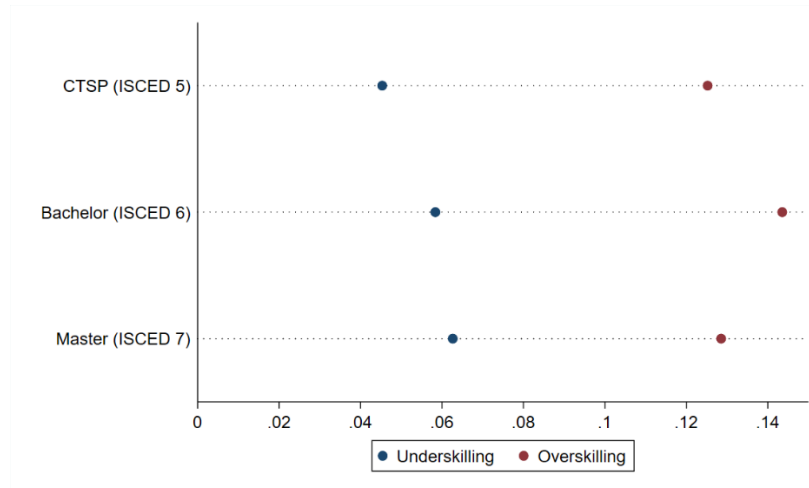
Graduates who hold a CTeSP degree (ISCED 5) are more frequent among the undereducated graduates relative to the other categories and, within the undereducated, graduates with a Bachelor's degree are, by far, in higher number. Also, Bachelor's graduates account for around 60% of the adequately matched graduates. Regarding the overeducated graduates, approximately 65% hold a Master's degree. Considering this, one will expect that it is more likely to be overeducated relatively to adequately matched for a Master's graduate rather than a Bachelor's graduate.

Regarding skill mismatches, from the Table 8, it is observable that both phenomena present, on average, low intensities. The intensity of underskilling among graduates is, on average, 6% in total, and the intensity of overskilling, although higher, is only around 14%. Differences between cohorts are not very significative. In the Figure 5, one can see that the average intensity of overskilling is higher among Bachelor's graduates, and the average intensity of underskilling is higher for Master's graduates. However, for the latter, the difference between the Bachelor's graduates is not very significative.

**Table 8** – Descriptive statistics of underskilling and overskilling variables by cohort

|                      | <b>N</b> | <b>Mean</b> | <b>St. Dev.</b> |
|----------------------|----------|-------------|-----------------|
| <b>2016/17</b>       | 3399     |             |                 |
| <b>Underskilling</b> |          | 0.0486      | 0.129           |
| <b>Overskilling</b>  |          | 0.126       | 0.223           |
| <b>2020/21</b>       | 4665     |             |                 |
| <b>Underskilling</b> |          | 0.0682      | 0.158           |
| <b>Overskilling</b>  |          | 0.144       | 0.236           |
| <b>Total</b>         | 8064     |             |                 |
| <b>Underskilling</b> |          | 0.0599      | 0.147           |
| <b>Overskilling</b>  |          | 0.136       | 0.231           |

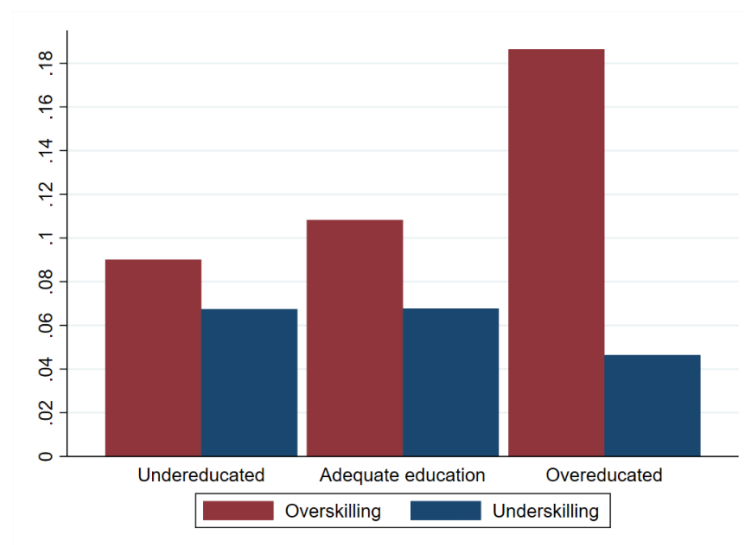
**Figure 5** – Average intensities of underskilling and overskilling by level of education



Source: *Eurograduate Survey 2022*. Own elaboration.

In the Figure 6 is displayed the average intensity of the skill mismatches among the educational mismatches. The average intensity of overskilling is relatively higher for the overeducated graduates, almost 19%, which can be an intuitive result if overeducation can correlate with underutilization of skills, as assignment theory predicts. One thing not very intuitive is the fact that overeducated graduates can also be underskilled, although, the average intensity of underskilling is the lowest relative to the others. It demonstrates that even being overeducated, a graduate can lack certain skills that are relevant or not in his job.

**Figure 6** – Average intensity of underskilling and overskilling by the educational mismatch categories



Source: *Eurograduate Survey 2022*. Own elaboration.

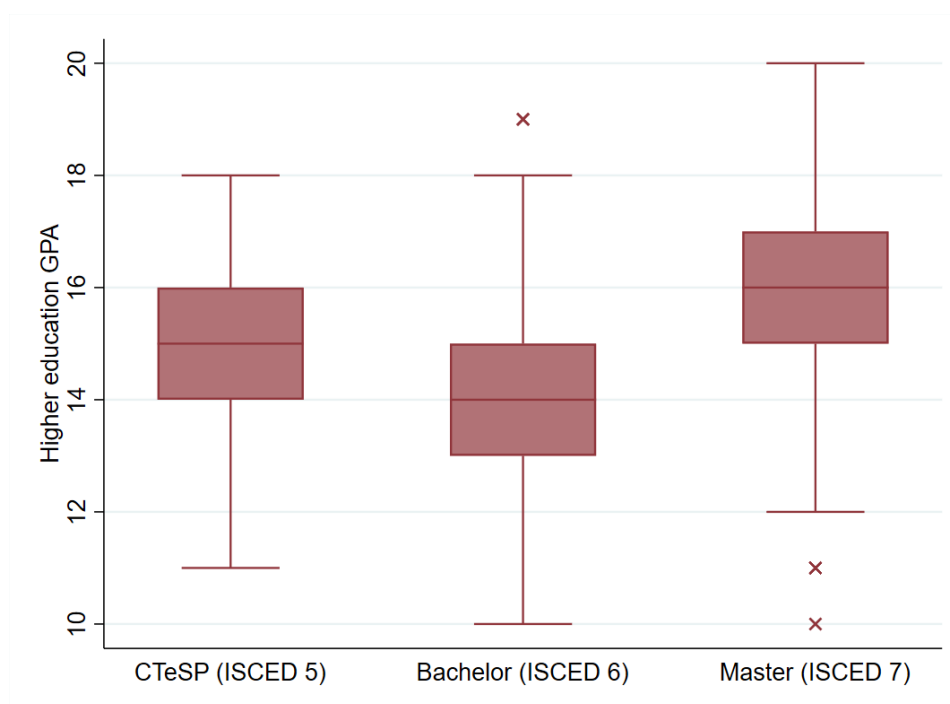
The average intensity of underskilling is lower than that of the overskilling for all the educational mismatches categories, and the difference between the undereducated and the adequately matched is almost nonexistent. The fact that the average intensity of overskilling is higher than the average intensity of underskilling among undereducated graduates is rather odd, but it can be about a subjective perception of one's abilities because even though the graduate does not have the right level of education, and it is insufficient, to perform the job he can consider that he has more capacity or more skills than what the job allows him to use or show.

Regarding the studies-related variables and the age variable, the statistical descriptives for the whole sample are displayed in the Table 9. Descriptives by cohort are not presented because the differences between cohorts are not significant, except for age. The graduates' average age is approximately 29 years and 9 months in total; however, the average age in the 2016/2017 cohort is higher in around 4 years than in cohort 2020/2021, as one would expect. The minimum and maximum age is 21 and 66 years old, respectively, which shows that graduates can be from very different age groups. Relative to the higher education and high school GPA, the mean value is approximately 15 points, ranging from 10 to 20. From the Figure 7, it is visible that Master's graduates have higher GPA's than the other levels of education, where at least 50% of the graduates have a GPA above or equal to 16, and the maximum value of 20 is only attained by Master's graduates. These two observations are consistent with the often less rigidity of grades or grade inflation in Master programmes relative to Bachelor ones. For Bachelor's graduates, the median GPA is 14 points, the lowest of the three, and for CTeSP graduates is 15 points.

**Table 9** – Statistical descriptives for age and the studies-related variables

|                                         | <b>N</b> | <b>Mean</b> | <b>St. Dev.</b> | <b>Min</b> | <b>Max</b> |
|-----------------------------------------|----------|-------------|-----------------|------------|------------|
| <b>Total</b>                            | 8064     |             |                 |            |            |
| <b>Age</b>                              |          | 29.77       | 7.894           | 21         | 66         |
| <b>Higher education GPA</b>             |          | 14.96       | 1.738           | 10         | 20         |
| <b>High school GPA</b>                  |          | 15.43       | 1.964           | 10         | 20         |
| <b>Part time student (share)</b>        |          | 0.217       | -               | -          | -          |
| <b>International experience (share)</b> |          | 0.122       | -               | -          | -          |
| <b>Internships (share)</b>              |          | 0.510       | -               | -          | -          |
| <b>Paid labour (share)</b>              |          | 0.288       | -               | -          | -          |
| <b>Voluntary activities (share)</b>     |          | 0.373       | -               | -          | -          |
| <b>Work experience (share)</b>          |          | 0.380       | -               | -          | -          |

**Figure 7** – Higher education GPA distribution by level of education



Source: *Eurograduate Survey 2022*. Own elaboration.

The remaining variables of the Table 9 are binary and represent some graduates' choices before or during the studies. Part-time students account for 21.7% of the sample, and 78.3% are full-time students. Relative to international experiences, internships or voluntary activities, 12.2% of the graduates had at least one international experience, 51% took an internship during the degree, and 37.3% enrolled in voluntary activities. Related to labour, almost 29% of the graduates had paid labour during the degree and, although not displayed here, approximately 67% of these graduates were full-time students. Around 38% of graduates had had a job or a work-related experience before enrolling in higher education for the first time.

The employment-related variables' statistic descriptives are presented in the Table 10 and are divided by cohort due to some differences between them. Experience is measured in months of employment after graduation; the total average is around 30 months. For this variable, we can see some visible differences between cohorts: for cohort 2016/2017 the average experience is 48.60 months whereas in cohort 2020/2021 is 17.09 months. This discrepancy is expected because cohort 2016/2017 graduates had more time to be employed until March 2023 (the end of *Eurograduate Survey 2022*) than 2020/2021 graduates. Another observation is that the average value of experience of cohort 2020/2021 indicates that, on



average, graduates from that cohort got employed right after graduation, which is a very good achievement for these recent graduates. The variable tenure is measured in years of employment in the current work and can also be a proxy for experience. The average total is approximately 4 years, where the cohort 2016/2017 average is around 5 years, and the 2020/2021 average is around 3 years.

**Table 10** – Statistical descriptives for employment related variables by cohort

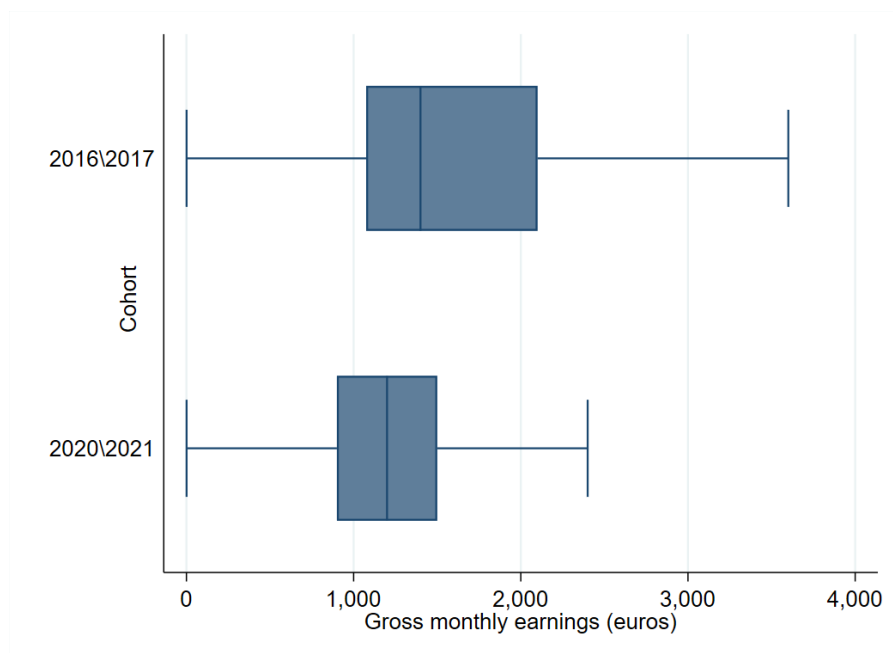
|                                | <b>N</b> | <b>Mean</b> | <b>St. Dev.</b> | <b>Min</b> | <b>Max</b> |
|--------------------------------|----------|-------------|-----------------|------------|------------|
| <b>2016/17</b>                 | 3399     |             |                 |            |            |
| <b>Wage</b>                    |          | 1,938.6     | 2,218.4         | 1          | 52,000     |
| <b>Experience</b>              |          | 48.60       | 18.16           | 0          | 60         |
| <b>Tenure</b>                  |          | 5.144       | 6.445           | 0          | 45.083(3)  |
| <b>First job (share)</b>       |          | 0.339       | -               | -          | -          |
| <b>Full time (share)</b>       |          | 0.970       | -               | -          | -          |
| <b>More than 1 job (share)</b> |          | 0.0844      | -               | -          | -          |
| <b>2020/21</b>                 | 4665     |             |                 |            |            |
| <b>Wage</b>                    |          | 1,427.2     | 1,815.2         | 1          | 69,000     |
| <b>Experience</b>              |          | 17.09       | 13.80           | 0          | 60         |
| <b>Tenure</b>                  |          | 2.836       | 5.749           | 0          | 43.75      |
| <b>First job (share)</b>       |          | 0.635       | -               | -          | -          |
| <b>Full time (share)</b>       |          | 0.924       | -               | -          | -          |
| <b>More than 1 job (share)</b> |          | 0.0690      | -               | -          | -          |
| <b>Total</b>                   | 8064     |             |                 |            |            |
| <b>Wage</b>                    |          | 1,642.8     | 2,010.9         | 1          | 69,000     |
| <b>Experience</b>              |          | 30.37       | 22.17           | 0          | 60         |
| <b>Tenure</b>                  |          | 3.809       | 6.158           | 0          | 45.083(3)  |
| <b>First job (share)</b>       |          | 0.510       | -               | -          | -          |
| <b>Full time (share)</b>       |          | 0.943       | -               | -          | -          |
| <b>More than 1 job (share)</b> |          | 0.0755      | -               | -          | -          |

Another variable with more noticeable differences between cohorts is the binary variable “First Job”. In cohort 2016/2017, for 33.9% of the graduates, the current job is their first. On the other and, in cohort 2020/2021, for 63.5% of the graduates the current job is their first. These results are consistent because one would expect that for the recent cohort, with fewer years to find jobs or to experience job mobility, the current job would be their first one. Regarding the remaining binary variables, “Full time” and “More than 1 job”, for the total sample, 94.3% of graduate workers work full time, and only 7.55% have more than one job.

The variable “Wage” indicates the gross monthly earnings, and, in total, the graduates’ average earnings are 1,642.8 euros. Also, graduates from cohort 2016/2017 earn, on average, 26.4% more than cohort 2020/2021 graduates, which can be because, on average, 2016/2017 graduates have more years on their current job and in the labour market and so, as they become “older” on the firm their wages tend to increase. The minimum wage is 1 euro, and the maximum is 69,000 euros, and although these values are doubtful, it is well known that these types of answers could emerge in a questionnaire – the subjective bias problem.

Nevertheless, these values account for few observations and in the Figure 8 it is noticeable that the sample is within a more moderate range of values. Also, the figure corroborates the earning differences between cohorts; for example, at least 75% of 2020/2021 graduates earn less or equal, approximately, than 1,500 euros, whereas in cohort 2016/2017, at least 75% of the graduates earn less or equal than, approximately 2,100 euros.

**Figure 8 – Gross monthly earnings (Wage) by cohort**



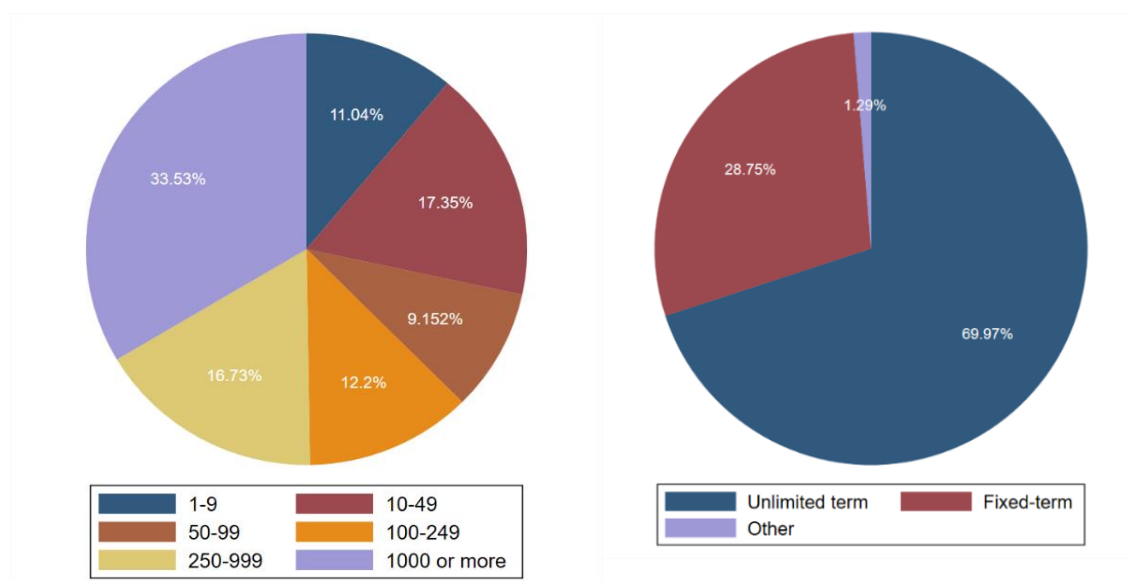
Source: *Eurograduate Survey 2022*. Own elaboration.

Other variables included in the regressions are the number of employees in the firm (size of the firm), type of employment contract, business sector or the firm CAE<sup>12</sup>, occupation

<sup>12</sup> CAE (Classificação da Atividades Económicas Portuguesa por ramos de atividade) is the portuguese classification of economic activities elaborated by INE (Instituto Nacional de Estatística), the portuguese institute for national statistics. It has a direct conversion for the statistical classification of economic activities in the

and the districts of the Portuguese higher education institutions. Regarding firm's size, as displayed in the Figure 9, the distribution is almost 50% to 50% between small and medium companies (<250) and big companies. Since Portuguese firms are 99% small and medium companies, these results can be indicative that many graduates work for non-Portuguese firms or, simply, work for multinational companies, either Portuguese or not. Another finding is that nearly 70% of graduates have an unlimited term contract.

**Figure 9** – Number of employers of the firm (right) and type of employment contract (left)



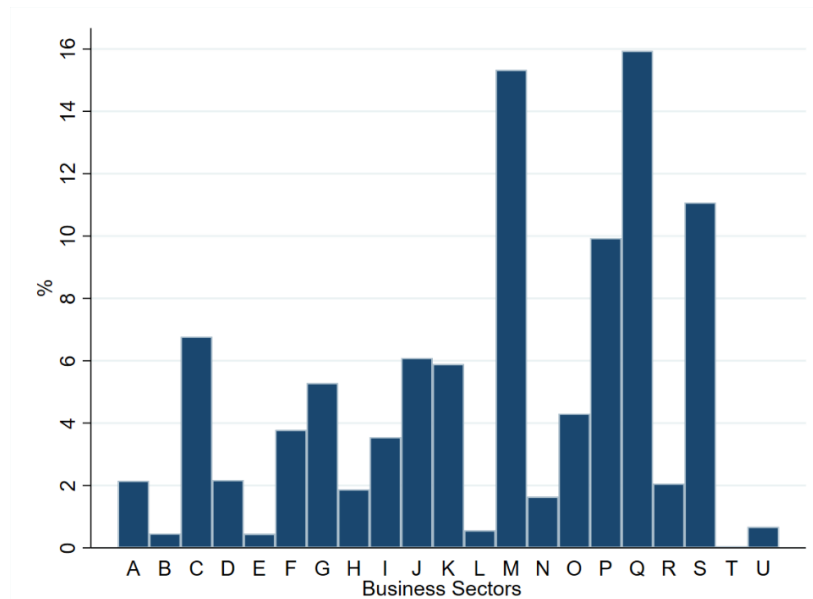
Source: *Eurograduate Survey 2022*. Own elaboration.

The Figure 10 and Figure 11 show us the share of graduates by business sector and occupation, respectively. Also, in the annexes, the list of the 21 business sectors and the 10 occupations included in *Eurograduate Survey 2022* is displayed. The most populated business sectors are the Human health and social work activities (Q) and the Professional, scientific and technical activities (M) with, approximately 16% and 15% of graduates, respectively, followed by Other service activities (S) and Education (P) with around 11% and 10% of graduates, respectively. Three occupations account for, approximately 85% of the sample, and they are the Professionals (35%), the Technicians and Associate Professionals (35%) and the Clerical and Support Workers (15%).

---

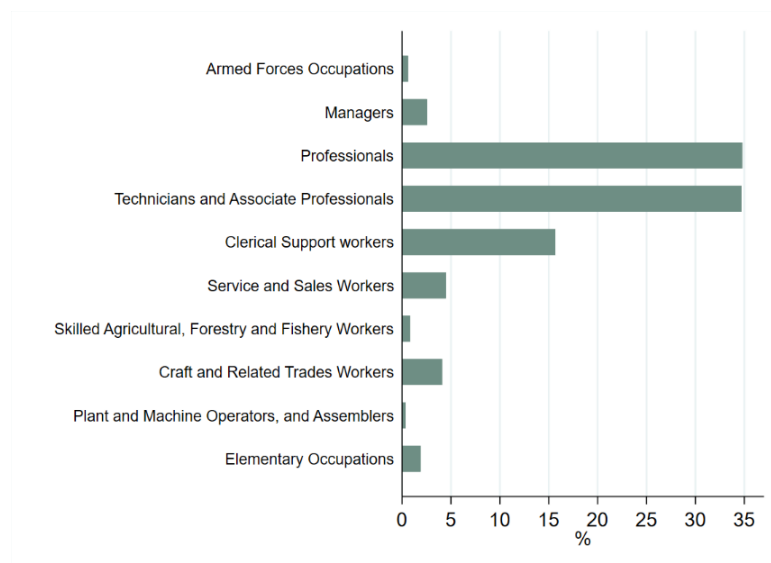
European Union, NACE (Nomenclature statistique des activités économiques dans la Communauté européenne) (INE, 2007; Eurostat, 2023b).

**Figure 10** – Share of graduates by business sector



Source: *Eurograduate Survey 2022*. Own elaboration.

**Figure 11** – Share of graduates by occupation

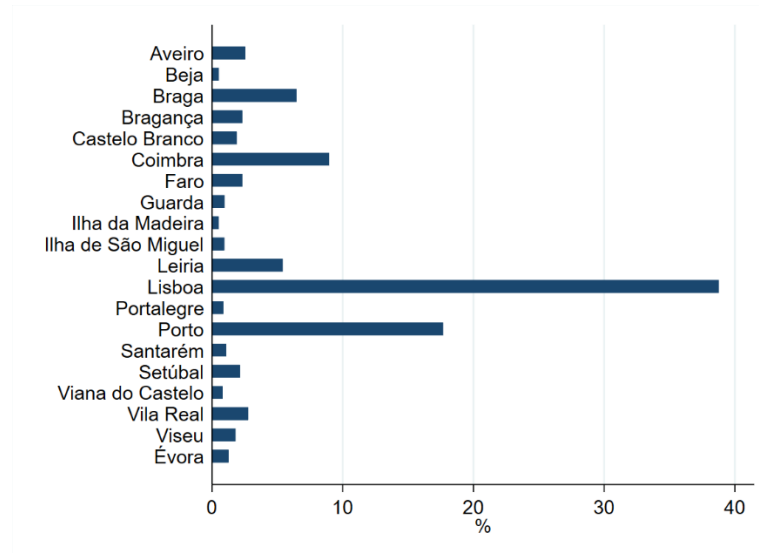


Source: *Eurograduate Survey 2022*. Own elaboration.

Concerning the district of the higher education institutions, from the Figure 12, we observe that 36.62% of the graduates graduated from institutions in Lisbon, 18.73% in Porto and 8.90% in Coimbra. More than 50% of graduates graduate from an institution from the three major academic cities in Portugal, demonstrating the high disparity between regions and higher education institutions. Nevertheless, the result is more than expected because

these districts concentrate more higher education institutions, such as the country's most known institutions, hence concentrating more students.

**Figure 12** – Distribution of graduates by the district of their higher education institution



Source: *Eurograduate Survey 2022*. Own elaboration.

## 4.2. Regression analysis

### 4.2.1. Determinants of the mismatches

The marginal effects of the determinants of overeducation, derived from the probit model, are presented in the Table 11. The first regression contains only the higher education GPA, and in the second is added the high school GPA. They were not included together to see the effect on the higher education GPA when introducing the high school GPA. From here, are added the set of control variables. In the third regression, the variables related to individual characteristics – gender, age and the level of education of the graduate – are added. The fourth regression introduces the variables related to studies or the characteristics held by the graduate during the higher education degree – field of study, enrolment status, international experience, internships or work placements, voluntary activities, paid labour and work experience before the degree. The fifth includes, in addition, the employment-related variables – more than one job, size of the firm/organization, type of contract, first job, part or full-time worker, type of employment, years in current employment, months in employment after graduation, business sector and occupation. Finally, in the sixth are added the

fixed effects for cohort, country of work and district of higher education institution. The variables displayed in the table are the ones that are statistically significant or of more interest to study.

**Table 11** – Probit model for overeducation (outcome) – average marginal effects

| VARIABLES                                           | (1)                   | (2)                    | (3)                    | (4)                    | (5)                    | (6)                    |
|-----------------------------------------------------|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Higher education GPA                                | 0.0406***<br>(0.0031) | 0.0482***<br>(0.0032)  | 0.0067*<br>(0.0035)    | -0.0081**<br>(0.0035)  | 0.0017<br>(0.0033)     | 0.0014<br>(0.0034)     |
| High school GPA                                     |                       | -0.0264***<br>(0.0028) | -0.0259***<br>(0.0028) | -0.0138***<br>(0.0027) | -0.0108***<br>(0.0025) | -0.0099***<br>(0.0026) |
| Female                                              |                       |                        | 0.0518***<br>(0.0107)  | 0.0365***<br>(0.0110)  | 0.0152<br>(0.0104)     | 0.0166<br>(0.0104)     |
| Age                                                 |                       |                        | 0.0074***<br>(0.0007)  | 0.0017**<br>(0.0008)   | 0.0023**<br>(0.0010)   | 0.0022**<br>(0.0010)   |
| HE Degree (omitted category: bachelor degree)       |                       |                        |                        |                        |                        |                        |
| CTSP degree                                         |                       |                        | 0.2721***<br>(0.0389)  | 0.2527***<br>(0.0382)  | 0.1044***<br>(0.0336)  | 0.0963***<br>(0.0334)  |
| Master degree                                       |                       |                        | 0.2741***<br>(0.0123)  | 0.3742***<br>(0.0124)  | 0.4335***<br>(0.0107)  | 0.4405***<br>(0.0108)  |
| Part time student                                   |                       |                        |                        | 0.0633***<br>(0.0136)  | 0.0496***<br>(0.0124)  | 0.0510***<br>(0.0125)  |
| International experience                            |                       |                        |                        | -0.0923***<br>(0.0162) | -0.0713***<br>(0.0151) | -0.0719***<br>(0.0153) |
| Internships                                         |                       |                        |                        | -0.0379***<br>(0.0115) | -0.0297***<br>(0.0105) | -0.0336***<br>(0.0105) |
| Paid labour                                         |                       |                        |                        | -0.0399***<br>(0.0113) | -0.0268***<br>(0.0104) | -0.0266**<br>(0.0104)  |
| Voluntary activities                                |                       |                        |                        | -0.0534***<br>(0.0108) | -0.0407***<br>(0.0100) | -0.0398***<br>(0.0099) |
| Work experience                                     |                       |                        |                        | 0.0527***<br>(0.0126)  | 0.0258**<br>(0.0116)   | 0.0233**<br>(0.0117)   |
| Type of contract (omitted category: unlimited term) |                       |                        |                        |                        |                        |                        |
| Fixed term contract                                 |                       |                        |                        |                        | -0.0519***<br>(0.0111) | -0.0524***<br>(0.0112) |
| Other type of contract                              |                       |                        |                        |                        | -0.0910**<br>(0.0385)  | -0.0936**<br>(0.0379)  |
| Full time                                           |                       |                        |                        |                        | -0.1626***<br>(0.0236) | -0.1646***<br>(0.0237) |
| Tenure                                              |                       |                        |                        |                        | 0.0024**<br>(0.0011)   | 0.0025**<br>(0.0011)   |
| Controls:                                           |                       |                        |                        |                        |                        |                        |
| Individual                                          |                       |                        | Yes                    | Yes                    | Yes                    | Yes                    |
| Studies                                             |                       |                        |                        | Yes                    | Yes                    | Yes                    |
| Employment                                          |                       |                        |                        |                        | Yes                    | Yes                    |
| Cohort/country/district FE                          |                       |                        |                        |                        |                        | Yes                    |
| Observations                                        | 7,755                 | 7,755                  | 7,755                  | 7,754                  | 7,754                  | 7,754                  |
| Pseudo R2                                           | 0.0163                | 0.0245                 | 0.0901                 | 0.1704                 | 0.2841                 | 0.2885                 |

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Controls: 1) Individual: sex, age, level of education; 2) Studies: field of study, enrolment status, international experience, internships, voluntary activities, paid labour, work experience; 3) Employment: more than one job, part time worker, type of employment, type of contract, years in current employment (tenure), months ins employment after graduation, business sector, occupation, number of employees in the firm. Fixed effects include cohort year, country of work and district of higher education institution.

The higher education GPA reveals not to be statistically significant, and it starts to lose its significance when the controls for individual characteristics are introduced, more precisely the level of education of the graduate; although it appears to regain significance when introducing the studies controls, it fades. On the contrary, high school GPA is statistically significant, and the findings are that workers with higher high school GPA's are less likely to be overeducated relative to being adequately matched. It might mean that a worker with a higher high school GPA (which can be seen as a proxy for innate ability) has more chances of being in a job adequate for his education level. Although a higher education degree constitutes a signal for employers, a higher GPA on higher education might not translate into a signal for ability. Might be that a worker with a higher level of high school GPA (higher levels of general ability) is more suitable for a particular job because it can perform tasks that go beyond the specialized knowledge offered by higher education, and this feature can be attractive for employers but a burden for employees.

Additionally, another remark can be that workers with higher high school GPA's could experience more mobility between jobs due to their higher innate ability or general skills, which makes it easier for them to find suitable jobs for their level of education. Nevertheless, both GPA's do not contribute much to the explanation of the overeducation phenomena as seen by the Pseudo R<sup>2</sup> in the first regression. As the various controls are added, the studies and employment characteristics become important, especially the latter.

Regarding the level of education, workers who hold a CTeSP or a Master's degree are more likely to be overeducated than workers with a Bachelor's degree. The fact that workers with a lower degree of education (CTeSP) have a higher tendency to be overeducated may be due to the nature of the CTeSP degree, which has a professional nature that is still not that appreciated by society comparatively to other higher education degrees, and also jobs that require this type of degree are relatively low. So, the supply of workers who hold a CTeSP may be higher than the demand for this qualification. Hence, there is a possibility for overeducation, which increases when we take into account that, most probably, CTeSP workers who do not find jobs suitable for their level of education have narrow possibilities of being in jobs that require higher education at all because of the differences in nature from the other higher education levels. Consequently, they will mainly take jobs requiring high school or even lower levels.

The second set of control variables, besides some fields of study, were revealed to be statistically significant. Being a part-time student increases the probability of being overeducated, whereas having had voluntary activities, at least one international experience or internships during the study time decreases the probability of being overeducated. The latter findings may indicate that making connections through activities that benefit the graduate when he transitions to the labour market can facilitate the search for a suitable job for their education level.

Graduates who had paid labour during their studies are less likely to be overeducated but graduates with work experience before entering higher education are more likely to be overeducated than adequately matched. Working full-time or having a fixed term or other type of employment contract (relative to having an unlimited term contract) reduces the probability of being overeducated.

One interesting finding is that age and tenure increase the probability of being overeducated relative to being adequately matched, and, generally, the effect is usually the opposite. The literature reveals that as a worker gets older, he has more chances to be in a job that matches his education because, through time, he is going to improve his human capital or move up job positions that match his potential. Also, older workers who are more exposed to technological changes and, consequently, changes in skill demand tend to need to catch up relative to younger workers. However, they can compensate for their lack of education with their experience, and younger workers compensate for their lack of experience with their higher education level (See Kiker et al., 1997; Leuven & Oosterbeek, 2011). So, one possible explanation for the positive effect of age on the probability of being overeducated could be that these older workers, as they are recent graduates, are competing with younger recent graduates and, due to all the recent digital and technological innovations, firms may be privileging the young talents and the older graduates end up in jobs not adequate for their education level.

The effects of the determinants of skill mismatch, more precisely, the effects of the determinants of overskilling and underskilling, are presented in the Table 12 and Table 13., respectively, based on OLS regressions. The same logic of inclusion of the explanatory variables of the probit model is applied in these OLS regressions.

Concerning overskilling (Table 12) and in respect of higher education and high school GPA's, the latter is the one with a statistically significant coefficient. This finding supports the initial hypothesis that high school GPA would have a higher impact, although small but



in this case significant, on determining skill mismatches. It can be thought that being considered as a proxy to innate ability or general skills, it is closer to the unobserved characteristics of workers that determine their skill levels. As it can be observed, higher high school GPA's increase the intensity of overskilling by 0.4 p.p., which can mean that more innate skilled workers may not be able to use their intrinsic potential in the workplace fully. Nevertheless, the fact that higher high school GPA's decrease the probability of being overeducated but increase the intensity of overskilling can corroborate the idea that, indirectly, this skill surplus could help workers find a job that matches their education level. For this reasoning, it would be helpful to observe the effects of the high school GPA on the probability of being under-educated relative to being adequately matched, but, unfortunately, that was not possible.

**Table 12** – OLS regression for the determinants of overskilling

| VARIABLES                                     | (1)                   | (2)                   | (3)                    | (4)                    | (5)                    | (6)                    |
|-----------------------------------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|------------------------|
| Higher education GPA                          | 0.0003<br>(0.0015)    | -0.0001<br>(0.0016)   | 0.0035**<br>(0.0018)   | 0.0015<br>(0.0019)     | 0.0035*<br>(0.0019)    | 0.0027<br>(0.0019)     |
| High school GPA                               |                       | 0.0013<br>(0.0013)    | 0.0019<br>(0.0014)     | 0.0028*<br>(0.0014)    | 0.0035**<br>(0.0014)   | 0.0041***<br>(0.0015)  |
| Female                                        |                       |                       | -0.0252***<br>(0.0054) | -0.0340***<br>(0.0058) | -0.0372***<br>(0.0058) | -0.0385***<br>(0.0059) |
| HE Degree (omitted category: bachelor degree) |                       |                       |                        |                        |                        |                        |
| CTSP degree                                   |                       |                       | -0.0269*<br>(0.0159)   | -0.0125<br>(0.0167)    | -0.0467***<br>(0.0169) | -0.0421**<br>(0.0170)  |
| Master degree                                 |                       |                       | -0.0220***<br>(0.0061) | -0.0167**<br>(0.0071)  | -0.0033<br>(0.0070)    | -0.0013<br>(0.0073)    |
| Paid labour                                   |                       |                       |                        | 0.0078<br>(0.0060)     | 0.0130**<br>(0.0059)   | 0.0121**<br>(0.0059)   |
| More than 1 job                               |                       |                       |                        |                        | 0.0235**<br>(0.0114)   | 0.0237**<br>(0.0114)   |
| Full time                                     |                       |                       |                        |                        | -0.0691***<br>(0.0143) | -0.0677***<br>(0.0143) |
| Controls:                                     |                       |                       |                        |                        |                        |                        |
| Individual                                    |                       |                       | Yes                    | Yes                    | Yes                    | Yes                    |
| Studies                                       |                       |                       |                        | Yes                    | Yes                    | Yes                    |
| Employment                                    |                       |                       |                        |                        | Yes                    | Yes                    |
| Cohort/country/district FE                    |                       |                       |                        |                        |                        | Yes                    |
| Constant                                      | 0.1317***<br>(0.0229) | 0.1178***<br>(0.0275) | 0.0864***<br>(0.0329)  | 0.1011***<br>(0.0356)  | 0.0967**<br>(0.0414)   | 0.0141<br>(0.0463)     |
| Observations                                  | 8,064                 | 8,064                 | 8,064                  | 8,064                  | 8,064                  | 8,064                  |
| R-squared                                     | 0.0000                | 0.0001                | 0.0044                 | 0.0158                 | 0.0640                 | 0.0708                 |

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Controls: 1) Individual: sex, age, level of education; 2) Studies: field of study, enrolment status, international experience, internships, voluntary activities, paid labour, work experience; 3) Employment: more than one job, part time worker, type of employment, type of contract, years in current employment (tenure), months ins employment after graduation, business sector, occupation, number of employees in the firm. Fixed effects include cohort year, country of work and district of higher education institution.

Relative to the education level, holding a CTeSP degree decreases the intensity of overskilling relative to a Bachelor's degree. However, as mentioned before, it increases the probability of being overeducated. It can be that the universe of jobs that require a CTeSP degree is smaller than the universe of workers who hold that degree, i.e., supply is above demand, and so this results in overeducation because those workers have to take jobs that do not require that higher education degree. On the other hand, it can reduce the intensity of overskilling relative to holding a Bachelor's degree because CTeSP is, by nature, a professional course which entails preparation in terms of skills more targeted to labour market needs (in specific areas).

Being a female or working full-time decreases the intensity of overskilling in 3.85 p.p. and 6.77 p.p., respectively. As in overeducation, working full-time relative to working part-time has a negative impact in these two phenomena, reinforcing the benefits of having more stable forms of employment. Having more than one job or having had paid labour during the studies increases the intensity of overskilling in 2.37 p.p. and 1.21 p.p., respectively.

Regarding the determinants of underskilling, it is found in the Table 13 that neither GPA's has a significative impact on the phenomenon. Working in companies with less than 1,000 employees reduces the intensity of underskilling. However, the effect is statistically significant only for firms with less than 50. Perhaps workers benefit more from small business environments to reduce their lack of skills relative to bigger companies because they can have more personalized training, i.e., more targeted to their specific needs, whereas in big companies, it is probably a generalized training. Having a fixed-term contract instead of an unlimited term increases the intensity of underskilling, and one more year in the current job decreases the intensity of underskilling by 0.07 p.p., a minimal effect but statistically significant. The latter could mean that as the worker stays more time in the same job, he gains the chance to develop his skills further, although at a small pace.

**Table 13** – OLS regression for the determinants of underskilling

| VARIABLES            | (1)                | (2)                   | (3)                    | (4)                    | (5)                   | (6)                 |
|----------------------|--------------------|-----------------------|------------------------|------------------------|-----------------------|---------------------|
| Higher education GPA | 0.0004<br>(0.0009) | -0.0004<br>(0.0010)   | -0.0007<br>(0.0011)    | 0.0014<br>(0.0012)     | 0.0008<br>(0.0012)    | 0.0007<br>(0.0012)  |
| High school GPA      |                    | 0.0030***<br>(0.0009) | 0.0015<br>(0.0009)     | -0.0001<br>(0.0009)    | -0.0004<br>(0.0009)   | -0.0002<br>(0.0010) |
| Female               |                    |                       | -0.0001<br>(0.0033)    | 0.0059*<br>(0.0035)    | 0.0067*<br>(0.0036)   | 0.0071*<br>(0.0036) |
| Age                  |                    |                       | -0.0019***<br>(0.0002) | -0.0014***<br>(0.0002) | -0.0006**<br>(0.0003) | -0.0004<br>(0.0003) |

|                                                                   |           |          |           |           |           |           |
|-------------------------------------------------------------------|-----------|----------|-----------|-----------|-----------|-----------|
| Number of employees in the firm (omitted category: $\geq 1,000$ ) |           |          |           |           |           |           |
| 1 to 9 employees                                                  |           |          |           |           | -0.0131** | -0.0116** |
|                                                                   |           |          |           |           | (0.0058)  | (0.0059)  |
| 10 to 49 employees                                                |           |          |           |           | -0.0127** | -0.0122** |
|                                                                   |           |          |           |           | (0.0049)  | (0.0050)  |
| 50 to 99 employees                                                |           |          |           |           | -0.0076   | -0.0066   |
|                                                                   |           |          |           |           | (0.0063)  | (0.0063)  |
| 100 to 249 employees                                              |           |          |           |           | -0.0055   | -0.0051   |
|                                                                   |           |          |           |           | (0.0057)  | (0.0058)  |
| 250 to 999 employees                                              |           |          |           |           | -0.0042   | -0.0043   |
|                                                                   |           |          |           |           | (0.0050)  | (0.0050)  |
| Type of contract (omitted category: unlimited term)               |           |          |           |           |           |           |
| Fixed term contract                                               |           |          |           |           | 0.0100**  | 0.0093**  |
|                                                                   |           |          |           |           | (0.0042)  | (0.0042)  |
| Other type of contract                                            |           |          |           |           | -0.0058   | -0.0070   |
|                                                                   |           |          |           |           | (0.0152)  | (0.0151)  |
| Tenure                                                            |           |          |           |           | -0.0006** | -0.0007** |
|                                                                   |           |          |           |           | (0.0003)  | (0.0003)  |
| Controls:                                                         |           |          |           |           |           |           |
| Individual                                                        |           |          | Yes       | Yes       | Yes       | Yes       |
| Studies                                                           |           |          |           | Yes       | Yes       | Yes       |
| Employment                                                        |           |          |           |           | Yes       | Yes       |
| Cohort/country/district FE                                        |           |          |           |           |           | Yes       |
| Constant                                                          | 0.0536*** | 0.0206   | 0.0988*** | 0.0777*** | 0.0771*** | 0.0696**  |
|                                                                   | (0.0142)  | (0.0178) | (0.0201)  | (0.0210)  | (0.0237)  | (0.0278)  |
| Observations                                                      | 8,064     | 8,064    | 8,064     | 8,064     | 8,064     | 8,064     |
| R-squared                                                         | 0.0000    | 0.0015   | 0.0113    | 0.0247    | 0.0330    | 0.0366    |

Standard errors in parentheses \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Controls: 1) Individual: sex, age, level of education; 2) Studies: field of study, enrolment status, international experience, internships, voluntary activities, paid labour, work experience; 3) Employment: more than one job, part time worker, type of employment, type of contract, years in current employment (tenure), months ins employment after graduation, business sector, occupation, number of employees in the firm. Fixed effects include cohort year, country of work and district of higher education institution.

#### 4.2.2. Impact of the mismatches on earnings

The impact of the mismatches on earnings is presented in the Table 14. Individual regressions for each mismatch, educational and skill, were run first and are signalled with the correspondent's name in the first row of the table. In the last column, both variables of the mismatches were introduced in the same regression. The first regression of each mismatch<sup>13</sup> contains only the variables regarding the mismatch, i.e., there are no controls. In the subsequent regressions<sup>14</sup>, the introduction of the control variables and fixed effects follows the same sequence as in the determinants of the mismatch, except in the sixth regression, where all variables are included at once.

<sup>13</sup> Regression number (1) for the educational mismatch and number (6) for the skill mismatch.

<sup>14</sup> Regressions number (2) to (5) for the educational mismatch and number (7) to (10) for the skill mismatch.

**Table 14** – Mincerian equation of the effects of educational mismatch and skill mismatch on earnings

|                                                 | Educational mismatch   |                        |                        |                        |                        | Skill mismatch         |                        |                        |                        |                        | Both                   |
|-------------------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| VARIABLES                                       | (1)                    | (2)                    | (3)                    | (4)                    | (5)                    | (6)                    | (7)                    | (8)                    | (9)                    | (10)                   | (11)                   |
| Mismatch (omitted category: adequately matched) |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| Undereducation                                  | 0.0460<br>(0.0443)     | 0.0484<br>(0.0425)     | 0.1239***<br>(0.0428)  | 0.1047***<br>(0.0396)  | 0.0767**<br>(0.0380)   |                        |                        |                        |                        |                        | 0.0752**<br>(0.0380)   |
| Overeducation                                   | -0.1266***<br>(0.0197) | -0.1576***<br>(0.0188) | -0.1704***<br>(0.0193) | -0.1231***<br>(0.0212) | -0.1181***<br>(0.0211) |                        |                        |                        |                        |                        | -0.1124***<br>(0.0217) |
| Underskilling                                   |                        |                        |                        |                        |                        | 0.0404<br>(0.0645)     | 0.1225*<br>(0.0635)    | 0.0167<br>(0.0626)     | -0.0104<br>(0.0596)    | -0.0072<br>(0.0588)    | -0.0102<br>(0.0587)    |
| Overskilling                                    |                        |                        |                        |                        |                        | -0.2475***<br>(0.0353) | -0.2504***<br>(0.0338) | -0.2133***<br>(0.0325) | -0.1264***<br>(0.0315) | -0.1015***<br>(0.0311) | -0.0718**<br>(0.0318)  |
| Controls:                                       |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| Individual                                      |                        | Yes                    | Yes                    | Yes                    | Yes                    |                        | Yes                    | Yes                    | Yes                    | Yes                    | Yes                    |
| Studies                                         |                        |                        | Yes                    | Yes                    | Yes                    |                        |                        | Yes                    | Yes                    | Yes                    | Yes                    |
| Employment                                      |                        |                        |                        | Yes                    | Yes                    |                        |                        |                        | Yes                    | Yes                    | Yes                    |
| Cohort/country/district FE                      |                        |                        |                        |                        | Yes                    |                        |                        |                        |                        | Yes                    | Yes                    |
| Constant                                        | 7.2005***<br>(0.0114)  | 5.9185***<br>(0.1796)  | 5.5649***<br>(0.2256)  | 5.4803***<br>(0.2666)  | 6.3307***<br>(0.2973)  | 7.1871***<br>(0.0120)  | 6.0771***<br>(0.1795)  | 5.5354***<br>(0.2274)  | 5.4538***<br>(0.2674)  | 6.3173***<br>(0.2980)  | 6.3268***<br>(0.2973)  |
| Observations                                    | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  | 8,064                  |
| R-squared                                       | 0.0058                 | 0.0690                 | 0.1378                 | 0.2061                 | 0.2372                 | 0.0050                 | 0.0662                 | 0.1321                 | 0.2030                 | 0.2344                 | 0.2376                 |

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Controls: 1) Individual: sex, age, months in employment after graduation; 2) Studies: level of education, higher education gpa, high school gpa, field of study, enrolment status, international experience, internships, voluntary activities, paid labour, work experience; 3) Employment: more than one job, part time worker, type of employment, type of contract, years in current employment (tenure), business sector, occupation, number of employees in the firm. Fixed effects include cohort year, country of work and district of higher education institution.

Considering the effects of the educational mismatch on earnings, both the undereducation and overeducation variables are statistically significant, and their impacts are consistent with the literature. Undereducated workers receive more 7,97%<sup>15</sup> on average than workers with the same education level but adequately matched in the job. An overeducated worker has a 12.54% penalty on earnings relative to a worker with the same education level but in a job requiring that level of education.

Regarding the impacts of the skill mismatches on earnings, the underskilling variable was revealed to have no statistically significant effect. Being overskilled negatively impacts earnings, and a worker who becomes totally overskilled (100%) sees his earnings decrease by 10.68%.

The abovementioned results are for the individual regressions for each mismatch. When we control for each type of mismatch, displayed in the eleventh regression, the results vary but not that significantly. The coefficient of the overskilling variable is the one with the most noticeable reduction from 10.68% to 7.44%; nevertheless, the variable remains statistically significant. The impact of overeducation and undereducation also decreased but not very significantly. These findings are aligned with the work of Green & McIntosh (2007), which also observed a minimal reduction in the impact of overeducation and undereducation when the skill mismatch variables were introduced, revealing that the two phenomena are not substitutes, although they have impacts on each other.

Other findings not displayed in the Table 14 are shown in the Table 15, which is relative to the eleventh regression in the Table 14. As we can see, females earn 13.66% less than males, which shows that the gender pay gap is still evident.

**Table 15** – Mincerian equation of the effects of educational mismatch and skill mismatch on earnings (eleventh regression of the Table 14)

| VARIABLES                                       | (1)                    |
|-------------------------------------------------|------------------------|
| Mismatch (omitted category: adequately matched) |                        |
| Undereducation                                  | 0.0752**<br>(0.0380)   |
| Overeducation                                   | -0.1124***<br>(0.0217) |
| Underskilling                                   | -0.0102<br>(0.0587)    |
| Overskilling                                    | -0.0718**              |

<sup>15</sup> The impacts are measured through  $(e^{\beta} - 1) \times 100$ .

|                                                                |            |
|----------------------------------------------------------------|------------|
|                                                                | (0.0318)   |
| Female                                                         | -0.1280*** |
|                                                                | (0.0191)   |
| HE Degree (omitted category: bachelor degree)                  |            |
| CTSP degree                                                    | -0.2398*** |
|                                                                | (0.0476)   |
| Master degree                                                  | 0.0790***  |
|                                                                | (0.0263)   |
| Higher education GPA                                           | 0.0261***  |
|                                                                | (0.0060)   |
| Field of study (omitted category: business and administration) |            |
| Generic programmes and qualifications (...)                    | 0.3782***  |
|                                                                | (0.0638)   |
| Education Science                                              | -0.3029**  |
|                                                                | (0.1290)   |
| Teacher Training                                               | -0.0859    |
|                                                                | (0.0888)   |
| Arts                                                           | -0.1423*** |
|                                                                | (0.0499)   |
| Humanities                                                     | -0.1101**  |
|                                                                | (0.0539)   |
| Languages                                                      | 0.0130     |
|                                                                | (0.0431)   |
| Social sciences, journalism and information                    | -0.0734**  |
|                                                                | (0.0301)   |
| Psychology                                                     | -0.0977**  |
|                                                                | (0.0496)   |
| Law                                                            | -0.1589**  |
|                                                                | (0.0791)   |
| Natural sciences, mathematics and statistics                   | -0.0394    |
|                                                                | (0.0368)   |
| ICT                                                            | 0.2286***  |
|                                                                | (0.0398)   |
| Engineering, manufacturing, construction                       | 0.1193***  |
|                                                                | (0.0269)   |
| Architecture and town planning                                 | -0.1596**  |
|                                                                | (0.0693)   |
| Agriculture, forestry, fisheries, veterinary                   | 0.0610     |
|                                                                | (0.0423)   |
| Medicine, dental studies                                       | 0.2406***  |
|                                                                | (0.0628)   |
| Health                                                         | -0.0271    |
|                                                                | (0.0495)   |
| Pharmacy                                                       | 0.1112**   |
|                                                                | (0.0452)   |
| Welfare                                                        | -0.1540**  |
|                                                                | (0.0693)   |
| Services                                                       | -0.0481    |
|                                                                | (0.0304)   |
| Number of employees in the firm (omitted category: ≥1000)      |            |
| 1 to 9 employees                                               | -0.2865*** |
|                                                                | (0.0299)   |
| 10 to 49 employees                                             | -0.1811*** |
|                                                                | (0.0221)   |

|                            |                        |
|----------------------------|------------------------|
| 50 to 99 employees         | -0.1842***<br>(0.0354) |
| 100 to 249 employees       | -0.1083***<br>(0.0305) |
| 250 to 999 employees       | -0.1004***<br>(0.0261) |
| First job                  | -0.0520***<br>(0.0190) |
| Country of work: Portugal  | -0.4451***<br>(0.0482) |
| Controls:                  |                        |
| Individual                 | Yes                    |
| Studies                    | Yes                    |
| Employment                 | Yes                    |
| Cohort/country/district FE | Yes                    |
| Constant                   | 6.4511***<br>(0.2946)  |
| Observations               | 8,064                  |
| R-squared                  | 0.2376                 |

Robust standard errors in parentheses: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Controls: 1) Individual: sex, age, months in employment after graduation; 2) Studies: level of education, higher education gpa, high school gpa, field of study, enrolment status, international experience, internships, voluntary activities, paid labour, work experience; 3) Employment: more than one job, part time worker, type of employment, type of contract, years in current employment (tenure), business sector, occupation, number of employees in the firm. Fixed effects include cohort year, country of work and district of higher education institution.

Workers with a Master's degree earn 8.22% more than workers with a Bachelor's degree, which is not a significant difference considering the two additional years of graduates' investment in their education. A possible explanation for this result is the fact that students who graduate with a Bachelor's degree and go straight to the labour market have the experience they gain in two years that a student who follows a master's "loses". The latter student gains more knowledge, especially in more specialized themes at the graduate taste, but, mostly, the core of the knowledge needed for the labour market was gained during his Bachelor's degree, and so after the two years of the Master's degree and entrance in the labour market, the wage premium relative to a Bachelor is minimum. Additionally, a Master's degree in Portugal has two natures: continuous learning or specialized learning, i.e, the former entails continuous learning of the core subject of the degree, whereas the latter entails specialized learning in a branch of the core subject. Hence, it is common that students who follow the Master's right after the Bachelor's degree go for the continuous nature instead of the specialized, which is more often populated by people with more experience in the labour market and are searching for additional or new knowledge that is necessary or could help them move on in their career. This is to show that the objective is not necessarily the search for a better

salary but more knowledge, which may be why the earnings difference is not that significant.

Relative to the GPA's, an increase of one point in the higher education GPA has a positive effect of 2.64% on earnings, and the high school GPA has no statistically significant impact. The latter result is expected because all the graduates in the sample have a higher education degree, so, the GPA that counts for labour market purposes is the higher education one. The fields of study that are better remunerated relative to a Business and Administration degree are, for example, the ICT (Information and Communication Technologies) and the Medicine degree, with an earnings premium of 25.68% and 27.20%, respectively. A worker who works in a big company with more than 1000 employees has a better salary than if he worked for smaller companies, which is a tendency in the labour market.

Having the first job impacts earnings negatively by 5.33%. It is congruent with the fact that in the earlier years of the career, people tend to have lower wages, especially if it is the first time entering the labour market. Although wages tend to increase with the years in the labour market, in this case, neither age, experience (measured in months of employment after graduation) nor tenure (measured in years in the current job) has a statistically significant impact on earnings. Also, graduates who work in Portugal have a wage penalty of 56.06% relative to graduates who work abroad. It is a significant penalty, and it shows that Portugal still has lower salaries compared to other countries which is the main factor of immigration of qualified workers. Nonetheless, only 10.70% of graduates worked abroad, which could influence this result.



## 5. Conclusions

Labour market frictions such as educational and skill mismatches are very common in the labour market, and these phenomena can be transitory or permanent. Either way, they impact individuals and firms through various channels. The impact of educational mismatches on earnings and its determinants are well-established in the literature. Skill mismatches are not that recurrent in the literature due to their subjective nature and for that they become hard to measure. Nevertheless, skill measures of mismatch can be more informative and complement educational mismatch measures.

Resorting to a new and rich Portuguese dataset – *Eurograduate Survey 2022* – this dissertation studied two cohorts of Portuguese higher education graduates, five years apart, to see the impacts of both mismatches on earnings and the determinants of the phenomena. The abovementioned dataset allowed for a variety of controls that are not usually seen in many studies. Findings reveal that an overeducated worker earns less 12.54% on average than a worker with the same education level, who took the same degree in the same higher education institution, who is in the same occupation and business sector (*ceteris paribus*) but whose job requires that level of education. A worker that becomes totally overskilled sees his earnings decrease by 10.68% on average, and such impact is reduced to 7.44% when controlled for educational mismatches. Educational mismatches also see a reduction in their impact, but not very significant.

This dissertation can be considered an exploratory work of overeducation, undereducation, overskilling and underskilling contributing to the literature on the determinants of the phenomena, their impacts on earnings and the idea that they can be considered different phenomena. As shown in the results of section 4.2., overeducation and overskilling have a substantial negative impact on the earnings of qualified workers. At an individual level, these effects can lead to discrediting of the value of investing in higher education or an uprising to the framework of the Portuguese labour market. People incur costs to pursue higher education, and then they do not find a job suitable for their education, which, consequently, ends up in earning less (in the case of overeducation and overskilling) than what they deserve or expect, and therefore causes dissatisfaction with the policies related to the labour market.

At an institutional level, higher education institutions should rethink the supply of courses or the teaching framework since graduates are not finding suitable jobs in which they can use the contents they learn in higher education. It should be aligned with labour market needs, although currently, labour market demand changes rapidly due ongoing innovation,

especially at a digital level, and higher education institutions will likely not follow these changes at the same pace. For this reason, the alignment between labour market demand and supply of qualified workers is challenging. Since the teaching framework of Portuguese higher education institutions is very steady and would need an extensive reform to be adjusted to the fast-paced changing knowledge economy, what higher education institutions could do would be, for example, to rethink the professional courses (CTeSP) and “shape” them to the most emerging needs of the labour market, since they have a smaller duration and have, supposedly, more direct connection with the labour market. This suggestion would only be successful if the labour market values this kind of degree, which, as mentioned before, is likely not the case, so the existence of the CTeSP degree should be revised.

Still, at an institutional level, the government should revise the support to younger graduates and, consequently, the wages in the first career years. It would involve political work and parties, and nowadays the political framework is very agitated in Portugal, so it is a case to say that any policy on the matter would probably be just a promise and not an act. Nevertheless, the government and firms or organizations should create or reform measures to retain qualified talent in the country and start by reviewing the wages, not only in the early career years but throughout all career life. Additionally, besides supporting graduates after leaving academia, the government should also support them while in academia so that young people have incentives to continue pursuing higher education and to have a feeling of security in the sense that those who pursue higher education do not posteriorly think that that investment was for nothing. For these reasons, the investigation presented in this dissertation is of higher interest and value to these three economic agents. It could give insights on further policy implications or on similar future investigations to be conducted.

Although the data used in this investigation, from *Eurograduate Survey 2022*, is very rich, there are some limitations to it. The fact that it is survey data, the responses to the questions may only sometimes be true and it is possible to have doubtful answers that lead to biased results or, if the answers are removed, to a decrease in the number of observations. Additionally, since responses are optional, there is the possibility that some variables of interest could not be integrated because the number of answers is low compared to many of the other ones.

Further work on the topic would include a more robust measure of the skill mismatches, exploratory analysis on each type of competencies considered and, more importantly, an

investigation about the skills that are more valued by the labour market so that it could enlighten higher education institutions, individuals, and politic agents about what are the most emergent labour market needs.

## Appendix

**Table A.1.** – Mincerian equation of the effects of the difference between the own and required level of each skill of Eurograduate Survey 2022 on earnings. Method of selection of the five competencies used in the skill mismatch measure

| VARIABLES                                                                  | (1)                           |
|----------------------------------------------------------------------------|-------------------------------|
| Difference between own and required level of skill:                        |                               |
| Mastery of your own field or discipline (a)                                | 0.0092<br>(0.0073)            |
| Analytical thinking (b)                                                    | 0.0015<br>(0.0102)            |
| <b>Ability to rapidly acquire new knowledge (c)</b>                        | <b>-0.0288***</b><br>(0.0107) |
| Ability to coordinate activities (d)                                       | 0.0131<br>(0.0102)            |
| Ability to work productively with others (e)                               | 0.0071<br>(0.0073)            |
| <b>Ability to make your meaning clear to others (f)</b>                    | <b>-0.0132*</b><br>(0.0075)   |
| Ability for applied use of information and communication technologies (g)  | 0.0094<br>(0.0089)            |
| Ability for advanced use of information and communication technologies (h) | 0.0009<br>(0.0074)            |
| Ability to come up with new ideas and solutions (i)                        | 0.0037<br>(0.0073)            |
| <b>Willingness to question your own and others' ideas (j)</b>              | <b>-0.0258***</b><br>(0.0089) |
| <b>Ability to present products, ideas or reports to an audience (k)</b>    | <b>0.0118*</b><br>(0.0063)    |
| <b>Ability to write and speak in a foreign language (l)</b>                | <b>-0.0135**</b><br>(0.0055)  |
| Controls:                                                                  |                               |
| Individual                                                                 | Yes                           |
| Studies                                                                    | Yes                           |
| Employment                                                                 | Yes                           |
| Cohort/country/district FE                                                 | Yes                           |
| Constant                                                                   | 6.5493***<br>(0.2726)         |
| Observations                                                               | 7,704                         |
| R-squared                                                                  | 0.2454                        |

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Controls: 1) Individual: sex, age, months in employment after graduation; 2) Studies: level of education, higher education gpa, high school gpa, field of study, enrolment status, international experience, internships, voluntary activities, paid labour, work experience; 3) Employment: more than one job, part time worker, type of employment, type of contract, years in current employment (tenure), business sector, occupation, number of employees in the firm. Fixed effects include cohort year, country of work and district of higher education institution.

**Table A.2.** – Description of the variables included in the regressions

| <b>Variables</b>                | <b>Description</b>                                                                                                                                                     |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dependent variables</b>      |                                                                                                                                                                        |
| <b>Overskilling</b>             | The variable indicates the extent to which a graduate is overskilled, i.e., the extent to which a graduate has more skills than the job requires.                      |
| <b>Underskilling</b>            | The variable indicates the extent to which a graduate is underskilled, i.e., the extent to which a graduate lacks the skills the job requires.                         |
| <b>Overeducation</b>            | The dummy variable indicates if the graduate is over-educated, i.e, if his level of education is higher than the required for the job.                                 |
| <b>Wage</b>                     | The variable indicates the graduate's gross monthly earnings (it does not include supplementary payments).                                                             |
| <b>Explanatory variables</b>    |                                                                                                                                                                        |
| <b>Female</b>                   | The dummy variable indicates if the graduate is a female or a male.                                                                                                    |
| <b>Age</b>                      | The variable denotes the graduate's age at the end of the questionnaire.                                                                                               |
| <b>Higher education degree</b>  | The variable indicates the graduate's level of education at the time of the questionnaire that corresponds to the level taken in that cohort and to the highest level. |
| <b>Higher education GPA</b>     | The variable corresponds to the final average grade of the higher education degree.                                                                                    |
| <b>High school GPA</b>          | The variable indicates the final average grade in high school.                                                                                                         |
| <b>Field of study</b>           | The variable denotes the field of study of the graduate's degree.                                                                                                      |
| <b>Enrolment status</b>         | The dummy variable indicates the graduate enrolment status at the time of the degree, if it was a part-time or a full-time student.                                    |
| <b>International experience</b> | The dummy variable indicates if the graduate had at least one international experience (for example, Erasmus +).                                                       |
| <b>Internships</b>              | The dummy variable indicates if the graduate enrolled in internships or work placements during the degree.                                                             |
| <b>Paid labour</b>              | The dummy variable indicates if the graduate had paid labour during the degree.                                                                                        |
| <b>Voluntary activities</b>     | The dummy variable indicates if the graduate participated in voluntary activities during the degree.                                                                   |
| <b>Work experience</b>          | The dummy variable indicates if the graduate had worked before enrolling in higher education.                                                                          |

|                                  |                                                                                                                     |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Experience</b>                | The variable indicates the number of months after graduation in which the graduate was employed.                    |
| <b>More than 1 job</b>           | The dummy variable indicates if the graduate has more than one job.                                                 |
| <b>Number of employees</b>       | The categorical variable indicates the number of employees of the firm or organization in which the graduate works. |
| <b>Type of contract</b>          | The categorical variable indicates the type of work contract the graduate holds.                                    |
| <b>First job</b>                 | The dummy variable indicates if the graduate's present job is his first job.                                        |
| <b>Full time</b>                 | The dummy variable indicates if the graduate has a part-time or a full-time job.                                    |
| <b>Type of employment</b>        | The categorical variable indicates if the graduate is employed, self-employed or both.                              |
| <b>Tenure</b>                    | The variable denotes the graduate's years in the current job.                                                       |
| <b>Bussiness sector</b>          | The variable corresponds to the bussiness sector of the graduate's job.                                             |
| <b>Occupation</b>                | The variable indicates the graduate's profession.                                                                   |
| <b>Country of work</b>           | The dummy variable indicates if the graduate works in Portugal or abroad.                                           |
| <b>Cohort</b>                    | The dummy variable indicates the graduate's cohort.                                                                 |
| <b>Higher education district</b> | The variable denotes the district of the higher education institution from which the graduate graduated.            |
| <b>Educational mismatch</b>      | The categorical variable denotes if the graduate is over-educated, undereducated or adequately matched.             |

## References

- Allen, J., & De Weert, E. (2007). What Do Educational Mismatches Tell Us About Skill Mismatches? A Cross-country Analysis. *European Journal of Education*, 42(1), 59-73. <https://doi.org/https://doi.org/10.1111/j.1465-3435.2007.00283.x>
- Allen, J., & van der Velden, R. (2001). Educational Mismatches versus Skill Mismatches: Effects on Wages, Job Satisfaction, and On-the-Job Search. *Oxford Economic Papers*, 53(3), 434–452. <http://www.jstor.org/stable/3488627>
- Balcar, J. (2016). Is it better to invest in hard or soft skills?. *The Economic and Labour Relations Review*, 27(4), 453–470. <https://doi.org/10.1177/1035304616674613>
- Becker, G. (1993). *Human Capital A theoretical and empirical analysis with special reference to education* (3<sup>rd</sup> ed.). The University of Chicago Press.
- Brunello, G., Wruuck, P. (2019). Skill Shortages and Skill Mismatch in Europe: A Review of the Literature (Discussion Paper Series IZA DP No. 12346). Institute of Labour Economics. <https://www.iza.org/publications/dp/12346/skill-shortages-and-skill-mismatch-in-europe-a-review-of-the-literature>
- Cedefop (2010). *The skill matching challenge Analysing skill mismatch and policy implications* (Publication No. 3056). Publications Office of the European Union, Luxembourg. <https://www.cedefop.europa.eu/en/publications/3056>
- Cedefop (2014). *Terminology of European education and training policy* (Publication No. 4117). Publications Office of the European Union, Luxembourg. <https://www.cedefop.europa.eu/en/publications/4117>
- European Commission (2011). The flexible professional in the knowledge society new demands on higher education in Europe. *Community Research and Development Information Service (CORDIS)*. <https://cordis.europa.eu/project/id/506352/reporting>
- European Commission, Directorate-General for Education, Youth, Sport and Culture (2021). *European graduate tracking initiative demystified*. Publications Office. <https://data.europa.eu/doi/10.2766/5990>
- European Commission (2023). International Standard Classification of Education (ISCED). *Eurostat Statistic Explained*. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International\\_Standard\\_Classification\\_of\\_Education\\_\(ISCED\)#Implementation\\_of\\_ISCED\\_2011\\_.28levels\\_of\\_education.29](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_Standard_Classification_of_Education_(ISCED)#Implementation_of_ISCED_2011_.28levels_of_education.29)
- Eurostat (2016). *Statistical approaches to the measurement of skills* (Product code: KS-TC-16-023).

- Publications Office of the European Union, Luxembourg. <https://ec.europa.eu/eurostat/documents/3888793/7753369/KS-TC-16-023-EN-N.pdf/438b69b5-2fcb-4923-b9e2-fa7b59906438?t=1480688572000>
- Eurostat (2023a). Nominal labour productivity per person employed (ESA 2010) (Online data: TEC00116). <https://ec.europa.eu/eurostat/databrowser/view/TEC00116/default/table?lang=en>
- Eurostat (2023b). Glossary: Statistical classification of economic activities in the European Community (NACE). *Eurostat Statistics Explained*. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Statistical\\_classification\\_of\\_economic\\_activities\\_in\\_the\\_European\\_Community\\_\(NACE\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE))
- Figueiredo, H., Biscaia R., & Teixeira, P. (2015). Should we start worrying? Mass higher education, skill demand and the increasingly complex landscape of young graduates' employment. *Studies in Higher Education*, 42(8), 1401-1420. <https://doi.org/10.1080/03075079.2015.1101754>
- Freeman, R. B. (1976). *The overeducated American*. Academic Press.
- Green, F., & McIntosh, S. (2007). Is there a genuine under-utilization of skills amongst the over-qualified? *Applied Economics*, 39(4), 427-439. <https://doi.org/10.1080/00036840500427700>
- Guvenen, F., Kuruscu, B., Tanaka, S., & Wiczer, D. (2020). Multidimensional Skill Mismatch. *American Economic Journal: Macroeconomics*, 12(1), 210-244. <https://doi.org/10.1257/mac.20160241>
- Handel, J. T. (2003). Skill mismatch in the labor market. *Annual Review of Sociology*, 29(2003), 135-165.
- INE – Instituto Nacional de Estatística (2007). Classificação Portuguesa das Actividades Económicas Rev.3. *Instituto Nacional de Estatística, I.P.*
- INE – Instituto Nacional de Estatística (2023). Taxa de escolaridade do nível de ensino superior (Série 2021 - %) da população residente com idade entre 25 e 64 anos por Local de residência (NUTS -2013), Sexo e Grupo etário; Anual. Available from [https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine\\_indicadores&indOcorCod=0011327&contexto=bd&selTab=tab2](https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorCod=0011327&contexto=bd&selTab=tab2)
- Ingram, B. F., Neumann, G. R. (2003). The returns to skill. *Labour Economics*, 13, 35 – 59.
- Juhn C., Murphy, W., Pierce, B. (1993). Wage Inequality and the Rise in Returns to Skill. *Journal of Political Economy*, 101(3), 410-442.



- Kiker, B. F., Santos, M. C., & Oliveira, de M. M. (1997). Overeducation and Undereducation: Evidence for Portugal. *Economics of Education Review*, 16(2), 111-125.
- Koch, A., Nafzinger J., & Nielsen H. S. (2014). Behavioral Economics of Education. *Journal of Economic Behavior & Organization*, 115, 3–17.
- Leuven, E., & Oosterbeek, H. (2011). Overeducation and mismatch in the labor market. *Handbook of the Economics of Education*, 4, 283–326.
- Livingstone, D. W. (1998). *The education-jobs gap: Underemployment or economic democracy*. Westview Press.
- Marques, P., Suleman F., & Costa, J. M. (2021). Moving beyond supply-side arguments to explain over-qualification: The ability to absorb graduates in different models of capitalism. *European Journal of Education* 2022, 57, 342-360.
- McGuinness, S. (2006). Overeducation in the labour market. *Journal of Economic Surveys*, 20, 387–418.
- McGuinness, S., Pouliakas, K., & Redmond, P. (2018). Skills mismatch: concepts, measurement and policy approaches. *Journal of Economic Surveys*, 32(4), 985-1015.
- Mincer, Jacob (1993). *Schooling, experience and earnings*. Gregg Revivals.
- Murphy, K., & Welch, F. (1989). Wage Premiums for College Graduates Recent Growth and Possible Explanations. *Educational Researcher*, 17-26.
- Psacharopoulos, G. (1994). Returns to Investment in Education: A Global Update. *World Development*, 22(9), 1325-1343.
- Polachek, W. S. (2002). *Labour Economics Mincer – Style: A Personal Reflection*. In: Jacob Mincer A pionner of Modern Labour Economics. Shoshana Grossbard (ed.)
- Polachek, W. S. (2003). *Proving Mincer Right: Mincer's Overtaking Point and the Lifecycle Earnings Distribution*. In: Jacob Mincer A pionner of Modern Labour Economics. Shoshana Grossbard (ed.)
- Rholing, T. A. (1986). Screening and Human Capital Theory: An Empirical Test. *Relations Industrielles / Industrial Relations*, 41(4), 817-826.
- Schulz, B. (2008). The Importance of Soft Skills: Education beyond academic knowledge. *Journal of Language and Communication*. 146-154
- Sgobbi, F., & Suleman, F. (2012). A Methodological Contribution to Measuring Skill (Mis)Match. *The Manchester School*, 81(3), 420-437. <https://doi.org/10.1111/j.1467-9957.2012.02294.x>

- Shields, R., & Hernandez, A. S. (2020). Mixed signals: cognitive skills, qualifications and earnings in an international comparative perspective. *Oxford Review of Education*, 46(1), 111-128.
- Sloane, P. J., & Mavromaras, K. (2020). Overeducation, skill mismatches and labor market outcomes for college graduates. *IZA World of Labor*.
- Spence, M. (1973). Job Market Signalling. *The Quarterly Journal of Economics*, 87(3), 355-374.
- Teixeira, P. N. (2007). *Jacob Mincer A Founding Father of Modern Labor Economics*. Oxford University Press.
- Teng, W., Ma, C., Pahlevansharif, S., & Turner, J. (2019). Graduate readiness for the employment market of the 4th industrial revolution The development of soft employability skills. *Education + Training*, 61(5), 591-604.
- Unesco (2011). *Classificação Internacional Tipo da Educação (CITE) 2011*. Unesco, Institute for Statistics. [https://estatistica.dgeec.mec.pt/docs/docs\\_cdr/ISCED2011\\_PT.PDF](https://estatistica.dgeec.mec.pt/docs/docs_cdr/ISCED2011_PT.PDF)
- Walters, D. (2004). The Relationship Between Postsecondary Education and Skill: Comparing Credentialism with Human Capital Theory. *The Canadian Journal of Higher Education*, 34(2), 97-124.

## Annexes

**Table A.1.** – Example questions within each section of the *Eurograduate survey 2022*

| Sections                 | Example Questions                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Education History</b> | – What was the name of your higher education institution?                                                                                                                |
|                          | – What type of qualification did you receive?                                                                                                                            |
|                          | – What was your main field of study?                                                                                                                                     |
|                          | – What was your formal enrolment status at the time of graduation?                                                                                                       |
|                          | – What was your average final grade?                                                                                                                                     |
|                          | – Did you gain any experience abroad as part of the programme that you graduated from in <i>yyyy/yyyy</i> (e.g. study abroad, internship, language course, etc.)?        |
|                          | – Did you do any internships or work placements during the study programme?                                                                                              |
|                          | – Did you engage in any paid labour (e.g. student job) during your study programme?                                                                                      |
|                          | – Did you do any voluntary activities during your study programme (e.g. student union, campus newspaper, youth work, trainer in sports club, etc.)?                      |
|                          | – What was your average final examination grade when you finished school?                                                                                                |
|                          | – After you obtained your degree in <i>yyyy/yyyy</i> , did you study in another higher education programme?                                                              |
|                          | – How would you describe your current situation? (for example, employed, student, unemployed)                                                                            |
| <b>Work</b>              | – Do you have more than one job?                                                                                                                                         |
|                          | – When did you start working with your current employer / in self-employment?                                                                                            |
|                          | – Where do you work?                                                                                                                                                     |
|                          | – What is your occupation?                                                                                                                                               |
|                          | – What is the main business activity of the organization where you work?                                                                                                 |
|                          | – How many people work in your organization in total (including all locations if applicable)?                                                                            |
|                          | – What is your current type of contract?                                                                                                                                 |
|                          | – Are you employed in the public sector?                                                                                                                                 |
|                          | – What are your gross monthly earnings (i.e. before taxes and levies/contributions) including regular extra payments (e.g. paid overtime, performance or shift bonuses)? |
|                          | – What level of education is usually required to perform this job?                                                                                                       |
|                          | – How satisfied are you all in all with your current work situation?                                                                                                     |
|                          | – Is your current job the first job you had after graduating in <i>yyyy/yyyy</i> ?                                                                                       |
|                          | – How many (main) employers have you had altogether since graduation?                                                                                                    |
|                          | – How long in total have you been employed since graduation?                                                                                                             |
|                          | – Do you think your chances of employment have increased or decreased as a result of the COVID-19 pandemic?                                                              |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Competences</b>                | <ul style="list-style-type: none"> <li>– Please rate on each competence, firstly, the level of competence required in your current work and, secondly, your current own level. (List of 12 competences)</li> <li>– To what extent does your current work demand more knowledge and skills than you can actually offer?</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Regional Mobility</b>          | <ul style="list-style-type: none"> <li>– Where did you mainly live during the study programme you graduated from in the academic year <b>yyyy/yyyy</b>?</li> <li>– Where do you mainly live at present?</li> <li>– Where did you mainly live in October 2018?</li> <li>– How important were the following reasons for you to move to your current place of residence? (for example, partnership or family reasons, higher income prospects)</li> </ul>                                                                                                                                                                                                                                                     |
| <b>EU Module</b>                  | <ul style="list-style-type: none"> <li>– All things considered, how satisfied are you with your life as a whole nowadays?</li> <li>– In your opinion, to what extent is it generally possible to trust people?</li> <li>– How interested would you say you are in politics?</li> <li>– How much would you say that the political system in Portugal allows people like you to have an influence on politics?</li> <li>– How confident are you in your own ability to participate in politics?</li> <li>– How important is it for you to live in a country that is governed democratically?</li> <li>– Do you think that climate change is caused by natural processes, human activity, or both?</li> </ul> |
| <b>Personal Social Background</b> | <ul style="list-style-type: none"> <li>– When were you born?</li> <li>– Where were you born?</li> <li>– Where were your parents or guardians born?</li> <li>– What is your native language?</li> <li>– Are you currently in a committed partnership?</li> <li>– Do you share a household with your partner?</li> <li>– Do you live with one or both of your parents or guardians in the same household?</li> <li>– Do you have children?</li> <li>– What is or was your parents' or guardians' highest level of education?</li> <li>– How is your health in general?</li> </ul>                                                                                                                            |

**Table A.2.** – Business sectors (NACE-rev2.0)

| <b>Value</b> | <b>Value label</b>                                                       |
|--------------|--------------------------------------------------------------------------|
| 1            | Agriculture, forestry and fishing (A)                                    |
| 2            | Mining and quarrying (B)                                                 |
| 3            | Manufacturing (C)                                                        |
| 4            | Electricity, gas, steam and air conditioning supply (D)                  |
| 5            | Water supply; sewerage, waste management and remediation activities (E)  |
| 6            | Construction (F)                                                         |
| 7            | Wholesale and retail trade; repair of motor vehicles and motorcycles (G) |
| 8            | Transportation and storage (H)                                           |
| 9            | Accommodation and food service activities (I)                            |
| 10           | Information and communication (J)                                        |
| 11           | Financial and insurance activities (K)                                   |
| 12           | Real estate activities (L)                                               |
| 13           | Professional, scientific and technical activities (M)                    |
| 14           | Administrative and support service activities (N)                        |
| 15           | Public administration and defence; compulsory social security (O)        |
| 16           | Education (P)                                                            |
| 17           | Human health and social work activities (Q)                              |
| 18           | Arts, entertainment and recreation (R)                                   |
| 19           | Other service activities (S)                                             |
| 20           | Activities of households as employers (T)                                |
| 21           | Activities of extraterritorial organisations and bodies (U)              |

**Table A.3.** – Occupations (ISCO-08 level 1)

| <b>Value</b> | <b>Value label</b>                                 |
|--------------|----------------------------------------------------|
| 1            | Managers                                           |
| 2            | Professionals                                      |
| 3            | Technicians and Associate Professionals            |
| 4            | Clerical Support Workers                           |
| 5            | Service and Sales Workers                          |
| 6            | Skilled Agricultural, Forestry and Fishery Workers |
| 7            | Craft and Related Trades Workers                   |
| 8            | Plant and Machine Operators, and Assemblers        |
| 9            | Elementary Occupations                             |
| 0            | Armed Forces Occupations                           |