

**UNIVERSITY OF LJUBLJANA
FACULTY OF ECONOMICS**

DAŠA FARČNIK

**THE SCHOOL-TO-WORK TRANSITION OF HIGHER
EDUCATION GRADUATES IN SLOVENIA**

DOCTORAL DISSERTATION

LJUBLJANA, 2012

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**(PREHOD SLOVENSКИH DIPLOMANTOV VISOKOŠOLSKIH
INŠTITUCIJ NA TRG DELA)**

DOCTORAL DISSERTATION

LJUBLJANA, 2012

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PREHOD SLOVENSКИH DIPLOMANTOV VISOKOŠOLSKIH INŠTITUCIJ NA TRG DELA

POVZETEK

V zadnjih dveh desetletjih tako v Sloveniji kot po svetu naraščajo izdatki za izobraževanje, narašča število študentov in posledično diplomantov, hkrati pa je prehod vse bolj izobraženih na trg dela zaznamovan z brezposelnostjo in delom, kjer se znanja, pridobljena med študijem, ne uporabljajo. Prav v zadnjem desetletju se je brezposelnost mladih diplomantov povečala v večini evropskih držav, kar poraja številna vprašanja o kakovosti visokošolskih inštitucij, preizobraženosti in neskladju med ponudbo diplomantov in povpraševanjem po visokokvalificirani delovni sili (Teichler, 2002). Doktorska disertacija zato preučuje prehod diplomantov slovenskih visokošolskih inštitucij na trg dela tako z vidika trajanja brezposelnosti oziroma verjetnosti zaposlitve v določenih časovnih obdobjih po diplomi kot tudi z vidika ujemanja prvih poklicev diplomantov s področji njihovega izobraževanja. Oba kazalca sta izračunana za posamezno področje izobraževanja, vrsto programa oziroma študija in visokošolsko inštitucijo ter ponujata nov pogled na slovenski visokošolski prostor. Primerjava v zaposlovanju diplomantov med visokošolskimi zavodi pa je eden izmed znakov kakovosti visokošolskih inštitucij. Prav kakovost izobraževalnih inštitucij, predvsem visokošolskih, pa pomembno vpliva na gospodarsko rast (Hanushek in Kimko, 2000).

Merjenje kakovosti samo po sebi predstavlja metodološke izzive, predvsem pristranskosti zaradi omejitve opazovanih spremenljivk in izključitve neopazovanih spremenljivk iz analize merjenja kakovosti. Tako študije vključujejo kontrolne spremenljivke, ki kontrolirajo nenaključni vpis in izbor študentov v šole, sociodemografske značilnosti in vpliv sošolcev. Poleg vključitve različnih spremenljivk v analizo pa se uporabljajo tudi instrumentalne spremenljivke in eksperimentalne metode analize vpliva kakovosti. Kakovost je sama po sebi atribut inštitucije, ki je enoznačno ne moremo izmeriti, zato se uporabljajo različne mere za merjenje kakovosti inštitucij. Med njimi prevladujejo predvsem monetarni kazalniki in uspehi študentov. Pomanjkanje soglasja pa je moč opaziti tudi pri vplivu kakovosti inštitucij predvsem na dohodek, kjer se ugotovitve razlikujejo po stopnjah izobrazbe in načinih preučevanja kakovosti. Vse več študij pa poroča o statistično značilnih pozitivnih vplivih predvsem kakovostnih visokošolskih inštitucij na dohodek diplomantov, verjetnost nadaljevanja študija, zadovoljstvo, zdravje in tudi na cene nepremičnin. Pregled literature kaže na pomanjkanje študij o merjenju kakovosti inštitucij z vidika prvih zaposlitev diplomantov.

Nadalje v disertaciji analiziram prehod diplomantov slovenskih visokošolskih inštitucij, ki so diplomirali v letih od 2007 do 2009, na trg dela. Z uporabo modela probit in z računanjem mejnih učinkov z analizo ugotavljam, da se verjetnost zaposlitve diplomantov, ki so študirali redno in prvo zaposlitev dobili po diplomi, statistično značilno razlikuje po posameznih področjih izobraževanja. Tako je v prvih treh mesecih po diplomi največja verjetnost za zaposlitev diplomantov medicine in tehnike, proizvodnih tehnologij in gradbeništva. Med diplomante z najmanjšo verjetnostjo zaposlitve tako v prvih treh kot tudi v prvih devetih

mesecih po zaposlitvi se uvrščajo diplomanti umetnosti in humanistike. Analiza kaže, da se statistično značilno razlikujejo tudi verjetnosti zaposlitve po posameznih visokošolskih inštitucijah in vrstah programov. Nadaljnja analiza z uporabo metode propensity score matching-a preučuje prav slednje, kjer je posebna pozornost namenjena razlikam med zaposljivostjo diplomantov novih bolonjskih programov poslovnih in upravnih ved. Rezultati na podlagi vzorca diplomantov poslovnih in upravnih ved Univerze 1 in 2, ki so diplomirali v letu 2008 ali 2009, kažejo na nižjo verjetnost zaposlitve za diplomante novih bolonjskih programov. Za dodatno analizo kakovosti visokošolskih inštitucij pa so narejeni izračuni na vzorcu diplomantov, ki so v letu 2007 diplomirali na enem izmed visokošolskih zavodov s področja poslovnih in upravnih ved. Ob izločenem vplivu različnih področij izobraževanja ugotavljam, da so bili med najbolj zaposljivimi diplomanti Univerze 1, in sicer Fakultete 1. Robustnost rezultatov je preverjena tudi z metodo Clarify.

Poleg trajanja brezposelnosti pa je z vidika produktivnosti delavcev pomembno tudi ujemanje področja izobraževanja in poklica diplomanta. Ne samo, da so zaradi neujemanja mogoči monetarni učinki, neujemanje je pomembno tudi z vidika investicije v izobraževanje. Na podlagi Standardne klasifikacije poklicev (SKP) je za vsako področje in ob upoštevanju podpodročij izoblikovan sistem kvalitete ujemanja področja izobraževanja in poklica diplomanta. Področje se lahko s prvim poklicem, ki ga diplomant opravlja, popolnoma ujema (match), delno ujema (weak match) ali nikakor ne ujema (mismatch). Poleg neujemanja področja izobraževanja pa je bilo do pred kratkim v literaturi v ospredju ujemanje stopnje izobrazbe z zahtevnostjo poklica. Tako se vse več pojavljajo študije, ki merijo tako imenovano preizobraženost, kjer diplomanti opravljajo poklice, za katere prva stopnja terciarnega izobraževanja ni potrebna. Na podlagi modela ordered logit in izračunanih mejnih učinkov analiza kaže, da se obseg neujemanja področja izobraževanja in poklicev statistično značilno razlikuje po področjih izobraževanja. Največ diplomantov, katerih poklic se ne ujema s področjem njihovega izobraževanja, je s področij novinarstva in obveščanja, varstva okolja in transportnih storitev. Na drugi strani pa se diplomanti izobraževalnih ved in izobraževanja učiteljev ter medicine najpogosteje zaposlujejo na delovnih mestih, ki se ujemajo s področjem njihovega izobraževanja. Poleg tega rezultati kažejo, da se je kvaliteta ujemanja področja in poklica v preučevanih letih poslabšala. Hkrati pa kažejo, da dlje časa kot so diplomanti brezposelni, večja je verjetnost, da se bodo zaposlili na delovnih mestih, ki niso povezana s področjem njihovega izobraževanja. Glede preizobraženosti diplomantov pa analiza kaže, da obstaja statistično značilna povezava med preizobraženostjo in kvaliteto ujemanja poklica in področja izobraževanja.

Ključne besede: prehod diplomantov na trg dela, zaposljivost diplomantov, visoko šolstvo, terciarna izobrazba, kakovost izobraževalnih inštitucij, bolonjska reforma, ujemanje področij izobraževanja in poklica, Slovenija.

THE SCHOOL-TO-WORK TRANSITION OF HIGHER EDUCATION GRADUATES IN SLOVENIA

SUMMARY

More and more resources have been devoted to education in the last two decades in both Slovenia and other countries. At the same time, the school-to-work transition of highly educated individuals is characterised by unemployment and a mismatch between an individual's field and level of education. This poses a series of questions about the reasons for and possible consequences of the quality of the university education system, over-education and the mismatch between the demand for qualified labour and the supply of university graduates (see the summary of discussions in Teichler, 2002). Therefore, this doctoral dissertation analyses the school-to-work transition of higher education graduates in Slovenia. First, I analyse the unemployment or probability of finding the first employment in a specific time period after graduation. Further on I pay particular attention to the quality of a match from the field of education and occupational point of view. Both measures are calculated with respect to different fields and types of study and higher education institutions and, together, they might shed light on the quality of institutions in the Slovenian higher education framework. Quality has a significant impact on national growth rates (Hanushek and Kimko, 2000). Therefore, firstly I present a literature review on school quality, with a special focus on quality in higher education.

Measuring school quality raises several methodological challenges that originate from bias in the selection on observables and unobservables. Therefore, studies pursue several different approaches to control for biases such as the non-random selection of students into schools, socio-demographic characteristics as well as peer effects. Some of them require a rich dataset to control for such biases using instrumental variables or even experimental methods. Interest has been growing in using propensity score matching techniques. School quality is a latent variable and therefore several different measures or proxies have been proposed. Most commonly certain kinds of measures of school resources are used to measure latent school quality or students' achievement. The lack of consensus in the area has also spread to the effects of school quality. Although a stream of very influential literature finds no significant effects of school quality on achievement and earnings, there is ever more evidence of the positive effects of especially university and college quality on either earnings, the likelihood of continuing with education as well as satisfaction, health outcomes and house prices. Based on a literature review I find limited evidence of the investigation of the effects of school quality for early labour market outcomes.

The dissertation then investigates the determinants of the school-to-work transition for three generations of graduates who graduated in 2007, 2008 and 2009, respectively. Using a probit model and calculating marginal effects, the study finds that for graduates securing their first employment after graduation the probability of employment in the first months following graduation varies with respect to different fields of study. The highest probability of employment in the first three and in the first nine months after graduation is exhibited by Health graduates and graduates of Engineering, Architecture and Building. In contrast,

graduates of the Humanities exhibit the lowest probability of employment. The results show that the probability of employment statistically significantly varies with respect to different higher education institutions and study programmes (or types of education). The later is analysed using propensity score matching with special attention to investigating the employability of graduates of Business and Administration who finished 1st Bologna cycle types of education. The results for Business and Administration graduates that studied at University 1 or 2 point to a lower probability of employment for graduates who finished 1st Bologna cycle type of education in the analysis. To further analyse the quality of higher education institutions, I constructed a subsample of Business and Administration graduates of the 2007 generation. By eliminating the effect of study field, I find that the probability of employment varies for graduates from the same field but from different institutions. The highest probability of employment in the first months after graduation is exhibited by the graduates of University 1, Faculty 1 (Public B&A School 1). The robustness of the results was checked using Clarify.

Apart from unemployment, to fully utilise the stock of human capital in the population it is essential to match individuals' education-specific skills with occupational/job characteristics. Based on the Standard Classification of Occupations ("SKP") for every field of education, by taking into account the subfields of education, one can predict specific groups of occupations that are a match, a weak match or a mismatch for particular education. Beside the quality of the education-occupation match, the vast literature focuses on the incidence and measurement of education level and occupation match and so-called measures of overeducation and undereducation have been proposed. Based on an ordered logit model I estimate the likelihood of a match, a weak match and a mismatch with respect to every field of education and find that the likelihood varies for different fields. The highest likelihood of a match is exhibited by Health and Education graduates and the lowest is exhibited by graduates of Journalism and Information, Environmental Protection and Transport Services. In addition, the results show that the quality of the match increased over the three years under observation. Again, using a probit regression, the results show that the longer a graduate is unemployed, the higher is the probability they will accept a job that does not match their field of education. Regarding the overeducation of graduates, I find a negative correlation between overeducation and the likelihood of an education-occupation match.

Key words: employability of graduates, higher education, tertiary education, school quality, Bologna reform, horizontal and vertical mismatch, Slovenia

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1 INTRODUCTION

1.1 MOTIVATION

According to human capital theory (Becker, 1964), education represents an investment in human capital and is considered to be one of the important factors of sound economic growth and development (Becker, 1964; Ben-Porath, 1967; and early works of Mincer, 1958 and 1962). Schultz (1961) defines investments in human capital as direct expenditures on education, health, internal migration to take advantage of better job opportunities, attending school and on-the-job training. Human capital theory asserts that an investment in education raises an individual's market productivity which is rewarded in the labour market by higher earnings or wages (for example Card, 1999; Harmon et al. 2001 for Europe; Boarini & Strauss, 2010 for OECD countries and Bartolj et al. 2011 for Slovenia). Economic growth models include some kind of measure of human capital. For example, Nelson and Phelps (1966) referred to the stock of human capital as a growth-generating component. Neo-classical economic growth models (Mankiw, Romer and Weil, 1992; Lucas, 1988) regard human capital as an additional accumulating factor of production in the Solow model. Benhabib and Spiegel (1994) show that the rate of productivity growth is positively correlated with the stock of human capital.

The focus on the importance of human capital consequently puts schooling in the spotlight. The expansion of schooling for the labour force was undoubtedly an important part of the economic growth story of the United States (Denison, 1974; Romer, 1989; Jorgenson and Fraumeni, 1992; Goldin, 1994). More precisely, the focus was on higher education since already during the 1960s and 1970s it was believed that the expansion of higher education might contribute significantly to economic growth and the reduction of social inequality. According to the analysis of a panel of around 100 countries observed from 1960 to 1995, Barro and Lee (2001) find that growth is positively related to the starting level of average years of school attainment of adult males at the secondary and higher education levels. Productivity growth can either be generated by imitation or by frontier innovation, with innovation becoming increasingly important for growth as countries move closer to the world technology frontier. In particular, according to (Acemoglu, Aghion & Zilibotti, 2006) and Aghion (2007) investment in higher education should have a bigger effect on a country's ability to make leading-edge innovations leading to economic growth, whereas primary and secondary education are more likely to make a difference in terms of a country's ability to implement existing technologies. Therefore, it is not only the total investment in education but also its allocation among different education levels that impact a country's growth depending on its development stage (in a similar study of 22 OECD countries over the 1960–2000 period Vandenbussche, Aghion and Meghir (2006) confirmed that the impact of higher education on growth increases when countries approach the technological frontier). As mentioned, education increases productivity and boosts cognitive skills. Hanushek and Kimko (2000) find a statistically and economically significant positive effect of cognitive skills on economic growth in the 1960–1990 period. A later study by Hanushek and Woessmann

(2009) finds that the robust association between cognitive skills and economic growth reflects the causal effect of cognitive skills and supports the economic benefits of effective school policy.

The importance of higher education has been stressed in literature investigating the returns to education by, among others, Becker (1964), Mincer (1974), Keane and Wolpin (1997) and Black and Smith (2006), where the majority of studies focused on the returns arising from an additional year of study. Apart from the monetary or market effects of education for an individual (returns to education) or for the economy (growth, productivity, externalities, technological change), Woessmann (2008) provides an excellent review of the non-monetary individual effects of education (life satisfaction, happiness, health, children's well-being, efficiency of choosing) and non-monetary effects for the society (democratisation, lower homicide rates and property crime, social cohesion and trust, reduction of poverty and population growth rates).

There has been a dramatic increase in students, graduates and resources devoted to education. For example, in Slovenia in the last two decades the number of graduates has risen by around 200 percent (SORS, 2011). Governments worldwide are attributing ever more importance to educational policies and resources dedicated to education. In its Europe 2020 Strategy, the European Union set a goal to increase the number of 30- to 34-year-olds with a tertiary education to 40% (from 32.3% in 2009). Boarini and Strauss (2010) show that if an individual attends tertiary education there is also a higher probability they will participate in the labour market and find a job. They also find that the probability of participation in the labour market for 21 OECD countries (Slovenia was not included) is around 94% for women and 97% for men.

On the other hand, persisting unemployment is a phenomenon that has plagued European economies since the 1980s. In the last 10 years a worrying trend has been observed of rising unemployment amongst those who are the most educated but still a vulnerable group – young university graduates (Quintini, Martin and Martin, 2007). In the search for their best job match, this particularly vulnerable group often goes back to education and training, especially after a spell of unemployment (Clark and Summers, 1982). The transition of youth to the labour market is characterised by the so-called experience gap of youth compared to adults (Caroleo and Pastore, 2007). A stream of the literature has therefore focused on this vulnerable group from the individual perspective. A number of studies thus investigate the incidence and consequences of youth unemployment, especially among the most educated ones. In addition, this poses a series of questions about the reasons for and possible consequences of the quality of the university education system, over-education and the mismatch between the demand for qualified labour and the supply of tertiary education graduates (Teichler, 2002). Emphasis has been put on individuals and their transition from school to the labour market, otherwise known as the school-to-work transition.

With the increasing number of students and graduates as well as resources dedicated to tertiary education on one hand and the persisting unemployment of educated youth on the

other, the school-to-work transition and subsequent labour market outcomes have been characterised by the quality of education. The majority of studies have therefore focused on the monetary returns of school quality in the sense of higher wages (Solmon and Wachtel, 1973; Solmon, 1975; Loury and Garman, 1995; Brewer, Eide, and Ehrenberg, 1999; Hilmer, 2000; Dale and Krueger, 2002; Chevalier and Conlon, 2003; Black and Smith, 2004; Hussain, McNally and Telhaj, 2009; Long, 2010). In addition, Brand and Halaby (2006) find that graduates from higher quality schools are more likely to find better occupations.

1.2 SCHOOL-TO-WORK TRANSITION

The time it takes to obtain one's first employment after graduation is often seen as a key indicator of the labour market conditions for young graduates. The school-to-work transition is a process where someone moves from the education system into a more or less stable working engagement. While one stream of the literature focuses on search models and matching processes (Lippman and McCall, 1976; Pissarides, 1985; Mortensen, 1968; Wolpin, 1987) from an individual perspective, the other stream concentrates on the institutional settings that influence these transitions. The latter identifies two important institutions that primarily influence school-to-work transitions: the education system and labour market conditions (Kerckhoff, 2000; Müller, 2005). This means that the transition is not merely dependant on individual resources and characteristics but is influenced by the institutional characteristics of the labour market, the education system and the linkages between those institutions (DiPrete et al., 2001). Hannan et al. (1997) similarly identifies four general dimensions of a conceptual framework for school-to-work transitions: the national context; the education/training system and its interconnection with the labour market, and state policies influencing these processes; the structure of the school-to-work transition process itself; and the outcomes of the transition process. Saar, Unt and Kogan (2008) further notes that the education system is providing standardised and specific vocational qualifications that have a clear value for prospective employers. In this regard, there are two different systems of the education-labour market relationship: internal labour markets (ILM) where employers' main signal is experience and occupational labour markets (OLM) where the employers' main signal is education. Marsden (1990) and Smyth et al. (2001) report that occupational labour market systems are more common in vocationally-oriented education where links between education and the labour market exist and the internal labour market in countries where experience is the main selection criterion for occupations and there are weaker links between education and the labour market.

Most surveys of the school-to-work transition usually studied the phenomenon with respect to labour market institutions, minimum wage legislation and internal labour markets in the case of school leavers. Many surveys make use of the CHEERS study (Careers after Higher Education: a European research study) where around 40,000 graduates of the academic year 1994/95 from 11 European countries and Japan were surveyed about four years after graduation (among others Schomburg and Teichler, 2006; Allen and van der Velden, 2007)

with special attention to the transition to employment, the employment situation during the first four years after graduation, the links between competencies acquired and work tasks, as well as the professional impact of values and orientations. Schomburg and Teichler (2007), for example, report that searching behaviour among graduates varies significantly in Europe. Over one-third of British students started their job search more than 3 months before they graduated while, at the other extreme, more than half of Italian, Spanish and French students waited until they graduated before they started searching for a job. Early searches are more likely when universities are strongly involved in the placement process. The beginning of such searching varies among fields of study, with any consistent patterns across countries being rare.¹ The CHEERS survey reports that the length of graduates' search for their first job in 1994/95 was 6 months on average, although 66 percent of all graduates did not search for more than 3 months (Schomburg and Teichler, 2007). The shortest search was reported by Czech and Norwegian graduates (2.9 months). A similar survey conducted by the HEGESCO consortium² shows that 12 to 32 percent of graduates started looking for a job before graduation and more than 90 percent of graduates obtained work within six months after graduation. Although the first job they obtained sometimes did not match their level and/or field of study, and involved only a temporary contract, five years after graduation most graduates had obtained a permanent contract in the field of their expertise.

A significant share of academic contributions on the school-to-work transition involves examining labour market outcomes in terms of earned wages associated with graduating from a specific field of study. These studies find that an individual labour market performance varies by field of study (James et al., 1989; Kelly, O'Connell and Smyth, 2010). In addition to what are mainly surveys of US graduates (for example Nguyen and Taylor, 2005), the duration of graduate unemployment according to different fields of study has been investigated for Taiwan (Chuang, 1997), Spain (Lassibille et al., 2001), the United Kingdom (Smith, McKnight and Naylor, 2000) and the Netherlands (Allen and van der Velden, 2009). The transition from school to work has long-term effects on subsequent career management and vocational futures (Lowe and Krahn, 1999 and Nurmi, 2004). For example, attaining a job in the first year after school increases work life goal-related achievement beliefs (Nurmi, Salmela-Aro, & Koivisto, 2002) and is associated with a stronger likelihood of being employed in later years (OECD, 1998).

While a large body of research exists on school-to-work transitions and the early careers of youth in most developed European countries and especially for the United States, little is known about youth transitions in Central and Eastern European countries. Yet the experience of post-communist countries seems to be unique since transition economies have been and are

¹ Health and Engineering graduates often start their search early. Law graduates, in contrast, start late, notably in Germany and Austria. In France, Business Studies graduates show a much stronger propensity to start their job searching prior to graduation than other graduates.

² The HEGESCO survey is based on the REFLEX methodology and was carried out in 2008 in four new EU countries (Slovenia, Lithuania, Poland and Hungary) and Turkey. There was a total of 8,742 responses. In Slovenia the questionnaire was mailed out to 6,000 graduates and the response rate was 49 percent.

still undergoing major structural changes in all sectors (education, the economy, the welfare state) at the same time, which are incomparable with the business cycle downturns known in Western economies (Redek and Sušjan, 2005). For three new EU member states, including Slovenia, Kogan and Unt (2005) investigate school-to-work transitions and focus on the effect of the level of education and social background on the timing of the first significant employment and the match between educational qualifications and occupation among school leavers. For Slovenia they find that in the earlier period of the country's transition to a market economy the differences in the speed of obtaining one's first significant employment with respect to different levels of education are quite small. However, the differences widen significantly in the later period when school leavers with a low and even a secondary education obtain their first employment much more slowly than higher education graduates. They also investigate the match of an individual level of education and jobs and find that the proportion of the overeducated (those who have a higher education than needed to perform the job) increased in the time of the transition. When focusing on Slovenia there are some studies that investigate labour market outcomes with respect to wages without merely concentrating on the school-to-work transition (Orazem and Vodopivec, 2002; Ahčan et al., 2008; Bartolj et al., 2011). Orazem and Vodopivec (2000) focus on male-female wage differences and find that returns to human capital rose during the transition, especially for female workers. Bartolj et al. (2011) estimate private rates of return to different levels and fields of tertiary education in the 1994–2008 period and find that during the transition annual returns followed an inverse U-shaped pattern with a peak around 2001 and that there are significant differences in returns to different levels as well as fields of education.

1.3 PURPOSE AND GOALS

Based on the lack of investigation of the school-to-work transition especially in the post-transition context and at the time of the economic downturn, the purpose of this dissertation is therefore to investigate the school-to-work transition of Slovenian higher education graduates. Slovenia as a former socialist economy inherited a relatively centralised and public education system. The system has been developing since the start of the transition process with the establishment of new public and private higher education institutions and implementation of the Bologna reform. With growing numbers of students and graduates and an increasing number of unemployed with a higher education, there is a need for an analysis of the early careers of recent cohorts of graduates. The purpose of this dissertation is to shed some light on the analysis of the school-to-work transition of Slovenian higher education graduates from the duration of unemployment point of view as well as to investigate the first employment they secure. In addition, the dissertation considers the quality of Slovenian higher education institutions. The analysis in the dissertation provides an insight into quality of Slovenian higher education area.

The quality of education has been widely addressed in the literature, mainly due to the statistically significant positive effects on earnings (for example, Solmon and Wachtel, 1973;

Solmon, 1975; Loury and Garman, 1995; Brewer, Eide, and Ehrenberg, 1999; Dale and Krueger, 2002; Chevalier and Conlon, 2003; Hussain, McNally and Telhaj, 2009; Long, 2010) as well as student education achievement (Kane and Dickens, 1996; Eide, Brewer and Ehrenberg, 1998; Strayer, 2002; Zhang, 2003; Brand and Halaby, 2006; Black and Smith, 2006; Malguzio, 2008) and non-monetary returns such as the time of starting a family and getting married (Long, 2010), health (Fletcher and Frisvold, 2009; Fletcher and Frisvold, 2011; Frisvold and Golberstein, 2011) and satisfaction (Bisconti & Solmon, 1977; Ochsner & Solmon, 1979; Zhang, 2003; Gibbons and Silva, 2011). Estimating the effect of college or university quality on the parameter of interest such as wages is not straightforward. Investigating the effects of school quality raises several methodological issues. Therefore, the primary aim of this dissertation is to systematically outline the different measures used and provide recent trends that might best summarise the past literature and provide the optimal measure. Another aim of this review is to summarise the methods and provide references for each as well as to serve as a starting point for future research. With the growing interest in school quality, especially college quality, as well as the long tradition of such research, I will provide an overview of the outcomes of interest where I not only focus on student achievement and earnings, but also house prices, satisfaction and the recent interest in the effect of school quality on health outcomes, marital status and childbearing.

Further on, the goal of the dissertation is to investigate the school-to-work transition of recent cohorts of graduates who graduated in the period from 2007 to 2009. The school-to-work transition is investigated by considering the unemployment spell between graduation and the first job by calculating the probability of employment at certain points in time after graduation. The probability of employment is investigated for graduates from different fields of education, types of education and higher education institutions. The graduates in focus are graduates who studied full time at one of Slovenia's higher education institutions, obtained an undergraduate education (either professional or academic), and secured employment after graduation. In the years under observation, graduates from the new Bologna programmes also graduated. The majority of them were graduates of the business and administration fields of education from two universities. Therefore, I will investigate how the probability of employment differs for graduates of the new Bologna programmes compared to graduates of former types of education in the business and administration field of education. Several different higher education institutions provide undergraduate education and therefore some light is shed on the variation in the employability of graduates from different institutions, in particular graduates of business and administration. Another goal of the dissertation is to analyse the match between the specific knowledge a graduate obtains while studying and the occupation they secure or to what extent graduates secure an occupation that matches their field of education. In the analysis the first-time wages are not used because collective bargaining in Slovenia means such first wages do not perfectly reflect the productivity of an individual.

In order to fully investigate the transition process, the research focuses is on: (1) the unemployment spell between graduation and the first job a graduate secures with respect to different study characteristics, especially the field of education and type of education; (2) an

occupation a graduate secures right after graduation and the match of that occupation with their field as well as level of education. All this can be placed in the perspective of the quality of higher education and the dissertation therefore attempts to; (3) provide a comprehensive review of literature on measuring and the effects of school quality, focusing primarily on higher education quality; and (4) providing some evidence of different quality institutions in the Slovenian higher education environment for a selected field of education.

This dissertation makes many contributions. In these times of economic downturn, significant attention is being devoted to the efficient use of public resources for education. From an individual perspective of the investment in human capital, the quality of a school represents an important aspect, especially if the returns are measured by earnings, satisfaction and other outcomes. Therefore, the dissertation: (1) reviews the literature on school quality, focusing especially on the quality of higher education, also including the latest studies in the field. This review provides a starting point for other school quality studies. (2) Schomburg and Teichler (2006) discovered that the majority of economically advanced countries had not carried out any major surveys on graduate employment and work after tertiary education beyond some general statistical data. This dissertation provides an analysis of the school-to-work transition of Slovenian higher education graduates with respect to different fields of education, types of education and higher education institutions. By considering the recent data on graduates it also investigates trends in the school-to-work transition in a period of economic downturn for a post-transition country that in recent years has also produced the first generations of those completing new Bologna types of education. (3) By investigating the graduates' transition from school to the labour market for a specific field of study, it provides further insight into higher education quality that has not been measured before. (4) The horizontal match of a graduate field of education and first occupation has not been well investigated, especially not in a post-transition country in South-East Europe.

1.4 RESEARCH FOCUS

The first focus of this dissertation is to systematically outline the different measures used for latent school quality and provide recent trends that might best summarise the past literature and provide the optimal measure. Another aim of this review is to summarise the methods and provide the relevant references. I will focus on an overview of the outcomes of interest such as student achievement and earnings, house prices, satisfaction and the recent interest in the effect of school quality on health outcomes, marital status and childbearing. The second and third focus of the dissertation provide an aspect of quality of Slovenian higher education area.

Second, the employability of graduates is analysed where unemployment after graduation is calculated as the probability of employment in the first three and nine months. The consequences of unemployment as the depreciation of general skills have been widely addressed, after pioneering work by Becker (1964). In addition, Koivisto et al. (2007) show that according to the developmental approach the transition from school-to-work has long-

term effects on subsequent career management and vocational futures (Lowe and Krahn, 1999 and Nurmi, 2004). For example, attaining a job in the first year after school increases work life goal-related achievement beliefs (Nurmi, Salmela-Aro, & Koivisto, 2002) and is associated with a greater likelihood of being employed in later years (OECD, 1998). The analysis therefore investigates not only the probability of employment in general for the three cohorts of graduates, but also the probability of employment with respect to different fields and types of education and higher education institutions. Benavot et al. (1991) emphasise that the more developed a society, the greater the emphasis in the curriculum on modern skills and values. Modern commentators on the role of higher education tend to highlight the research and education that contributes to the creation of new technologies, products, concepts and social practices (Yorke and Knight, 2004). Therefore, I will test whether graduates from science and technical fields of education exhibit the highest employability.

H1: The transition of graduates on average varies when comparing different fields of education with science and technical fields of education that generally exhibit the shortest duration of unemployment after graduation when controlling for ability.

As mentioned, employability could serve as a proxy for the quality of higher education institutions. As stressed by Fiorito (1981), institutional factors may also be important determinants of transition probabilities.

H2: Graduates from different higher education institutions exhibit varying school-to-work transition paths when controlling for ability and fields of education.

H3: Graduates of different types of education in the same field of education and higher education institution exhibit varying school-to-work transition paths.

A huge body of literature has emerged that investigates gender wage gap differences (for example, Altonji and Blank, 1999 and Blau and Kahn, 2000). As Napari (2009) points out, a typical finding of such studies is that the gender wage gap is fairly small upon entry to the labour market, but after a few years a considerable gender wage gap emerges (e.g. Loprest, 1992; Manning and Swaffield, 2008). Therefore, I am also interested if gender affects the school-to-work transition.

H4: The probability of employment is not affected by any personal characteristics such as gender when controlling for ability.

Third, to fully utilise the stock of human capital in the population it is essential to match individuals' education-specific skills (as opposed to more general skills) with occupational job characteristics (Nordin, Persson and Rooth, 2010). Sattinger (1993) shows that the quality of a job match determines the productivity level and earnings in a job. To achieve the optimal allocation every worker must be matched to a job that he or she performs better than all other workers. The match between a specific degree or college major and a job after graduation is uncertain. Therefore, there are some costs in the form of lower wages when a job does not match the specific knowledge an individual has acquired at university (Robst, 2007). In

addition, individuals choose a field of education with the expectation of working in a job related to that field. The utilisation of the education-specific skills of graduates is analysed as the likelihood of a match between a graduate's field of education and the first job they secure. The analysis considers the very first job a graduate of a specific education field secures after graduating to determine the quality of the horizontal match. Based on a matching mechanism the quality of a match is determined regarding whether a graduate has been educated to perform the occupation (a match), if the occupation does not match one's field of education very well (a weak match) or the graduate has received a degree that has nothing to do with the knowledge needed to perform the job (a mismatch). Therefore, the dissertation provides calculations on the likelihood of a match for different fields of education. Calculations are performed separately for different cohorts of graduates to check whether the probability of a match has changed during the economic downturn. In addition, based on job search theory, the analysis continues by investigating evidence of the probability of accepting a job that does not match an individual's education when their spell of unemployment is increasing.

A cross-sectional study based on all Swedish individuals in the age group 28–39 living in Sweden in 2003 by Nordin, Perrson and Rooth (2010) finds that people with a dentist, police, law and veterinarian education are mismatched the least often, whereas those with a biology, psychology or artistic education are mismatched the most often. Robst (2007) investigates whether an educational mismatch is more likely among workers with degree fields that provide general skills and less likely among graduates of areas providing occupation-specific skills. Therefore, the following hypothesis checks whether the likelihood of a match varies for different fields of education for Slovenian graduates.

H5: The likelihood of a field of education-occupation match varies for different fields of education, including in the first job a graduate secures.

H5.1: The likelihood of a field of education-occupation match is higher for graduates from ISCED 72 (Health).

H5.2: The likelihood of a field of education-occupation match is higher for graduates from ISCED 5 (Engineering, Manufacturing and Construction).

To investigate the effect of the changed economic environment in the period of interest, I investigate how the likelihood of a match varies for later generations of graduates and how it differs for different fields of education.

H6: The likelihood of a field's education-occupation match is constant over time.

Based on job search theory I want to test if the probability of accepting a job that does not match the specific knowledge a graduate possesses increases with the duration of their unemployment. Another interesting empirical question is whether this probability has been affected by the crisis.

Hypotheses 7: The probability of a mismatch increases with the duration of one's unemployment.

In order to check the hypothesis based on the literature mentioned above that the school-to-work transition is affected by the institutional setting of the labour market and the education system, they are briefly described in the following section.

1.4.1 INSTITUTIONAL SETTING

School-to-work transition is also affected by the institutional setting of the labour market, especially flexibility (Gregg and Manning, 1997; van der Velden and Wolbers, 2003). Bertola et al. (2001) find that the rigidity of the labour market has a negative effect on youth employment. Caroleo and Pastore (2007) in particular note that a rigid labour market negatively affects the school-to-work transition of youth that is characterised by an experience gap. Youth therefore need some kind of temporary working options as a stepping-stone to find a job match. The rigidity of the Slovenian labour market, characterised by difficulties in the hiring and firing of workers, has been perceived as one of the most important Slovenian challenges (Mrak et al., 2004) and one of the factors of the country's low competitiveness (Stanovnik and Kovačič, 2000). A rigid labour market actually reduces young people's prospects (especially young women) because it favours full-time employees and gives them a privileged position (Feldmann, 2004; OECD, 2004). A labour law introduced in 2003 (Uradni list RS, no. 42/2002) regulates contractual and individual employment contracts and sets minimum standards, while all further provisions regarding the employment relationship are to be agreed upon through collective agreements (Domadenik, Kaše and Zupan, 2005). Based on employment protection legislation ("EPL") that can be understood as a set of constraints on employers (Addison and Teixeira, 2001), Domadenik, Kaše and Zupan (2005) cluster countries with respect to different flexibility regulations and using 2004 data find that Slovenia has rigid regulation, but with relatively flexible hiring and rigid regulation of working hours. Saar et al. (2008) report the EPL index for Slovenia and other European countries and rank Slovenia among countries with the most restrictive labour regulations, with Slovenia differing from the other Central and Eastern ("CEE") European countries by its stronger labour market legislation, stronger trade union density and higher spending on labour market policies. Although Ryan (2001) notes that a centralised system of collective bargaining can benefit youth labour market integration, Saar et al. (2008) investigate the transition from education systems to labour markets for 22 European countries and find that in Slovenia the youth unemployment level is on an average level, although entrants are considerably more disadvantaged regarding labour market access than experienced workers. Another study by Domadenik and Pastore (2006) examines the determinants of the participation of young people in the labour market in Slovenia and their transition paths from school to employment. They find that tertiary education represents an important buffer against the risk of unemployment. Another consequence of the transition process is a change in the returns on education. While returns on education were extremely low before the transition period, they have increased dramatically during the transition (Munich, Svejnar and Terrel, 2005, Ahčan et al., 2008; Bartolj et al. 2011).

1.4.2 THE SLOVENIAN HIGHER EDUCATION SYSTEM

Along with other Central and Eastern European economies, Slovenia inherited a highly centralised and state-controlled education system from the socialist period (Saar, 1997). Young people were allocated to the education system in accordance with the economic and social goals of central planning. The transition from school to work was smooth since the first workplace was often assigned by state agencies, supported by employers and secured for all school leavers virtually irrespective of their education level (Gerber, 2003, Helemäe and Saar 2000, Róbert and Bukodi, 2005). The organisation of the school structure and curricula was based on the dual system model so the link between one's education level and future job was clearly defined, although the status match was more important than the skill match (Helemäe and Saar, 2000, Róbert and Bukodi, 2005). The period of transition was followed by a two-fold restructuring: on the labour demand side (see for example Domadenik, Prašnikar, Svejnar, 2008) and on the side of educational and training systems. Together with a substantial rise in participation in tertiary programmes and the emergence of several new private institutions, young graduates have encountered many problems when searching for their first job. As a consequence, the unemployment rates of young graduates have risen significantly in all CEE states. Thus, a major challenge for the school-to-work transition in transition countries has been to qualify the new entrants (in addition to re-qualifying a large part of the workforce) for the labour market at a time when resources are limited and education institutions and training providers are themselves being restructured (Cazes and Nesporova, 2003).

Tertiary education is an international term that encompasses all post-secondary education. Based on the International Standard Classification of Education ("ISCED"), tertiary education is divided into the traditional higher education (ISCED 5A-6) and newly developed higher vocational education sectors (ISCED 5B).³ The term higher education traditionally includes professional and academic undergraduate programmes, master programmes and doctoral programmes and does not include higher vocational education. After introduction of the Bologna reform, tertiary education is now divided into three Bologna cycles: the first is undergraduate education, the second is master education and the third is doctoral education.

The Slovenian higher education system is classified according to the national classification system of education and training activities and outcomes ("KLASIUS") and uses a different classification than the International Standard Classification of Education. According to KLASIUS, there are eight levels of education (not six like in the ISCED classification), as presented in Table 1. With the introduction of the Bologna reform a revised classification has been developed. There is a higher vocational programme available and two undergraduate higher education programmes: a professional higher first Bologna cycle and an academic higher first Bologna cycle.

³ The division of tertiary education in Slovenia differs somewhat. In 5B (former) professional higher education is also included and specialisation after short-term (former) higher education.

Table 1: KLASIUS and a description of education levels in the Slovenian higher education system

KLASIUS	Description of type of education
6	Sixth level: First cycle of higher and similar education
6.1	- Sublevel 6/1: Short-term higher education, higher vocational education and similar education
6.2	- Sublevel 6/2: First cycle of higher education (first Bologna cycle), professional higher (former), academic higher education (first Bologna cycle), specialisation after short-term higher education (former)
7	Seventh level: Second cycle of higher and similar education - Specialisation after professional higher education (former), Academic higher education (former), Master's education (second Bologna cycle),
8.	Eighth level: Third cycle of higher and similar education
8.1	- Sublevel 8/1: Education leading to »magisterij« of science (former) and similar education
8.2.	- Sublevel 8/2: Education leading to doctorate of science (former) and doctorate of science (third Bologna cycle) and similar education

Source: SORS, 2011

Higher education institutions in Slovenia are public and private universities, faculties, art academies and professional colleges (MVZT, 2011). Faculties and art academies can offer both academic and professional study programmes, while professional colleges offer undergraduate professional study programmes or academic programmes on the graduate level. The difference between university and professional institutions lies in research-based studies and academic research activities. In the 2009/2010 study year there were 80 higher education institutions (MVZT, 2010). There are three public universities in the country: the University of Ljubljana, with 26 members, the University of Maribor, with 16 members, and the University of Primorska, with 6 members. The University of Nova Gorica with 6 members is a private institution. In addition, there are 26 independent higher education institutions of which one is public and 25 are private. In the 2009/2010 academic year there were also six higher education institutions (“HEIs”) that did not enrol any students in that particular year.

The focus of this dissertation are graduates of higher education, with special attention to the graduates of undergraduate professionally-oriented programmes and academically-oriented programmes. In particular, I focus on professional higher (former) graduates and academic higher (former) graduates that form a group of undergraduate higher education. In the Business and Administration field of education, students of the new Bologna programmes also graduated in the years under observation. Therefore, the focus is also on professional and academic higher 1st Bologna cycle graduates of Business and Administration. Their school-to-work transitions are investigated in terms of the probability of employment in three and nine months (Chapter 3) and as the likelihood of a field’s education-occupation match (Chapter 4). In the two parts of the analysis I also include graduates from a higher vocational type of education in the analysis of a field’s education-occupation mismatch (ISCED 5B/KLASIUS

6.1/Short Bologna cycle) and in the analysis of the employability of the business and administration graduates.

1.5 DATA AND METHODOLOGY

This dissertation employs a unique micro dataset on graduates from 2007 to 2009 provided by the Statistical Office of the Republic of Slovenia (“SORS”). Data from graduation statistics “ŠOL-DIPL” for 2007 and 2008 and “ŠOL-DIPL-TERC” for 2009 include personal characteristics (gender, year of birth, living conditions), graduation characteristics (year of graduation, duration of study), and tertiary education characteristics (field and type of education, mode, and higher education institution). The secondary education matriculation exam or final exam test score is included in “ŠOL-ŠTUD”. These datasets are matched with data from the Statistical Register of the Labour-Active Population (“SRDAP”) which includes the entire employment history of every graduate. The matched employer-employee dataset allows an investigation of the duration of unemployment of each graduate as well as the occupation an individual secures. Different samples are used in the two empirical chapters of the dissertation and therefore the samples are described accordingly.

The methods used vary according to the different research questions. In order to investigate employability, the probability of employment is calculated using a probit regression and marginal effects. To control for the selection on observables bias, when the effects of the Bologna Process and Bologna-harmonised study programmes on employment are estimated, I use propensity score matching. To make further inferences about the quality of higher education institutions I calculate differences in the employability of Business and Administration graduates where I use a probit regression and Clarify to check for the robustness of the results. The investigation of the likelihood of a field’s education-occupation match with respect to different fields and types of education and higher education institutions is based on calculations involving an ordered logit regression. Again probit is used to check the probability of accepting a job that does not match an individual’s field of education as one’s unemployment spell increases. The methods are described in detail in Chapters 3 and 4, respectively.

1.6 LIMITATIONS

This doctoral dissertation provides new evidence of the school-to-work transition of higher education graduates in Slovenia with respect to the duration of unemployment after graduation and the effect of different fields of study, study programmes and higher education institutions as well as the likelihood of a vertical and horizontal match. The study uses a very rich microdata set of three generations of graduates from 2007 to 2009, although the data limitations are one of the shortcomings of this dissertation.

In the research I include measures of ability. The ability of students, usually measured by a scholastic achievement test, is a powerful predictor of wages, schooling, participation in crime, health and success in many other aspects of economic and social life (among others Murnane, Willett, and Levy, 1995; Cuhna and Heckman, 2009). However, the importance of non-cognitive skills an individual possesses is also gaining increasing attention in the economic literature (Heckman, Stixrud, and Urzua, 2006; Cuhna and Heckman, 2009). Non-cognitive skills may play an important role in determining the labour market outcome and are not included in the empirical part of the dissertation. I only control for above-average study durations as a motivation of students.⁴ The data limitation concerning non-cognitive skills is perceived as one of the limitations of this dissertation.

In the thesis I attempt to provide some evidence of the impact of the Bologna reform and the employability of new Bologna types of education graduates. However, due to the data available I only investigate students who graduated from 2007 to 2009, when only a minority finished one of the new Bologna programmes. Therefore, the analysis is limited to an investigation of the school-to-work transition of Business and Administration graduates from the new Bologna programmes. In addition, the number of graduates from the independent HEIs in the analysis of the effect of different higher education institutions is very limited and perceived as another data limitation.

The reasons for unemployment such as a structural mismatch, aggregate demand and hysteresis examined by Jackman, Pissarides and Savouri (1990) and Jackman and Layard (2004) are not considered in the dissertation. Although Munich and Svejnar (2007) outline three hypotheses for explaining unemployment phenomena in CEE and provide evidence for the Czech Republic, Hungary, Poland, Slovakia and Germany, the dissertation does not attempt to provide such evidence. While Jurajda and Terrel (2007) also provide evidence of inadequate labour market institutions that may lead to a skill mismatch, the data used in the dissertation is limited to graduates and therefore to the labour supply. Some inferences can be drawn from the matching mechanism in the three consequent years, but I do not follow this course and this could be perceived as a limitation of the dissertation.

Apart from the quality of a match, I do not control for any other job characteristics such as long-term employment or temporary employment and since, there is collective bargaining present in Slovenia, especially at the beginning of a professional career wages do not properly reflect the differences in the quality of a match. Still, this can be perceived as one of the limitations of the thesis. In addition, I only observe the first job a graduate secures, information which is rarely available, the first job can serve as a stepping stone in a young graduate's career. Including additional longitudinal data and presenting the very first results of the school-to-work transition thus represents a trade-off.

⁴ Motivation is one of the non-cognitive abilities or personality traits, yet only including motivation is not sufficient. Goldberg (1990), for example, defines the Big 5 of personal traits as: Openness to Experience; Conscientiousness; Extraversion; Agreeableness; and Neuroticism that define personality.

1.7 STRUCTURE OF THE DOCTORAL DISSERTATION

The dissertation has three major chapters and some concluding remarks pertaining to the whole dissertation are found in Chapter 4. Each major chapter investigates the school-to-work transition, with the first one focussing on a review of the literature on the quality of schools that affect the school-to-work transition, the second one examining the employability of graduates in Slovenia and the third considering the field of education-occupation match.

The first chapter presents an attempt to provide a comprehensive school quality literature review with a special focus on higher education. After a short introduction of the topic, I continue with a review of the methodology where I focus on regression-based estimates, the non-random selection of students into colleges, experimental and quasi-experimental methods, propensity score matching and instrumental variables. The different proxies used to measure latent school quality are listed in Section 2.3 The effects of different school quality are reported in Section 2.4, where I outline studies focusing on direct monetary effects (earning), the probability of attending further schooling, house prices and other effects such as satisfaction, health and childbearing. Section 2.5 sets out concluding remarks.

Chapter 2 continues with an analysis of the employability of Slovenian higher education graduates. After a short introduction, I continue with an additional literature review focusing on the school-to-work transition and I outline the hypotheses. In Section 3.3 I outline different methods used to investigate the school-to-work transition. First, I use probit to investigate the employment probability of graduates from different fields and types of education and higher education institutions and control for individual characteristics and modes of study. In order to further investigate the effect of the new Bologna programmes, I use propensity score matching that is described in Section 3.3.2 This analysis in particular focuses on the generation of graduates from Business and Administration in 2007. For this generation the effect of higher education institution is also investigated, also by using a probit model as well as a method Clarify. In Section 3.4 the data are described and in Section 3.5 the results are reported. The results reveal the effect of different fields of education on the probability of employment (Section 3.5.1), the impact of the new 1st Bologna cycle types of education (Section 3.5.2) and the effect of different higher education institutions on the employment probability of Business and Administration graduates. Section 3.6 provides some concluding remarks.

Chapter 4 focuses on field of education-occupation mismatch concerning the first job three cohorts of graduates from 2007 to 2009 have secured. After a short introduction, a literature review with research questions is outlined. The chapter employs two different quality measures of education-occupation match, with the first being a horizontal measure that measures the level of education acquired and the level of education needed to perform a job. The second is the vertical match that investigates the specific knowledge a graduate acquired when studying in a specific field. Section 4.3 describes the data used where the quality of a match and the matching mechanism is explained. In Section 4.4 I propose the methods used where I focus on the logit model to investigate the likelihood of a match with respect to

different fields and types of education and higher education institutions and the effect of year of graduation, and probit to investigate the effect of the duration of unemployment on the probability of a mismatch. The results are presented in the following section. First, the results regarding the effect of different fields of education on the likelihood of a match are presented (Section 4.5.1) and, second, the results regarding the duration of unemployment and the probability of a mismatch (Section 4.5.2). Section 4.6 presents some concluding remarks.

Although each chapter provides an introduction and a conclusion, Chapter 5 summarises the overall main findings of the dissertation. These conclusions (Chapter 5) are followed by references (Chapter 6) and appendixes (Chapter 7). Chapter 8 provides a longer abstract in the Slovenian language.

2 MEASURING THE QUALITY OF HIGHER EDUCATION INSTITUTIONS: A LITERATURE REVIEW

2.1 INTRODUCTION

Throughout the entire twentieth century there was a general trend of the expansion of schooling and a dramatic rise of inputs dedicated to schooling, especially real expenditure per student. Based on human capital theory, measures of inputs into schooling are frequently thought of as convenient summaries of the investment in human capital (Hanushek, 1996). However, they rely on a series of suspect assumptions whereby one must believe that inputs are converted efficiently into outputs and that measured school inputs comprise the bulk of all inputs into human capital. The debate about the efficiency of transforming inputs saw the emergence of literature on school quality. The early school quality literature focused on the quality of primary and secondary schools (Coleman, 1966; Welch, 1966) with such studies finding that after controlling for innate ability and family characteristics there is no effect of different school quality as measured by dedicated expenditure. Later studies of this kind included Morgan and Sirageldin (1968), Johnson and Stafford (1973) and Rizzuto and Wachtel (1980) where, contrary to all of these studies, they found that spending per student was positively associated with students' subsequent earnings and that returns to quality are higher than returns to schooling (Rizzuto and Wachtel, 1980). The quality of higher education institutions was not neglected for long (Solmon and Wachtel, 1975; Solmon, 1973), with the classic and highly cited study of Solmon and Wachtel (1975) finding that differences in type of institution attended have highly significant effects on differences in students' lifetime earnings patterns. The majority of the consequent literature makes use of data on college or university quality in the United States, with only rare studies concerning the rest of the world.

The interest in school quality originates from the monetary effects or the returns to education students from particular schools exhibit after entering the labour market. Therefore, school quality, especially in higher education, was addressed as the wage benefit associated with the institutional quality (Loury and Garman, 1995; Brewer, Eide, and Ehrenberg, 1999; Hilmer, 2000; Dale and Krueger, 2002; Chevalier and Conlon, 2003; Black and Smith, 2004; Hussain, McNally and Telhaj, 2009; Long, 2010). Several other aspects of the importance or effect of school quality have also been addressed, especially the likelihood of graduation and further enrolment in graduate school (Eide, Brewer and Ehrenberg, 1998; Light and Stayer 2000; Dale and Krueger, 2002; Long, 2010), house prices (Goodman and Thibodeau, 1998; Downes and Zabel, 2002; Brasington and Haurin, 2006; Gibbons and Machin, 2008), health (Fletcher and Frisvold, 2009; Frisvold and Golberstein, 2011) as well as satisfaction (Zhang, 2003; Gibbons and Silva, 2011) and childbearing (Long, 2010).

The estimation of the effect of college or university quality on the parameter of interest such as wages is not straightforward. When investigating the effects of school quality several methodological issues arise. According to Chevalier and Conlon (2003), a simple comparison of the earnings of graduates from different institutions is uninformative, which creates

difficulties in estimating the returns to university quality. These difficulties originate from the heterogeneity of the effects of school quality, the sorting of students and different family endowments. Cunha and Heckman (2007) note that the majority of preferences and skills are determined early in life when children are still at school and these factors originate in the family, and include genes and the environments that families select and create.⁵ Student ability, usually measured by a scholastic achievement test, is a powerful predictor of wages, schooling, participation in crime, health and success in many other aspects of economic and social life (among others Murnane, Willett, and Levy, 1995; Cunha and Heckman, 2009).

Students tend to attend a university that matches their ability (Hoxby, 1997). Therefore, the preferred setting is as usual the random assignment of students into different quality schools or some kind of experiment. Studies that adjust for non-random selection include for example Altonji and Dunn (1996) who used pairs of matched family members from the National Longitudinal Surveys of Labour Market Experience, Behrman, Rosenzweig and Taubman (1996) who used data from a survey of identical and non-identical twins born in Minnesota to estimate the impact of college quality on women's earnings and the influence of family and individual endowments on college choice, and Lindahl and Regner (2005) who used Swedish siblings' data. In addition, sibling data provide an opportunity to control for unobserved family background and neighbourhood characteristics that, according to Coleman et al. (1966), prevail when it comes to determining educational and labour market outcomes. Some other studies use data from natural experiments such as Gould, Lavy, and Paserman (2005), Angrist and Lavy (1999), Krueger (1999) and Hoxby (2000a).

In the absence of a randomised experiment, except for the rare cases of a natural experiment (Krueger, 1999; Krueger and Whitmore, 2001; Angrist and Lavy, 1999; Gould, Lavy and Paserman, 2005), inferences about the causal effect of schooling in respect to quality have to be derived from non-experimental methods. The majority of studies therefore adopt the selection on observables and unobservables where several potential biases may arise. As mentioned, students are not randomly selected into school so there is a potential selection bias (Hoxby, 1997; Dale and Krueger, 2002). In addition, students are endowed with different abilities that might affect the outcome of interest regardless of the quality of a school or so-called ability bias (Behrman, Rosenzweig and Taubman, 1996). Other biases mentioned in the literature include: prior school bias (Wachtel, 1976; Behrman, Rosenzweig and Taubman, 1996), family characteristics bias (Solmon, 1973; Wachel, 1976; Card and Krueger, 1992b) and peer effect (Hoxby, 2000b; Gould, Lavy and Paserman, 2005). In the early 1990s studies using IV regression were used where the identification of variables that affect schooling but not the variable of interest (controlling for schooling) was developed. Angrist and Krueger (1991) used the quarter of an individual's birth as an instrumental variable and in another study (1992) they used a lottery number assigned during the Vietnam era draft as an instrument and concluded that OLS underestimates the causal effect of schooling. A study by Butcher and Case (1994) uses the presence of any sisters (effect of sibling composition), Kane

⁵ Also non-cognitive abilities are gaining recognition in the economic literature (Heckman, Stixrud, and Urzua, 2006).

and Rouse (1993) use the relative labour market valuation of credits from regular 2-year and 4-year colleges and Card (1993) uses a nearby college based on county of residence in 1966. Yet these studies do not directly investigate the effect of school quality and only try to estimate the effect of schooling. Nevertheless, they are closely connected with further development of the school quality literature.

Based on the literature that explores the relationship between wages and the characteristics of schools, Speakman and Welch (2006) point out several main challenges researchers have to consider when examining the role of school quality on outcomes of interest. According to Hussain, McNally and Telhaj (2009), the first is on how to measure 'quality' since quality is a latent variable that can be proxied by different variables or a combination of such variables, while the second is how to eliminate the effect of unobserved characteristics that influence the probability of admission to schools of different qualities. Several different approaches have been adopted and different quality measures have been used. Heckman Layne-Ferrar and Todd (1996) suggest that estimates of the effect of quality of education are sensitive to the choice of these quality measures as well as to the level of aggregation of the data. The most common proxy for latent school quality are measures related to resources devoted to schooling as measured by expenditure per pupil (among others, Johnson and Stafford, 1973; Wachel, 1973; James et al. 1989; Hanushek, 1996; Dale and Krueger, 2002; Chevalier and Conlon, 2003), student/teacher ratio (among others: Welch, 1966; Rizzuto and Wachel, 1980; Card and Krueger, 1992a, 1992b; Altonji and Dunn, 1996; Heckman et al., 1996; Frisvold and Golberstein, 2011), teachers' pay (Betts, 1995; Heckman, Layne-Ferrar and Todd, 1996; Hanushek, 2003), and especially in the college quality literature studies have proxied quality by selectivity, usually the average score in tests such as SAT (Solmon, 1975; Loury and Garman, 1995; Hilmer, 2000; Dale and Krueger, 2002; Black and Smith, 2004, 2006; Melguizo, 2008; Long, 2010) or A-level tests in the UK (Chevalier and Conlon, 2003), or measures such as retention rate (Hussain et al., 2009). In addition, Black and Smith (2004) show that much of the existing literature likely underestimates the labour market effects of college quality as a result of using a single quality variable as a proxy for the true, unobserved college quality.

The importance of school quality has been widely accepted and agreed upon, yet there is no consensus regarding the different measures used to proxy latent school quality. Some studies use a single measure and others combinations of measures that might also be problematic (Black and Smith, 2006). Further, Hanushek and Kimko (2000) note that given the several different attempts to measure school quality and its importance for economic growth there is a need for a comprehensive review. Therefore, this paper presents a first attempt to systematically outline the different measures used and outline recent trends that might best summarise the past literature and provide the optimal measure. However, measures of school quality are not the only area that lacks a consensus. The same applies to the methodology: there are rare studies that employ experimental data and therefore several econometric difficulties arise. This review also attempts to summarise the methods and provide references for each of them as well as to serve as the starting point for future research. Given the

increasing interest in school quality, especially college quality, as well as the long tradition of such research, I provide an overview of the outcomes of interest where I not only focus on student achievement and earnings but also on house prices, satisfaction and the recent interest in the effect of school quality on health outcomes, marital status and childbearing. I add an important aspect to the literature: I systematically outline the effects of school quality on its positive or negative sign for each outcome of interest.

In this chapter much of the interest is on college/university quality since, as Speakman and Welch (2006) note, the large majority of empirical studies of school quality represent schools using characteristics of elementary and secondary schools and a major part of the measured incremental value of schooling refers to wage gains from attending college. By college, I mean to address higher education.⁶ However, the research on school quality started with research on primary and secondary schools and therefore this chapter acknowledges the importance of such research that significantly affected the further development of college quality that was built on the methodological and conceptual issues in primary and secondary school quality. I attempt to identify and provide all the literature that has significantly contributed to the development of such research.⁷

The structure of this chapter is as follows. First, the methodological issues arising from using a regression analysis such as the selection on observables and unobservables are addressed, where special attention is paid to the non-random selection of students, ability bias, peer effect, family characteristics as well as prior-school bias. Then in Section 3 different measures for latent school quality are summarised, where the monetary measures generally used in the research of primary and secondary school quality such as teacher/pupil ratio, expenditures per student and teacher pay are outlined. To investigate the effect of college quality measures, different rankings are used, especially average student scores that explain the selectivity of colleges. Different areas of interest when investigating the effect of school quality are outlined in Section 4, where the effect on earnings receives the most interest, although recent developments in the field are also mentioned. Section 5 concludes.

2.2 METHODOLOGY

The effect of school quality on various outcomes mostly involves some kind of modification of the following basic equation:

$$y_i = S_i\beta_1 + X_i\beta_2 + F_i\beta_3 + Q_j^*\beta_4 + \varepsilon_i \quad (2.1)$$

⁶ When I talk about college quality I mean college and university quality or basically higher education quality. Some studies also include master and PhD students (Wales, 1973).

⁷ I limited the research to the most important and relevant studies to prevent any confusion and to consequently achieve the goal of this paper.

Where y is the outcome of interest, S is years of completed education, X is a vector of student characteristics (usually also including some kind of measure of ability), Q_j^* is a vector of school quality and ε is an independent identically distributed (“i.i.d.”) error term.

Quality cannot be directly measured and therefore a proxy or combination of variables needs to be used (Black and Smith, 2004):

$$q_{kj} = \alpha_k Q_j^* + u_{kj} \quad (2.2)$$

where q_{kj} denotes the various (k) school (j) proxies used, $\alpha_k > 0$ is a scale coefficient and u_{kj} is a measurement error that is assumed to be uncorrelated with Q_j^* and X_i .

Generalisation of the classical measurement error model requires

$$q_{kj} = Q_j^* + u_{kj}. \quad (2.3)$$

When estimating equation (1) above, a simple comparison of the earning of graduates from different institutions is uninformative (Chevalier and Conlon, 2003). Several econometric difficulties arise. First, college quality cannot be observed directly so several different proxies have been used. The issue of different proxies is addressed in Chapter 2.3. In the next part, I mainly focus on econometric difficulties, including the use of a simple regression. Estimating the equation using ordinary least squares (“OLS”) or similar can cause estimates to be biased and inconsistent if there are some unobservable characteristics of individuals that effect the outcomes directly and are correlated with school quality measures. First, I address the issue of selection on observables and unobservables and point to several of the most common biases addressed: selection bias and ability bias, family characteristics bias, previous-school bias and peer-effect bias. I proceed with econometric methods in order to control for bias such as the instrumental variables approach, experimental methods and matching methods.

2.2.1 REGRESSION-BASED ESTIMATES

The ordinary least squares estimates are the most common method used to estimate the effect of school quality on various outcomes (among others, Welch, 1966; Rizzuto and Wachtel, 1980; Link and Ratledge; 1975a, Behrman, Rosenzweig and Taubman, 1996; Eide and Showalter, 1998; Strayer, 2002; Black and Smith, 2004; Long, 2010). However, the estimates can be biased and inconsistent if there are unobservable characteristics of individuals that affect the outcomes directly and are correlated with the school quality measures of the school a student attends. They are also biased and inconsistent if there are unobservable characteristics of schools that affect the outcomes of students at those colleges and are correlated with school quality measures (Hinrichs, 2011). Most studies assume “selection on observables” assumption which means that the effect of school quality can be investigated based on the variables available to the researcher (Heckman and Robb, 1985), where Dale and Krueger (2002) extend the assumption to “selection on observables and unobservables”. The result of such selection is omitted variable bias causing biased estimates. For example, there is

an endogenous selection of students and schools so that the whole process cannot be observed by data such as the motivation of students. This positive, unobserved characteristic may lead to an upward bias in estimation.

One of the papers addressing this issue by Berkowitz and Hoekstra (2011) who find that students of elite private high schools subsequently attend colleges and universities whose students have SAT scores that are 20 points higher on average although, after taking into account the omitted variable bias by following Altonji et al. (2005), they find that the difference is even bigger and students of elite private schools attend colleges and universities whose attendees' SAT scores are roughly 40 points higher. Berkowitz and Hoekstra (2011) cannot reject the hypothesis of no omitted variable bias. The method developed by Altonji et al. (2005) when investigating the effect of Catholic schools is used in an approach that considers the degree of selection on observables as a guide to the degree of selection on the unobservables. Investigating the probability of attending college they take into account the probability of graduation in a Catholic high school as well as enrolment in a high school. They argue that for the decision to attend a Catholic school selection on the unobservables is likely to be less strong than selection on the observables.⁸ Accounting for selection on observables and unobservables, they find that Catholic high schools substantially increase the probability of graduating from high school and attending college.

Several different methods can be applied to overcome omitted variable bias. One solution is to assume that students select schools only on the basis of observable characteristics, where extra characteristics such as ability, family endowments, peer effect and similar variables can be included. For example, Long (2010) uses a rich dataset of control variables, many of which proxy students' and parents' taste for education and the students' ambition. Investigating a cohort of graduates and their application and selection into colleges, Dale and Krueger (2002) note that information on the unobservables can be inferred from the outcomes of independent admission decisions by the schools the student applied to. Similarly, Berkowitz and Hoekstra (2011) investigate the effect of attending an elite private high school on college placement by limiting the sample to admitted applicants and control directly for the scores assigned by admissions based on in-depth analyses of the applicants and their families.

Another solution is to employ instrumental variables. Recently, researchers have used two other different methods. The first is discontinuity analysis and the second is propensity score matching. First, I will focus on the different explanatory variables, continue with the

⁸ Altonji et al. (2005) obtain a lower-bound estimate of the Catholic school effect by estimating joint models of school choice and the outcome model subject to the restriction that selection on unobservables and observables is equal. The OLS or probit models assume that selection on the unobservables is zero and provide an upper-bound estimate. The estimate of the effect of Catholic school on high school graduation declines from the univariate estimate of about 0.08, which they view as an upper bound, to 0.05 when they impose equal selection, which they view as a lower bound, although sampling error widens this range. The estimate of the effect on college attendance declines from the univariate estimate of 0.15 to 0.03 or 0.02, depending on the details of the estimation method.

instrumental variable approach and then explain discontinuity analysis and propensity score matching.

2.2.2 NON-RANDOM SELECTION OF STUDENTS INTO COLLEGES

Students select schools while there is also a selection on the behalf of the schools. More selective schools tend to accept students with a higher earnings capacity (Hoxby, 1997; Dale and Krueger, 2002). Researchers include a sufficient rich number of explanatory variables to control for this non-random matching of students and colleges.⁹ According to Black and Smith (2004), this non-random selection of students is the key econometric difficulty in the literature on school quality¹⁰. Already Hoxby (1997) pointed out that better students sort into better quality colleges or, in other words, students tend to attend a university that matches their ability. Further, Light and Strayer (2000) as well as Dale and Krueger (2002) find that more selective schools accept students with greater earnings potential, and students with greater earnings potential are more likely to apply to more selective schools. Therefore, Brewer, Eide and Ehrenberg (1996) control for the non-random selection of students and colleges by explicitly modelling high school students' choice of college type based on individual and family characteristics (including ability and parental economic status), and an estimate of the net costs of attendance and expected labour market return. They apply a generalisation of Willis and Rosen's (1979) selectivity model and find that white students and students with higher family incomes, and more educated parents are more likely to attend higher quality colleges. After controlling for the selection decisions of students, they find evidence of a large labour market premium for attending an elite private institution. Strayer (2002) follows a similar procedure in order to investigate college quality on earnings and first models college choice that in fact depends on the quality of high school¹¹. His results suggest that high school quality influences earnings by affecting college choice behaviour, while the direct effect of school quality on earnings is less evident. A similar procedure is applied by Altonji et al. (2005) who investigate the effect of a Catholic high school on college choice and Melguizo (2008) who corrects for unobservable characteristics in investigating college completion rates¹².

⁹ The chapter focuses on colleges and universities where there is more selection present, whereas parents usually choose primary and secondary schools by selecting the place of residence, as addressed in Section 2.4.

¹⁰ Regarding the selection of students into colleges, Black and Smith (2004) point to another issue which is a "common support" condition, where they note that in the case that only highly endowed students attend high-quality colleges and only lowly endowed students attend low-quality colleges there is a common support problem as there is no counterfactual outcome (highly endowed students attending a low-quality college). Black and Smith (2004) therefore employ propensity score matching.

¹¹ Strayer (2002) argues that students from higher quality high schools are better prepared for college, learn more about college from their teachers, peers and school counsellors, and have easier access to college-related materials than do their counterparts at weaker schools.

¹² After correcting for unobservable characteristics, Melguizo (2008) finds that the magnitude of the coefficients of the different categories of selectivity decreased slightly for all groups except minorities, and the coefficients were no longer significant for Asian students. These results imply an upward bias in the coefficient on selectivity, suggesting that there might be other, unaccounted-for, individual characteristics contributing to the

A closely related issue is **prior-education bias**. Behrman, Rosenzweig and Taubman (1996) note that school quality is represented by a vector of inputs at a given school level, but such studies should include inputs for all school levels to which an individual has been exposed. If quality is correlated over schooling levels, the effects of college quality are biased because they not only represent college quality but also quality at the prior primary and secondary school levels. Studies that control for pre-college quality are rare, with some exceptions being Wachtel (1976) who uses pre-college quality measures, or Behrman, Rosenzweig and Taubman (1996) who follow a different approach using a sample of twins to avoid this kind of bias. However, another body of literature tackles this bias in a different way by controlling for the selection of students into colleges and universities as mentioned above. Hilmer (2000) points to another issue relating to prior-school bias – transfer students and the quality of prior-school bias. He reports that up to one-third of all college graduates attend more than one institution during their post-secondary career, so the initial quality effect is a potentially important effect that should be considered when examining the return to university quality.

As mentioned, another of the omitted variables is potential **ability bias**¹³. Concern for potential ability bias has been highlighted first when calculating the return to education and spread also over the calculating difference in the return to education for different school qualities. This bias also arises because students are not randomly assigned to different quality schools and therefore the returns to education cannot be consistently measured by simply comparing graduates from two different schools. Studies show that by omitting ability bias OLS estimates are biased. For example, Angrist and Krueger (1992) find that conventional OLS estimates may be somewhat understated if no ability variable is included. Ashenfelter and Krueger (1994) confirm downward omitted ability bias by estimating the return to education using genetically identical twins¹⁴. However, Link and Ratledge (1975b) find that omitting ability measured by IQ overstates returns to education by 15 percent and the return to quality by 10 percent. In addition, Jud and Walker (1977) find that the coefficient on quality is a positive determinant of ability, but not on schooling or earnings directly. On the contrary, Altonji and Dunn (1996) find that adding ability and an ability by schooling interaction has very little effect on the quality estimates.

relatively higher college completion rates of students at these types of institutions. In terms of the magnitude of the effect, the results suggest that the impact of attending selective institutions versus non-selective institutions on the probability of graduating from college is not as high as reported by Bowen and Bok (1998), but is not zero as was reported by Dale and Krueger (1999).

¹³ Ability bias has been widely addressed in educational and labour economics when investigating differences in wages. See, for example, Griliches and Mason (1972), Griliches (1977), Taubman (1976), Blackburn and Neumark, 1992; Heckman and Vytlačil (2001).

¹⁴ Studies investigating the ability bias using twins also include: Taubman (1976); Behrman and Taubman (1989), Ashenfelter and Krueger (1994); Behrman, Rosenzweig and Taubman (1996); Behrman and Rosenzweig (1999); Arias, Hallock and Sosa-Escudero (2001) that find more able individuals obtain more schooling perhaps due to lower marginal costs and/or higher marginal benefits of schooling and that higher ability individuals have greater returns to schooling consistent with a non-trivial interaction between schooling and unobserved abilities in the generation of earnings, while Conneely and Uusitalo (1998) investigate the question of heterogeneous returns for Swedish men, as do Lindahl and Regner (2005) and Miller, Mulvey and Martin (1995) for Australia.

Nevertheless, studies have used a proxy for ability some kind of ability test scores. In the USA the most commonly used measure is the SAT score (for example, Solmon, 1973, Wachtel, 1976; Dale and Krueger, 2002; Long, 2010) or the Armed Services Vocational Aptitude Battery (ASVA) (for example, Black and Smith, 2004), Chevalier and Conlon (2003) used A-level test scores in the UK, which is similar to SAT. The sufficiency of these ability measures has also been questioned. Behrman, Rosenzweig and Taubman (1996) argue that tests used to measure endowments might not only measure endowments incompletely and imperfectly, but might also reflect the influence of school inputs, thus introducing two forms of bias. Ordine and Rose (2011) note that wage inequality may arise because of inefficient self-selection into education in the presence of ability-complementary technological progress and asymmetric information on individuals' ability. A crucial role is played by educational quality since it determines the signalling mechanisms in the labour market.

Different **family endowments** could also represent another omitted variable bias. One can easily argue that family background variables affect both education expenditures and labour market earnings. In this case, the correlation of school quality and earnings is potentially spurious (Card and Krueger, 1992). It may affect pupils' achievements in various ways. Becker (1981) distinguishes between financial and time resources allocated to the child. Financial resources may be used to choose better schools for the child, and to provide a more suitable environment for studying. Time inputs may consist of the time parents spend with their child explaining homework exercises, for instance. Better educated parents may also be more efficient in aiding their children's education (e.g. when helping the child with homework) and may provide more support for their academic development. Card and Krueger (1992) confirm the bias with the explanation that, for example, students from wealthier families enrol children in smaller classes and who tend to stay in school longer earn higher wages due to family connections.

There has been no conclusion regarding this kind of bias. Several studies control for family inputs (Solmon, 1973; Wachtel, 1976). However, Behrman, Rosenzweig and Taubman (1996) note that these studies are unlikely to control well for the actual resources allocated to children in the home and, to the extent that endowments are correlated across generations, are correlated with such endowments if the latter are not measured or controlled, thereby leading to bias. Using a sample of twins, Behrman, Rosenzweig and Taubman (1996) find that family and individual-specific endowments affect these components of human capital investment and should be controlled for in school quality analysis.

However, with the inclusion of family background (income and parents' school level) Card and Krueger (1992) find no effect of family background on earnings when school quality measures are already incorporated. Similarly, Chevalier and Conlon (2003) confirm that a quality premium is never correlated with either ability or family background. Using data of NLS and within-family differences in school resources, Altonji and Dunn (1996) find the estimated effect of school resources to be greater, not smaller, when family background characteristics are held constant. Card and Krueger (1996) even reject family background as an omitted variable bias.

Peer effects have long been of interest to social scientists because, if they exist, they affect the optimal organisation of schools, jobs, neighbourhoods and other forums in which people interact (Hanushek, 1979; 2003; Hoxby, 2000b). Coleman et al. (1966) find that peer effects are important for explaining student outcomes.¹⁵ By using idiosyncratic sources of variation in a classroom, Hoxby (2000b) finds that students are affected by the achievement level of their peers.¹⁶ Several studies focus on the effect of peer effect and mainly investigate the presence and effect in primary and secondary school (Betts and Morell, 1999; Banerjee and Besley, 1990; Case and Katz, 1991; Epple and Romano, 1998; Mora and Oreopoulos, 2011) where studies have also investigated the composition of classes (Gould, Lavy and Paserman, 2005). Although estimating the peer effect of secondary school students (15 to 18 years old), Eisenkopf (2010) uses an experiment to investigate the existence of the peer effect. The research is of particular interest as it investigates the partner effect and finds that a partner has a motivational effect even before actual cooperation takes place. However, the peer effect in college has not been investigated much and the results are rarely straightforward. For example, for Dorthmouth students Sacerdote (2001) finds no evidence that a student's first year grade point average is influenced by his/her roommate's score and similarly Zimmerman (2003) also finds no evidence of a peer effect measured by roommates' SAT score on first-year grades. There is some evidence of a peer effect, for example (Stinebrickner and Stinebrickner, 2006; Kremer and Levy, 2008) Kremer and Levy (2008) who analysed college performance and the roommate's pre-college drinking behaviour. Therefore, although studies find a significant peer effect in primary and secondary schools, at college the effect is not so evident.

2.2.3 EXPERIMENTAL AND QUASI-EXPERIMENTAL METHODS

Even though it is hard to obtain, several papers make use of experimental data in order to avoid any econometric issues originating from the non-random selection of students in school as well as ability bias and other issues I mentioned. Krueger (1999) and Krueger and Whitmore (2001) use a controlled experiment, the Tennessee Student/Teacher Achievement Ratio Experiment, also known as the STAR experiment. In the experiment, 11,600 Tennessee kindergarten students and teachers were randomly assigned to differently sized classes. Krueger and Whitmore (2001) investigate the effect of attending a small class in early grades on college test taking and middle school test results and find that attending a small class in early grades is associated with an increased likelihood of taking a college-entrance exam, especially among minority students, and somewhat higher test scores. There is no agreement when also using experimental data because when using the same data Hanushek (1999b) finds no such effect.

Several different studies use quasi-experimental data introduced by some kind of policy to investigate several aspects of schooling quality. For example, Angrist and Lavy (1999) use

¹⁵ Mosteller and Moynihan (1972) show that this was due to a coding error and that with a correct coding family and individual characteristics are statistically significant in explaining the outcomes and not peer effect.

¹⁶ Hoxby (2000b) finds that one point in peers' reading scores raises a student's own score by between 0.15 and 0.4 points, depending on the specification. She finds that peer effects are intra-race.

Maimonides' rule in Israeli elementary schools that directs the size of classes and investigate the effect of a reduction in class size on students' performance on tests. Gould, Lavy and Paserman (2005) use a quasi-random assignment of 15,000 Ethiopian Jews brought to Israel in 1991 and examine the extent to which the initial elementary school environment affected the high school outcomes of those Ethiopian children. Angrist et al. (2001) use data on Colombia's programme which provided over 125,000 pupils from poor neighbourhoods with vouchers that covered approximately half the cost of private secondary school allocated by lottery and use differences in outcomes between lottery winners and losers to assess programme effects. Banerjee et al. (2007) conducted two randomised experiments to test the effect of remedial education in India.

2.2.4 PROPENSITY SCORE MATCHING

Following Rosenbaum and Rubin (1983) and very influential labour market studies that employ propensity score matching are studies by Heckman et al. (Heckman and Hotz, 1989; Heckman, Smith, and Todd, 1997; Heckman, Ichimura, Smith, and Todd, 1998) involving matching methods that have become popular as a complement to regression in applied econometric research (e.g., Angrist and Krueger, 1999; Dehejia and Wahba, 2002; Heckman et al., 1998; Brand and Halaby, 2006). Matching methods avoid the assumption about the functional form or the model such as linearity, for example. Dehejia and Wahba (2002) state that another advantage of using propensity score matching is the dimensionality of the observable characteristics. Even though many matching variables are used, propensity score matching proves a natural weighting scheme that yields unbiased estimates of the treatment impact. The matching method has also been adopted by researchers investigating school quality (Brand and Halaby, 2006; Black and Smith, 2004; as well as Dearden et al. (2002) who investigate the effects of secondary school quality in Britain).

Black and Smith (2004) employ propensity score matching where they match the predicted probability of attending a high-quality university, which is a function of observed personal characteristics, rather than matching directly on those characteristics. They estimate that in the long run attending a top quality university increases earnings by about 6% for men and 10% for women. Compared with Bowen and Bok (1998), the extent of sorting of students by ability into colleges of different qualities is smaller in a random sample than in a non-random sample, and less than suggested by Herrnstein and Murray (1994). In addition, they find that the sorting is asymmetrical: there are more high-ability students in low-quality colleges than low-ability students in high-quality colleges. Light and Strayer (2000) investigate the match between student ability and college quality to determine college graduation rates and find that ability has a pronounced, positive effect on the probability of college attendance, regardless of which college quality level is considered.

2.2.5 INSTRUMENTAL VARIABLES

In the absence of random assignment, the noted biases above can be overcome by using instrumental variables that are correlated with school quality but have no other effect on

earnings (Angrist and Krueger, 1992). Therefore, in the early 1990s several studies of the economics of education started to use instrumental variables (IV) regression, where the identification of instrumental variables that affect schooling but not the outcome of interest (controlling for schooling) was developed. Although this method has been criticised by Altonji, Elder and Taber (2005) for identifying plausible instruments, several studies use instrumental variables in order to overcome some econometric issues. Angrist and Krueger (1992) used a lottery number assigned during the Vietnam era draft to estimate the payoff to schooling.¹⁷ Similarly, in an earlier paper Angrist and Krueger (1991) use TSLS estimates to identify the variation in education that results from differences in season of birth. The difference OLS and using two stage least squares (TSLS) instrumental variables estimates are typically not statistically significant and suggest there is little bias in the conventional estimates. Whatever differences that do exist tend to suggest that omitted variables, or measurement error in education, may induce a downward bias in the OLS estimate of the return to education. Several different instrumental variables have been used. Among others, a study by Butcher and Case (1993) uses the presence of any sisters (effect of sibling composition), Kane and Rouse (1995) uses the relative labour market valuation of credits from regular 2-year and 4-year colleges and Card (1993) uses a nearby college based on the county of residence in 1966 to make inferences about returns to schooling. Angrist and Lavy (1999) use Maimonides' rule for instrument as a source of exogenous variation for class-size research.

2.3 HOW TO MEASURE LATENT SCHOOL QUALITY?

Different proxies are used in the literature to measure the effect of latent school quality. Most commonly resources devoted is used as usually measured by either: teacher-student ratio, teachers' salaries, expenditure per pupil, administrative inputs and facilities or very commonly teacher education, teacher experience or a combination of those measures.

Several studies use a single measure of school quality (Loury and Garman, 1995; Hilmer, 2000; Ono, 2004), although Black and Smith (2006) suggest that using a single proxy for a latent school quality might impose bias in the estimation. Heckman et al. (1996) suggest that estimates of the effect of quality of education are sensitive to the choice of quality measures and the level of aggregation of the data. Black and Smith (2006) show that various dimensions of quality have nontrivial positive correlations with each other. Therefore, only including one dimension means that its coefficient incorporates some of the effects of the other dimensions and consequently likely underestimates unobserved college quality. Card and Krueger (1992) first enter three different quality measures (pupil/teacher ratio, term length, and the relative teacher wage) and find significant effects on the return to education. When they entered all three quality measures together the effects of term length and pupil/teacher ratio are smaller and less precisely determined, presumably as a result of the

¹⁷ They find there is little evidence of a positive ability bias and suggest that conventional OLS estimates may be somewhat understated.

multicollinearity among the quality variables. Heckman et al. (1996) find some evidence of an inverse relationship between school quality measures. More recent studies have attempted to broaden the definition of university quality by including a variety of institutional characteristics besides average ability (Black and Smith (2004, 2006), Black, Kermit and Smith (2005), Dale and Krueger (2002)). Chevalier and Conlon (2003) use pupil-staff ratio, research assessment and the destination of graduates to measure the quality of universities in the UK. Card and Krueger (1992) use three different measures for school quality: the ratio of enrolled students to instructional staff in the state (pupil/teacher ratio), term length and normalised annual teacher salaries.¹⁸ A recent study by Hussain et al. (2009) measures institutional quality in a different way. They measure the quality by the RAE (Research Assessment Exercise) score; the faculty-student ratio; the retention rate; the total tariff score (i.e. score based on A-levels or other eligible qualifications); the mean faculty salary and expenditure per pupil.

In the following section I will outline the most proxies or measures of school quality that are the most commonly used.

2.3.1 COLLEGE RANKINGS AS A PROXY FOR SCHOOL QUALITY

There have been several attempts to rank colleges and universities in order to provide additional information for students at the time of enrolment. The aims are twofold: first students can effectively sort themselves in a college of a quality they perceive they can complete and benefit from. On the other hand, based on a theory of assortative matching universities also profit from a successful match. Webster (2001) points to the value of college rankings for different stakeholders. They are important to prospective students since this information makes the search process more efficient and less costly and affects the quality of admission applications and, when admitted, the quality of the student body (also according to retention rates); for college and university administrators because they partly define the institution's market niche, influence the perception of the institution and value of the institution's degree. Enrolment affects the institution's tuition-based revenues and, therefore, financial resources, operating budgets, per student expenditures and faculty/student ratios. These factors, in turn, are likely to further influence the academic reputation of the college or university, which could impact alumni contributions, foundation grants and other non-tuition-based revenue sources.

¹⁸ Card and Krueger (1992) used the pupil/teacher ratio as reductions in it improve the quality of classroom instruction and lead to higher returns for each year of completed education. They used term length as it increases the materials covered and therefore increases the economic value of additional years of schooling; and average annual teachers' salaries as they hypothesise that higher teachers' salaries enable schools to attract and retain more qualified and highly motivated teachers, leading to improved classroom instruction and bigger returns to education. Teachers' salaries are normalised with the average salary in the state.

Most of the research using college rankings to make inferences about the effect of school quality on several outcome variables of interest comes from the United States¹⁹. For example, when Cass and Birnbaum (1964) construct a Comparative Guide to American Colleges and note that a college can never be much better than its student body and is not likely to be much worse. Morgan and Sierageldin (1968) use college rankings and in addition test scores of recent freshman classes and expenditures in primary and secondary school data to proxy school quality. They find a positive return on investment in quality and a higher return to most selective colleges. Also Solmon and Wachtel (1973) use the Carnegie classification^{20,21} and find that differences in type of institution attended have highly significant effects on differences in the lifetime earnings patterns of students. Monks and Ehrenberg (1999) use U.S. News & World Report College rankings and find that a less favourable rank leads an institution to accept a greater percentage of its applicants, a smaller percentage of its admitted applicants matriculate, and the resulting entering class is of a lower quality, as measured by its average SAT scores. Several studies have used U.S. News & World Report College, among others²²: Marc (2004); Pike (2004) Griffith and Rask (2007). Several studies investigating the effect of college quality in the USA use Barron's Profiles of American Colleges²³ that is the only authoritative ranking available for an earlier historical period, and has the advantage of over time comparability because of its use as an indicator of college selectivity by several contemporary studies (Brand and Halaby, 2006; Behrman, Rosenzweig and Taubman, 1996; Brewer, Eide and Ehrenberg, 1999, Long, 2010).

¹⁹ The International Academic Ranking of World Universities published by Shanghai Jiao Tong University is one of the best known university rankings, however most of the research attention is devoted to methodological issues of the rankings and not graduate outcomes per se (Liu and Cheng, 2005; Marginson and van der Wende (2007).

²⁰ The Carnegie Classification™ has been the leading framework for recognising and describing institutional diversity in US higher education for the past four decades. Starting in 1970, the Carnegie Commission on Higher Education developed a classification of colleges and universities to support its programme of research and policy analysis (<http://classifications.carnegiefoundation.org/>).

²¹ Solmon and Wachtel (1973) use groups of higher education institutions classified as: leading research universities, research universities, large doctoral granting institutions, small doctoral granting institutions, comprehensive colleges with a substantial selection of programmes, comprehensive colleges with a limited selection of programmes, highly selective liberal arts colleges, other liberal arts colleges.

²² The U.S. News & World Report bases its college and university rankings on a set of up to 16 measures of academic quality that fall into seven broad categories: academic reputation, student selectivity, faculty resources, student retention, financial resources, alumni giving and, for national universities and national liberal arts colleges only, graduate rate performance (Webster, 2001).

²³ Barron's reports a single summary measure of selectivity (non-competitive, less competitive, competitive, very competitive, highly competitive and most competitive) based on the entering class' SAT and ACT scores, class rank, high school grade-point average, and the percentage of applicants who were accepted (Monks, 2000).

Table 2: Selected literature using different college and university rankings

Author	Notes
<i>Comparative Guide to American Colleges (Cass and Birnbaum, 1964)</i>	
Morgan and Sieageldin (1986) Astin (1977) James et al. (1989) Hilmer (1997)	
<i>Gourman Academic Ranking</i>	
Wales (1973) Solmon (1973) Solmon (1975)	
<i>Carnegie Classification</i>	
Solmon and Wachtel (1973) Braxton and Nordvall (1985) Eide, Brewer and Ehrenberg (1999) Monks (2000) Zhang (2003) Angrist & Guryan (2008)	Examination and selection process for entering a college. Probability of graduate school attendance. Advancement to graduate education. Teacher quality.
<i>Barron's Profiles of American Colleges</i>	
Behrman et al. (1996) Brewer at al. (1999) Hilmer (1997) Monks (2000) Light & Strayer (2000) Long (2004) Brand and Halaby (2006)	College completion. College decisions over time. Also investigated probability of graduation.
<i>US News and World Report College Rankings</i>	
Monks and Ehrenberg (1999) Marc (2004) Pike (2004) Buss, Parker and Rivenburg (2004) Griffith and Rask (2007)	Determinants of student body. Comparing different rankings. Demand for higher education. Effect on the matriculation decision of high-ability students.

For the UK Chevalier and Conlon (2003) use a classification of colleges into three groups: the Russell group, Modern and Old universities and find that returns to higher education vary by the type of institution attended, even after accounting for student characteristics. The quality premium ranges from 9% to 12% for the Russell Group and 3% and 8% for the other Old universities. They also find differences in quality within group where they find that for two members of the Russell group graduates from the higher quality university earn between 9% and 10% more than those from the control institution.

2.3.2 STUDENT ACHIEVEMENT AND SCHOOL QUALITY

Based on a literature review Speakman and Welch (2006) find that if there is any consensus regarding the quality of colleges and universities it is probably closely related to the average SAT scores of entering freshmen and perhaps to the reputation of their faculties²⁴. Black and

²⁴ SAT or the Scholastic Aptitude test (later renamed the Scholastic Assessment Test) is an American test taken to apply for colleges and was first introduced in 1926. The maximum number of points and composition of the

Smith (2006) share similar findings on the SAT score as the single most reliable signal about college quality, which supports its wide use in the literature. Although results of this manner of measuring quality are varied (for example, Dale and Krueger, 2002 report no effect) the very recent literature still uses scores in standardised tests as one of the measures of school quality (Long, 2010)²⁵.

Average student achievement in a standardised test is often used as a measure of selectivity to enter a college and therefore as a proxy for the quality of a college. Already Solmon (1975) uses the average SAT score and in addition uses Astin's intellectualism index and Astin's selectivity index. He finds that SAT verbal score (also a measure of peer quality) appears to be the most important component in college quality. James et al. (1989) use the average SAT score of entering freshmen as an index of institutional selectivity and find that the score has a significant positive effect – a 100 point increase raises annual earnings by about 3 percent. Loury and Garman (1995), Hilmer (2000) and Melguzio (2008) use the SAT score of the college last attended as a single quality variable when investigating earnings. Studies also used the SAT score as one component of quality (Black and Smith, 2006; Long, 2010). For the UK, Hussain et al. (2009) used a score for A-levels or other eligible qualification and in addition use the retention rate. Long (2010) also uses the percentage of applicants who are rejected. On the contrary, Dale and Krueger (2002) use both the average SAT score and tuition and find that students who attended more selective colleges (measured by the average SAT score) earned about the same as students of seemingly comparable ability who attended less selective schools.

2.3.3 DOES AN INCREASE IN SPENDING OR SCHOOL RESOURCES INCREASE QUALITY?

There was a dramatic rise of inputs into schooling, especially real expenditure per student, over the entire twentieth century. Based on human capital theory, measures of inputs into schooling are frequently thought of as convenient summaries of investment in human capital (Hanushek, 1996) and usually proxy school quality. The inputs most frequently measured are: expenditure per student, student/teacher ratio²⁶ or teachers' wages. There are several influential studies investigating the positive effect of expenditure per student and students outcomes (for example, Welch, 1966; Morgan and Sirageldin, 1968²⁷; Johnson and Stafford, 1973; Rizzuto and Wachtel, 1980), student/teacher ratio or smaller class size (for example, Angrist and Lavy, 1999; Krueger and Whitmore, 2001) and teachers' wages (Welch, 1966;

test has changed over time, and now consists of three parts: mathematics, critical reading and writing (800 points for each test). Another test that US students take is the ACT test (American College Testing).

²⁵ Hanushek and Woessman (2011) provide an overview of international tests of educational achievements.

²⁶ The teacher/student ratio is also used.

²⁷ Already in the 1970s Morgan and Sirageldin (1968) reported evidence of an association between the amounts the state spends per year on primary and secondary education and the subsequent earnings of people. They find that the relationship between state spending and people's earnings is strong, even after attempts to eliminate a spurious correlation by removing the effects of other determinants that may potentially affect earnings, such as education of the head of the family, sex, race and age.

Hanushek, 1972; Hanushek and Rivkin, 2007; Hussain et al., 2009). Welch (1966) finds that teacher/student ratio and wages are highly correlated with expenditure/pupil reflecting a trade-off between the two. Behrman, Rosenzweig and Taubman (1996) find that expenditure on other than faculty salaries is negatively associated with student outcomes (earnings in their study). However, there is also evidence of no such effect. Hanushek (1986) notes that differences in quality do not seem to reflect variation in expenditures, class size or other commonly measured attributes of schools and teachers. Based on 377 studies and a pioneering study by Coleman et al. (1966), Hanushek (1996) finds that the primary resources for schools are not consistently related to student performance and school quality cannot be measured, for example, spending per student. A similar, highly cited study by Betts (1995) repeats the analysis under many different specifications, and use various subsamples designed to eliminate potential data problems and finds that the three commonly used measures of school quality (student/teacher ratio, teachers' salaries and the percentage of teachers with master's degrees or higher) in general have no significant positive relationship with the subsequent earnings of students. Similarly, based on PISA results across countries Woessmann (2006) summarise findings on expenditures and student performance and states that countries with higher expenditures do not systematically perform better in cross-national comparisons.

These discrepancies appear as researchers face a number of obstacles when studying the connection between school resources and economic outcomes. According to Card and Krueger (1996), appropriate data acquisition is one of them. Researchers need to acquire school data as well as the labour market outcomes of students for which several years might be needed. Further, since labour market structure differences may affect the reward to skills, and thus the measured impact of school resources, evaluations of the economic returns to school resources may require nontrivial identification assumptions, or complex econometric modelling, or both. Taking that into consideration, the variance in earnings is large, making it more difficult to detect modest effects of school quality. Other methodological and related issues such as omitted variable bias are explained in Chapter 2.2. Another explanation of the different results that have been obtained is noted by Bedard (2003) who used the Canadian Census and finds that the size and direction of the impact of class size, school size and teacher salaries vary across points in the conditional wage distribution. More specifically, the returns to any given input tend to be of the opposite sign at opposing ends of the conditional wage distribution. Given the structure of the returns to school inputs across quantiles, it is not surprising that many studies have been unable to find a statistically significant relationship between school inputs and average wages.

In the section below I present both significant and insignificant effects of school resources (expenditure per pupil, student/teacher ratio and teacher wages) as Card and Krueger (1996) note that, to some extent, interpreting the literature depends on the strength of one's prior expectations. If one starts from the position that school resources do not make a difference, then one can point to the bulk of the evidence on the lack of a statistically significant connection between school resources and test scores, and the handful of studies on economic outcomes, to support that view. First, I focus on expenditure per pupil or school resources as a

direct measure of increased resources devoted to schooling. Then I focus on student/teacher ratio as the indirect measure of resources devoted because increased resources allow the hiring of more teachers and therefore the student/teacher ratio decreases. Similarly, I also focus on teachers' wages as a measure of teacher quality.

2.3.3.1 Expenditure per pupil/School resources

As noted, in early researches school quality was approximated by expenditure per student. In addition to Welch (1966), Morgan and Sirageldin (1968), Johnson and Stafford (1973), Wachtel (1976) and Rizzuto and Wachtel (1980) also directly correlated school quality and earnings and found a significantly positive relationship between them, even after eliminating spurious correlations (Morgan and Sirageldin, 1968). Johnson and Stafford (1973) use expenditure per pupil to approximate the quality of education and find high but diminishing marginal returns to investment in expenditures per pupil per year. Expenditure per student is an encompassing measure of inputs that considers not only personnel costs but also the material costs of education (Woessmann, 2006).

Based on 377 studies and a pioneering study by Coleman et al. (1966), Hanushek (1996) finds that the primary resources for schools are inconsistently related to student performance and school quality cannot be measured by spending per student. In addition, Hanushek (2003) presents an overall summary of basic results concerning the key resources dedicated to either a decrease in the teacher-pupil ratio, an increase in teachers' education, teacher experience, teachers' salaries, expenditure per pupil, other available facilities, administration or teacher test scores. Although it has been argued that increased resources improve the quality of instruction and consequently the positive effect on student performance that are both used as a measure of quality (Krueger and Whitmore, 2001 and Card and Krueger, 1996), Hanushek (2003) finds that simply adding more resources to schools gives little confidence with regard to improving quality.

2.3.3.2 Student/teacher ratio

Several studies have investigated the effect of the student/teacher ratio on performance. The wide interest in student/teacher ratio is, according to Card and Krueger (1996), important as differences in class size account for close to one-half of the variation in expenditure per pupil across school districts, and because changes in class size are the object of many educational reform proposals.²⁸ A number of studies have found positive and significant effects of a smaller class size on students' achievement (Krueger, 1999 and Krueger and Whitmore, 2001), although there has been no conventional result that showing class size does matter (Hanushek, 1998; Hoxby, 2000a). Endogeneity is one of the problems that challenge the

²⁸ Several challenges have to be taken into account when estimating the effect of class size. Hoxby (2000a) notes the challenge of the difference of a one-student reduction and proposes using the natural logarithm of class size to take account of the fact that a one-student reduction is proportionately larger from a base of 17 students, say, than from a base of 35 students.

positive empirical results of smaller student/teacher ratios (Woessmann, 1996) or the lack of cross-national data on increasing achievement (Hanushek, 1996; 1998). Studies controlling for endogeneity are, for example, Krueger and Whitmore (2001) who use a controlled experiment with an exogenous introduction of class size. In this section, I review the student/teacher ratio findings focusing mostly on primary and secondary education, but also on tertiary education (Kokkelenberg, Dillon and Christy, 2008; De Paola, Scoppa and Lombardo 2010; Leuven, Oosterbeek and Ronning, 2008).

There have been two widely recognised meta-analyses of class-size research. The first is by Glass and Smith (1979) and the second is by Glass, Cahen, Smith and Filby (1982). Both are based on several studies and by using meta-analysis conclude that smaller classes affect children's test scores in a positive way through higher scores. Several different experimental studies confirm this. Using Maimonides' rule in Israeli elementary schools, Angrist and Lavy (1999) find that reducing class size significantly affects students' performances in tests. Using data from the STAR natural experiment, Krueger and Whitmore (2001) investigate the effect of attending a small class in the early grades on college test taking and middle school test results and find that attending a small class in early grades is associated with an increased likelihood of taking a college entrance exam, especially among minority students, and somewhat higher test scores.

The student/teacher ratio is also a very common measure of school quality (for example, Welch, 1966; Rizzuto and Wachtel, 1980; Card and Krueger, 1991, 1992; Altonji and Dunn, 1996; Heckman, Layne-Farrar and Todd, 1996; Frisvold and Golberstein, 2011). Studies find that a smaller student/teacher ratio has a positive effect on the rate of return to schooling. For example, Card and Krueger (1991) find that a decrease in the student/teacher ratio by five students is associated with a 0.4 percentage point increase in the rate of return to schooling. Also Card and Krueger (1992) in a primary model only include the pupil/teacher ratio which has a positive and significant effect on earnings and, when teacher salaries are added along with term length, the coefficient starts to change signs. Once already in college, a study by Kokkelenberg, Dillon and Christy (2008) finds that when controlling for academic department, peer effects, student ability, level of student, level of course, gender, minority status, and other factors the average grade point declines as class size increases. The negative effect of class size has also been found in an empirical study of Italian public universities (De Paola, Scoppa and Lombardo, 2010), but not for Norway (Leuven, Oosterbeek and Ronning, 2008).

While the well cited and well known study by Hanushek (1998) shows that on aggregate pupil-teacher ratios have fallen dramatically for decades but student performance has not improved, and international comparisons also fail to show any significant improvements from having smaller pupil-teacher ratios, several studies produce different results. The student/teacher ratio has also been widely addressed due to the possibility of allowing cross-national comparisons. Studies from different countries report similar results. For example, Case and Deaton (1999) examine the relationship between pupil/teacher ratios and school outcomes in South Africa immediately before the end of the apartheid government when there

were disparities in average class sizes. Controlling for household background variables, they find strong and significant effects of pupil/teacher ratios on enrolment, educational achievement, and test scores for numeracy. Dustmann, Rajah and van Soest (2003) examine the effects of class size on the decision to stay on in full-time schooling at the age of 16 and on wages in later stages in life in England and Wales and find a sizeable and significant effect on the decision to remain in full-time education beyond the minimum age. Combining this effect with the effect of class size on the decision to stay on, their results reveal that class size significantly affects future wages. Positive effects of smaller class size were also confirmed in Denmark (Browning and Heinsen, 2007) and Italy, where the focus was on college graduates (De Paola, Scoppa and Lombardo, 2010). There is also no consensus on the effect of class size in developing countries. Urquiola (2006) finds a significant effect of class size on student achievement in Bolivia. However, using national secondary school survey data in Bangladesh, Asadullah (2005) finds that a reduction in class size in secondary grades is not efficient in a developing country like Bangladesh.

Hoxby (2000) explains the difference in the results with the fact that the natural experiment involved varied class size but did not vary incentives, while the policy experiment varied class size and contained implicit incentives for teachers and administrators to make good use of smaller class sizes (because full enactment of the policy depended on a successful evaluation). In addition, Woessmann (1996) raises doubts about endogeneity bias in class size which is not only a cause but also a consequence of student performance or of factors related to student performance. A whole host of features may lead to the joint and simultaneous determination of class size and student performance, making class size endogenous to student performance; therefore, there may be a significant association between the two without there being a causal class-size effect.

2.3.3.3 Teachers' wages and teacher quality

Teachers' wages and teacher quality have been especially addressed when investigating primary and secondary school quality. A large number of investigations of teacher quality focuses on the effects of specific teacher characteristics on outcomes, controlling for student differences (Hanushek and Rivkin, 2007).²⁹ For example, when investigating the effect of secondary school characteristics on subsequent wages Welch (1966) finds a positive effect of teachers' wages and concludes that, in addition to the size of the secondary school, teacher salaries are the most important determinant of school quality. Most of the literature on teacher wages and quality has been relying on work by Hanushek (1972) and a later study (1986) where he finds certain characteristics of teachers do have an impact. In particular, Hanushek finds that teachers' verbal aptitudes, the newness of their training and racial differences, which he interprets as differences in the quality of teacher training, significantly influence

²⁹ Several econometric issues also arise when estimating the quality of teachers where studies usually focus on the achievement of students. Numerous current and past factors affect achievement and it is also difficult to point to the causal relationship of teachers, schools and students, where students are not randomly assigned, like teachers. In addition, in several countries policies can vary significantly. Therefore, value added models are usually used with students' prior achievement to mitigate omitted variable bias (Hanushek and Rivkin, 2007). Another important issue is the lack of data to estimate teachers' effectiveness.

children's learning facility. Later on, Hanushek and Rivkin (2007) argue that the quality of teachers is very important as a string of good teachers can help offset the deficiencies of the home environment or push students with good preparation even further. However, teacher quality has been declining. According to Hanushek and Rivkin (2007), the drop off in average teacher quality has likely been caused by the long decline in teachers' relative earnings. But the extent of any decline in teacher quality is unclear and depends in large part on the correlation between teaching skills and the skills rewarded in the non-teacher labour market. Teachers' quality is typically measured by characteristics such as possession of an advanced degree, experience, or even salaries or scores in licensing examinations. Hanushek and Rivkin (2007) note that if teaching places a greater emphasis on a particular set of communication and interpersonal relation skills than the general labour market does, relative teacher salaries may not be a particularly good index of teacher quality. They propose that teacher quality should be measured by the contribution of a teacher to student learning, typically measured by test scores, and conclude that the best way to improve the quality of instruction would be to lower barriers to becoming a teacher and to link compensation and career advancement more closely with performance.

Teacher education and experience are most frequently used as a proxy for quality. Both are reflected in wages, which is usually the only data available for teachers. Hanushek and Rivkin (2007) summarised studies on teacher quality up to 2004 and find that teachers with higher degrees have no systematic relationship to student outcomes, whereas experience has a more positive relationship, albeit still not that strong. Some studies use teachers' scores in achievement tests to proxy the quality of teachers (Wayne and Youngs, 2003) or teacher certification (Goldhaber and Brewer, 2000; Jepsen and Rivkin, 2002).

The work of Hanushek and colleagues largely focuses on primary and secondary education. However, studies of college quality also use teachers' wages (Heckman, Layne-Ferrear and Todd, 1996; Black and Smith, 2004, 2006; Hussain et al. 2009) or teacher education (Strayer, 2002; Long, 2010).

2.4 DOES IT PAY OFF TO ATTEND A HIGH QUALITY SCHOOL?³⁰

Why do students want to attend high quality schools and why do parents move to areas where there are better quality schools? Apparently, they thrive on the quality of the institution attended, whether through improved scores, achievement, likelihood of finishing school or continuing with education and especially because of the higher earnings (the reasons for higher earnings are explained in the introduction). Some papers even investigate the effect of school quality on health outcomes, satisfaction levels and childbearing and marriage.

³⁰ The title of this chapter is adopted from Brewer, Eide and Ehrenberg (1998).

2.4.1 DO GRADUATES OF HIGH QUALITY SCHOOLS EARN MORE?

The interest in investigating earnings and the effect of school quality on them started with the highly cited Coleman Report (Coleman et al., 1966) and several papers by Hanushek (1970, 1979, 1986, 1996, 2003, 2006) that found no effect of measures of school quality on earnings. From the very beginning of the investigation of college quality on earnings there has also been no consensus of the effect. Two pioneering studies investigated the effect of college or university quality on earnings (Wales, 1973 and Solmon, 1975) along with a study by Astin (1968) that investigated undergraduate achievement and institutional excellence³¹. Wales (1973) points to three effects of college or university quality on earnings: marginal productivity interpretation (high quality schools impart different and/or additional skills compared to low quality schools, that are rewarded in the market place), as a screening device by firms or a proxy for mental ability³². Similar effects on earnings are listed in James et al. (1989). Using the Gourman college rankings he finds significant differences in monthly earnings for different quality schools³³. In addition to the Gourman college rankings, Solmon (1975) uses different measures of college quality: average faculty salary, school expenditure for instruction, research and library per full-time equivalent student, expenditure per student³⁴ and finds that the quality of higher education institutions has an important impact on lifetime earnings. Quality affects later incomes more than it influences incomes immediately when entering the labour market. These results hold even after controlling for certain occupational choices, individual ability and socio-economic background. Using the same dataset, Solmon and Wachtel (1973) employ a different measure of school quality – the Carnegie Classification – and find statistically significant positive effects of school quality and earnings.³⁵ Later on, James et al. (1989) find that what matters most is not which college you

³¹ Astin (1986) finds that students' achievement is not a result of the intellectual level of peers, the level of academic competitiveness, or financial resources (so institution quality does not play a role in achievement). He also finds that the benefit of a college does not depend on his intellectual level but on variations in student characteristics.

³² If, for example, the Gourman college ranking that is used by Wales (1973) to proxy quality permits students to match their capabilities, as reflected by the SAT ratings with schools, an individual SAT and school quality ratings are then perfectly correlated so the quality ratings would be reflecting mental ability rather than a school quality difference. Similarly, Solmon (1973) indicates that school quality and the average IQ of those attending are positively correlated. When investigating the relationship between school quality and mental ability, Wales (1973) finds that the effects of quality on earnings are not generally larger for a higher ability level and find no systematic interaction effect between school quality and mental ability that influences earnings. These findings suggest that the quality variable is measuring something different from that measured by the ability variable. This issue was later addressed by Dale and Krueger (2002) who find that students who attended more selective colleges (measured by the average SAT) earned about the same as students of seemingly comparable ability who attended less selective schools.

³³ A graduate from a top-ranked undergraduate school earned 23 percent more than a graduate from the bottom of the school quality rankings and 22 percent more than a graduate school.

³⁴ Solmon (1975) explains measures of school quality: average faculty salary (the assumption is that higher paid faculty have either more experience, better teaching ability, more professional prestige from research or greater opportunities to earn elsewhere, all of which are indicators of greater productivity in their professional roles), school expenditure for instruction, research and library per full-time equivalent student (high-quality faculty are attracted by expenditures beyond those on salaries alone).

³⁵ Solmon and Wachtel (1973) classified colleges in eight categories based on the Carnegie Classification including faculty compensation per student, average faculty salary, average SAT verbal and maths score, total expenditure per student, and the Gourman index and estimated a separate return for each college type and the

attend but what you do while you are there. In fact, these college experience variables explain more of the variance than measured family background, ability, and college characteristics combined. In addition, focusing on primary and secondary school quality and resources used as a proxy of school quality, Hanushek finds no significant effect of school quality on subsequent earnings. Similar conclusions are arrived at by Betts (1995), Grogger (1996) and Heckman, Layne-Ferrar and Todd (1996).

Speakman and Welch (2006) provide a comprehensive summary of papers on the effect of primary and secondary school quality on earnings. Based on a review of 36 papers starting from the 1986 paper by Morgan and Sirageldin and the 2002 paper by Strayer (2002) they conclude that although wages are not a perfect measure for quality, but due to poor alternatives recon the superiority of wages. Based on this extensive review, Speakman and Welch (2006) conclude that it is unclear whether the positive correlations between wages and either school expenditures or teachers' wages found in many papers is indicative of a causal relationship or whether it captures other economic phenomena that supersede the relationship being suggested. This is especially the case in the USA as the school quality-wage relationship cannot be simply investigated due to migration or a violation of an assumption of the national labour market, where Speakman and Welch (2006) note that there need not be a direct relationship between school quality and wage increments from added schooling. In the following paragraph I therefore continue the work by focusing on papers not included in their review either in the era under consideration or published after 2002 and the first publications focusing on college or university quality rather than primary and secondary level quality.

In addition to the pioneering studies mentioned (Wales, 1973; Solmon and Wachtel, 1975, Solmon, 1975), Hilmer (2000) provides an overview of previous research estimating the return to university quality. The estimates are between three (James et al., 1989) and seven percent for each 100 point increase in the average SAT score of entering freshmen at a student's graduation university (Rumberger & Thomas (1993); James et al.(1989); Wise (1975); Solmon & Wachtel (1975); Wales (1973)). Similarly, using a national representative sample of male senior-year college students in 1972, Loury and Garman (1995) investigate college selectivity measured by the SAT average on earnings. They find that college selectivity positively affects earnings and that college grade point average and choice of major both have large and significant effects on earnings. In addition, the results imply that past work that does not include measures of college performance overstates the effect of college selectivity for Whites and understates it for Blacks.

Black and Smith (2004) investigate the effect of college quality proxied by the average faculty salary in 1997 (a measure of inputs), the average Scholastic Aptitude Test (SAT) score of the entering class in 1990 (a measure of selectivity or, alternatively, of peer quality) and the average freshman retention rate in 1990 (a measure of quality as perceived by students and their parents). Their use of the National Longitudinal Survey of Youth 1979 cohort which

rates vary from 2.87 percent for type 8 (the lowest quality) colleges to 6.61 percent for type 1 colleges (the highest quality).

includes both a measure of ability as well as numerous background variables allows them to employ two different estimations, namely OLS and propensity score matching (also described in Section 3.2). They find positive effects of school quality on earnings, regardless of the method. Black and Smith (2006) extended the research on the impact of school quality on earnings by including several measures of school quality and when applying three different estimation techniques (OLS, factor analysis and GMM) again find a positive effect of school quality on earnings and that the existing literature likely underestimates the positive labour market effects of college quality as a result of using a single quality variable as a proxy for the true, unobserved college quality. Long (2010) estimates changes in the effect of college quality on three cohorts of students in the United States and finds that college quality raises earnings and the magnitudes of these effects have increased over time.

Considering three cohorts of graduates of 1985, 1990 and 1995 in the United Kingdom, Chevalier and Conlon (2003) find that returns to quality for males have increased in time from 1% to 6%. With the rise in the number of students, the higher education system has become more polarised and the students more homogenous within a university type. This segregation of students has increased the premium to quality. As predicted by theoretical models and experienced in the USA (Hoxby, 1997), the tougher competition for students has led to greater heterogeneity between institutions and thus higher returns to quality. Similarly, Hussain, McNally and Telhaj (2006) find a positive return to university quality with an average earnings differential of about 6 percent for one standard deviation rise in university quality measured by the Research Assessment Exercise (RAE) score, faculty-student ratio, retention rate, total tariff (score based on A-levels or other eligible qualifications), mean faculty salary, and expenditure per student. In addition, by investigating four cohorts of graduates they find some indication that returns might be rising over time. Following Black and Smith (2004), they find evidence of a non-linear relationship between measures of institutional quality and wages.

Regarding Honduras, Bedi and Edwards (2002) combine household survey data with unique data on school quality such as teacher training, school infrastructure and school crowding and different model specifications and find strong positive effects of school quality on earnings and educational returns. In relation to Japan, Ono (2004) also finds that college quality significantly improves the earnings of Japanese men. Concerning Sweden, Holmlund (2009) finds that college quality has a negative effect on the lower part of the income distribution, while it has a positive effect on the upper part. Separate quantile regressions for men and women show that men experience a negative effect of college quality over the whole distribution, even though the effect is not significant in the upper half. In contrast, women have a small positive effect in the top percentiles. The quantile regressions provide weak evidence that women and men gain differently from college quality. A sensitivity analysis also shows that the effect of quality differs by field of study, but not by parental background. The small positive effect of college quality is, at least partly, explained by where an individual chooses to work after leaving college. There appears to be a sorting of students

from high quality colleges to labour market regions with higher income levels, or regions with better possibilities for full-time work.

Similarly, using data on a 1976 entering cohort of students and control for selection bias Dale and Krueger (2002) find that students who attended more selective (measured by the average SAT) colleges earned about the same as students of seemingly comparable ability who attended less selective schools. Nonetheless, they find a substantial payoff from attending schools with higher net tuition. Children from low-income families, however, earned more if they attended selective colleges.

An important aspect of college quality highlighted by Hilmer (2000) is transfers between colleges. He finds a significant positive return to university quality that exists exclusively for students who transfer to a university and community college from the highest quality universities (1,2001 SAT points)³⁶, whereas there is a significant negative return associated with transferring down from the highest quality universities to lower quality universities. In addition, the length of time university transfer students spend at their initial institutions is also found to have a significant negative effect on their post-graduation earnings. Based on this research of transferring students, Hilmer (2000) concludes that findings suggest there could be potential deleterious effects of mismatching between students and initial institutions rather than institutional effects on earnings.

Eide and Showalter (2005) investigate the relationship between high school quality and the probability of extended unemployment among non-college-bound males and find that larger high schools and schools with lower pupil-teacher ratios tend to decrease the probability of being unemployed shortly after graduation.

³⁶ Such students are estimated to earn nearly twice as much upon graduation as similar students who graduate from the lowest quality universities (800 SAT points).

Table 3: Selected literature of the effect of school quality on earnings

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Wales (1973)	NBER-Thorndike Data, The Gourman Report (averaged across departments) was divided into quintiles and matched to the undergraduate and graduate institution attended	Gourman's academic rating of colleges, college education of a teacher, indicators of quintiles of a composite hobbies index, maths ability	1969 monthly earnings	Regression separately for quintiles of quality distribution (to allow a non-linear effect on earnings). Dividing the sample into 4 groups to allow the effect of quality to vary with education	Quality is a positive and significant determinant of earnings at both the graduate and undergraduate levels. This may capture increases in marginal productivity, screening by firms or omitted ability variables. However, it is unclear to what extent the quality variable is reflecting educational quality as opposed to individual scholastic abilities (by measuring selection of entrance to college).
Solmon and Wahctel (1975)	Thorndike and Hagen data (1959) drawn from a group of males who were tested by the Air Force as part of a search for bombardiers, pilots, and navigators in World War II	Carnegie classification (Leading research universities, research universities, large doctoral granting institutions, small doctoral granting institutions, comprehensive colleges with a substantial selection of programmes, comprehensive colleges with a limited selection of programmes, highly selective liberal arts colleges, other liberal arts colleges.)	Earnings	Regression using Mincer equation	Differences in type of institution attended have highly significant effects on differences in the lifetime earnings patterns of students.
Solmon (1975)	NBER Thorndike data	The Gourman Index (subjective evaluation of institutions), average faculty salary, school expenditure on instruction, research and library per full-time equivalent student, expenditure per student	Earnings	Regression	The quality of higher education institutions has an important impact on lifetime earnings. Quality affects later incomes more than it influences incomes immediately when entering the labour market. These results hold even after controlling for certain occupational choices, individual ability, and socio-economic background.

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
James et al. (1989)	National Longitudinal Study of the High School Class of 1972 (NLS-72) and the fifth follow-up of this cohort in 1986. Higher Education General Information Survey (HEGIS) from 1975, data from James Cass and Max Birnbaum (1975) and The Postsecondary Education Transcript Study (PETS)	College expenditures (general spending per student and instructional expenditures per student) and student body composition (average SAT score of entering freshmen as an index of institutional selectivity, share of students who are part-time, share of graduating students who are liberal arts majors and share of graduate students in total enrolments)	Earnings	Weighted least squares	Regardless of which variables are in the model, measured college effects are small, explaining 1-2 percent of the variance in earnings. These effects are largely unchanged when controls for family background and prior academic background are added, although they decline when major and even more so, when occupation averages are added. The SAT score of the freshman class has a significant positive effect - a 100 point increase raises annual earnings by about 3 percent.
Loury and Garman (1995)	Nationally representative sample of males from the National Longitudinal Study (NLS) of the High School Class of 1972. The same individuals were reinterviewed in 1973, 1974, 1976, 1979, and 1986 to determine their post-high-school progress. The sample includes out-of-school males with positive earnings who received at least 1 year of education at a 4-year college	Median SAT score of the college last attended	Earnings	Regression analysis	College grade point average and choice of major both have large and significant effects on earnings. In addition, the results imply that past work that does not include measures of college performance overstates the effect of college selectivity for Whites and understates it for Blacks.

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Behrman, Rosenzweig and Taubman (1996)	A survey of identical and non-identical twins born in Minnesota between 1936 and 1955 and initiated in May 1994	Total expenditure per student, number of full-time enrolled students, students per faculty member, whether the institution grants Ph.D.s, whether a public or private institution, and mean salaries of full professors	Wages	Using least squares, correcting the coefficient standard errors for the clustering of the twins in families	Graduates from universities and colleges that grant Ph.D.s, that are private, have smaller enrolments and that pay senior faculty high salaries have significantly higher earnings. Expenditures per student on other than faculty salaries are associated with lower earnings, and higher numbers of faculty per student have no effect on earnings. They also find incidences of ability bias (quantity of school time and the quality of other schooling inputs are allocated to higher-endowed individuals).
Hilmer (2000)	Respondents of the High School and Beyond (HSB) survey were first questioned in 1980 as either sophomores or seniors in high school. Follow-up interviews were conducted in 1982, 1984, and 1986.	Mean SAT score for entering freshman as published in Barron's Profiles of American Colleges	Wages	OLS using results from a four-way multinomial logit to calculate selectivity correction terms that are included as additional regressors	Return to university quality differs dramatically across university quality ranges. A large, positive return to graduation quality is observed for university and community college transfers graduating from the highest quality universities, while an insignificant return is observed for all other students. Further, the length of time spent at initial institutions has a significant negative effect on university transfers.
Dale and Krueger (2002)	College and Beyond data set and National Longitudinal Survey of the High School Class of 1972 to acquire data on a 1976 entering cohort of students.	Average SAT score, tuition (investigated separately)	Wages and controlling for selection bias (investigating the effects of students who applied to, and were accepted by, similar colleges)	WLS (Weighted Least Squares)	Students who attended more selective (measured by the average SAT) colleges earned about the same as students of seemingly comparable ability who attended less selective schools. Nonetheless, they find a substantial payoff from attending schools with a higher net tuition. Children from low-income families, however, earned more if they attended selective colleges.

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Bedi and Edwards (2002)	1986 household survey data with district data on school quality from Honduras	Percentage of teachers with professional degrees, teachers' years of schooling and experience, percentage of schools with electricity, with water, percentage of multigrade schools, student-teacher ratio, class-student ratio, desk-student ratio	Earnings	OLS and quantile regression	Men educated in counties of Honduras with better quality schooling earned significantly more than men educated in counties with low-quality schools. The findings were robust to a variety of specifications. When including family characteristics they find no significant difference in the results.
Chevalier and Conlon (2003)	Three cohorts of UK graduates (1985, 1990 and 1995), who were surveyed 11, 6 and 3 years after leaving university	Using three groups: The Russell Group, Modern universities and Old universities	Wages	OLS and propensity score matching using only male	Returns to higher education vary by the type of institution attended even after accounting for students' characteristics. The quality premium ranges from 9% to 12% for the Russell Group and 3% and 8% for other Old universities. Returns to quality are higher for younger cohorts. Graduating from an Old university rather than a Modern university yields a financial premium. They also find differences in quality within group where they find that for two members of the Russell group, graduates from higher quality university earn between 9% and 10% more than those from the control institution.
Black and Smith (2004)	National Longitudinal Survey of Youth 1979 cohort	Average faculty salary in 1997 (a measure of inputs), the average Scholastic Aptitude Test (SAT) score of the entering class in 1990 (a measure of selectivity or, alternatively, of peer quality) and the average freshman retention rate in 1990 (a measure of quality as perceived by students and their parents).	Wages and controlling for ability as well as numerous other background variables.	OLS and propensity score matching	Substantial sorting based on ability into colleges of differing qualities for both men and women in the NLSY. There are differences in OLS and matching estimators but the effects of college quality are positive no matter the estimation technique.

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Ono (2004)	Japanese 1995 Social Stratification and Mobility National Survey (SSM) of a representative sample of men and women aged between 20 and 69 residing in Japan in 1995	Mean scores in entrance examinations administered by each college	Earnings	The standard Mincerian equation with included college quality. Analysis is only for males	College quality significantly improves the earnings of Japanese males.
Black and Smith (2006)	National Longitudinal Survey of Youth (NLSY). For ability they used the Armed Services Vocational Aptitude Battery (ASVAB), for college characteristics the Department of Education's Integrated Post-secondary Education System and the US News and World Report's Directory of Colleges and Universities.	Faculty-student ratio, the rejection rate among those who applied for admission, the freshmen retention rate, the mean SAT score of the entering class, and the mean faculty salaries	Wages	OLS, factor analysis, instrumental variables, GMM (prefer)	Analysis shows that much of the existing literature likely underestimates the labour market effects of college quality as a result of using a single quality variable as a proxy for the true, unobserved college quality. The GMM estimator, which builds on a generalisation of the classical measurement error model and makes use of information on four additional proxies for college quality, suggests that existing estimates understate the effect of college quality by around 20 percent.
Homlund (2008)	Administrative data on a 1997 cohort of college graduates in Sweden	Proportion of teachers with a PhD, teacher/student ratio and grade-point average (GPA) from upper secondary school among contemporary college beginners	Earnings	Quantile regression with selection on observables with separate regressions for females and males	College quality has a negative effect on the lower part of the income distribution, and a positive effect on the upper part. Separate quantile regressions for males and females show that males experience a negative effect of college quality over the whole distribution, even though the effect is not significant in the upper half. In contrast, females experience a small positive effect in the top percentiles.

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Hussain, McNally, and Telhaj (2009)	Individual survey data on 4 cohorts of graduates surveyed 11 and 6 years after graduation (1985, 1990) or 3 and 4 years after graduation (1995, 1999) in the United Kingdom	Research Assessment Exercise (RAE) score, faculty-student ratio, retention rate, total tariff (score based on A-levels or other eligible qualifications), mean faculty salary, expenditure per student	Earnings	Factor analysis and instrumental variables	Positive return to university quality with an average earnings differential of about 6 percent for one standard deviation rise in university quality. Some indication that returns might be increasing over time, evidence of a non-linear relationship between measures of institutional quality and wages.
Long (2010)	NLS 1972 to 1986, high school and beyond (HSB) from 1980 to 1992 and NELS of 1988 to 2000 and extracting data for graduates of 1972, 1982 and 1992. These are nationally representative data, large enough to allow for separate analysis for groups, a lot of variables to mitigate omitted variable bias and consistent variable definition across surveys	Index based on the college's median freshman SAT/ACT score, percent of college applicants who are rejected, tuition, full-time faculty-to-student ratio, percent of the faculty with a doctoral degree, college Barron's index of selectivity	Earnings	Regression also repeated for separate cohorts	Educational attainment and college quality raise earnings and the magnitude of these effects have increased over time. The increase in college quality raised the likelihood of earning a bachelor degree by 5.0, 7.4 and 8.5 percentage points in the observed three cohorts, respectively. College quality has an insignificant effect on voter registration for one cohort (NLS) and postpones marriage as well as childbearing.

**All studies listed above show positive and significant effect of school quality on earnings, except for Homlund (2008) that used Swedish data and James et al. (1989) reports small effects.*

2.4.2 EDUCATIONAL ACHIEVEMENT

Several studies investigate the effect of school quality on test scores as measured by a number of different proxies. These studies mainly focused on monetary measures of school quality and several test scores such as TIMSS, SAT or equivalent³⁷. according to Hanushek (1986, 1996), the most influential studies find no effect of increased school quality (measured by educational resources) on student test scores, while Eide and Showater (1998) find the positive effect for some may involve positive effects at points in the conditional distribution of test score gains other than the mean. A positive effect of school quality on students' achievement is reported among others by Card (1990), Krueger and Whitmore (2001), Woessmann (2004), Kokkelenberg, Dillon and Christy (2008), Chaudhary (2009).

While academic outcomes in the sense of test scores or GPA has been of interest when estimating the effect of mainly primary and secondary school, the likelihood of graduation, likelihood of attending a graduate school and probability of attending an elite graduate school are of interest when investigating college quality.

Several empirical findings confirm the importance of school quality on college completion (Bowen & Bok, 1998; Dale & Krueger, 2002). For example, Light and Strayer (2000) use a two-period model to control for the probability of attending institutions of different quality, and conclude that students of all ability levels (measured by Armed Forces Qualification Test scores) have higher chances of graduating if the quality level of their college (as measured by the average SAT scores of freshmen) matches their observed skill level. Kane and Dickens (1996) find that selective institutions seem to enhance earnings prospects and raise the college completion rates for both minority and non-minority youth, while Malguzio (2008) focuses solely on minority students and finds that school quality also positively affects the likelihood of graduation for minority students in the USA.

A pioneering paper by Eide, Brewer and Ehrenberg (1998) analyses the correlation of college on graduate school attendance for three cohorts of students (high school classes of 1972, 1980, 1982) and finds that attendance at an elite private college significantly increases the probability of attending a graduate school and, more specifically, a graduate school at a major research institution. Further, the college quality–graduate school relationship is generally robust across cohorts of students and at different points in time.

Zhang (2003) finds that college quality emerges as a strong predictor for graduate programme enrolment. Relative to BA graduates from low-quality public colleges, BA recipients from high-quality colleges are about 16% (private) and 18% (public) more likely to enrol in some kind of graduate programme within four to five years after obtaining their BA. Students from middle quality institutions also enjoy an about 10% greater likelihood of graduate school attendance than low quality institutions. Zhang also finds a small but significant effect that students from high-quality public colleges are more likely to enrol in doctoral programmes

³⁷ For an excellent review of the achievement tests see Hanushek and Woessmann (2011)

than master programmes, relative to students from low-quality public schools. For example, on average, students from high-quality undergraduate institutions, relative to those from low-quality undergraduate colleges, are about 40% less likely to enrol in comprehensive universities and greater than 50% more likely to enrol in research universities.

Similarly, Brand and Halaby (2006) follow a high school graduation and college entry cohort in Wisconsin across nearly four decades of labour force participation and estimate elite college effects for multiple outcomes situated at different points along their career trajectory. They find that attending an elite college boosts the probability of graduating from college and of obtaining an advanced degree, and increases the socio-economic status of the first job. Similar results are obtained by Strayer (2002) and Black and Smith (2006).

A very recent study by Long (2010) finds that one standard increase in college quality, measured as an index based on the college's median freshman SAT/ACT score, percentage of college applicants who are rejected, tuition, full-time faculty-to-student ratio, percentage of faculty with a doctoral degree, college Barron's index of selectivity, raised the likelihood of earning a bachelor's degree. Using data for three different cohorts of graduates in the USA (1972 (National Longitudinal Study – NLS), 1982 (High School and Beyond – HSB) and 1992 (National Educational Longitudinal Study – NELS) the effect increased over time by 5.0, 7.4 and 8.5 percentage points for the three different cohorts of graduates in the USA over three decades.

Table 4: Selected literature on the effect of college quality on student achievement

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Eide, Brewer, and Ehrenberg (1998)	National Longitudinal Study (three cohorts of students of high school classes of 1972, 1980, and 1982) and High School and Beyond	Barron's Profiles of American Colleges to classify Elite/Top, Middle and Bottom universities separately for private and public schools and the Carnegie classification	Probability of graduate school attendance	Probit and calculating marginal effects and multinomial logit model	Attendance at an elite private college significantly increases the probability of attending a graduate school and, more specifically, a graduate school at a major research institution
Monks and Ehrenberg (1999)	U.S. News & World Report and Consortium on Financing Higher Education	U.S. News & World Report ranking	Applications, admissions, and enrolment decisions of institutions	Regression	A less favourable rank leads an institution to accept a greater share of its applicants, a smaller share of its admitted applicants matriculate, and the resulting entering class is lower in quality, as measured by its average SAT scores. While tuition levels are not responsive to less favourable rankings, institutions offer less visible price discounts in the form of slightly lower levels of expected self-help (loans and employment opportunities) and significantly more generous levels of grant aid. These decreases in net tuition are an attempt to attract additional students from their declining applicant pool.
Strayer (2002)	NLSY9 that includes data from 1979 to 1994	Share of teachers with a graduate degree, P/T ratio, availability of technical programmes, and availability of agricultural programmes	Probability of attending college, and hourly wages	Multinomial logit for a probability of attending college and OLS for the effect of quality on wages	High school quality has a positive and significant effect on the probability of college attendance and on the type of college attended. College choice affects post-school earnings. The direct effect of college quality is positive but insignificant. The results suggest that high school quality influence earnings by affecting college choice behaviour, while the direct effect of school quality on earnings is less evident.

Authors	Data	Measure(s) of school quality	Variable of interest (Dependent variable)	Method	Findings/Results
Zhang (2003)	School-level data from the Integrated Postsecondary Education Data System 1992–93 (IPEDS) and Barron's Profiles of American Colleges	Barron's Profiles of American Colleges and forming three quality groups	Probability of attending a graduate school (MA, MBA or PhD)	Binomial logit and multinomial logit	College quality emerges as a strong predictor for graduate programme enrolment. Relative to BA graduates from low-quality public colleges, BA recipients from high-quality colleges are about 16% (private) and 18% (public) more likely to enrol in some kind of graduate programme within four to five years after obtaining their BA.
Altonji, Elder and Taber (2005)	National Educational Longitudinal Survey of 1988 (NELS:88)	Catholic High School	Probability of graduating from high school and probability of attending college	OLS and probit investigating selection on observables and unobservables to control for college attendance	Attending a Catholic high school substantially raises high school graduation rates and affects the likelihood of attending college, especially for urban minorities.
Brand and Halaby (2006)	The Wisconsin Longitudinal Study (WLS), a panel study based on a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957 and are observed in 1964, 1975 and 1992	Barrons Profiles of American Colleges 1969 College Admissions Selector. Colleges in the top two categories are considered elite.	Effect of elite college on educational outcomes (graduation, further education) and occupational outcomes.	Regression analysis and propensity score matching	The results indicate that attending an elite college boosts the probability of graduating from college and obtaining an advanced degree, and increases the socio-economic status of the first job.
Melguzio (2008)	National Education Longitudinal Study high school senior class of 1992 (NELS:88) and four follow-up surveys of the students in 1990, 1992, 1994 and 2000	Average SAT scores of the freshman class	College completion rates	Logit model and using Dale and Krueger's correction (self-revelation variable)	The results show that minorities and White students benefited greatly from attending the most and highly selective institutions (with average SAT scores higher than 1240) as opposed to non-selective ones.

2.4.3 SCHOOL QUALITY AND HOUSE PRICES

The relationship of school quality measured by academic performance and its effect on house price has also been addressed. Brasington (1999) finds that expenditure per student and average teacher salary and student attendance rates are valued in the property market, whereas a high student/teacher ratio is consistently penalised in the property market. There is much evidence of the correlation of test scores as a measure of school quality on house prices for the USA (Goodman and Thibodeau, 1998; Downes and Zabel, 2002; Brasington and Haurin, 2006). A study by Gibbons and Machin (2008) finds that one standard deviation increase in average test scores affects the house price with a premium of 3–4 percent in the United Kingdom, while Davidoff and Leigh (2008) report an increase in house prices as a result of higher test scores in Australia, with Fiva and Kirkeboen (2008) doing so for Norway and Fack and Grenet (2010) for France.

Again investigating school quality and house prices also imposes some challenges arising from the sorting of families in different areas and therefore different schools (endogeneity issue). There might be a strong correlation between neighbourhood characteristics and school quality and therefore estimates of the value of school quality would be biased upward by omitted neighbourhood or house quality characteristics (Black and Machin, 2010). Black and Machin (2010) provide a comprehensive review of empirical studies that attempted to deal with the correlation between neighbourhood characteristics (observed and unobserved) and schools. As this is mostly relevant for primary and secondary schools, I just briefly review the findings. Six different approaches have been used. For example, more recent studies include Brasington and Haurin (2006), Gravel, Michelangeli and Trannoy (2006), and Crone (2006) that use regressions including rich data on various house and neighbourhood characteristics and find a positive relationship of increased school quality and prices. Chesire and Sheppard (2004) and Brasington and Hite (2008) use parametric and nonparametric modelling of unobservable factors and again report a positive relationship. Several studies use an instrumental variable approach (such as Bradbury, Mayer, and Case 2001; and Rosenthal, 2003) that finds comparable results. Almost all of the studies using either discontinuity methods with administrative boundaries (Black, 1999; Fiva and Kirkeboen, 2008) or differences, difference-in-differences, repeat sales, and quasi-experimental methods as well as combinations of these methods report a significant association between school quality and house prices.

2.4.4 STUDIES ON OTHER EFFECTS OF SCHOOL QUALITY

Several studies go beyond the investigation of monetary effects of school quality, either as earnings difference, unemployment spell or completion of college, and focus on health for example or the effect on marriage and childbearing. Long (2010), for instance, finds that enrolling in a high-quality college appears to lead to a delay in marriage and childbearing. For example, he finds that one standard deviation increase in college quality significantly lowers the likelihood of being married by 4.0 percentage points and having a child by 3.9 percentage

points for the 1979 cohort of graduates analysed. This effect increases for the most recent cohort investigated.

Studies so far have mainly focused on the important relationship between education and **health** as well as the quantity of education and health outcome, where studies mostly find a positive relationship between education and health outcomes (Mustard, et al. 1997, Deaton and Paxson, 2001; Arendt, 2005; Cutler and Lleras-Muney, 2006).³⁸ Cutler and Lleras-Muney (2006) even note that the monetary value of the return to education in terms of health is perhaps half of the return to education on earnings. Moreover, using a large cohort of Wisconsin high school graduates that has been followed for nearly 50 years Fletcher and Frisvold (2009) find that attending college is associated with an approximately 5–15 percent increase in the likelihood of using several types of preventive care. A pioneering study by Fletcher and Frisvold (2011) investigates the effect of college school quality on short and intermediate term effects on health. They find that attending a more selective college may significantly increase people's health over time through a broad set of health behaviours and outcomes. They find that students of more selective colleges more rarely use tobacco and marijuana but the selectivity of college has small and possibly positive effects on binge drinking. The effects on weight behaviours are suggestive of reduced weight, potentially through diet, but not exercise. Frisvold and Golberstein (2011) estimate the effect of school quality on the relationship between schooling and health outcomes using the substantial improvements in the quality of schools attended by black students in the segregated southern states during the mid-1900s as a source of identifying variation. Using data from the National Health Interview Survey, their results suggest that improvements in school quality, measured as the pupil-teacher ratio, average teacher's wage, and length of the school year, amplify the beneficial effects of education on several measures of health in later life, including self-rated health, smoking, obesity and mortality.

A limited number of studies has investigated the relationship between college quality and **satisfaction** and they find insignificant effects (Bisconti & Solmon, 1977; Ochsner & Solmon, 1979). A more recent study is by Zhang (2003) who measured job satisfaction with nine indicators (pay, fringe benefits, job challenge, working conditions, promotion opportunity, job security, relations with superiors, relations with co-workers, and educational benefits). He finds that college quality does not seem to matter for graduates from public institutions, but graduates from private institutions are generally less satisfied. An even more recent study by Gibbons and Silva (2011) is one of the first to study the relationship between performance-based measures of school quality, and subjective measures of enjoyment and satisfaction reported by pupils and their parents. They find that parental satisfaction with school quality is strongly related to test-based measures of the progress in their child's school and to the academic ability of the school intake, and even their child's current enjoyment of school life is unrelated to either of these two indicators of a school's academic status. Using the Longitudinal Survey of Young People in England encompassing about 15,000 children

³⁸ Eide and Showater (2011) provide an overview of the relatively recent research on causal links between education and health.

and parents, Gibbons and Silva also find that parents' judgements of school quality and satisfaction are only moderately correlated with their child's enjoyment.

2.4.5 WHO BENEFITS FROM IMPROVED QUALITY?

While Brewer, Eide, and Ehrenberg (1999) find significant returns to attending higher-quality schools for all students, several studies show that the positive effects of school quality are not homogenous and invariant over time. For example, Long (2010) finds that the magnitude of a positive effect of school quality on earnings has increased over time.³⁹ Behrman, Rosenzweig and Taubman (1996) find that the quality of schooling resources are allocated to higher-endowed individuals, which exacerbates pre-existing inequality in human capital and biases conventional estimates of school quality effects. Berkowitz and Hoekstra (2011) find that the gain arising from attending selective private high school is bigger for girls and students from lower income families. Similarly, Dale and Krueger (2002) find that attending a more selective college increases earnings for disadvantaged students, for example students from low-income families, although it has no effect on other students. In addition, using the STAR experiment data, Krueger (1999) finds that class size has a larger effect on the test scores of minority students and those receiving free lunches. With all these positive effects of school quality for disadvantaged students, a recent study by Hill and Winston (2010) finds evidence of bias against low-income students at highly selective schools due to geography, searching and recruiting. A study by Jurajda and Munich (2010) finds evidence of the use of the alphabet in admission to selective schools.

Using 1960 and 1970 US census data, Rizzoto and Wachtel (1980) find that the returns to quality are generally higher for Blacks. In addition, the results of Card and Krueger (1992) indicate a substantial variation in the rate of return to education across individuals born in different states and at different times. Men who were educated in states with higher quality schools have a bigger return to additional years of schooling. Rates of return are also higher for individuals from states with better-educated teachers and with a higher share of female teachers. However, for South Africa Yamauchi (2011) investigates the positive correlation between school quality and school fees in post-apartheid South Africa and finds that quality education is concentrated in formerly white, coloured and Indian schools in areas where the majority is non-African. Their findings show that both historical constraints as well as financial constraints matter in terms of access to quality education in South Africa.

2.5 CONCLUSIONS

Using regression-based analysis, the bulk of studies employ a selection on observables approach and agree upon a non-random selection of students into colleges and propose a control for such bias by including a selection variable also measured by ability (Brewer, Eide

³⁹ A wide body of literature has also examined this trend and finds that the increase in returns to college quality might be due to increased returns to ability (Herrnstein and Murray, 1994; Murnane, Willett, and Levy, 1995; Heckman and Vytlačil, 2001).

and Ehrenberg, 1996; Hoxby, 1997; Light and Strayer, 2000; Dale and Krueger, 2002; Strayer, 2002; Black and Smith, 2004). Although ability measures in the form of standardised tests may not measure endowments incompletely and imperfectly (Behrman, Rosenzweig and Taubman, 1996), the majority of studies agree upon including ability measures to control for ability bias (among others, Solmon, 1973; Watchte, 1976; Angrist and Krueger, 1992; Ashenfelter and Krueger, 1994; Dale and Krueger, 2002; Long 2010). There is no consensus regarding family endowments and their potential bias when omitted from the regressions. Studies of primary and secondary school quality usually control for family background, although it is not that common for college quality investigation. Although studies find a significant peer effect in primary and secondary schools, at college the effect is not that evident.

In order to avoid several biases researches have made use of experimental data (Gould, Lavy, and Paserman, 2005; Angrist and Lavy, 1999; Krueger, 1999 and Hoxby, 2000, Krueger and Whitmore, 2001; Angrist et al., 2001; Banerjee et al., 2007), matching methods (Heckman, Smith, and Todd, 1997; Heckman, Ichimura, Smith, and Todd, 1998; Angrist and Krueger, 1999; Light and Strayer, 2000; Dearden et al., 2002; Dehija and Wahba, 2002; Black and Smith, 2004; Brand and Halaby, 2006) or instruments (Angrist and Krueger, 1992; Angrist and Krueger, 1992; Butcher and Case, 1993; Card, 1995; Kane and Rouse, 1995; Angrist and Lavy, 1999). The literature review suggests using either the three mentioned alternative methods or including a rich enough dataset to control for the mentioned biases.

Different measures and combinations of measures have been used to proxy latent school quality. Most of the literature on primary and secondary schools uses monetary measures such as spending measures or school resources. Spending per students or expenditure per student have most commonly been used where the results of an increase or decrease have not been equal across the studies. Very influential studies, including one by Coleman et al. (1966) and others by Hanushek (1986, 1996 and 2006), find no effect of increased resources on students' achievement or earnings. However, another stream of literature finds significant effects of increased resources per student (Welch, 1966; Morgan and Sirageldin, 1968⁴⁰; Johnson and Stafford, 1973; Rizzuto and Wachtel, 1980) or consequently a smaller teacher/student ratio (Krueger, 1999; Angrist and Krueger, 2001). Several studies also examine the ratio for colleges and universities and find a positive effect of smaller classes (Kokkelenberg, Dillon and Christy, 2008; De Paola, Scoppa and Lombardo 2010; Leuven, Oosterbeek and Ronning, 2008).

Regarding college quality, studies focus on measuring selectivity as a proxy for quality either by student achievement in a standardised test (Loury and Garman, 1995; Hilmer, 2000; Dale

⁴⁰ Already in the 1970s Morgan and Sirageldin (1968) reported evidence of an association between the amounts the state spends per year on primary and secondary education and people's subsequent earnings. They find that the relationship between state spending and people's earnings is strong, even after attempts to eliminate a spurious correlation by removing the effects of other determinants that may potentially affect earnings, such as education of the head of the family, sex, race and age.

and Kruger, 2002; Speakman and Welch, 2006; Long, 2010) or by using several rankings of colleges and universities that use students' achievements in tests as well as resources devoted (Morgan and Sirageldin, 1986; Wales, 1973; Solmon and Wachtel, 1973; Solmon, 1975; Behrman et al., 1996; Eide, Brewer and Ehrenberg, 1998; Monks and Ehrenberg, 1999; Light & Strayer, 2000; Zhang, 2003; Brand and Halaby, 2006).

Several different outcomes of interest have been investigated when measuring the effect of school quality. Based on a comprehensive summary of papers on the effect of primary and secondary school quality, Speakman and Welch (2006) conclude that although wages are not a perfect measure to the added value of schools, but due to poor alternatives they contend that wages are superior to other possible choices. Based on this literature review, I find there is no consensus on the effect of school quality on earnings. This originates from the different measures used and, when school resources are proxied for school quality, Coleman et al. (1966) and several papers by Hanushek (1986, 1996, and 2006) find no effect on earnings, with some early studies already finding such an effect (Wales, 1973; Solmon, 1975). Findings regarding college quality are more straightforward with the majority finding the positive and significant effect of college quality usually measured by selectivity on earnings in the USA (Solmon & Wachtel, 1975; Wales, 1973; Rumberger and Thomas, 1993; James et al., 1989; Loury and Garman, 1995; Behrman, Rosenzweig and Taubman, 1996; Hilmer, 2000; Black and Smith, 2004; Long, 2010), as well as in the UK (Chevalier and Conlon, 2003; Hussain et al. 2009) and other countries (Bedi and Edwards (2002; Ono (2004; Holmlund, 2009). Further, regarding student achievement especially in primary and secondary school there is also no consensus, but again for college quality there is evidence of a positive effect of college quality on the likelihood of graduation and further schooling (Kane and Dickens, 1996; Eide, Brewer and Ehrenberg, 1998; Strayer, 2002; Zhang, 2003; Brand and Halaby, 2006; Black and Smith, 2006; Malguzio, 2008). School quality also affects house prices (Goodman and Thibodeau, 1998; Downes and Zabel, 2002; Brasington and Haurin, 2006; Gibbons and Machin, 2008; Black and Machin, 2010), the time of starting a family and getting married (Long, 2010), health (Fletcher and Frisvold, 2009; Fletcher and Frisvold, 2011; Frisvold and Golberstein, 2011) and satisfaction (Bisconti & Solmon, 1977; Ochsner & Solmon, 1979; Zhang, 2003; Gibbons and Silva, 2011).

3 THE SCHOOL-TO-WORK TRANSITION OF GRADUATES WITH A SPECIAL EMPHASIS ON EVIDENCE CONCERNING THE BOLOGNA REFORM⁴¹

3.1 INTRODUCTION

A sound education system represents an important layer of sustainable economic growth by equipping potential employees with the knowledge and skills they will need to actively participate in the labour market. Unemployment represents a poor match between vacancies and the supply of human capital, whereas a bad start to a young person's working life has immediate and long-lasting economic, personal and social effects. Therefore, the last decade has seen increased attention to the analysis of youth unemployment within the school-to-work transition framework (Quintini, Martin and Martin, 2007; Kogan and Unt, 2005; Pastore, 2008). This chapter provides additional empirical evidence on young people's school-to-work transition immediately after their graduation by firstly calculating the effect of different fields of education on the probability of employment and, secondly, calculating the average treatment effect of renewed programmes introduced according to the Bologna Reform and thirdly investigating the school-to-work transition for Business and Administration graduates of a generation of 2007 because this kind of education can be obtained from different higher education institutions, especially all the universities.

Using a unique dataset of three entire populations of graduates that studied full time and graduated in the period from 2007 to 2009 and are entering the labour market for the first time, this chapter investigates the effect of different fields of education and new 1st Bologna cycle types of education on employability. To calculate differences in the probability of employment for different fields of education a probit model and propensity score matching are applied to investigate the effect of different types of education in each educational field on early career outcomes such as being employed within the first three months as well as the first nine months after graduation. To investigate the effect of particular higher education institutions, probit is again used together with the tool Clarify to check the robustness of the results.

This chapter contributes to the existing literature in several important ways. First, school-to-work studies of post-transition countries are scarce (except for Kogan and Unt, 2005). Moreover, the complete dataset of the entire population of graduates matched with employment outcomes provides rich information on the students' higher education records (including institution and graduation data), previous schooling and first labour market entrance. This allows to present empirical evidence on the school-to-work transition of graduates in different fields of education in Slovenia.⁴² Second, this chapter is distinctive for

⁴¹ This chapter of the dissertation has been published as Farčnik and Domadenik (2012) and Domadenik, Drame and Farčnik (2011).

⁴² A complete dataset on graduates is very valuable as the information base on developments in employability in the Bologna Process is quite limited, as noted by Schomburg and Taichler (2011).

it also investigates the effect of the new 1st cycle Bologna types of education on graduates' employability using propensity score matching. In addition, academic papers using propensity score matching in educational research are scarce and, to my knowledge, this is the first paper to employ this method to investigate the effect of different types of undergraduate education. Third, graduates of the new 1st Bologna cycle in specific fields are competing for the same vacancies with graduates from the previous, pre-Bologna types of education which enables me to provide first evidence on the new programmes in terms of employability after controlling for institution, innate ability, previous education and fields of education. Subsequent data on graduates that also includes the most recent cohort of graduates allows me to investigate variations in employment probability in a time of changed economic environment. Further, it is particularly important to construct school performance indicators based on students' employment outcomes. Of special note is the part that focuses on different unemployment spells for graduates of the same field, but different higher education institutions. Therefore, the fourth important contribution of the paper is that the outcomes of this research could also serve as a management tool for the ministry responsible for higher education regarding the efficient distribution of funds dedicated to higher education.

The rest of this chapter is organised as follows: Section 3.2 starts with a literature review regarding this topic where no particular interest is devoted to the school quality literature described in the previous chapter (Chapter 2). In Section 3.3 the methods used are described, which is followed by a detailed description of the sample and the subsample used to investigate the effect of school quality. In Section 3.5 the results are presented and some concluding thoughts are set out in Section 3.6.

3.2 LITERATURE REVIEW AND RESEARCH QUESTIONS

A significant share of academic contributions on the school-to-work transition involves examining labour market outcomes in terms of earned wages associated with graduating from a specific field of education. These studies find that an individual labour market performance varies by field of education (James et al., 1989; Kelly, O'Connell and Smyth, 2010). Using the National Longitudinal Study of the High School Class of 1972, James et al. (1989) found that male graduates of a Business and Engineering major receive large positive returns but Education graduates receive a large negative return. About two decades later, using Irish data Kelly, O'Connell and Smyth (2010) find higher returns for individuals graduating from Medicine and Veterinary Science, Engineering and Architecture, Education, Science and Computers and IT relative to the Humanities and Arts base cases. Several studies have focused on the duration of graduate unemployment according to different fields of education and found that the school-to-work transition is affected by the field of education (Chuang, 1997 for Taiwan; Lassibille et al., 2001 for Spain; Nguyen and Taylor, 2005 for US graduates). Further, Smith, McKnight and Naylor (2000) find statistically significant marginal effects associated with the subject studied at university on the early career paths of UK graduates. Allen and van der Velden (2009) compare employment histories across different

fields and find evidence that graduates from the fields of Health Care and Engineering on average exhibit a shorter school-to-work transition than their peers (Social Sciences, Business and Law), while graduates from the Humanities and the Arts face longer transition periods.

I therefore investigate the probability of employment with respect to different fields of education, study programmes and higher education institutions for Slovenian higher education graduates. Benavot et. al. (1991) emphasised that the more developed a society, the greater the emphasis in the curriculum on modern skills and values. Nowadays commentators on the role of higher education tend to highlight the research and education that contributes to the creation of new technologies, products, concepts and social practices (Yorke and Knight, 2004). I will accordingly test if graduates from science and technical fields of education exhibit the highest employability.

H1: The transition of graduates on average differs when comparing different fields of education with science and technical fields of education, that on average exhibit the shortest duration of unemployment after graduation if controlling for ability.

As mentioned, employability could serve as a proxy for the quality of higher education institutions. As stressed by Fiorito (1981), institutional factors may also be important determinants of transition probabilities.

H2: Graduates from different higher education institutions exhibit different school-to-work transition paths if controlling for ability and fields of education.

H3: Graduates of different types of education in the same field of education and same higher education institution exhibit different school-to-work transition paths.

Apart from the effect of different fields of education, gender differences in college majors have also been addressed, focusing on a comparison of gender differences in rates of return in different fields of study (Eide, 1994; Machin and Puhani, 2003) or the selection of majors (Blakemore and Low, 1984). However, studies investigating gender differences in the school-to-work transition show mixed results. Using Spanish data, Lassibille et al. (2001) find that female graduates are less likely than their male counterparts to find their first job within 10 months of graduating. Interestingly, Chuang (1999) finds the reverse trend in Taiwan and Franz et al. (2000) reports no differences for German youth. Another personal characteristic that affects the school-to-work transition is the age of graduates when they enter the labour market. Using Taiwanese data on graduates, Chuang (1999) finds that unemployment after graduation is longer for those graduates who are older. I will therefore test the following hypothesis:

H4: The probability of employment is not affected by any personal characteristic such as gender if controlling for ability.

Students tend to attend a university that matches their ability (Hoxby, 1997) and large ability differences also exist across majors (Arcidiacono, 2004). To control for ability, Solmon

(1975) employed the Astin test and Scholastic Aptitude Test score (SAT). The latter was also used by Berg Dale and Krueger (2002). Chevalier and Conlon (2003) used A-level test scores in the UK and Black and Smith (2004) used the ASVAB (Armed Services Vocational Aptitude Battery). Using data on Italian graduates, Biggeri et al. (2001) find that academic ability measured by final grades has a positive effect on the probability of obtaining one's first job.

Due to the non-random assignment of students to schools and programmes, a so-called selection bias might arise (Hoxby, 1997). In the absence of a randomised experiment, except for the rare cases of a natural experiment (Gould, Lavy and Paserman, 2005), several studies employ non-experimental methods to adjust for a non-random assignment to schools (Altonji and Dunn, 1996). Still, estimating the effect of treatment may be biased due to the existence of confounding factors. To control for that, Rosenbaum and Rubin (1983) developed a technique called propensity score matching. This technique was later harnessed by Dehejia and Wahba (1999) who analysed a subset of data used in LaLonde (1986). Academic papers using propensity score matching in educational research are scarce. Brand and Halaby (2003) employ propensity score matching to analyse the effect of elite college attendance on career outcomes, Fan and Nowell (2011) analyse the effect of attending a private/public school on academic achievement while Nguyen, Taylor and Bradley (2006) use a propensity score to investigate the effect of a Catholic school on academic performance and the probability of applying for college. To our knowledge, this is the first paper to investigate the effect of different types of education (study programmes) by using propensity score matching.

3.3 METHODOLOGY

The methodology for investigating the school-to-work transition is divided between using several forms of survival analysis (Chuang, 1999, Biggeri et al., 2001, Bradley and Nguyen, 2003) or probability models (Lassibille et al., 2001; Smith, McKnight and Naylor, 2000)⁴³.

3.3.1 PROBIT

Following Smith, McKnight and Naylor (2000) and Johnston and DiNardo (1997), I calculate the probability of employment as:

$$\Pr_i(y_i = 1 | X_i) = \Phi(X_i\beta) \tag{3.1.}$$

⁴³ Alternatively, logit can be used where instead of a normal distribution a logistic distribution is assumed. However, as Hahn and Soyer (2005) summarise and point out, unless in the case of multivariate response models both methods give the same conclusions in most applications (e.g., Maddala, 1983; Davidson and MacKinnon, 1993; Long, 1997; Greene, 1997; Powers and Xie, 2000; Fahrmeir and Tutz, 2001; Hardin and Hilbe, 2001). In addition, Chambers and Cox (1967) found that it was only possible to discriminate between the two models when sample sizes were large and certain extreme patterns were observed in the data. Also in our case, the marginal effects of different Business and Administration Schools as well as individual characteristics on the probability of employment using logit do not differ significantly.

where the dependent variable (employment) is a binary random variable described by $y_i = \{0,1\}$, where $y_i = 1$ indicates employment and $y_i = 0$ indicates unemployment⁴⁴. Independent variables X_i are vector covariates of personal characteristics and institutional characteristics, t indexes time and takes values $t = \{0,1,2\}$ where 0 represents graduation, $t = 1$ represents three months after graduation, and $t = 2$ nine months after graduation, respectively. i indexes individuals, Φ is the standard cumulative normal probability distribution and $X_i\beta$ is called the probit score or index. To calculate the probability of employment I use a probit model.

$$\begin{aligned} \Pr_t(y_i = 1 | X_i) &= \\ &= \Pr_t(y_i = 1 | gen, age, score, study_duration, grad_quarter, educ_field, educ_type, HEI) \end{aligned} \quad (3.2.)$$

where *gen* is the gender of a graduate, *age* is age at graduation, *study_duration* is the duration of study in months, *grad_quarter* is the quarter a graduate graduated (first, second, third and fourth), *educ_field* is the field of education, *educ_type* is the type of education and *HEI* is the higher education institution, respectively.

I calculate the employment probability in the first three months after graduation and the first nine months after graduation for our base group of male graduates of Business and Administration from Public University 1 and a former academic higher (pre-Bologna reform academic programme) with an average matriculation/final exam score, average year of age and who graduated in the first quarter of the year. Successful labour market entry for first-time jobseekers also depends on factors influencing labour demand that might be proxied by general economic conditions (McGinnity et al., 2005). To control for changed economic conditions I conduct the analysis separately for every year. As unemployment also critically depends on a relative abundance of labour supply over labour demand, I control for the month of graduation as it is evident that the biggest supply of new graduates is usually seen in the third quarter of the year. I calculate marginal effects at the mean value for continuous variables (age, duration of schooling and matriculation exam score) and report them as a difference in probabilities as compared to the base group described below.

To investigate the higher education institution on the school-to-work transition again the dependent variable (employment) is binary coded whereby 1 indicates employment and 0 indicates unemployment. Independent variables are vector covariates such as personal characteristics and institutional characteristics.

The probit model is defined as (3.1.), where t indexes time and takes the value $t = 0,1,2,3$; where 0 represents graduation, $t = 1$ represents three months after graduation, and $t = 2$ six

⁴⁴ Every employment has to be reported to the Statistical Office of the Republic of Slovenia which gathers data on the date of employment and date of unemployment from the very first entry in the labour market. This provides us with the exact date of first employment. Unfortunately, I do not have dates on the actual searches for employment, which is perceived as a limitation of the paper.

and $t = 3$ nine months after graduation, respectively. i indexes individuals, Φ is the standard cumulative normal probability distribution and $X_i\beta$ is the probit score. An individual is observed to be employed ($y_i = 1$) whenever the index value is greater than ε :

$$X_i\beta + \varepsilon_i > 0, \quad (3.2.)$$

where X_i is a vector of individual and institutional characteristics, β is a vector of parameters and ε_i is a stochastic normally distributed error term. Individual characteristics included in the model are: gender, age at graduation and living conditions while a school's value added is controlled by institutional dummy variables. Individual ability is proxied by the deviation from the average duration of study calculated for every individual in our database. Living conditions proxies an individual's tendency to move.⁴⁵ Marginal effects are calculated as the slope of the probability curve relating X_k to $\Pr(Y = 1 | X)$, holding all other variables constant. I check the following specification:

Specification 1: $\Pr_t(y_i = 1 | X_i) = \Pr_t(y_i = 1 | gen, HEI)$

Specification 2: $\Pr_t(y_i = 1 | X_i) = \Pr_t(y_i = 1 | gen, HEI, dev_f_av_dur)$

Specification 3: $\Pr_t(y_i = 1 | X_i) = \Pr_t(y_i = 1 | gen, HEI, living_cond)$

Specification 4: $\Pr_t(y_i = 1 | X_i) = \Pr_t(y_i = 1 | gen, HEI, living_cond, dev_f_av_dur)$

where *gen* is gender of a graduate, *HEI* is higher education institution, *def_f_av_dur* is calculated deviation from average duration and *living_cond* are living conditions of a graduate during study.

The control group represents a male university graduate from Public B&A School 1. I control for reported living conditions as they might serve as a push factor when searching for employment and also investigate any incidence of possible discrimination.

3.3.2 PROPENSITY SCORE MATCHING

Due to the non-random assignment of students to schools and programmes a so-called selection bias arises (Hoxby, 1997). To control for that, Rosenbaum and Rubin (1983) developed a technique called propensity score matching. This method reduces bias by comparing outcomes using treated and control subjects who are as similar as possible. The pre-treatment characteristics of each subject are summarised in a single variable – the propensity score. I use the proposed method to analyse the effect of the new 1st Bologna cycle types of education.

⁴⁵ This variable might indirectly measure an individual's ability. It is reported in various empirical studies that people with a higher innate ability tend to move more than others.

Rosenbaum and Rubin (1983) define a propensity score as the conditional probability of receiving treatment giving the pre-treatment characteristics:

$$p(X) = \Pr(D = 1|X) = E(D|X) \quad (3.3.)$$

where the treatment is a binary variable described by $D = \{0,1\}$, $D_i = 1$ if unit i is assigned to the treatment and $D_i = 0$ if unit i is assigned to a control treatment and X is a multidimensional vector of pre-treatment characteristics. Following Rosenbaum and Rubin (1993), the Average Effect of Treatment on the Treated (ATT) can be estimated as follows⁴⁶:

$$\begin{aligned} ATT &= E\{Y_{1i} - Y_{0i}|D_i = 1\} = \\ &= E[E\{Y_{1i} - Y_{0i}|D_i = 1, p(X_i)\}] = \\ &= E[E\{Y_{1i}|D_i = 1, p(X_i)\} - E\{Y_{0i}|D_i = 0, p(X_i)\}|D_i = 1] \end{aligned} \quad (3.4.)$$

where Y_{1i} and Y_{0i} are potential outcomes of two counterfactual situations of treatment and no treatment, respectively. To estimate the propensity score, one can use a probit or logit model. Following Fan and Nowell (2011), I use a logistic regression model.

A 1st Bologna cycle type of education ($D_i = 1$ if student i enrolled in a 1st Bologna cycle type of education) represents the treatment while the control is the same programme before the reform ($D_i = 0$ if student i enrolled in the programme before it adopted the Bologna reform) and X is a multidimensional vector of pre-treatment characteristics (gender, matriculation exam score). The outcome of interest is employment in the first three and nine months after graduation. I therefore separately calculate the ATT of higher academic and higher professional 1st Bologna cycle types of education on employment three and nine months after graduation, respectively. For the matching mechanism I use Nearest-Neighbour Matching.

Based on Becker and Ichino (2002), the formula for this matching estimator can be written as:

$$\begin{aligned} ATT &= \frac{1}{N^T} \sum_{i \in T} \left(Y_i^T - \sum_{j \in C(i)} w_{ij} Y_j^C \right) = \\ &= \frac{1}{N^T} \left(\sum_{i \in T} Y_i^T - \sum_{i \in T} \sum_{j \in C(i)} w_{ij} Y_j^C \right) = \\ &= \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum_{j \in C} w_j Y_j^C \end{aligned} \quad (3.5.)$$

where T stands for the treatment and C for the control. N^T is the number of units in the treatment group, and the weights are defined:

⁴⁶ Rosenbaum and Rubin (1983) show that if the exposure to treatment is random within cells defined by X , it is also random within cells defined by the values of the one-dimensional variable $p(X)$. As a result, given a population of units denoted by i , if the propensity score $p(X_i)$ is known, then the ATT can be estimated. Formally, to derive the estimation of ATT Rosenbaum and Rubin propose the balancing of pre-treatment variables given the propensity score and unconfoundedness.

$$w_{ij} = \begin{cases} \frac{1}{N_i^j}; & \text{if } j \in C(i) \\ 0; & \text{otherwise} \end{cases} \quad (3.6.)$$

Based on Heckman, Ichimura and Todd (1997), when evaluating the treatment effect I take account of the so-called common support condition to avoid biases. This ensures that people with the same values of covariates have a positive probability of being both participants and non-participants (Heckman, LaLonde and Smith, 1999). This means that some randomness is needed which guarantees that persons with identical characteristics can be observed in both states (Heckman, Ichimura and Todd, 1997).

3.3.3 CLARIFY

In order to measure the effect of graduating from different Business and Administration schools on the probability of employment at different levels of independent variables, the distribution estimation technique Clarify (King, Tomz and Wittenberg, 2000; Tomz, Wittenberg and King, 2003) is used. This technique uses a Monte Carlo simulation to convert the raw output of the probit model into the predicted probability associated with a change in the explanatory variables. An overall change in the predicted probability associated with changes in explanatory variables along with standard errors is generated.

Schools marginal effects across the whole distribution of students (separately for full-time and part-time students) are estimated by deviation from the average study duration. Marginal effects on the probability of employment for Business and Administration schools as well as individual characteristics at two different thresholds are calculated: average duration or less and the mean deviation from the average duration, respectively.

3.4 DATA DESCRIPTION

I use micro data on the entire cohort of graduates in three sequential years from 2007 onwards collected by the Statistical Office of the Republic of Slovenia. The graduation data (“ŠOL-DIPL” and “ŠOL-DIPL-TERC” for 2009) include the year and month of graduation, the higher education institution, the International Standard Classification of Education (ISCED) field of study, the level of study completed, the higher education institution, the type of education, the mode of study (full- or part-time), the year of first enrolment and personal characteristics (gender, year of birth, nationality). In addition, data on the type of exam after completing secondary education and the score at the exam (“ŠOL-ŠTUD”) are included. A student can either take a matriculation exam that usually follows after gymnasium, or a vocational matriculation exam that follows after a four-year vocational secondary school. After completing a three-year vocational school one can also take a so-called final exam that enables successful candidates to apply for a university education. The type of exam and test scores allows observation of the heterogeneity of the students’ abilities. Based on an identical individual number assigned to each graduate I matched graduates with their scores at the exams. The matched dataset is again matched with data from the Statistical Register of the

Labour-Active Population (“SRDAP”) which includes the entire employment history. Based on this matched dataset, I could correctly identify each individual’s employment history (date of starting employment or unemployment, job classification, part- or full-time work, number of shifts). The described dataset is truncated at the end of September 2010, which allows me to examine the employment of the 2009 cohort and their employment status 9 months after graduation at the latest.

The first sample consists of 27,875 full-time graduates who graduated in the years from 2007 to 2009. Due to missing data about their final exam after secondary school, I had to drop 3,083 observations. Out of those, 28.41 percent of graduates were employed before their graduation in 2007, 32.23 percent in 2008 and 27.48 percent in 2009, respectively. In order to investigate the school-to-work transition of graduates who enter the labour market after graduation and not during the time of study, and by excluding graduates from higher vocational type of education⁴⁷, I identified 18,052 observations of graduates for further analysis. The number of observations by year and percentages of graduates in a particular field and type of education, and higher education institution are presented in Table 5.

Table 5 also shows how the percentage of graduates in 1st Bologna cycle types of education increased over the years and that the percentage of graduates in former types (3-year professional degree and university degree) consequently decreased. Due to the very low number of individuals who graduated from 1st Bologna cycle types of education, they are omitted from certain further analysis in 2007 and 2008. The same argument applies to graduates of University 4.⁴⁸ In calculating probit described in the previous section for covariates, the matriculation or final exam score, gender, previous education, institution, field and type of education are included.

⁴⁷ Graduates from higher vocational types of study are included in the analysis of the probability of employment for different higher education graduates of Business and Administration.

⁴⁸ The percentage of graduates from the 1st Bologna cycle differs from the entire population where graduates who were employed before graduation are also included. In 2007 0.56 percent of graduates finished a professional higher 1st Bologna cycle type of education and the figure rose to 2.41 in 2008 and 5.35 in 2009, respectively (STAT, 2011). In 2007, 1.69 percent of graduates finished an academic higher 1st Bologna cycle type of education and the figure went up to 2.52 and 8.89 percent in 2008 and 2009, respectively.

Table 5: Sample characteristics for graduates of generations 2007, 2008 and 2009: sample size, gender, field of education type of education, higher education institution in percent

	2007	2008	2009
Observations	5,903	5,644	6,505
Female	66.29	66.62	68.38
<i>Fields of Education</i>			
Education	11.50	11.52	10.32
Arts	2.42	2.00	1.63
Humanities	6.61	6.34	7.13
Social and Behavioural science	11.05	10.05	11.35
Journalism and Information	0.98	0.82	1.38
Business and Administration	21.29	22.06	23.75
Law	6.93	7.02	5.63
Science	6.17	6.18	5.95
Engineering and Construction	10.98	10.74	9.72
Manufacturing and Processing	3.00	3.38	2.86
Agriculture	2.86	3.08	2.66
Veterinary	0.76	0.76	0.85
Health and Welfare	11.27	11.75	11.11
Personal services	0.91	0.94	1.25
Transport services	1.39	1.65	2.28
Environmental protection and Security services	1.88	1.72	2.15
<i>Types of Education</i>			
Professional higher (former)	31.12	27.55	28.78
Professional higher (1 st Bologna cycle)	0.29	0.88	3.17
Academic higher (former)	68.34	64.56	57.69
Academic higher (1 st Bologna cycle)	0.25	2.63	10.36
<i>Higher Education Institutions</i>			
University 1	73.73	70.73	72.49
University 2	21.89	20.77	26.50
University 3	2.83	2.57	3.83
University 4	0.36	0.34	0.30
Independent higher education institutions	1.20	1.20	2.00

Source: SORS, 2010; own calculations

In order to study the effect of quality education on employment prospects, the sample is limited solely to graduates from Business and Administration as this is the only field of education offered at all universities and numerous private institutions. This corresponds to 37.38 percent of all graduates, namely 5,505 graduates⁴⁹. Observations with a misspecified month of graduation (12 observations) or graduates who did not enrol in the first year of study

⁴⁹ This figure differs from the number in Table 5 because part-time graduates are also included.

as that would cause biased estimates (981 observations) are excluded.⁵⁰ Finally, the sample encompassed 4,513 observations, of which 1,956 or 43.34 percent of graduates studied full-time.

In 2007 a student could obtain a Business and Administration (“B&A”) degree at four different universities, offering six different programmes and for this part of the analysis I name them: Public Business and Administration Schools 1, 2, 3, 4 and 5 (Public B&A Schools)⁵¹ and several higher vocational or independent higher education institutions (independent HEI). In Table 6 and Table 7 number of graduates, the share of females and full-time graduates, the average age at graduation and the share of employed graduates before graduation for full-time and part-time students are reported, respectively.

Table 6: Number, gender structure, average age at graduation and share of employed graduates before graduation for graduates who studied full time

	Number of observations	Share of males (in %)	Average age at graduation*	Share of those employed before graduation (in %)
Public B&A School 1	779	33.63	25.46 (1.94)	29.01
Public B&A School 2	296	30.07	25.48 (1.97)	20.27
Public B&A School 3	196	36.22	25.85 (1.97)	31.63
Public B&A School 4	183	15.85	24.86 (1.69)	17.49
Public B&A School 5	41	26.83	25.58 (1.84)	43.90
Independent HEI	177	28.25	28.71 (7.11)	40.11
Higher vocational institutions	284	22.89	28.02 (7.04)	40.14
Full-time graduates	1,956	29.50	26.12 (4.01)	29.81

*(standard deviation in parentheses)

Source: SORS, 2009

Table 6 and Table 7 reveal a different transition-to-employment trend among the two types of graduates. Although one could expect that part-time students would be those who were already employed, it can be observed that only 66.6 percent of all such graduates were employed at the time they graduated. It can be assumed that the one-third of part-time students had opted for this type of education after they were unable to obtain a full-time study position in their desired field of education. Therefore, commencing employment is particularly hard for them as employers perceived them as students with less ability. Further, the average age at graduation is higher for part-time graduates as is the share of those who were employed before graduation.

⁵⁰ Students are able to change their study programme under specific conditions. Moreover, they can enrol in a new study programme after they complete the first one. Due to several reasons of non-enrolment in the first year of study, I decided to exclude these individuals from our sample in order to obtain clear effects of a particular institution on employability.

⁵¹ Due to the small number of graduates one public business school was excluded from further analysis. Under the Law on National Statistics, the names of the schools cannot be disclosed (*Zakon o državni statistiki – ZDSta*, 1995).

Table 7: Number, gender structure, average age at graduation and share of employed graduates before graduation for graduates who studied part time

	Number of observations	Share of males (in %)	Average age at graduation*	Share of those employed before graduation (in %)
Public B&A School 1	270	31.48	32.53 /6.02)	71.11
Public B&A School 2	151	29.14	31.70 (6.04)	60.26
Public B&A School 3	217	45.16	33.15 (5.85)	69.59
Public B&A School 4	340	30.00	33.97 (6.37)	59.41
Public B&A School 5	40	40.00	33.40 (7.40)	82.50
Independent HEI	407	2.95	35.26 (7.34)	65.85
Higher vocational institutions	1,132	24.38	35.24 (7.50)	67.67
Part-time graduates	2,557	24.76	34.37 (7.07)	66.60

*(standard deviation in parentheses)

Source: SORS, 2009

This analysis also focuses on calculating the probability of becoming employed (“the probability of employment”) for the two different cohorts in different time periods after graduation: 3, 6 and 9 months. The analysis includes 1,373 full-time graduates who were not employed before graduation and 854 part-time graduates, respectively. Nine months after graduation 57 percent of all graduates were already employed, indicating much lower probabilities than reported in the CHEERS survey. On average, only 29 percent of all graduates in the CHEERS survey reported a job search period that was longer than 9 months (Schomburg and Teichler, 2007).

This analysis also pays some attention to the effect of living conditions on the probability of becoming employed. Table 8 and Table 9 show the relative share of graduates reporting different living conditions during their studies. All graduates from Public B&A Schools 2 and 4 specified their living conditions as “Other” in contrast to the majority of graduates from all other schools who lived with their parents. Comparing the living conditions of those graduates who studied full time with graduates who studied part time, it can be observed that the majority of the latter who studied at either an independent higher education institution or higher vocational institution already had their own family (57.55 percent and 51.64 percent, respectively) and only 18.50 percent of all graduates who studied part time still lived with their parents. However, it is interesting that again all graduates from Public B&A Schools 2 and 3 described their living conditions during their studies as “Other”.

Table 8: Living conditions of graduates who studied full time

Institution	Living conditions				
	Parents	Partner	Family	Alone	Other
Public B&A School 1	65.82	0.90	1.27	9.76	22.24
Public B&A School 2	0.00	0.00	0.00	0.00	100.00
Public B&A School 3	64.93	10.45	7.46	1.49	15.67
Public B&A School 4	0.00	0.00	0.00	0.00	100.00
Public B&A School 5	56.52	0.00	8.70	30.43	4.35
Independent HEI	67.92	3.77	11.32	10.38	6.60
Higher vocational institutions	70.00	5.29	14.71	2.94	7.06

Source: SORS, 2009

Table 9: Living conditions of graduates who studied part time

Institution	Living conditions				
	Parents	Partner	Family	Alone	Other
Public B&A School 1	33.33	6.41	28.21	10.26	21.79
Public B&A School 2	0.00	0.00	0.00	0.00	100.00
Public B&A School 3	24.24	53.03	4.55	0.00	18.18
Public B&A School 4	0.00	0.00	0.00	0.00	100.00
Public B&A School 5	42.86	14.29	42.86	0.00	0.00
Independent HEI	20.14	7.19	57.55	8.63	6.47
Higher vocational institutions	23.22	7.10	51.64	7.92	10.11

Source: SORS, 2009

3.5 RESULTS AND DISCUSSION

3.5.1 THE EFFECT OF FIELD OF EDUCATION

First I focus on the effect of different fields of education on the school-to-work transition by calculating the probability of employment in the first three and nine months after graduation. The results in Table 10 show that the probability of employment differs by field of education in all observed years. When entering the labour market for the first time after graduation, male university graduates from the Business and Administration field of education who completed secondary school with an average score at the matriculation exam and were at an average age and had an average duration of schooling in 2007 faced a 0.543 probability of employment in the first three months after graduation. Graduates from the fields of the Humanities and Social Sciences had a statistically significant lower probability of securing employment in the first three months after graduating. The highest probability of employment in the first three months after graduation in 2007 was enjoyed by graduates in the field of Health, followed by graduates from Engineering and Architecture and building. In 2008 the probability of employment in the first three months after graduation for graduates in the base group rose

slightly to 0.597, when the highest probability was again held by graduates in the field of Health followed by graduates from Engineering and Architecture and building. Higher probability than graduates in the base group was exhibited by graduates from Mathematics and statistics and Computing. In contrast, a lower employment probability than for the base group was exhibited by graduates from the Humanities and Arts, Social Sciences and Journalism and information. In 2009 the probability of employment in the first three months after graduation for graduates in the base group dropped to 0.351 where, again, positive changes in probability compared to the base group were the highest for graduates from Health, Science, Mathematics and Computing, Engineering and Architecture and building. Interestingly, graduates from Education have a higher probability of employment than the base group of Business and Administration graduates. The explanation for this might lie in the public sector employment of the majority of Education graduates. Similarly, for Ireland Kelly, O'Connell and Smyth (2010) find higher returns to education for Education graduates compared to the Humanities and Arts and explain this finding by public sector employment.

Looking at the effect of different fields of education on the employment probability of graduates who took a vocational matriculation or final exam, similar differences in the probability regarding the field of education are observed (Table 10).⁵² Again, graduates from the Health field have the highest probability of employment followed by graduates from Engineering, Architecture and building, Mathematics and Statistics and Computing as well as Law graduates. When comparing the probability of employment for the base group, graduates who finished secondary school with a matriculation exam were better off in the first three months after graduation. The effects are very similar in all three observed years, whereas in 2009 Education and Veterinary Science graduates exhibit a higher employment probability than the base group.

Table 10: Probit estimates of the probability of employment within the first three months of graduation (marginal effects) for graduates who took a matriculation exam after secondary school.

		2007		2008		2009		Pooled 2007-2009	
Number of observations		1,403		2,153		3,585		7,141	
Pseudo R2		0.0723		0.1048		0.1781		0.1338	
Probability of employment for the base group		0.5431		0.5972		0.3517		0.4801	
Variables		dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.
<i>Personal Characteristics</i>									
Female	#	-0.0179	.0334	-0.0533 ^b	.0264	-0.0423 ^b	.0211	-0.0428	.0152
Age		-0.0058	.0132	-0.0045	.0086	0.0256 ^a	.0097	-0.0010	.0058
Final Exam Score		-0.0018	.0031	-0.0036	.0026	0.0009	.0021	-0.0008	.0015
<i>Graduation Characteristics</i>									

⁵² Multiplications of the matriculation exam or final exam school and field of study were also included in one specification of the model. However, the results were insignificant and I therefore do not report them here.

Duration		-0.0024	.0014	-0.0010	.0008	-0.0051 ^a	.0010	-0.0023	.0006
Second quarter (April to June)	#	-0.0910 ^c	.0486	-0.1430 ^a	.0409	-0.0791 ^a	.0304	-0.1008	.0225
Third quarter (July to September)	#	-0.0283	.0479	-0.0260	.0395	0.0063	.0304	-0.0135	.0222
Fourth quarter (October to December)	#	-0.0072	.0488	-0.1044 ^b	.0414	0.0019	.0321	-0.0355	.0230
<i>Fields of Education</i>									
Education	#	-0.0155	.0545	0.0289	.0436	0.1008 ^a	.0372	0.0562 ^b	.0252
Arts	#	-0.0892	.1144	-0.2742 ^a	.0867	-0.1001	.0704	-0.1633	.0498
Humanities	#	-0.3456 ^a	.0845	-0.2749 ^a	.0686	-0.1190 ^a	.0412	-0.2033	.0333
Social Sciences	#	-0.1617 ^a	.0607	-0.2125 ^a	.0497	-0.1326 ^a	.0349	-0.1574	.0266
Journalism and information	#	-0.1318	.1222	-0.2368 ^b	.1125	-0.1079	.0686	-0.1486	.0553
Law	#	0.0654	.0581	0.0395	.0471	0.1445 ^a	.0423	0.0944 ^a	.0276
Life and physical science	#	0.0185	.0883	-0.0551	.0695	0.1605 ^a	.0536	0.0566	.0383
Mathematics, statistics and computing	#	0.0748	.0889	0.1570 ^a	.0590	0.3376 ^a	.0546	0.2206 ^a	.0367
Engineering, Architecture and building	#	0.1985 ^a	.0602	0.1603 ^a	.0480	0.2410 ^a	.0412	0.2013 ^a	.0277
Manufacturing and processing	#	-0.0264	.1414	-0.0065	.0751	0.0449	.0613	0.0075	.0455
Agriculture and Veterinary Science	#	0.0689	.1168	-0.1482 ^c	.0879	-0.1345 ^b	.0654	-0.0993 ^c	.0509
Forestry	#					0.0572	.1590	-0.0135	.1607
Health	#	0.3216 ^a	.0674	0.2806 ^a	.0516	0.3704 ^a	.0454	0.3227 ^a	.0303
Social services	#			-0.1231	.2077	0.1566 ^c	.0921	0.0007	.0814
Personal and Security services	#	-0.1224	.1096	-0.1995	.1372	-0.1012	.0645	-0.1683 ^a	.0516
Transport services	#	-0.0438	.1610	-0.1175	.1322	-0.0393	.0920	-0.1023	.0672
<i>Types of Education</i>									
Professional higher (former)	#	-0.1730 ^a	.0616	-0.1809 ^a	.0516	-0.1032 ^b	.0399	-0.1192 ^a	.0279
Professional higher (1 st Bologna cycle)	#			-0.1415	.2317	-0.1637 ^c	.0947	-0.2855 ^a	.0747
Academic higher (1 st Bologna cycle)	#	-0.2669	.1697	-0.4833 ^a	.0536	-0.2335 ^a	.0362	-0.3791 ^a	.0264
<i>Higher Education Institutions</i>									
Public University 2	#	-0.1029 ^a	.0372	-0.1086 ^a	.0304	-0.1097 ^a	.0232	-0.1045 ^a	.0169
Public University 3	#	-0.0668	.0854	0.0751	.0761	0.0826	.0573	0.0579	.0402
Independent HEI	#	0.0662	.1525	0.1255	.1066	-0.0734	.1030	0.0385	.0730

Note:

1. dy/dx is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.
2. The base group consists of average-age, male graduates from Business and Administration who finished the former higher academic type of education at Public University 1, had an average score at a professional matriculation exam and graduated in the first quarter.
3. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2010; own calculations

Table 11: Probit estimates of the probability of employment in the first three months after graduation (marginal effects) for graduates who took a vocational matriculation exam or final exam after secondary school

		2007		2008		2009		Pooled 2007-2009	
		dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.
Number of observations		4,200		3,186		2,843		10,246	
Pseudo R2		0.0979		0.0915		0.1155		0.0935	
Probability of employment for the base group		0.3846		0.3484		0.2730		0.3218	
Variable		dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.
<i>Personal Characteristics</i>									
Female	#	-0.0452 ^b	.0178	-0.0157	.0208	-0.0383 ^c	.0214	-0.0360 ^a	.0111
Age		-0.0128 ^b	.0057	-0.0125 ^b	.0064	0.0123 ^c	.0069	-0.0160 ^a	.0033
Matriculation Exam Score		-0.0015	.0022	0.0008	.0026	0.0038	.0028	0.0006	.0014
Taking Final Exam		0.1281 ^a	.0251	0.0841 ^a	.0285	-0.0122	.0299	0.1375 ^a	.0147
<i>Graduation Characteristics</i>									
Duration		-0.0024 ^a	.0005	0.0000	.0003	-0.0016 ^b	.0007	-0.0007 ^a	.0002
Second quarter (April to June)	#	-0.1021 ^a	.0222	-0.0702 ^a	.0243	-0.0497 ^c	.0262	-0.0752 ^a	.0135
Third quarter (July to September)	#	-0.0651 ^a	.0231	-0.0798 ^a	.0252	-0.0782	.0266	-0.0696 ^a	.0139
Fourth quarter (October to December)	#	-0.0049	.0240	-0.0862 ^a	.0257	-0.0196	.0273	-0.0350 ^b	.0143
<i>Fields of Education</i>									
Education	#	-0.0617 ^b	.0309	0.0547	.0406	0.2101	.0489	0.0250	.0212
Arts	#	-0.1819 ^a	.0446	-0.2398 ^a	.0513	-0.0346	.0749	-0.1542 ^a	.0294
Humanities	#	-0.1953 ^a	.0306	-0.1351 ^a	.0381	-0.0566	.0460	-0.1381 ^a	.0199
Social sciences	#	-0.1521 ^a	.0298	-0.0293	.0443	-0.0533	.0548	-0.0876 ^a	.0211
Journalism and information	#	0.0308	.0945	0.1316	.1314	-0.0749	.1567	0.0773	.0707
Law	#	0.1055 ^b	.0407	0.0749	.0526	0.0609	.0766	0.0977 ^a	.0289
Life and physical science	#	-0.0066	.0446	0.0011	.0606	0.1649 ^b	.0802	0.0333	.0318
Mathematics, statistics and computing	#	0.1386 ^a	.0525	0.1587 ^a	.0574	0.1393 ^b	.0609	0.1270 ^a	.0322
Engineering, Architecture and building	#	0.2546 ^a	.0294	0.2667 ^a	.0327	0.2567 ^a	.0365	0.2454 ^a	.0185
Manufacturing and processing	#	-0.0482	.0395	-0.0261	.0436	0.1026 ^b	.0495	-0.0017	.0244
Agriculture and Veterinary Science	#	-0.1075 ^b	.0396	-0.1065 ^b	.0420	-0.1057 ^b	.0418	-0.1029 ^a	.0228
Forestry	#	-0.0688	.0719	0.0947	.0803	0.1692 ^b	.0852	0.0243	.0436
Health	#	0.2901 ^a	.0284	0.3230 ^a	.0307	0.4102 ^a	.0332	0.3216 ^a	.0176
Social services	#	-0.1272 ^b	.0648	-0.0977	.0692	-0.0709	.0593	-0.0921	.0364
Personal and Security services	#	-0.1705 ^a	.0428	-0.1850 ^a	.0422	-0.0545	.0444	-0.1419 ^a	.0235
Transport services	#	-0.1033 ^b	.0460	-0.0340	.0583	0.0079	.0476	-0.0723 ^a	.0271

Environmental protection		-0.0028	.1748	-0.0742	.1299	0.0201	.1547	-0.0440	.0820
<i>Types of Education</i>									
Professional higher (former)	#	-0.0173	.0201	0.0019	.0220	0.0049	.0224	0.0009	.0120
Professional higher (1 st Bologna cycle)		0.0337	.1426	-0.1066	.0775	-0.0781 ^c	.0430	-0.1403 ^a	.0303
Academic higher (1 st Bologna cycle)	#					-0.1245 ^b	.0546		
<i>Higher Education Institutions</i>									
Public University 2	#	-0.0550 ^b	.0213	-0.0335	.0238	-0.0634 ^a	.022	-0.0428 ^a	.0126
Public University 3	#	0.0950	.0695	0.2087 ^a	.0685	-0.0207	.0497	0.1202 ^a	.0361
Independent HEI	#	-0.0329	.0663	0.0152	.0752	0.0214	.0603	-0.0060	.0375

Note:

1. dy/dx is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.

2. The base group consists of average-age, male graduates from Business and Administration who finished the former higher academic type of education at Public University 1, had an average score at a professional matriculation exam and graduated in the first quarter.

3. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2010; own calculations

Similar to the research findings of Salas-Velasco (2007) and Lassibille et al. (2001) who report negative gender differences in securing a first job in favour of males in developed countries, the results show that female graduates on average exhibit a lower employment probability than their male counterparts, regardless of the year observed. In addition, the increased duration generally has a negative effect on the probability of employment.

When comparing the variation in probabilities of gaining employment within the first nine months of graduation over the three observed years, a decreasing time trend common to most fields of education is observed (the estimates are reported in Appendix 1). The probability for the base group fell slightly from 0.630 in 2007 to 0.622 in 2008 and 0.453 in 2009. The probability of employment was still high for graduates who mostly find employment in the public sector such as Health graduates and Education graduates who in 2009 exhibit a higher employment probability than the base group. Similarly, the probability of employment in the first nine months after graduation for the base group who finished secondary education by either a final exam or vocational matriculation exam decreased in 2009 compared to 2007 (Appendix 2). Interestingly, in the observed years the probability of employment increased for Education graduates, which is possibly also due to employment in the public sector. For the same reason, the probability of employment also slightly dropped for Health graduates. Regarding the quarter of the year of graduation, graduates from the first quarter of the year (the base group) were better off than their counterparts who graduated later in the year.

Table 10 and Table 11 show that changes in employment probability due to graduating from a different higher education institution are rarely significant. A negative effect on the probability of employment in the first three and nine months after graduation, compared to graduates of Public University 1, is experienced by graduates of Public University 2. Conversely, graduates with a diploma from Public University 3 had a higher probability of employment.

3.5.2 THE EFFECT OF A NEW BOLOGNA-HARMONISED STUDY PROGRAMME

When looking at the effect of a different programme in Table 10 and Table 11, it can be observed that graduates from the 1st Bologna cycle types of education exhibit a lower probability than their pre-Bologna counterparts. This finding should be interpreted with caution. In 2009 the majority or 86.9 percent of all graduates who finished a higher professional 1st Bologna cycle were graduates of the Social Sciences, Business and Law, following by Service graduates with 10.1 percent and Engineering, Manufacturing and Construction with 1.3 percent and Agriculture, Forestry and Fishery with 1.6 percent, respectively (MVZT, 2010). The situation regarding the higher academic 1st Bologna cycle type of education is similar. In 2009, 88 percent of 1st Bologna cycle graduates were graduates of Social Sciences, Business and Law, followed with 6.5 percent of Service graduates and 3.9 percent by graduates of the Humanities and Arts, respectively. 1.6 percent of these new 1st Bologna cycle graduates also represented graduates of Engineering, Manufacturing and Construction and with 0.1 percent graduates of Life sciences. However, this effect is reported for the average individual and to study it more accurately propensity score matching just for graduates from Business and Administration is employed since the number of new programmes there is sufficient to study the effect. The parameter of interest is secured employment and the average treatment effect of 1st Bologna cycle types of education employment (ATT) within the first three and nine months of graduation. Various matching methods are used to estimate the results to demonstrate the robustness of the result. First, nearest neighbour matching with replacement is used such that the control unit can be a best match for more than one treated unit. The ATT is estimated in the region of common support and without common support. Second, I use stratification matching that divides the range of variation of the propensity score in intervals so that within each interval treated and control units have, on average, the same propensity score (Becker and Ichino, 2002).⁵³

In the Business and Administration field of education the first graduates from the new higher academic 1st Bologna cycle in Slovenia emerged in 2007. They were graduates from Public University 3. However, the number of graduates is insufficient for analysis. I start the analysis

⁵³ Variables that help explain the selection of a treatment or non-treatment group, as well as those that may explain the outcome variable, should be included when creating the propensity score as the omission of relevant covariates may lead to bias in estimating propensity scores (Baser, 2006). Fan and Nowell (2011) suggest including covariates based on the literature. In educational research, covariates such as demographics, income, parental education, family structure, and school characteristics are often considered viable and relevant covariates. Bryson, Dorsett and Purdon (2002) suggest over-specification of the model as the inclusion of too many variables may exacerbate the support problem. On the other hand, Fan and Nowell (2011) suggest excluding those variables that do not have a significant effect on the probability of being in a treatment; whereas according to Bryson, Dorsett and Purdon (2002) that would increase the variance. When investigating the school-to-work transition in three transition economies, including Slovenia, Kogan and Unt (2005) find that parental education does not seem to play any role in the speed of obtaining one's first significant job. Based on the literature I considered including several covariates, however I calculate the probability of enrolling in either a 1st Bologna cycle or former type of study and I therefore only include the matriculation exam score and gender. I included the matriculation exam as students are selected by a higher education institution based on it and gender that has a statistically significant effect on enrolment in either programme.

with Business and Administration graduates from Public University 1 who graduated in 2008, whereby 27.08⁵⁴ percent of them graduated from the new 1st Bologna cycle types of education. The estimated effect of a Bologna-harmonised programme on employment is presented in Table 12.

Table 12: Estimated effect of the higher academic 1st Bologna cycle type of education on employment using the matching method for Business and Administration graduates from Public University 1 in 2008

Outcome variable: employment within the first three months of graduation					
No. of treated	No. of control	ATT	std. err.	t	Matching Method
109	21	-0.196 ^b	0.109	-1.801	Nearest neighbour, common support
114	202	-0.199 ^c	0.123	-1.615	Nearest neighbour
106	24	-0.289 ^a	0.104	-2.777	Stratification, common support
106	130	-0.289 ^a	0.118	-2.450	Stratification
Outcome variable: employment within the first nine months of graduation					
No. of treated	No. of control	ATT	std. err.	t	Matching Method
109	21	-0.246 ^b	0.132	-1.866	Nearest neighbour, common support
114	202	-0.273 ^b	0.142	-1.928	Nearest neighbour
106	24	-0.347 ^a	0.129	-2.701	Stratification, common support
106	130	-0.347 ^a	0.126	-2.752	Stratification

1. All standard errors are bootstrapped, standard errors based upon 100 replications.
2. The outcome variable is 1 if a student was employed and 0 otherwise.
3. In the propensity score equation only the matriculation score variable was included as the gender effect was statistically insignificant and the balancing property was also not satisfied.
4. c significant at 10%; b significant at 5%; a significant at 1%

Source: SORS, 2010; own calculations

The results show that graduates from the new 1st Bologna cycle types of education exhibit a lower probability of employment than their counterparts. The size of the effect differs according to different matching methods; however, the negative effect can be observed irrespectively. In Appendix 3 the effect of graduation from a new Bologna-harmonised programme on employment 9 months after graduation did not change much (depending on the matching method), although the effect increased when looking at employment 9 months after graduation.

In 2009 the first graduates of Business and Administration graduated after finishing a 1st Bologna cycle type of education at Public University 2. 125 graduates, representing 47.17 percent of graduates, competed for jobs with graduates from the former types of education. For estimating the treatment effect a different number of graduates was included in the

⁵⁴ The percentage of 1st Bologna cycle graduates differs from the data for the entire population. The reason lies in the sample restrictions imposed for this analysis, which are graduates who studied full time and were not employed at the time they were studying.

sample, depending on the matching method. The estimated effect of a 1st Bologna cycle type of education in 2009 on employment is presented in Table 13 and again shows a negative effect of the Bologna cycle type of education.

Table 13: Estimated effect of the higher academic 1st Bologna cycle type of education on employment using the matching method for Business and Administration graduates from Public University 2 in 2009

Outcome variable: employment within the first three months of graduation					
No. of treated	No. of control	ATT	std. err.	t	matching
119	169	-0.188 ^a	0.045	-4.181	nearest neighbour, common support
119	169	-0.188 ^a	0.047	-4.006	nearest neighbour
119	173	-0.207 ^a	0.039	-5.311	stratification, common support
119	173	-0.207 ^a	0.042	-4.900	stratification
Outcome variable: employment within the first nine months of graduation					
No. of treated	No. of control	ATT	std. err.	t	matching
119	169	-0.512 ^a	0.059	-8.645	nearest neighbour, common support
119	169	-0.512 ^a	0.061	-8.364	nearest neighbour
119	173	-0.538 ^a	0.045	-12.053	stratification, common support
119	173	-0.538 ^a	0.039	-13.723	stratification

1. All standard errors are bootstrapped standard errors based upon 100 replications.

2. The outcome variable is 1 if a student was employed and 0 otherwise.

3. c significant at 10%; b significant at 5%; a significant at 1%

Source: SORS, 2010; own calculations

In addition, I also calculated the average treatment effect of the treated (programme) separately for graduates from the Humanities and Social Sciences in 2009 and also find a statistically significant negative average treatment effect of the treated (programme). The estimated negative effect of Bologna-harmonised programmes is also significant in the employment of graduates who finished a higher professional 1st Bologna cycle type of education. The effect is similar for both Public University 1 and Public University 2 and, as in the case of academic graduates, increases in the first nine months after graduation.

3.5.3 THE EFFECT OF DIFFERENT HIGHER EDUCATION INSTITUTIONS ON THE PROBABILITY OF EMPLOYMENT FOR BUSINESS AND ADMINISTRATION GRADUATES

Table 14 and Table 15 report the probability of becoming employed in the first 3 months after graduation for graduates of different higher education institutions that offer education Business and Administration for full-time and part-time graduates, respectively. The different specifications include various sets of explanatory variables divided into two main groups: institutional and personal characteristics (gender and living conditions). In the second and fourth specifications of the model I also included a variable that measures individuals' deviations from the average study duration of a particular programme.

The probability of employment in the first 3 months after graduation for male graduates who studied full time in the former higher academic type of education at Public B&A School 1 in 2007 is 0.529. In contrast, graduates from other Business and Administration schools in the same period exhibit a lower probability of employment, with graduates from the higher vocational institutions that offer a higher vocational degree exhibiting the lowest probability of employment, holding all other variables constant. Differences in the probability of employment are significant at 1%, except for graduates of Public B&A School 5. The positive deviation from the average schooling duration has a statistically significant negative effect on the probability of employment, indicating that every extension of schooling beyond the average duration of schooling decreases the probability of employment. Living conditions are included in Specifications 3 and 4, where living with one's parents serves as a control variable. Graduates with their own family on average exhibit a significantly lower probability of employment in the first 3 months, indicating that having children reduces the probability of securing employment in the first 3 months after graduation. All the estimations are robust.

Table 14: Probit estimates of the probability of employment in the first three months after graduation (marginal effects) for graduates who studied full time

Specification		1	2	3	4
Number of observations		1,373	1,373	1,373	1,373
Pseudo R ²		0.061	0.062	0.069	0.071
Average probability of employment for a male graduate from Public B&A School 1		0.529	0.529	0.507	0.513
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	-0.203 ^a (0.031)	-0.202 ^a (0.030)	-0.200 ^a (0.040)	-0.200 ^a (0.040)
Public B&A School 3	#	-0.128 ^a (0.039)	-0.140 ^a (0.039)	-0.138 ^b (0.040)	-0.141 ^a (0.040)
Public B&A School 4	#	-0.220 ^a (0.033)	-0.221 ^a (0.033)	-0.217 ^a (0.041)	-0.218 ^a (0.041)
Public B&A School 5	#	-0.092 (0.090)	-0.094 (0.090)	-0.073 (0.094)	-0.077 (0.094)
Independent HEI		-0.231 ^a (0.036)	-0.230 ^a (0.036)	-0.221 ^a (0.037)	-0.221 ^a (0.037)
Higher Vocational institutions	#	-0.323 ^a (0.022)	-0.323 ^a (0.026)	-0.313 ^a (0.027)	-0.315 ^a (0.027)
<i>Personal Characteristics</i>					
Gender (female)	#	0.043 (0.029)	0.036 (0.029)	0.044 (0.029)	0.037 (0.029)
Living with family	#			-0.239 ^a (0.056)	-0.224 ^a (0.059)
Living with partner	#			0.136 (0.094)	0.145 (0.094)
Other	#			-0.008 (0.042)	-0.007 (0.042)
Living alone	#			-0.023 (0.057)	-0.018 (0.057)
Deviation from average study duration			-0.003 ^b (0.001)		-0.002 ^b (0.001)

Note:

1. *dy/dx* is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.
2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS (2009), own calculations

Differences in the probability of employment in more than 3 but less than 6 months are similar to those observed in the first 3 months after graduation, they become smaller in the first 6 months after graduation and, with the exception of the Independent Higher Education institutions and Higher Vocational Institutions, the effects of graduating from different business schools are not statistically significant (results are reported in Appendix 4). The effect of gender did not play any significant role in the employability outcomes. The only statistically significant effect on the probability of employment from 6 to 9 months after graduation is again a negative effect of graduating from a Higher Vocational Institution

(results are reported in Appendix 5). When living conditions are also added into the model specification, a positive effect of graduating from Public B&A School 4 and a negative one from living with one's family or alone on the probability of becoming employed can be observed.

Table 15 reports the average probability of employment for male graduate of Public B&A School 1 that studied part-time and changes in probability for graduating from different B&A schools. Compared to full-time students, a lower probability of employment in the first 3 months after graduation can be observed if a graduate was not employed during their studies. Part-time graduates of Public B&A School 4 as well as Independent Higher Education Institutions and Higher Vocational Institutions exhibit a statistically significant lower probability of employment.

Table 15 also shows that gender does not affect the probability of employment; however, living conditions have a statistically significant effect on the probability of employment. Graduates living with their parents (the control group) on average exhibit the highest probability of employment, while graduates with a family statistically significantly have the lowest probability of employment. The duration of study that might serve as a proxy for individual ability has no effects on the employability of part-time students. Obviously, employers regard part-time students who are not employed as a homogenous group of students with lower innate ability.

Table 15: Probability of employment for graduates who studied part time in the first 3 months after graduation

Specification		1	2	3	4
Number of observations		854	854	854	854
Pseudo R ²		0.051	0.055	0.149	0.153
Average probability of employment for a male graduate from Public B&A School 1		0.154	0.152	0.275	0.277
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	-0.002 (0.029)	-0.002 (0.029)	-0.003 (0.028)	0.004 (0.028)
Public B&A School 3	#	-0.035 (0.018)	-0.035 ^c (0.018)	-0.023 (0.014)	-0.023 (0.013)
Public B&A School 4	#	-0.047 ^b (0.015)	-0.046 ^b (0.015)	-0.029 ^b (0.015)	-0.028 ^c (0.015)
Public B&A School 5	#	-0.005 (0.064)	-0.004 (0.065)	-0.007 (0.045)	-0.006 (0.046)
Independent HEI		-0.059 ^a (0.013)	-0.058 ^a (0.014)	-0.035 ^b (0.012)	-0.035 ^b (0.012)
Higher Vocational institutions	#	-0.081 ^a (0.022)	-0.080 ^a (0.023)	-0.054 ^b (0.018)	-0.053 ^b (0.018)
<i>Personal Characteristics</i>					
Gender (female)	#	0.002 (0.017)	0.002 (0.017)	0.009 (0.012)	0.009 (0.012)
Living with family	#			-0.092 ^a (0.015)	-0.091 ^a (0.015)
Living with partner	#			-0.037 ^a (0.009)	-0.036 ^a (0.009)
Other	#			-0.041 ^b (0.017)	-0.041 ^b (0.017)
Living alone	#			0.034 ^a (0.009)	0.034 ^a (0.009)
Deviation from average study duration			0.000 (0.000)		0.000 (0.000)

Note:

1. dy/dx is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.

2. ^c significant at 10%; ^b significant at 5%; ^a significant at 1%

Source: SORS, 2009; own calculations

Appendix 6 reports the results of employability for part-time graduates of B&A schools in more than 3 but less than 6 months after graduation. No statistically significant differences among the schools are observed. However, living conditions again have a statistically significant effect on the probability of employment. Due to a lack of observation units I was unable to calculate the probability of employment for part-time graduates from 6 to 9 months after graduation.

Robustness of the results for Business and Administration graduates

Table 16 and Table 17 report the marginal effects of different schools and individual characteristics on the probability of employment in the first three months after graduation for graduates who studied full and part time respectively.⁵⁵ It can be observed that the results calculated with probit are robust as the results calculated with Clarify generally do not differ significantly.

Table 16: Marginal effects of different Business and Administration schools on the probability of employment in the first three months after graduation by deviation from the average study duration for full-time students

Deviation from avg. Duration		Below average or average	Below average or	Mean	Mean
Number of observations		1,373	1,373	1,373	1,373
Probability of employment for a male graduate from Public B&A School 1		0.521 (0.032)	0.525 (0.032)	0.505 (0.028)	0.508 (0.031)
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	-0.224 ^a (0.036)	-0.220 ^a (0.046)	-0.221 ^a (0.036)	-0.218 ^a (0.045)
Public B&A School 3	#	-0.154 ^b (0.045)	-0.157 ^b (0.049)	-0.156 ^b (0.046)	-0.156 ^b (0.048)
Public B&A School 4	#	-0.251 ^a (0.042)	-0.250 ^a (0.051)	-0.247 ^b (0.041)	-0.247 ^a (0.050)
Public B&A School 5	#	-0.102 (0.099)	-0.082 (0.105)	-0.102 (0.096)	-0.081 (0.104)
Independent HEI		-0.266 ^a (0.047)	-0.256 ^a (0.049)	-0.259 ^a (0.045)	-0.253 ^a (0.048)
Higher Vocational institutions	#	-0.371 ^a (0.036)	-0.363 ^a (0.038)	-0.363 ^a (0.033)	-0.353 ^b (0.037)
<i>Personal Characteristics</i>					
Gender (female)	#	0.036 (0.031)	0.038 (0.030)	0.036 (0.031)	0.038 (0.030)
Living with family	#		-0.257 (0.080)		-0.253 ^b (0.078)
Living with partner	#		0.140 (0.082)		0.142 (0.083)
Other	#		-0.006 (0.044)		-0.006 (0.044)
Living alone	#		-0.017 (0.061)		-0.017 (0.061)

Note:

1. *dy/dx* is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.
2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2009; own calculations

⁵⁵ The marginal effects of different schools and individual characteristics on the probability of employment from three to six months and from six to nine months separately for full- and part-time students are similar to the probit estimations and can be obtained from the author upon request.

Table 17: Marginal effects of different Business and Administration schools on the probability of employment in the first three months after graduation by deviation from the average study duration for part-time students

Deviation from average duration		Below-average or average duration	Below-average or average duration	Mean	Mean
Number of observations		854	854	854	854
Probability of employment for a male graduate from Public B&A School 1		0.153 (0.047)	0.280 (0.077)	0.154 (0.046)	0.285 (0.076)
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	-0.000 (0.061)	-0.022 (0.107)	-0.000 (0.061)	-0.022 (0.108)
Public B&A School 3	#	-0.070 (0.051)	-0.105 (0.089)	-0.071 (0.055)	-0.106 (0.090)
Public B&A School 4	#	-0.092 (0.045)	-0.124 (0.081)	-0.093 (0.045)	-0.125 (0.082)
Public B&A School 5	#	0.026 (0.143)	0.013 (0.212)	0.026 (0.144)	0.012 (0.213)
Independent HEI		-0.115 ^b (0.045)	-0.162 (0.074)	-0.115 ^b (0.045)	-0.164 ^b (0.074)
Higher Vocational institutions	#	-0.113 ^b (0.044)	-0.178 (0.068)	-0.113 ^b (0.043)	-0.180 ^b (0.068)
<i>Personal Characteristics</i>					
Gender (female)	#	0.001 (0.038)	0.042 (0.058)	0.001 (0.038)	0.042 (0.059)
Living with family	#		-0.251 (0.069)		-0.255 ^a (0.069)
Living with partner	#		-0.189 (0.071)		0.192 (0.072)
Other	#		-0.157 (0.074)		-0.159 (0.074)
Living alone	#		-0.184 (0.080)		-0.187 (0.081)

Note:

1. *dy/dx* is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.

2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2009; own calculations

3.6 CONCLUSIONS

There is growing concern regarding the situation facing young people in the labour market. In the last few years I have witnessed a new phenomenon in the form of the rising unemployment of highly educated young people in developed countries. As pointed out in the recent OECD report “Better policies for better lives”, skills have become increasingly important in labour markets whereby “lifelong employability” and “lifelong learning” have replaced the notion of “lifetime employment” (OECD, 2011). Although the Bologna

Declaration, signed by 29 nations in 1999, clearly states the common goal of the increased employability of young graduates, our paper reports the mixed effect of the new Bologna-harmonised programmes on graduates' employment.

Based on data on university graduates in the 2007–2009 period, I report that employability varies according to the field of education, higher education institution as well as the type of education. Regarding fields of education, I find that the highest probability of employment is experienced by Health graduates from University 1, regardless of the year. In terms of the time trend, the average probability decreased in 2009 which might be due to the deepening of the economic crisis in Slovenia. I also find that graduates from the new 1st Bologna cycle types of education exhibit a lower probability of employment than their pre-Bologna counterparts. However, due to the different shares of graduates of Bologna types of education in different fields I therefore conducted a further in-depth analysis to investigate the effect of the Bologna process on the early labour market outcomes of young graduates by using propensity score matching.

1st Bologna cycle graduates in specific fields compete for the same vacancies with graduates from the previous pre-Bologna types of education and this enables an assessment of the new programmes in terms of employability but after controlling for institution, matriculation or final exam score, previous education and fields of education. I estimate the average treatment effect of the 1st Bologna cycle types of education separately for fields of education where the first Bologna graduates finished their studies. The size of the effect varies for different fields and, on one hand, decreases for graduates from the Social Sciences over the years and increases for graduates from Business and Administration. An increased negative effect on employment in the first nine months compared to employment in the first three months after graduation is common to all fields of education.

Similar negative outcomes of the Bologna Process are shared by a neighbouring country – Italy. Cammelli et al. (2011) find that only 46 percent of bachelors who graduated in 2008 were employed one year after graduation. In Austria, 40 percent of graduates questioned in 2008 were studying after having obtained a bachelor's degree as the graduates perceived their study would be complete upon graduating from a master's programme (Scheeberg and Petanovitsch, 2010). Among those seeking a job, bachelor graduates from universities in Austria reported an average 4.9 months of searching, while such searches took less time for graduates from professional schools – 3.2 months on average (Guggenberger, Keplinger and Unger, 2011). In the Czech Republic, the share of graduates who continued to study has increased over time. For example, 68 percent of graduates of 2008 pursued further study 6 months after graduation and 74 percent from 12 to 24 months after graduation (Ryška and Zelenka, 2011). This supports the assumption that graduates from the new Bologna types of education consider the programmes are not equivalent to the old ones and need to further pursue their education, which consequently also disturbs the expectations of employers. Secondly, graduates first want to find a job and in the case of having no success in that regard they enrol in further study.

Due to the insufficient number of observations of graduates who finished professional programmes, I limit the analysis by estimating the effect of the 1st Bologna cycle types of education only for graduates from Business and Administration from Public University 1 and Public University 2. Here I find a significant negative effect of treatment – enrolling in the 1st Bologna cycle type of education regardless of the university. This effect increases when looking at employment chances in the first nine months after graduation.

This chapter studied the characteristics of the employability of young graduates while controlling for different individual abilities and a school's value added in the context of human capital theory. The latter is the most important component of a school's reputation. MacLeod and Urquiola (2009) show that when schools are able to select students based on their innate ability there is an “anti-lemons” effect: namely entry by relatively small schools that serve students within a specific ability range. This leads to stratification whereby the most able students attend schools with the best reputations and subsequently earn the highest incomes, while the least able remain in the worst schools. The tuition fee follows the quality principle, with the best schools charging the highest tuition fees.

In Slovenia the system of public financing represents the main source of funds for state and private higher education institutions and is based on the student per capita principle. The aim of part of this chapter has been to research the quality of education services by using a proxy that has not often been used in the literature: the employability of graduates. In order to avoid school-to-work transitions in different fields of education I focus only on graduates in the field of Business and Administration. Although employment also depends on regional labour demand factors, it can be assumed that young graduates are mobile and have no problems in also searching for a job in other regions. However, there are potential shortcomings that arise from the data availability. The biggest shortcoming is that what the value added of the education system is is not exactly investigated as I have only partially controlled for students' innate ability.

This part of the study reveals significant differences in the employability of young graduates, irrespective of whether they were full- or part-time students. Part-time students generally exhibit higher employability at the time of graduation, but the trend is lower in the period after graduation. Therefore, it might be assumed that students who did not obtain positions as full-time students of Business and Administration due to their low level of achievement in their secondary education are facing big problems in the school-to-work transition. However, when speaking about full-time students some institutions exhibit a higher probability of employment, showing considerable differences in quality. Those institutions provide their education services at a lower price per “employable” graduate compared to other higher education institutions. The new private schools exhibited a significantly lower employability of their full- and part-time graduates, which might indicate the lower innate ability of the students enrolled in these schools and/or the lower quality of their academic programmes. As these schools compete for public funding and did not find private funds for their operation, I

strongly advise that the current system of financing should be reconsidered by incorporating “quality” as an important determinant of the allocation of budget funding.

To sum up, the findings show that in fact the graduates of science and technical fields of education together with Health graduates exhibit the highest probability of employment in both the first three and first nine months after graduation (Hypothesis 1). As mentioned, I also find that the school-to-work transition is affected by the higher education institution a graduate graduated from (Hypothesis 2) as well as by different types of education (Hypothesis 3). More precisely, I find that graduates who graduated from the new 1st Bologna cycle academic and professional types of education on average exhibit a lower probability of employment in first three and nine months. This finding holds for graduates of Business and Administration who were the first ones to finish the 1st Bologna cycle types of education. Regarding the effect of gender on the probability of employment I find mixed results (Hypothesis 4). For example, female graduates who took a matriculation exam were on average less successful in 2008 and 2009 but no statistical significant difference is found for the 2007 generation. For female graduates who took a vocational matriculation exam or final exam the negative effect of gender is significant for the 2007 and 2009 generations of graduates.

4 FIELD OF EDUCATION-OCCUPATION MISMATCH

4.1 INTRODUCTION

Each individual selects a field of education with the expectation of working in a job related to that field of education. However, some graduates may secure a job that does not match their field of education or they can occupy a job position where the required level of education is lower than the level they have completed. The quality of this job match determines the productivity level and earnings in a job (Sattinger, 1993). Garcia-Espejo and Ibanez (2006) define two different matches: education match as the correspondence of an education level and the level required for the job, and skill match as the correspondence between the knowledge acquired during schooling and the knowledge required to perform one's job.⁵⁶ The level of education possessed by an individual and the level needed to perform a job have been widely addressed in the literature and so-called measures of overeducation and undereducation has been developed (among others, Sicherman, 1991; Hersch, 1991; Robst, 1995, Alba-Ramirez, 1993; Cohn and Kahn, 1995; Sloane, Battu & Seaman, 1999; Groot & van den Brink, 2000). Recently, an increasing body of literature has been investigating the skill match where the focus of research is on the match between an individual's specific education or field of education, where particular knowledge and skills are acquired, and the job an individual actually secures.⁵⁷ Following the seminal paper of Robst (2007), papers like Nordin, Perrson and Rooth (2010) investigate the field of education-occupation match with a primary interest in graduates.⁵⁸ Studies of the horizontal match or the field of education-occupation match find that the effect of the field of education-occupation match is more significant than the effect of the education match.

This chapter investigates the determinants of the field of education-occupation match of higher education graduates, where the focus is on the specific knowledge a graduate obtains while studying and its applicability to work. In this chapter, the very first job a graduate of a specific field of education secures after they graduate is used to determine the quality of a match by investigating whether a graduate has been educated to perform the occupation (a match), if the occupation poorly matches one's field of education (a weak match) or the graduate actually received a degree that has nothing to do with the knowledge needed to perform a job (a mismatch). In other words, these studies investigate the connection between a university degree and the content of a job.

This chapter uses microdata on three generations of Slovenian graduates who studied full time and obtained their first job after graduation (as described in Section 3.4). The generations of graduates from 2007 to 2009 allow an investigation of the difference in the likelihood of a match for different fields of study, higher education institutions and study programmes.

⁵⁶ Education match is a vertical match between levels and skill match is a horizontal match between fields.

⁵⁷ When the type of schooling is not appropriate (Sloane, 2003).

⁵⁸ Although Garcia-Espejo and Ibanez (2006) define a field of education-occupation match as a skill match, I follow the most recent findings and terminology of Nordin, Perrson and Rooth (2010) that define the match in interest field of education-occupation match. I follow the later.

Consequent populations also allow an investigation of the trend of the likelihood of an education-occupation match or how the likelihood of a match varies with respect to different generations. This time spread is particularly interesting due to the economic situation in the observed years. Similarly Andrews, Bradley and Upward (2001) using microdata on UK graduates find that a probability of a match is pro-cyclical. Following that, this chapter also investigates differences in the likelihood of an education-occupation match for three generations of students from the years 2007 to 2009. These three generations are especially interesting because they graduated in years where the economic environment was changing. In addition, based on job search theory the effect of the duration of unemployment on the probability of a match is investigated. Analysis is conducted with respect to fields of education where one would predict that the longer a graduate stays unemployed the more likely they are to accept a job that does not match their field of education.

Following the extensive body of literature on the level of schooling (or years of schooling) obtained and the actual level needed to perform a job, measures of overeducation (more education obtained than needed) and undereducation (an insufficient level of education to perform a job) were introduced. Based on the Standard Classification of Occupations (SCO or *Standardna Klasifikacija Poklicev – SKP* in Slovenian) and data on first occupation a graduate secured, measures of overeducation were assigned to every graduate in the dataset. This chapter further includes the effect of overeducation on the likelihood of a match, meaning that it investigates if the graduates are also more likely to be mismatched if they are overeducated.

This chapter adds to the literature in several ways. First, it includes an ability measure which was one of the limitations of the pioneering mismatch study by Robst (2007). Second, the quality of a match in terms of a mismatch, a weak match or a match is objectively assigned.⁵⁹ Self-reported results were considered a drawback of the mentioned pioneering study. Using data on first occupation a graduate secured the quality of a match was assigned based on the official classification of (which is aligned with the International Labour Organisation (“ILO”) classification and explained below). Third, the mentioned classification also allows controlling for overeducation separately and objectively. Fourth, the first labour market outcomes of graduates are used. Fifth, the data on the three generations of graduates from 2007 to 2009 who entered the labour market from January 2007 onwards actually investigate recent labour market trends in youth employment especially in the changed economic conditions. Sixth, this chapter investigates how the spell of unemployment affects the likelihood of a match. In addition, studies that use microeconomic data in this context are rare, except for example Andrews, Bradley and Upward (2001).

⁵⁹ There are three approaches in the literature used to identify the match: normative (Robst, 2007; Yakusheva, 2010), statistical (for example Verdugo and Verdugo, 1989), and self-declared (for example Sloane et al., 1999; Battu et al., 2000).

This chapter starts with a literature review, research questions and hypotheses, continues with the data description and the methodological part. The results are presented in Section 4.5 and a conclusion is given in Section 4.6.

4.2 LITERATURE REVIEW AND RESEARCH QUESTIONS

To fully utilise the stock of human capital in the population it is essential to match individuals' education-specific skills (as opposed to more general skills) with occupational job characteristics (Nordin, Persson and Rooth, 2010). Sattinger (1993) shows that the quality of a job match determines the productivity level and earnings in a job. To achieve the optimal allocation every worker must be matched to a job that he or she performs better than all other workers. Most literature on mismatches has focused on differences between the achieved schooling level of an individual and the level of education required for the job an individual performs (for example, Sicherman, 1991; Hersch, 1991; Robst, 1995, Alba-Ramirez, 1993; Sloane, Battu & Seaman, 1999). Using concepts of achieved and required education, measures of over- and under-education are derived to study the consequences of a mismatch mostly on wages (Bauer, 2000; Groot and van den Brink, 2000; McGuinness, 2006; Battu, Belfield and Sloane, 1999; Grazier, O'Leary and Sloane, 2008; Green and Zhu, 2008).

Very few studies have so far focused on the match between an individual's field of education and their occupation, also referred to as a horizontal match (Boudarbat and Montmarquette, 2007). The pioneering paper by Robst (2007) and further study by Nordin, Perrson and Rooth (2010) stress the importance of another type of educational matching problem that should be investigated – the field of education-occupation mismatch. These occupation mismatches can be the result of incomplete information on the abilities of school-leavers and the characteristics of jobs offered by employers (Wolbers, 2003). A match between a specific degree or college major and a job after graduation is uncertain. Therefore, there exist some costs in the form of lower wages when a job does not match an individual's specific knowledge they acquired at university (Robst, 2007). Garcia-Espejo and Ibanez (2006) defines two different matches: education match as the correspondence of education level and the level required for the job, and skill match as the correspondence between the knowledge acquired during schooling and the knowledge required to perform one's job. Allen and van der Velden (2001) investigate the relationship between the knowledge acquired during the education process and the knowledge required on the job and define a skill match. They take into account the heterogeneity of skills acquired by individuals who have the same educational level (Halaby, 1994). Yakusheva (2010) defines occupational mismatch as a situation in which a position is filled by an individual with the wrong type of education. In this chapter I follow Nordin, Perrson and Rooth (2010) who define the match between the field of education and occupation as a field of education-occupation match.

Matching between an individual and a job has been widely addressed and different theories have been proposed concerning the determinants of a match.⁶⁰ Two different, prevailing theories explain the match: human capital theory and screening theory. According to human capital theory individuals invest differently in education (human capital) and education generates skills which determine an individual's productivity and affects their salaries. Garcia and Espejo Ibanez (2006) provide a relevant review of different matching methods: according to screening theory, education does not reflect an increase of productivity but is an indicator of innate ability (Arrow, 1973; Spence, 1973). In addition, the job competition model proposed by Thurow (1975) explains education similarly as a screening tool but focuses on it as a signal of an individual's capacity to be trained within a firm (on-the-job training). Within this model, Osterman (1983) develops a waiting time or moratorium model where first jobs are acquired in a secondary labour market with low stability and constitute a moratorium which ends in the acquisition of a primary job.

In the literature either objective or subjective measurements have been constructed to define a match. When using objective measures labour analysts produce indicators based on the occupational classification of jobs and their correspondence with the adequate educational level (Rumeberger, 1987). Subjective measures are self-reported by individuals (Robst, 2007). Since several papers point out the limitations of such an approach (Robst, 1995), this analysis instead follows the objective measure approach.

In addition, individuals select a field of education with the expectation of working in a job related to that field. When selecting a field of education a rational individual considers monetary returns and invested effort or costs as well as other non-monetary returns.^{61,62} In addition, after graduation costs also arise when an individual faces unemployment or, as mentioned, their specific knowledge is not utilised. Using data on US college graduates, Robst (2007) finds that having a major subject that does not match the occupation is associated with a roughly 11 percent lower annual income compared to having a major subject that does. Thus, the income penalty for a field of education-occupation mismatch seems to be larger than the penalty for being overeducated or undereducated.

The previous chapter examined the duration of unemployment of Slovenian graduates who first enter the labour market after graduating and found that it varies for different fields of study, study programmes and higher education institutions. However, the quality of a job in respect to a vertical and horizontal match was not investigated. This chapter attempts to shed

⁶⁰ At this point, there is no difference made regarding the match as a level of education or specific field of study/major.

⁶¹ Woessmann (2008) provides an excellent review of the non-monetary individual effects of education (life-satisfaction, happiness, health, children's well-being, efficiency of choosing) and non-monetary effects for society (democratisation, lower homicide rates and property crime, social cohesion and trust, reduction of poverty and population growth rates).

⁶² The returns to education vary for different fields of study. Graduates from Health, Science, Engineering and Business have higher returns than graduates from, for example, the Humanities and Arts and some other Social Science fields (for example, Altonji, 1993; Arcidiacono, 2004, Sloane and O'Leary, 2005 and Kelly, O'Connell and Smyth, 2010).

light on the likelihood of a match for graduates from different fields of education for the three generations of graduates in focus. The proposed hypotheses are:

Hypothesis 1: The likelihood of a field of education-occupation match varies for different fields of education also in the first occupation a graduate secures.

Hypothesis 1.1: The likelihood of a field of education-occupation match is higher for graduates from ISCED 72 (Health).

Hypothesis 1.2: The likelihood of a field of education-occupation match is higher for graduates from ISCED 5 (Engineering, Manufacturing and Construction).

However, there are very interesting empirical questions about whether there is persisting mismatch for specific fields of education and whether the likelihood of a match changed during the observed years.

Hypotheses 2: The likelihood of a field of education-occupation match is constant over time.

Based on job search theory I want to test if the probability of accepting a job that does not match the specific knowledge a graduate possesses increases with the duration of unemployment. Another interesting empirical question is whether this probability has been affected by the crisis.

Hypotheses 3: The probability of a mismatch increases with the duration of unemployment.

Reasons for the mismatch can be twofold: from the supply side (an increasing supply of graduates, especially in the social sciences) or the demand side (the need of companies and the economy for specific labour in the sense of the level of education or graduates from a specific field of education). This chapter does not provide evidence of the reasons for a match or the extent of a mismatch; instead, it focuses on providing evidence of the phenomena.

4.3 DATA DESCRIPTION

This chapter uses an Employer-Employee matched dataset from the Statistical Office of the Republic of Slovenia for three generations of graduates from 2007 to 2009 (as described in Section 3.4)⁶³. Data from the Statistical Register of the Labour-Active Population (“SRDAP”) are used to obtain the first jobs of graduates and to classify a match, a weak match or a mismatch. To define it, the Standard Classification of Occupation 2008 (SKP 2008) prepared by the Statistical Office of the Republic of Slovenia is employed which is a national standard used to collect, analyse and distribute statistical data and is in line with the Resolution of the International Labour Organisation (ILO) and update of the International Standard

⁶³ In Chapter 3 I included higher education graduates who graduated from the following undergraduate types of education: professional higher 1st Bologna cycle graduates, professional higher (former) graduates, academic higher 1st Bologna cycle graduates and academic higher (former) graduates. In this chapter the analysis is expanded and also includes graduates of professional 2-year programmes (*višješolski programi* in Slovenian).

Classification of Occupation 2008 (ISCO-08). Different skills are needed for different occupations. ISCO-08 adopts *skill* as the ability to carry out the tasks and duties of a given job, where two dimensions of skill are used to arrange occupations into groups. These are *skill level*⁶⁴ and *skill specialisation*. There are four skill levels defined and for skill level also the level of formal education of the International Standard Classification of Education (ISCED-97) is defined. The knowledge and skills required at Skill Level 3 are usually obtained as the result of study at a higher educational institution following the completion of secondary education for a period of 1 – 3 years (ISCED Level 5b). The knowledge and skills required at Skill Level 4 are usually obtained as the result of study at a higher educational institution for a period of 3 – 6 years leading to the award of a first degree or higher qualification (ISCED Level 5a or higher).⁶⁵

A variable of overeducation is assigned to graduates who perform jobs where a lower level of education (as defined in ISCED-97) is required. Although formal education and training requirements are only one component of the measurement of skill level and should be seen as indicative only, they are a measure that is used to define overeducation. Overeducation is defined as the excessive schooling an individual has acquired where less would be required for a specific occupation. Graduates who graduated from a study programme of the first cycle of tertiary education are, based on ISCED 97, classified on the 5th level and fulfil requirements for the third and fourth skill levels. Therefore, these graduates should perform occupations in the groups: (1) legislators, senior officials and managers; and (2) professionals. Graduates holding a 2-year professional diploma acquire a third skill level and fulfil requirements for (3) technical and associate professionals.⁶⁶ I follow the body of literature on vertical matches where a person is overeducated if the level of schooling they possess exceeds the actual needs of the job they perform. I use the ISCO-08 classification of occupations which, based on skill level, classifies occupations in 10 major groups. For (1) legislators, senior officials and managers and (2) professionals the ISCO-08 assumes the highest skill level that is acquired during tertiary education. In order to define the overeducation of graduates, overeducation is considered if a graduate secures employment in the group of clerical support workers, service and sales workers, skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators, and assemblers as well as elementary occupations.⁶⁷

⁶⁴ Skill level is defined as a function of the complexity and range of tasks and duties to be performed in an occupation. Skill level is measured operationally by considering one or more of: (1) the nature of the work performed in an occupation in relation to the characteristic tasks and duties defined for each ISCO-88 skill level; (2) the level of formal education defined in terms of the International Standard Classification of Education (ISCED-97) required for the competent performance of the tasks and duties involved; and (3) the amount of informal on-the-job training and/or previous experience in a related occupation required for the competent performance of these tasks and duties.

⁶⁵ In some cases, experience and on-the-job training may substitute for formal education. In many cases appropriate formal qualifications are an essential requirement for entry to an occupation.

⁶⁶ Based on an in-depth interview with a statistician responsible for ISCO-08, in fact all graduates should perform occupations in the first two groups.

⁶⁷ By introducing these measures I might introduce some bias as certain occupations in the group of technical and associate professionals are clearly for non-graduates; however, there are also some that graduates are

Horizontal matching is done separately for every field of education based on the International Standard Classification of Education (ISCED). Slovenian higher education institutions offer education in eight different fields of education which each have four levels of specificity⁶⁸. Data include the second level of specificity that accounts for 22 different fields of education (presented in Appendix 7). However, to minimise the bias when assigning the quality of a match, a third level is also considered that further specifies subfields and allows me to control for the diversity of each field of education (the number of all specifications amounts to 593). In Appendix 8 an example of the third level of specification for field of education - Education.

Data on graduates include only the field of education in the second level of specification, although the third level (subfield) was very important when it came to assigning the occupations that match a specific field of education. For every field of education, including the subfields of education, a match, a weak match or a mismatch was assigned based on the Standard Classification of Occupation (Appendix 9). This classification has ten different groups and five different levels. The ten different groups are: (0) armed forces; (1) legislators, senior officials and managers; (2) professionals; (3) technicians and associate professionals; (4) clerks; (5) service workers and shop and market sales workers; (6) skilled agricultural and fishery workers; (7) craft and related trades workers; (8) plant and machine operators and assemblers; (9) sales and services elementary occupations. Every group has several subgroups. For example, if the focus is on professionals, there are several subgroups: (21) physical, mathematical and engineering science professionals; (22) life science and health professionals; (23) college, university and higher education teaching professionals; (24) other professionals where several groups of occupations are included with another level specified: (241) business professionals; (242) legal professionals; (243) archivists, librarians and related information professionals; (244) social science and related professionals; (245) writers and creative or performing artists; (246) religious professionals; (246) other public service administrative professionals not elsewhere classified). The number reveals the classification as well as the level of classification. The more numbers there are, the more specific the occupation is. For example, level 241 is a subgroup of business professionals and consists of several other subgroups: (2411) Accountants; (2412) Personnel and careers professionals; (2419) Business professionals not elsewhere classified. An additional level is defined that actually is an occupation. For example, for (2411) accountants there are the occupations described in Table 18. All the groups, subgroups and occupations sum up to 2,585 different specifications.

educated for or which constitute a stepping stone in their career (such as physical and engineering science technician). Therefore, in order not to overestimate the over-education of Slovenian graduates I instead follow a conservative measure.

⁶⁸ Because of the focus on higher education general and basic programmes, literacy and numeracy and personal development fields are excluded.

Table 18: An example of a classification

Level of classification	Classification	Descriptor
1	2	PROFESSIONALS
2	24	OTHER PROFESSIONALS
3	241	BUSINESS PROFESSIONALS
4	2411	Accountants
5	2411.00	Financier, accountant, auditor (not specified)
5	2411.01	Tax inspector
5	2411.02	Tax consultant
5	2411.03	Rates inspector
5	2411.04	Financial analyst
5	2411.05	Financial inspector
5	2411.06	Financial consultant
5	2411.07	Firm's value assessor
5	2411.08	Auditor
5	2411.09	Accountants
5	2411.10	Inspector
5	2411.11	Real estate consultant
5	2411.12	Budget consultant

Source: SORS, 2010

The quality of a match (match, weak match or mismatch) was assigned in the following way: for every ISCED subgroup a group of occupations was assigned as a match, another subgroup of occupations as a weak match and all other groups were considered a mismatch. Following Yakusheva (2010), a match is defined on an individual basis. The quality of a match is defined based on the field of education and occupation a graduate secures. A match is assigned if the occupation is closely related to the field of education, meaning that the specific knowledge acquired at a higher education institution is utilised. A weak match is found if the occupation relates to the one a graduate should occupy or one where their specific knowledge is moderately utilised. Finally, a mismatch is found if a graduate secures an occupation for which none of the specific knowledge is required and mainly general knowledge is utilised or some other specific knowledge is needed that is acquired in a different field of education. For example, for the ISCED 14 field of education, which is teacher training and education science, there are groups of occupations that such education provides the necessary knowledge to perform the work. At this point, there has been no consideration regarding the level of education as there is a special variable measuring an individual's level of education and the level needed. The groups of occupations as well as some specific occupations that either match or weakly match the education are presented in Appendix 10. For some groups of occupations, all the occupations in a subgroup are considered, although in some subgroups only few of them are taken into account.

The sample includes graduates who studied full time, had never been employed before graduation and graduated in the years from 2007 to 2009. Following McGuinness and Sloane, 2011, master and PhD graduates as well as those who were employed while studying were excluded from the sample). After excluding observations with missing data, I was left with 27,875 observations (Table 19). Due to data limitations, only the first nine months after graduation can be taken into consideration. An observation is included in the sample if a graduate secured a job in that period. As presented in Section 3.4. a measure of ability is included in the data. After secondary school, graduates could either take a matriculation exam or a final exam to enrol in a higher education institution. This ability variable included in the analysis controls for the heterogeneity of students and is one of the contributions of this chapter. However, some observations have a missing value for the ability variable and I therefore include 24,732 observations in the subsample. The subsample is further divided into two parts: one with graduates taking a matriculation exam (13,761 observations with a mean score of 19.69 points and a standard deviation of 5.16 points) and one with graduates taking a final exam (10,971 observations with a mean score of 3.64 points and a standard deviation of 0.88 of a point).

Table 19 reveals that about one-third of the sample constitutes graduates from each generation. The majority are female graduates and most obtained an education in Business and Administration. In the observed years a graduate could have finished different types of study. In the period under study, the majority finished the former academic higher education, namely academic education before the Bologna reform was introduced. Graduates with an academic higher education (1st Bologna cycle) were increasing in the years being observed. In the sample, nearly 4 percent possess this kind of education and the majority of them are graduates of the social sciences, business and law.⁶⁹ Most of them studied at Public University 1, where 63.98 percent of the graduates studied, 21.11 percent studied at Public University 2, 3.34 percent at Public University 3, 0.38 percent at Private University 1, and 1.98 percent at several independent higher education institutions, respectively. 9.23 percent of the graduates studied at one of the upper vocational study schools.

⁶⁹ In 2007 the only academic higher education (1st Bologna cycle) involved graduates of the Social Sciences, Business and Law. Their number in the whole generation amounted to 202 (MVZT, 2010). In 2008, the number of these graduates amounted to 296 and in 2010 to 1,115, where again the majority of them (87.98 percent) were graduates of the Social Sciences, Business and Law.

Table 19: Sample characteristics: number of observations and share of them in each year, share of female graduates and share of graduates from each ISCED field of education

Number of observations	27,875
2007 (in %)	32.18
2008 (in %)	32.49
2009 (in %)	35.33
Female (in %)	63.92
<i>Fields of Education</i>	
Education	12.24
Arts	2.07
Humanities	5.90
Social and behavioural science	8.83
Journalism and information	0.95
Business and administration	24.58
Law	4.76
Life sciences	1.46
Physical sciences	1.07
Mathematics and statistics	0.45
Computing	3.53
Engineering and engineering trades	8.67
Manufacturing and processing	3.68
Architecture and building	3.58
Agriculture, forestry and fishery	3.10
Veterinary	0.54
Health	7.59
Social services	0.99
Personal services	1.98
Transport services	2.83
Environmental protection	0.46
Security services	1.73
<i>Types of Education</i>	
Higher Vocational	9.23
Professional higher (former)	28.61
Professional higher (1 st Bologna cycle)	1.39
Academic higher (former)	56.78
Academic higher (1 st Bologna cycle)	3.99
<i>Higher Education Institutions</i>	
Public university 1	63.98
Public university 2	21.11
Public university 3	3.34
Private university 1	0.38
Upper schools for vocational education	9.21
Independent higher education institutions	1.98

Source: SORS, 2010; own calculations

4.4 METHODOLOGY

First, I investigate if the likelihood of a match varies for different fields of study. Based on the literature (among others Robst, 2007; Caroleo and Pastore, 2012), there is a clear case that being mismatched ($j=0$) is worse than being weakly matched ($j=1$) and better than being weakly matched is if a graduate is completely matched ($j=2$). There is a clear order of the possible labour market outcomes and I therefore use an ordered logit model. This ordered logit model uses a logistic regression and calculates the likelihood of a match. The logit model is used to make inferences about the first two hypotheses: whether the likelihood of a match varies for different fields of study, and if it is constant over time.

Probability Y_{ij} as the probability that the i th individual is in the j th or higher category is calculated. Following Cameron and Trivedi (2005) the general logit model takes the form

$$p_i = Pr[y_i = 1|x_i] = \frac{\exp(\beta_1 + \beta_2 x_i)}{1 + \exp(\beta_1 + \beta_2 x_i)} \quad (4.1)$$

Which also ensures that $0 < p_i < 1$. The model is estimated by maximum likelihood and marginal effects for the logit model are calculated as:

$$\frac{dp_i}{dx_i} = \frac{\exp(\beta_1 + \beta_2 x_i)}{(1 + \exp(\beta_1 + \beta_2 x_i))^2} \beta_2 \quad (4.2)$$

Ordered model with 3 alternatives is then defined as

$$y_i = j \text{ if } \alpha_{j-1} < y_i^* \leq \alpha_j, \quad (4.3)$$

where $\alpha_0 = -\infty$. Then

$$\begin{aligned} Pr[y_i = 1] &= Pr[\alpha_{j-1} < y_i^* \leq \alpha_j] \\ &= Pr[\alpha_{j-1} < x_i' \beta + u_i \leq \alpha_j] \\ &= Pr[\alpha_{j-1} - x_i' \beta < u_i \leq \alpha_j - x_i' \beta] \\ &= F(\alpha_j - x_i' \beta) - F(\alpha_{j-1} - x_i' \beta) \end{aligned}$$

where F is the cdf of u . The regression parameters β and the 2 threshold parameters α_1, α_2 are obtained by maximizing the log-likelihood with p_{ij} as defined in (4.3). u is logistic distributed with $F(z) = e^z / (1 + e^z)$.

Marginal effects are calculated

$$\frac{\partial Pr[y_i=j]}{\partial x_i} = \{F'(\alpha_{j-1} - x_i' \beta) - F'(\alpha_j - x_i' \beta)\} \beta, \quad (4.4)$$

where F' denotes the derivative of F .

The equation for the whole sample is run first and then repeated separately for genders. Several specifications are tested, where a dummy variable for fields of education, 1 type of education, and higher education institutions are assigned, respectively. The test score and duration of unemployment is an integer number. The model estimates from the logistic regressions are maximum likelihood estimates arrived at through an iterative process (Long, 2007; Freese and Long, 2006). The STATA module reports pseudo R^2 for evaluating the goodness of fit.

The likelihood of a match is calculated with different specifications:

Specification 1:

$$Y_{ij} = f(\text{gender}, \text{score}, \text{year of graduation}, \text{duration of unemp.}, \text{field of education})$$

Specification 2: $Y_{ij} = f(\text{gender}, \text{score}, \text{year of graduation}, \text{type of education}, \text{field of education})$

Specification 3:

$$Y_{ij} = f(\text{gender}, \text{score}, \text{year of graduation}, \text{type of education}, \text{HE institution}, \text{field of education})$$

After every ordered logit I calculate the probability of being matched and report marginal effects.

In order to test the third hypothesis and investigate how the duration of unemployment affects the probability of an unemployment mismatch, I apply a probit model where the outcome variable y takes one of two values:

$$y = \begin{cases} 1 & \text{with probability } p \\ 0 & \text{with probability } 1 - p \end{cases},$$

where 1 represents a mismatch and 0 a match or a weak match.

Following Smith, McKnight and Naylor (2000) and Johnston and DiNardo (1997), I calculate the probability of employment as an alternative to unemployment after graduation with respect to the duration of unemployment measured in months:

$$p_i \equiv \Pr_i(y_i = 1 | X_i) = \Phi(X_i\beta)$$

Independent variables X_i are vector covariates of personal characteristics (gender, ability⁷⁰), studying characteristics (year of graduation, duration of study, ISCED field of education,

⁷⁰ The choice of field of education depends on ability (Arcidiacono, 2004) and some control for ability needs to be taken into consideration. To deal with unobserved heterogeneity, Kelly, O'Connell and Smyth (2009) propose using pre-college test score data and I follow that suggestion.

higher education institution and study programme) and labour market outcomes (duration of unemployment, classification of occupation). i indexes individuals, Φ is the standard cumulative normal probability distribution and $X_i\beta$ is called the probit score or index. After the probit I calculate the marginal effects.

4.5 RESULTS AND DISCUSSION

Based on the matching mechanism described in Section 4.3. the quality of a field of education-occupation match was assigned to each individual. Table 20 represents the distribution of a match based on personal characteristics (gender) and year of graduation. 48.57 percent of all graduates in the three generations managed to acquire a job that matched their field of education, 6.98 percent had a weak match and 44.45 percent did not match their field of education. A mismatch of occupation and field of education was more common for women, with 46.04% of female graduates having been mismatched in their first job after graduation. This is in fact one of the results that allows some inferences about the effect of gender on the likelihood of a match and is investigated later in this section. The percentage share of matched graduates decreased in time. In 2007, 58.67 percent of graduates found jobs that closely matched their field of education, whereas in 2009 only 36.00 percent of those who found jobs in the first nine months after graduation actually found a job that matched their field of education.

Table 20: The match between the graduates' field of study and first occupation in percent

	Matched (%)	Weakly Matched (%)	Mismatched (%)	Overeducated (%)
Total	48.57	6.98	44.45	40.10
Men	49.25	9.11	41.64	36.37
Women	48.18	5.78	46.04	42.20
Year	-----			
2007	58.67	8.27	33.05	27.50
2008	52.11	7.24	40.53	36.35
2009	36.00	5.57	58.43	55.03

Source: SORS, 2010; own calculations

From Table 20 40.10 percent of all graduates in the sample were overeducated, more precisely, 42.20 percent of the female and 36.37 of the male graduates, respectively. The share of overeducated graduates was increasing in the last three years. In 2007, 27.50 percent of the graduates were overeducated, in 2008 there were 36.35 percent and in 2009 55.03 percent.

4.5.1 THE EFFECT OF DIFFERENT FIELDS OF EDUCATION ON THE LIKELIHOOD OF A MATCH FOR GRADUATES TAKING A MATRICULATION EXAM

First, I estimate the effect of different fields of education on the likelihood of a match for graduates who took a matriculation exam after secondary school. Table 21 contains results from the ordered logit regressions where a likelihood of a match (y) is calculated using different model specifications and run for the sample of graduates who took a matriculation exam at the end of secondary education. Relative to the omitted category (base group) of graduates of Business and Administration the extent of the mismatch varies across different fields of education. The average likelihood of a field of education-occupation match for the base group (graduates from Business and Administration who finished the former academic programme former at Public University 1) was 0.434. The highest likelihood of a match was experienced by graduates from Veterinary and Health, where the likelihood rises by 0.376 and 0.363, respectively. A statistically significantly higher likelihood of a field of education-occupation match is also exhibited by graduates from Architecture and Building (0.233), Education (0.195) all science fields of education (Life sciences, Physical sciences, Mathematics and Statistics and Computing). From the broader group of social sciences fields of education, a higher likelihood than the base group is exhibited by Law graduates who on average have a 0.185 higher likelihood of a field of education-occupation match than the base group. Some of these occupations typically have a governmentally regulated employment process (for example teachers, lawyers and doctors), are in high demand in the labour market and exhibit high employability (as reported in Chapter 3 and in Farčnik and Domadenik, 2012) or require field-specific knowledge (Robst, 2007) or both. Graduates with the lowest probability of a match and therefore the highest probability of a mismatch are Service graduates (graduates of Environmental protection, Transport and Security services), and other Social Sciences, except Law graduates. The smallest likelihood of a match is shown by graduates from Environmental protection who have a 0.328 lower likelihood of a field of education-occupation match than the graduates from Business and Administration (the base group).

I obtain slightly different results when running the ordered logit separately for females. For female graduates it can be observed that from the first specification in Appendix 11 that the likelihood of a field of education-occupation match for the base group was 0.429. The highest likelihood of a match is again exhibited by graduates from Health Care. It is higher than the likelihood of a base group by 0.360 and is higher than for the graduates in the entire sample. Interestingly, female graduates in some technical fields of education exhibit a lower likelihood of a field of education-occupation match than in the full sample. They are, for example, female graduates from Manufacturing and Processing, Engineering and Mathematics and Statistics. In those fields the majority of graduates are men.

The year of graduation also affects the likelihood of being matched. The probability of a field of education-occupation match on average drops by 0.159 for every year later than 2007.⁷¹ When I include type of education in Specification 2, the year of graduation is significant at 1% and the same goes for Specification 3 where the probability of an education-occupation match on average fall by 0.141 for every later year of graduation after 2007. Therefore, I find that the later a graduate graduated the less likely they are of securing an occupation that matches their field of education. This allows some inferences about the hypothesis on the effect of a different year of graduation on the likelihood of a match, and in some way also provides some rationale about the effect of the economic downturn.⁷² Another very common trend in Slovenia is an extended time before graduating. Interestingly, adding in the above average time to graduate does not affect the likelihood of being matched⁷³. When also an overeducation dummy is included in the model (Appendix 13) the results show that the likelihood of field of education-occupation mismatch decreases. This means that if graduates are overeducated they are less likely to secure an employment where the knowledge acquired during education is utilized. Instead of including a measure of effort invested, I include ability which improves the explanatory power of the model and therefore all specifications include ability measures. I find that the likelihood of a field of education-occupation match rises slightly for students who scored higher points at a matriculation exam. The change in probability is 0.001 (Specifications 2 and 3, respectively) to 0.002 (Specification 1, but an insignificant change). For a subsample of female graduates, at the level of 5% the matriculation exam score statistically significantly affects the likelihood of a field of education-occupation match in Specification 3, where the probability increases by 0.002.

⁷¹ Table 21 shows that the marginal effect of year of graduation is not significant, although at -0.647 the likelihood of a field of education-occupation match is highly significant at 1%.

⁷² The reasons for the negative trend of the likelihood of a match are not considered here. I do not have sufficient data to make inferences about the effect of the decreased overall demand for labour, the reduced demand for new graduates or increased supply of new graduates.

⁷³ Including the above-average time to graduate did not affect the likelihood of a match significantly; therefore the specification is omitted from the results.

Table 21: Ordered logit results for the likelihood of an education-occupation match (marginal effects) for graduates who took a matriculation exam after secondary school

	Specification 1	Specification 2	Specification 3
Number of observations	13,761	13,761	13,761
Pseudo R ²	0.1182	0.1381	0.1397
Probability of education-Occupation match for base group	0.434	0.421	0.421
Variables			
	<i>Marg. Eff.</i> (<i>Std. Err.</i>)	<i>Marg. Eff.</i> (<i>Std. Err.</i>)	<i>Marg. Eff.</i> (<i>Std. Err.</i>)
<i>Personal Characteristics</i>			
women	-0.020 ^c (0.011)	-0.023 ^b (0.011)	-0.024 ^b (0.011)
test score	0.002 (0.002)	0.001 ^c (0.000)	0.001 ^c (0.001)
<i>Graduation Characteristics</i>			
year of graduation	-0.159 (0.159)	-0.141 ^a (0.015)	-0.141 ^a (0.048)
<i>Types of Education</i>			
Higher Vocational		-0.173 ^a (0.014)	-0.175 ^a (0.015)
Professional higher (former)		-0.107 ^a (0.012)	-0.119 ^a (0.012)
Professional higher (1 st Bologna cycle)		-0.233 ^a (0.022)	-0.256 ^a (0.020)
Academic higher (1 st Bologna cycle)		-0.350 ^a (0.011)	-0.356 ^a (0.011)
<i>Higher Education Institutions</i>			
Public University 2			-0.024 ^b (0.011)
Public University 3			0.111 ^a (0.024)
Private University 1			0.222 ^c (0.133)
Independent higher education institutions			0.081 ^b (0.035)
<i>Fields of Education</i>			
Education	0.195 ^a (0.014)	0.052 ^a (0.016)	0.052 ^a (0.016)
Arts	-0.038 (0.035)	-0.161 ^a (0.029)	-0.165 ^a (0.029)
Humanities	-0.206 ^a (0.020)	-0.289 ^a (0.015)	-0.303 ^a (0.014)
Social and behavioural science	-0.245 ^a (0.012)	-0.312 ^a (0.011)	-0.316 ^a (0.011)
Journalism and information	-0.097 ^b (0.041)	-0.152 ^a (0.039)	-0.157 ^a (0.039)
Law	0.185 ^a	0.038	0.040 ^c

	(0.019)		(0.023)		(0.023)
Life sciences	0.163	a	0.000		-0.007
	(0.036)		(0.037)		(0.038)
Physical sciences	0.180	a	0.031		0.022
	(0.046)		(0.049)		(0.049)
Mathematics and statistics	0.057		-0.051		-0.048
	(0.050)		(0.047)		(0.047)
Computing	0.210	a	0.115	a	0.120
	(0.028)		(0.030)		(0.030)
Engineering and engineering trades	0.104	a	0.023		0.028
	(0.018)		(0.019)		(0.019)
Manufacturing and processing	-0.132	a	-0.188	a	-0.186
	(0.021)		(0.019)		(0.019)
Architecture and building	0.233	a	0.109	a	0.107
	(0.022)		(0.025)		(0.026)
Agriculture, forestry and fishery	-0.163	a	-0.218	a	-0.216
	(0.022)		(0.019)		(0.019)
Veterinary	0.376	a	0.248	c	0.241
	(0.104)		(0.150)		(0.152)
Health	0.363	a	0.301	a	0.301
	(0.015)		(0.018)		(0.018)
Personal services	-0.010		0.003		-0.032
	(0.027)		(0.028)		(0.029)
Transport services	-0.296	a	-0.299	a	-0.296
	(0.017)		(0.016)		(0.016)
Environmental protection	-0.328	a	-0.320	a	-0.337
	(0.040)		(0.038)		(0.035)
Security services	-0.248	a	-0.285	a	-0.272
	(0.024)		(0.019)		(0.021)

1. *y* is the likelihood of a match for a male graduates from Business and Administration who finished the old university programme at Public University 1, and had an average test score at a matriculation exam

2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2010; own calculations

The likelihood of being matched or mismatched also depends on the type of education and higher education institution. I again calculate the likelihood for the base group who graduated from the former academic type of education at Public University 1 and report the marginal effects. Adding in types of study and higher education variables improves the explanatory power of the model by improving pseudo R^2 . Table 21 reveals that all the marginal effects of other types of study are statistically significantly negative at 1%. Graduating from an academic programme (1st Bologna cycle) reduces the likelihood of a field of education-occupation match by 0.350, a professional programme (1st Bologna cycle) by 0.233, a former professional programme by 0.107 and a vocational programme by 0.176, respectively. The results are similar for the subsample of female graduates, except that the negative marginal effects are slightly smaller. Note that graduates who finished a 1st Bologna cycle – either professional or academic – exhibit a lower probability of employment (as calculated in

Chapter 3 and reported in Farčnik and Domadenik, 2012), their likelihood of securing a job that does not match their field of study is higher than graduates from a former academic programme. Controlling for higher education institution, I find that compared to the omitted category of graduates from Public University 1, the likelihood of a match on average increases for all other institutions.⁷⁴

4.5.2 THE EFFECT OF DIFFERENT FIELDS OF STUDY ON THE LIKELIHOOD OF A MATCH FOR GRADUATES TAKING A FINAL EXAM

The analysis above is repeated for the graduates who took a final exam after secondary school. Again the base group encompasses graduates from Business and Administration who graduated from the former academic type of education at Public University 1. The subsample now includes 10,971 observations and the likelihood of a field of education-occupation match for the base group and marginal effects after the ordered logit are reported in Table 22. On average, the likelihood of a field of education-occupation match for the base group was 0.531, which is higher than for the graduates who took a matriculation exam. However, the base group exhibits one of the highest likelihoods of a field of education-occupation match. A higher likelihood of a match is only exhibited by Health Care graduates by 0.163 and Computing graduates by 0.017, respectively. The smallest likelihood of a match was shown by graduates from Environmental Protection and Social Science. Very interestingly, I find that graduates who exhibit the highest likelihood of a field of education-occupation match in the subsample of graduates who took a matriculation exam exhibit a lower likelihood in this subsample. For example, Mathematics and Statistics graduates have, at the 1% level, a statistically significantly smaller likelihood (0.309) of a match than Business and Administration graduates. The same goes for other Science and Technical fields of study. Probably the graduates of Business and Administration who took a final exam possess more general skills that are rewarded in the labour market and other graduates with specific technical skills are not recognised at the same labour market. Most of the marginal effects are smaller for this subsample compared to graduates who took a matriculation exam. The results for female graduates are reported in Appendix 11. I find that the probabilities are very much consistent with the whole sample.

⁷⁴ This result should be interpreted with caution as I will continue this analysis with an investigation of both the effect of a different field of study and different study programme independently for each field of study. However, this is beyond the scope of this chapter.

Table 22: Ordered logit results for the likelihood of an education-occupation match (marginal effects) for graduates who took a final exam after secondary school

	Specification 1		Specification 2		Specification 3	
Number of observations	10,971		10,971		10,971	
Pseudo R ²	0.0986		0.1026		0.1046	
Probability of education-Occupation match for base group	0.531		0.531		0.531	
Variables						
	<i>Marg. Eff.</i> (<i>Std. Err.</i>)		<i>Marg. Eff.</i> (<i>Std. Err.</i>)		<i>Marg. Eff.</i> (<i>Std. Err.</i>)	
<i>Personal Characteristics</i>						
women	-0.031	a	-0.029	b	-0.033	a
	(0.011)		(0.011)		(0.011)	
test score	0.010	c	0.007		0.005	
	(0.006)		(0.006)		(0.006)	
<i>Graduation Characteristics</i>						
year of graduation	-0.090	a	-0.089	a	-0.089	a
	(0.006)		(0.004)		(0.011)	
<i>Types of Education</i>						
Higher Vocational			-0.107	a	-0.117	a
			(0.023)		(0.023)	
Professional higher (former)			-0.118	a	-0.111	a
			(0.013)		(0.013)	
Professional higher (1 st Bologna cycle)			-0.124		-0.137	
			(0.093)		(0.095)	
Academic higher (1 st Bologna cycle)			-0.171	c	-0.168	c
			(0.093)		(0.094)	
<i>Higher Education Institutions</i>						
Public University 2					-0.027	c
					(0.014)	
Public University 3					-0.033	
					(0.042)	
Private University 1					-0.376	a
					(0.041)	
Independent higher education institutions					0.033	
					(0.040)	
<i>Fields of Education</i>						
Education	-0.086	a	-0.156	a	-0.157	a
	(0.018)		(0.019)		(0.019)	
Arts	-0.271	a	-0.323	a	-0.330	a
	(0.024)		(0.022)		(0.022)	
Humanities	-0.353	a	-0.401	a	-0.407	a
	(0.014)		(0.013)		(0.013)	
Social and behavioural science	-0.425	a	-0.462	a	-0.467	a
	(0.011)		(0.010)		(0.010)	
Journalism and information	-0.092	c	-0.164	a	-0.174	a
	(0.054)		(0.053)		(0.052)	

Law	0.152 (0.024)	a	-0.221 (0.023)	a	-0.223 (0.023)	a
Life sciences	-0.217 (0.032)	a	-0.279 (0.029)	a	-0.286 (0.029)	a
Physical sciences	-0.205 (0.035)	a	-0.255 (0.033)	a	-0.265 (0.032)	a
Mathematics and statistics	-0.309 (0.046)	a	-0.306 (0.047)	a	-0.316 (0.045)	a
Computing	0.017 (0.033)		-0.009 (0.034)		-0.018 (0.034)	
Engineering and engineering trades	-0.082 (0.019)	a	-0.097 (0.019)	a	-0.107 (0.020)	a
Manufacturing and processing	-0.322 (0.016)	a	-0.319 (0.016)	a	-0.327 (0.016)	a
Architecture and building	-0.026 (0.028)		-0.055 (0.028)	c	-0.063 (0.028)	b
Agriculture, forestry and fishery	-0.366 (0.017)	a	-0.373 (0.017)	a	-0.379 (0.017)	a
Veterinary	-0.174 (0.040)	a	-0.241 (0.037)	a	-0.249 (0.036)	a
Health	0.163 (0.021)	a	0.136 (0.022)	a	0.129 (0.023)	a
Personal services	-0.137 (0.038)	a	-0.102 (0.039)	a	-0.093 (0.045)	b
Transport services	-0.452 (0.013)	a	-0.453 (0.034)	a	-0.456 (0.013)	a
Environmental protection	-0.511 (0.016)	a	-0.511 (0.016)	a	-0.510 (0.018)	a
Security services	-0.324 (0.031)	a	-0.307 (0.033)	a	-0.313 (0.033)	a

1. *y* is a probability that a male graduate from Business and Administration who finished the old university programme at Public University 1 had an average test score at the final exam

2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2010; own calculations

Again, women in the investigated subsample exhibit a lower likelihood of a field of education-occupation match relative to their male counterparts, as the probability of a match on average decreases by 0.029 (Specification 2) to 0.033 (Specification 3). Again graduating every later year than in 2007 statistically significantly decreases the likelihood of a match at the 1% level of significance. The marginal effect of the final exam score has the same sign as in the sample of graduates who took a matriculation exam. The effect is slightly higher and persistent and slightly higher also when I investigate the subsample of female graduates. When also an overeducation dummy is included in the model (Appendix 13) the results show that the likelihood of field of education-occupation mismatch decreases. This means that if graduates are overeducated they are less likely to secure an employment where the knowledge acquired during education is utilized.

The field of education-occupation mismatch also varies for different types of study. Graduates who graduated from a vocational type of education, a former professional study programme or a professional higher (1st Bologna cycle) study programme exhibit a lower likelihood of a field of education-occupation match by 0.107, 0.118 and 0.171, respectively. Looking at the subsample of female graduates the negative marginal effect of graduating from a professional higher (1st Bologna cycle) study programme decreases the likelihood of a field of education-occupation match even more (by 0.225). Graduating from all other higher education institutions except independent higher education institutions decreases the likelihood of a field of education-occupation match. However, the marginal effect of graduating from Independent higher education institutions is not significant. This finding does not change when I investigate the effect only for the female subsample.

4.5.3 THE EFFECT OF THE DURATION OF UNEMPLOYMENT ON THE PROBABILITY OF A MISMATCH IN TIME

Further on, the duration of unemployment and its effects on the probability of a match is estimated. Table 23 reports marginal effects on the probabilities of a mismatch for different fields of education relative to the omitted category and controlled by the time of unemployment and year of graduation. In this analysis only graduates who secured a job in the first nine months after graduation were included. The time spent in the labour market statistically significantly increases the probability of a mismatch, meaning that the longer a graduate searches for a job, the more likely they are to accept a job that mismatches their field of education. It is therefore assumed that they accept a job where more general knowledge is needed and does not utilise the skills and knowledge they acquired during their schooling. No significant effect is found when controlling for different higher education institutions. But when controlling for fields of education the probability of a mismatch decreases compared to the omitted category of Business and Administration only for Health and Computing graduates. These are the two groups of graduates who are the most employable (as calculated in Chapter 3 and reported in Farčnik and Domadenik, 2012).

Considering the three generations of graduates from 2007 to 2009, the probability of a mismatch differs. The results show that for these graduates who entered the labour market from January 2007 onwards the probability of a mismatch increased for every consequent generation of graduates. This means that in these times of a downward trend in economic conditions the probability of a match decreases and the probability of a mismatch increases.⁷⁵

⁷⁵ How exactly the economic conditions affect the probability of a match lies beyond the scope of this chapter.

Table 23: Probit estimates of the probability of education-occupation mismatch (marginal effects)

	Specification 1		Specification 2		Specification 3		
Number of observations	11,438		9,873		9,873		
Pseudo R2	0.1447		0.1572		0.1531		
Probability for the base group	0.322		0.327		0.327		
	dy/dx		dy/dx		dy/dx		
	(Std. Err.)		(Std. Err.)		(Std. Err.)		
Duration of unemployment	0.028	a	0.023	b	0.023	b	
	(0.006)		(0.007)		(0.007)		
Year of graduation	0.090	a	0.111	a	0.111	a	
	(0.005)		(0.006)		(0.006)		
Test score			-0.003	a	-0.003	a	
			(0.000)		(0.000)		
<i>Types of Education</i>							
Higher Vocational	#		0.153	a	0.158	a	
			(0.027)		(0.027)		
Professional higher (former)	#		0.094	a	0.094	a	
			(0.014)		(0.014)		
Professional higher (1 st Bologna cycle)	#		0.067		0.067		
			(0.014)		(0.064)		
Academic higher (1 st Bologna cycle)	#		-0.055		-0.054		
			(0.046)		(0.046)		
<i>Higher Education Institutions</i>							
Public University 2	#				0.011		
					(0.013)		
Public University 3	#				0.013		
					(0.034)		
Private University 1	#				0.279		
					(0.148)		
Independent higher education institutions	#				-0.044		
					(0.046)		
<i>Fields of Education</i>							
Education	#	0.067	a	0.095	a	0.093	a
		(0.017)		(0.021)		(0.021)	
Arts	#	0.180	a	0.217	a	0.221	a
		(0.043)		(0.050)		(0.050)	
Humanities	#	0.331	a	0.353	a	0.355	a
		(0.023)		(0.026)		(0.027)	
Social and behavioural science	#	0.486	a	0.519	a	0.522	a
		(0.016)		(0.017)		(0.018)	
Journalism and information	#	0.009		0.076		0.080	
		(0.055)		(0.065)		(0.066)	
Law	#	0.015		0.054	b	0.053	b
		(0.020)		(0.024)		(0.024)	
Life sciences	#	0.151	a	0.194	a	0.198	a
		(0.034)		(0.037)		(0.038)	

Physical sciences	#	0.092 (0.038)	b	0.153 (0.045)	b	0.157 (0.045)	b
Mathematics and statistics	#	0.335 (0.057)	a	0.366 (0.057)	a	0.367 (0.057)	a
Computing	#	-0.049 (0.028)	c	-0.064 (0.030)	b	-0.064 (0.030)	b
Engineering and engineering trades	#	0.163 (0.018)	a	0.145 (0.020)	a	0.146 (0.020)	a
Manufacturing and processing	#	0.487 (0.022)	a	0.458 (0.024)	a	0.459 (0.025)	a
Architecture and building	#	-0.024 (0.024)		-0.006 (0.026)		-0.005 (0.027)	
Agriculture, forestry and fishery	#	0.305 (0.029)	a	0.261 (0.031)	a	0.263 (0.031)	a
Veterinary	#	0.145 (0.051)	b	0.174 (0.052)	c	0.178 (0.55)	b
Health	#	-0.153 (0.014)	a	-0.164 (0.015)	a	-0.163 (0.016)	a
Personal services	#	0.146 (0.051)	b	0.087 (0.052)	c	0.080 (0.054)	
Transport services	#	0.579 (0.020)	a	0.559 (0.023)	a	0.558 (0.024)	a
Environmental protection	#	0.560 (0.046)	a	0.573 (0.067)	a	0.560 (0.074)	a
Security services	#	0.417 (0.038)	a	0.420 (0.045)	a	0.417 (0.045)	a

Note:

1. # dy/dx is for a discrete change of the dummy variable from 0 to 1
2. The base group are graduates of Business and Administration, that finished academic higher(former) at University 1.
3. c significant at 10%; b significant at 5%; a significant at 1%

Source: SORS, 2010; own calculations

4.6 CONCLUSIONS

The study of the field of education-occupation mismatch of Slovenian graduates who entered the labour market for the first time after graduation and secured a job in nine months after graduation at the latest shows that the likelihood of a mismatch increased in the last years with the changed economic environment. The so-called horizontal mismatch is even bound to increase due to two main factors: the mounting complexity of the industrial structure, which causes a mismatch between the composition of labour demand and supply by educational types and skills and the insufficient coordination of educational institutions with labour market developments (Caroleo and Pastore, 2012).

The likelihood of a match also differs for different fields of education and is the highest for Health, Computing and Architecture and Building graduates. The likelihood of a match is

lower for female graduates and is also determined by different study programmes. In addition, how the duration of unemployment affects the probability of a match is investigated, where it is found that the longer a graduate is unemployed, the higher the probability of accepting a job where the specific knowledge acquired at the higher education institution is not utilised. When considering separate results for genders, the effect does vary greatly for different fields of education. For example, the fields of education with the highest likelihood of a match for male graduates – technical fields of education – have a lower likelihood of a match for female graduates. Also when controlling for overeducation, the effects increase and the effect of overeducation is very high, meaning that if a graduate is overeducated they are very likely to also be mismatched.

This chapter also holds practical implications for students as this information on the likelihood of a match for their first job should be considered when deciding on a field of education. No similar analysis has been conducted in the wider geographical area or for a country with similar specific features. In addition, it also provides information for policymakers. This paper provides recent analysis of one of the important aspects of youth's school-to-work transition. Early market career is important for development and affects later labour market outcomes as well as having immediate implications for graduates' well-being.

Of course, this analysis has some limitations. The first one is the time constraint imposed by the availability of the data. Graduates are only observed up to nine months after they graduate. In addition, by using test scores after secondary school the ability of graduates is only proxied and more effort should be devoted to finding a more appropriate measure. Although a very common limitation in the literature, no data on the effort involved in finding a job are included.

CONCLUDING REMARKS

There is growing concern regarding the situation young people are facing in the labour market. In the last few years we have witnessed a new phenomenon in the form of the rising unemployment of highly educated young people in developed countries. As pointed out in the recent OECD report “Better policies for better lives”, skills have become increasingly important in labour markets where “lifelong employability” and “lifelong learning” have replaced the notion of “lifetime employment” (OECD, 2011). This has imposed a need to investigate the situation of youth in the labour market.

This doctoral dissertation focused on the school-to-work transition of Slovenian higher education graduates. Using a unique microdata set of the three entire and consequent generations of higher education graduates of 2007 to 2009; the dissertation addressed the process of the school-to-work transition. Moreover, the complete dataset of the entire population of graduates matched with employment outcomes provides rich information on the students’ higher education records (including institution and graduation data), previous schooling and first labour market entrance. This allows the presentation of empirical evidence on the school-to-work transition of graduates in different fields and types of education and higher education institutions. In the absence of any other quality measures in the Slovenian higher education system, this can allow inferences about the quality of higher education institutions. In addition, it can provide relevant information for students deciding what and where to study. First, the dissertation reviewed the literature on school quality, focusing especially on higher education quality and including the most recent studies in the field. This first chapter of the dissertation systematically outlined different measures of school quality and pointed out recent trends that might best summarise the past literature, summarised the methods used and provided an overview of the outcomes of interest (earnings, student achievement, house prices, satisfaction, health outcomes, marital status and childbearing). Second, in Chapter 2 I investigated the school-to-work transition of higher education graduates and calculated their probabilities of employment in the first three and nine months after graduation with respect to different fields and types of education as well as higher education institutions. This dissertation is distinctive since it also investigates the effect of the new Bologna types of education on the school-to-work transition. That was calculated using propensity score matching and for a cohort of graduates in 2008 and 2009. Subsequent data on graduates that includes the most recent cohort of graduates allowed me to investigate variations in employment probability in times of an economic downturn. Third, in Chapter 3 I further investigated the graduates’ transition to the labour market by investigating the quality of their first job. I calculated the likelihood of a field of education-occupation match, a weak match and a mismatch again with respect to different fields and types of education as well as higher education institutions. I also investigated the probability of a mismatch with respect to the duration of unemployment. In addition, it is particularly important to construct school performance indicators based on students’ employment outcomes. Therefore, the fourth important contribution of the dissertation is that the outcomes of this research could also serve

as a management tool for the ministry responsible for education. In the following part, I briefly outline the main conclusions of each chapter.

Chapter two addressed school quality with a special focus on college or university quality. The importance of school quality has been widely addressed and agreed upon. However, the almost half a century of research starting from Coleman (1966) has produced different results. First of all, school quality is a latent variable and several different proxies and a combination of them have therefore been introduced. To investigate the effect, primary and secondary school quality measures such as expenditure per pupil, the pupil/teacher ratio or teachers' wages have mostly been introduced while, for college quality, measures like average test score or the selectivity of a college have been introduced. The effect of school quality has mainly been addressed from a test score point of view or even house prices (primary and secondary schools) and subsequent earnings, likelihood of graduation or further education (colleges). Recently, the effects of school quality on health and satisfaction as well as childbearing and divorce rates have been analysed.

However, several econometric difficulties arise when investigating the effects of college quality, especially because a simple comparison of students from different schools is not advised. Applying regression-based analysis, a bulk of studies use a selection on observables approach and agree on a non-random selection of students into colleges. In the absence of an experiment, the chapter addressed different strategies, such as instrumental variables, and introduces matching methods. The literature review suggested either using the three mentioned alternative methods or including a rich enough dataset to control for biases. Studies on primary and secondary school quality usually control for family background, yet it is not that common in the investigation of college quality. Although studies find a significant peer effect in primary and secondary schools, at college the effect is not so evident.

Regarding college quality, the studies focus on measuring selectivity as a proxy for quality either by student achievement at a standardised test or by using several rankings of colleges and universities that use students achievements at tests as well as the resources devoted. Several different outcomes of interest have been investigated when measuring the effect of school quality. Based on a comprehensive summary of papers on the effect of primary and secondary school quality, Speakman and Welch (2006) conclude that while wages are not a perfect measure to assess the added value of schools, due to poor alternatives the superiority of wages should be reconsidered. Based on this literature review, I found there is no consensus on the effect of school quality on earnings. This originates from the different measures used and when school resources are proxies for school quality Coleman et al. (1966) and several papers by Hanushek (1986, 1996, and 2006) find no effect on earnings and already some early studies find such an effect. Findings regarding college quality are more straightforward where the majority find a positive and significant effect of college quality usually measured by selectivity on earnings in the USA and the UK and other countries. Regarding student achievement especially in primary and secondary school there is also no consensus, but again for college quality there is evidence of a positive effect of college quality

on the likelihood of graduation and further schooling. School quality also affects house prices, the time of starting a family and getting married, health and satisfaction.

Chapter 3 sets out an empirical investigation of the school-to-work transition of Slovenian higher education graduates. In the chapter I tested the first four hypotheses: if the transition of graduates on average varies for different fields of education with science and technical fields of education, that on average exhibit the shortest duration of unemployment after graduation if controlling for ability; if graduates from different higher education institutions exhibit different school-to-work transition paths when controlling for ability and fields of education; if graduates of different types of education in the same field of education and higher education institution exhibit different school-to-work transition paths and whether the probability of employment is affected by personal characteristics such as gender. The analysis shows that employability varies according to the field of education, higher education institution as well as the type of education. The probability of employment in the first three and nine months is calculated as the marginal effect on probability compared to the reference group of Business and Administration graduates. The highest probability of employment is exhibited by Health graduates from University 1, regardless of the year. Engineering and Architecture and Building graduates also exhibit a statistically significant higher probability of employment than Business and Administration graduates. Several different groups of graduates exhibit a slightly higher, but insignificant probability of employment than the reference group (Mathematics, Statistics and Computing graduates, as well as Law and Agriculture and Veterinary Science graduates). In contrast, a lower employment probability than for the base group was exhibited by graduates from the Humanities and Arts, Social Sciences and Journalism and Information. In 2009 the probability of employment in the first three months after graduation for graduates in the base group dropped where, again, positive changes in probability compared to the base group were the highest for graduates from Health, Science, Mathematics and Computing, Engineering and Architecture and Building. Interestingly, graduates from Education have a higher probability of employment than the base group of Business and Administration graduates. The explanation for this might lie in the public sector employment of the majority of Education graduates.

The investigation of the effect of the 1st Bologna cycle types of education analysis showed that those graduates who completed new programmes exhibit a lower probability of employment than their counterparts who graduated from the former types of education. Further in-depth analysis was conducted to investigate the effect of the Bologna Process on the early labour market outcomes of young graduates of Business and Administration from two public universities by using propensity score matching. New 1st Bologna cycle graduates in specific fields are competing for the same vacancies with graduates from the previous pre-Bologna programme. The average treatment effect of graduating from the 1st Bologna cycle is estimated separately for fields of education where the first Bologna graduates had finished their studies. The size of the effect varies for different fields and, on one hand, decreases for graduates from the Social Sciences over the years and increases for graduates from Business and Administration. An increased negative effect on employment in the first nine months

compared to employment in the first three months after graduation is common to all fields of education. This evidence is similar to that found for neighbouring Italy (Cammelli et al., 2011).

The investigation of the school-to-work transition showed different effects on the probability of employment for higher education institutions. In order to further investigate the effect of higher education, an analysis as conducted of differences in the probability of employment for only Business and Administration graduates. This kind of education is offered at all universities and the majority of other higher education institutions. Using a proxy that, due to data availability, has not often been used in the literature – the employability of graduates – the dissertation also investigated the quality of higher education institutions. The analysis showed there are significant differences in the employability of young graduates, irrespective of whether they are full- or part-time students. Part-time students generally exhibit higher employability at the time of graduation, but the trend is lower in the period after graduation. Therefore, it might be assumed that students who did not obtain positions as full-time students of Business and Administration due to their low level of achievement in secondary education are facing big problems in the school-to-work transition. However, when speaking about full-time students some institutions exhibit a higher probability of employment, such as Public University 1, revealing considerable differences in quality. The new private schools exhibited the significantly lower employability of their full- and part-time students, which might indicate the lower quality of their academic programmes.

Chapter 4 of this dissertation investigated whether a graduate has been educated to perform the occupation they are engaged in (a match), if the occupation poorly matches their field of education (a weak match) or if the graduate has actually received a degree that has nothing to do with the knowledge they need to perform the job (a mismatch). In the case of a weak match or a mismatch, all of the knowledge a graduate acquired during their education is not being utilised. Based on the quality of a match, I wanted to test if the likelihood of a field of education-occupation match varies for different fields of education also in the first job a graduate secures or, more specifically, if the likelihood of a match is higher for Health graduates and graduates of Engineering, Manufacturing and Construction). In addition, I sought to test if the likelihood of this match is constant over time and whether the probability of a mismatch increases with the duration of unemployment.

The analysis showed that the likelihood of a match varies for different fields of education and is the highest for Health, Computing and Architecture and Building graduates. The likelihood of a match is lower for female graduates and is also determined by different types of education. An increasing duration of unemployment negatively affects the probability of a match or, in other words, the longer a graduate is unemployed, the more likely they are to accept a job that does not match their education. Obtaining separate results for genders showed that the effect does vary very much for different fields of education. For example, the fields of education with the highest likelihood of a field of education-occupation match for male graduates – technical fields of education – have a lower likelihood of a match for female

graduates. Also, when controlling for overeducation the effects increase and the effect of overeducation is very strong, meaning that if a graduate is overeducated they are very likely to also be mismatched.

As mentioned, the dissertation provides alternative measures of the quality of higher education and adds new insights into the employability of graduates from different fields of education and types of education where some of the first evidence of the employability of the new 1st Bologna types of education graduates is presented. In addition, the analysis also investigated the quality of field of education-occupation match with respect to different fields and types of education and higher education institutions. The dissertation also holds practical implications for students as information on the probability of a match and the likelihood of a match for their first job should be considered when they are deciding on a field of study and a higher education institution. No similar analysis has been conducted in the wider geographical area or for a country with similar specific features, especially because it offers information on very recent cohorts of graduates. In addition, it also provides information for policymakers. Early market career is important for individuals' development and affects their later labour market outcomes, while having immediate implications for graduates' well-being.

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APPENDIXES

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Appendix 1: Probit estimates of the probability of employment in the first nine months after graduation (marginal effects) for graduates who took a matriculation exam after secondary school

Number of observations		1,403		2,153		3,591		7,147	
Pseudo R2		0.0914		0.1620		0.2480		0.1990	
Probability of employment for the base group		0.7112		0.7476		0.6150		0.6837	
Variable		dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.
<i>Personal Characteristics</i>									
Female	#	-0.0225	.0305	-0.0401 ^c	.0234	-0.0029	.0219	-0.0206	.0140
Age		0.0026	.0118	0.0175	.0071	0.0298 ^a	.0097	0.0086 ^c	.0051
Final Exam Score		0.0018	.0028	-0.0043 ^b	.0022	0.0008	.0021	-0.0002	.0013
<i>Graduation Characteristics</i>									
Duration		-0.0013	.0013	-0.0007	.0007	-0.0029 ^a	.0010	-0.0012 ^b	.0005
Second quarter (April to June)	#	0.0659	.0446	-0.0394	.0373	0.0106	.0327	0.0098	.0213
Third quarter (July to September)	#	-0.0743 [*]	.0450	-0.1239 ^a	.0370	-0.0656 ^b	.0320	-0.0853 ^a	.0211
Fourth quarter (October to December)	#	-0.0081	.0453	-0.1520 ^a	.0393	-0.0918 ^a	.0338	-0.0902 ^a	.0220
<i>Fields of Education</i>									
Education	#	-0.0121	.0493	0.0940 ^a	.0353	0.0658 ^a	.0335	0.0608 ^a	.0213
Arts	#	-0.2961 ^a	.1113	-0.2486 ^a	.0857	-0.1446 ^b	.0760	-0.2249 ^a	.0502
Humanities	#	-0.3428 ^a	.0898	-0.1824 ^a	.0664	-0.1763 ^a	.0442	-0.2086 ^a	.0334
Social Sciences	#	-0.1539 ^a	.0572	-0.1421 ^a	.0445	-0.1690 ^a	.0353	-0.1562 ^a	.0246
Journalism and information	#	-0.0881	.1171	-0.1911 ^b	.1094	-0.2017 ^a	.0771	-0.1731 ^a	.0561
Law	#	0.0755	.0514	0.1456 ^a	.0375	0.1291 ^a	.0370	0.1267 ^a	.0227
Life and physical science	#	0.0929	.0731	0.0885 ^b	.0504	0.1263 ^a	.0470	0.1017 ^a	.0312
Mathematics, statistics and computing	#	0.1166	.0736	0.1308 ^a	.0466	0.2580 ^a	.0445	0.1760 ^a	.0295
Engineering, Architecture and building	#	0.1501 ^a	.0554	0.1191 ^a	.0401	0.1972 ^a	.0368	0.1562 ^a	.0239
Manufacturing and processing	#	-0.1414	.1424	0.0311	.0602	-0.0225	.0595	-0.0252	.0414
Agriculture and Veterinary Science	#	0.1662 ^b	.0846	0.0057	.0699	-0.1651 ^b	.0745	-0.0393	.0473
Forestry	#					0.2996 ^a	.0917	0.2457 ^a	.0772
Health	#	0.2466 ^a	.0590	0.2386 ^a	.0452	0.3542 ^a	.0390	0.2892 ^a	.0258
Social services	#			0.1022	.1119	0.1352 ^b	.0757	0.0750	.0640
Personal and Security services	#	-0.2834 ^a	.0991	-0.1225	.1179	-0.1754 ^a	.0674	-0.2036 ^a	.0500
Transport services	#	-0.0409	.1479	-0.1485	.1270	0.0065	.0892	-0.0662	.0632
Environmental protection	#					-0.1049	.2106	-0.1457	.2076
<i>Types of education</i>									
3-year professional degree	#	-0.1124 ^b	.0638	-0.1908 ^a	.0542	-0.2191 ^a	.0484	-0.1646 ^a	.0305
3-year professional Bologna-harmonised degree				-0.2651	.2341	-0.3700 ^a	.0940	-0.4272 ^a	.0769
Bologna-harmonised university degree	#	-0.1680	.1749	-0.5721 ^a	.0534	-0.4082 ^a	.0363	-0.4951 ^a	.0244
<i>Higher Education Institutions</i>									
Public University 2	#	0.0362	.0344	-0.0262	.0264	-0.0520 ^b	.0246	-0.0173	.0157
Public University 3	#	0.0463	.0664	0.1279 ^a	.0482	0.0755	.0496	0.1006 ^a	.0295
3-year Private schools	#	0.0272	.1321	0.1597 ^a	.0593	-0.0276	.0993	0.0680	.0548

Note:

1. dy/dx is for a discrete change of the dummy variable from 0 to 1

2. The base group consists of average age, male graduates from Business and Administration who finished the old university programme at Public University 1, had an average score at a professional matriculation exam and graduated in the first quarter.
3. c significant at 10%; b significant at 5%; a significant at 1%.

Source: SORS (2010), own calculations

Appendix 2: Probit estimates of the probability of employment in the first nine months after graduation (marginal effects) for graduates who took a vocational matriculation exam or final exam after secondary school

		2007		2008		2009		Pooled 2007-2009	
Number of observations		4300		3186		2843		10246	
Pseudo R2		0.0967		0.1326		0.1352		0.1141	
Probability of employment for the base group		0.6302		0.6220		0.4523		0.5500	
Variable		dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.	dy/dx	St. Err.
<i>Personal Characteristics</i>									
Female	#	-0.0257	.0185	-0.0217	.0221	-0.0121	.0241	-0.0284 ^b	.0125
Age		-0.0052	.0053	-0.0057	.0062	0.0116	.0077	-0.0118 ^a	.0035
Matriculation Exam Score		-0.0069 ^a	.0022	-0.0039	.0027	0.0063 ^b	.0031	-0.0030 ^b	.0015
Taking Final Exam		0.1300 ^a	.0244	0.1209 ^a	.0276	0.0116	.0344	0.1634 ^a	.0152
<i>Graduation Characteristics</i>									
Duration		-0.0016 ^a	.0005	-0.0001	.0003	-0.0010	.0008	-0.0006 ^a	.0002
Second quarter (April to June)	#	-0.0323	.0239	-0.0853 ^a	.0283	-0.0131	.0311	-0.0423 ^a	.0160
Third quarter (July to September)	#	-0.1199 ^a	.0247	-0.2124 ^a	.0285	-0.1418 ^a	.0306	-0.1507 ^a	.0161
Fourth quarter (October to December)	#	-0.0115	.0252	-0.1653 ^a	.0297	-0.0625	.0317	-0.0704 ^a	.0167
<i>Fields of Education</i>									
Education	#	-0.0296	.0325	0.1234 ^a	.0361	0.2659 ^a	.0431	0.0879 ^a	.0219
Arts	#	-0.2759 ^a	.0509	-0.3911 ^a	.0646	-0.0008	.0809	-0.2304 ^a	.0355
Humanities	#	-0.2009 ^a	.0359	-0.1354 ^a	.0447	-0.1227 ^b	.0500	-0.1552 ^a	.0241
Social Sciences	#	-0.1803 ^a	.0337	-0.0810 ^c	.0477	-0.0112	.0609	-0.1051 ^a	.0247
Journalism and information	#	0.0021	.0958	0.0654	.1211	-0.0423	.1713	0.0648	.0721
Law	#	0.0951 ^b	.0381	0.1534 ^a	.0453	0.1944 ^a	.0730	0.1481 ^a	.0282
Life and physical science	#	0.1130 ^a	.0428	0.0980 ^c	.0576	0.1796 ^b	.0765	0.1248 ^a	.0325
Mathematics, statistics and computing	#	0.0830 ^c	.0490	0.1029 ^b	.0516	0.2143 ^a	.0574	0.1140 ^a	.0315
Engineering, Architecture and building	#	0.1761 ^a	.0282	0.2281 ^a	.0307	0.2860 ^a	.0355	0.2204 ^a	.0185
Manufacturing and processing	#	-0.0409	.0415	0.0151	.0436	0.1087 ^b	.0489	0.0141	.0259
Agriculture and Veterinary Science	#	-0.0377	.0434	-0.0227	.0450	0.0729	.0478	-0.0039	.0263
Forestry	#	0.0044	.0769	0.1442 ^b	.0694	0.2334 ^a	.0784	0.0941 ^b	.0460
Health	#	0.3010 ^a	.0286	0.3195 ^a	.0312	0.4345 ^a	.0322	0.3582 ^a	.0177
Social services	#	-0.0992	.0714	0.1074 ^c	.0645	-0.0314	.0685	-0.0023	.0411
Personal and Security services	#	-0.1271 ^b	.0503	-0.1228 ^b	.0527	-0.0677	.0481	-0.1186 ^a	.0287
Transport services	#	-0.0354	.0493	-0.726	.0619	-0.0173	.0495	-0.0846 ^a	.0307
Environmental protection		0.1115	.1567	0.1424	.1150	-0.0734	.1559	0.0423	.0875
<i>Types of Education</i>									
3-year professional degree	#	-0.0454 ^b	.0214	-0.0494 ^b	.0237	0.0147	.0255	-0.0254 ^b	.0135
3-year professional Bologna-harmonised degree	#	-0.0884	.1467	-0.0875	.0928	-0.1178 ^a	.0469	-0.1942 ^a	.0366
Bologna-harmonised university	#			-0.0332	.0258	-0.1406 ^b	.0629		

degree Bologna-harmonised

Higher Education Institutions

Public University 2	#	-0.0480b	.0230	0.1327b	.0561	-0.0650b	.0260	-0.0410a	.0146
Public University 3	#	0.0964	.0602	-0.0008	.0738	0.0440	.0593	0.1205a	.0336
3-year Private schools	#	-0.1216c	.0697	0.1597a	.0593	0.0109	.0634	-0.0424	.0399

Note:

1. dy/dx is for a discrete change of the dummy variable from 0 to 1

2. The base group consists of average age, male graduates from Business and Administration who finished the old university programme at Public University 1, had an average score at a professional matriculation exam and graduated in the first quarter.

3. c significant at 10%; b significant at 5%; a significant at 1%

Source: SORS, 2010; own calculations

Appendix 3: Estimated effect of the Bologna-harmonised programme on employment using the matching method for Business and Administration graduates from Public University 1 in 2009

Outcome variable: employment within the first three months of graduation					
No. of treated	No. of control	ATT	Std. Err.	t	Matching Method
303	115	-0.258 ^a	0.074	-3.478	Nearest neighbour, common support
316	267	-0.276 ^a	0.071	-3.864	Nearest neighbour
303	131	-0.230 ^a	0.055	-4.169	Stratification, common support
303	131	-0.230 ^a	0.067	-3.432	Stratification
Employment within the first nine months of graduation					
No. of treated	No. of control	ATT	Std. Err.	t	Matching Method
303	131	-0.457 ^a	0.079	-5.760	Nearest neighbour, common support
316	267	-0.460 ^a	0.076	-6.086	Nearest neighbour
303	131	-0.418 ^a	0.064	-6.524	Stratification, common support
303	131	-0.418 ^a	0.069	-6.041	Stratification

1. All standard errors are bootstrapped standard errors based upon 100 replications. The outcome variable is 1 if a student was employed and 0 otherwise

2. c significant at 10%; b significant at 5%; a significant at 1

Source: SORS, 2010; own calculations

Appendix 4: Probit estimates of the probability of employment in the first three months after graduation but no later than six months after graduation (marginal effects) for graduates who studied full-time

		Specification 1	Specification 2	Specification 3	Specification 4
Number of observations		850	850	850	850
Pseudo R ²		0.021	0.027	0.028	0.036
Probability of employment for a male graduate from Public B&A School 1		0.296	0.290	0.287	0.284
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	-0.019 (0.040)	-0.019 (0.040)	-0.029 (0.054)	-0.029 (0.054)
Public B&A School 3	#	-0.031 (0.049)	-0.030 (0.049)	-0.026 (0.050)	-0.025 (0.050)
Public B&A School 4	#	-0.006 (0.049)	-0.005 (0.047)	-0.017 (0.059)	-0.015 (0.059)
Public B&A School 5	#	-0.123 (0.086)	-0.125 (0.086)	-0.099 (0.095)	-0.100 (0.095)
3-year Private Schools	#	-0.175 ^a (0.036)	-0.177 ^a (0.035)	-0.166 ^a (0.038)	-0.167 ^a (0.037)
2-year Private Schools	#	-0.112 ^b (0.036)	-0.111 ^b (0.036)	-0.098 ^b (0.039)	-0.097 ^b (0.039)
<i>Personal Characteristics</i>					
Gender (female)	#	-0.011 (0.032)	-0.009 (0.032)	-0.007 (0.032)	-0.004 (0.032)
Living with family	#			-0.147 ^b (0.051)	-0.157 ^b (0.049)
Living with partner	#			-0.052 (0.101)	-0.055 (0.101)
Other	#			-0.002 (0.050)	-0.003 (0.050)
Living alone	#			-0.079 (0.059)	-0.080 (0.058)
Deviation from average study duration	#		-0.001 (0.001)		-0.001 (0.001)

Note:

1. dy/dx is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.

2. c significant at 10%; b significant at 5%; a significant at 1%

Source: SORS, 2009; own calculations

Appendix 5: Probit estimates of the probability of employment in the six months after graduation but no later than nine months after graduation (marginal effects) for graduates who studied full-time

		Specification 1	Specification 2	Specification 3	Specification 4
Number of observations		640	640	626	626
Pseudo R ²		0.023	0.028	0.034	0.041
Probability of employment for a male graduate from Public B&A School 1		0.156	0.156	0.155	0.155
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	0.032 (0.045)	0.031 (0.045)	0.087 (0.074)	0.086 (0.073)
Public B&A School 3	#	0.040 (0.058)	0.040 (0.058)	0.046 (0.060)	0.046 (0.060)
Public B&A School 4	#	0.094 (0.058)	0.095 (0.058)	0.157 ^c (0.089)	0.159 ^c (0.089)
Public B&A School 5	#	0.219 (0.151)	0.218 (0.151)	0.246 (0.152)	0.247 (0.152)
3-year Private Schools	#	-0.037 (0.047)	-0.039 (0.047)	-0.028 (0.051)	-0.030 (0.050)
2-year Private Schools	#	-0.063 ^c (0.038)	-0.064 ^c (0.038)	-0.059 ^c (0.040)	-0.058 (0.040)
<i>Personal Characteristics</i>					
Gender (female)	#	-0.019 (0.032)	-0.017 (0.032)	-0.013 (0.032)	-0.01 (0.032)
Living with family	#			-0.101 ^b (0.042)	-0.107 ^b (0.040)
Other	#			-0.076 (0.052)	-0.076 (0.052)
Living alone	#			-0.103 ^b (0.042)	-0.102 ^b (0.042)
Deviation from average study duration	#		-0.001 (0.001)		-0.001 (0.001)

Note:

1. *dy/dx* is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.
2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2009; own calculations

Appendix 6: Probit estimates of the probability of employment in the three months after graduation but no later than six months after graduation (marginal effects) for graduates who studied part-time

		Specification 1	Specification 2	Specification 3	Specification 4
Number of observations		800	800	800	800
Pseudo R ²		0.051	0.051	0.216	0.217
Probability of employment for a male graduate from Public B&A School 1		0.060	0.061	0.055	0.054
		dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)	dy/dx (St. Err.)
<i>Higher Education Institutions</i>					
Public B&A School 2	#	0.098 (0.069)	0.098 (0.069)	0.205 (0.143)	0.202 (0.142)
Public B&A School 3	#	-0.004 (0.035)	-0.005 (0.034)	0.002 (0.026)	0.001 (0.025)
Public B&A School 4	#	-0.019 (0.025)	-0.019 (0.025)	0.035 (0.051)	0.034 (0.051)
Public B&A School 5	#	0.101 (0.154)	0.095 (0.150)	0.090 (0.155)	0.085 (0.150)
3-year Private Schools		0.017 (0.035)	0.015 (0.034)	0.038 (0.035)	0.037 (0.035)
2-year Private Schools	#	-0.028 (0.027)	-0.029 (0.026)	-0.007 (0.017)	-0.008 (0.017)
<i>Personal Characteristics</i>					
Gender (female)	#	0.020 (0.015)	0.019 (0.015)	0.018 (0.008)	0.018 (0.008)
Living with family	#			-0.089 ^a (0.015)	-0.089 ^a (0.015)
Living with partner	#			-0.030 ^a (0.008)	-0.030 ^b (0.008)
Other	#			-0.055 ^b (0.019)	-0.054 ^b (0.019)
Living alone	#			-0.022 ^b (0.007)	-0.022 ^b (0.007)
Deviation from average study duration	#		-0.000 (0.000)		-0.000 (0.000)

Note:

1. *dy/dx* is for a discrete change of the dummy variable from 0 to 1, standard errors are reported in parentheses.

2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS (2009), own calculations

Appendix 7: ISCED fields of education

Level of classification	of Classification	Description
1	0	GENERAL PROGRAMMES
2	1	BASIC PROGRAMMES
2	8	LITERACY AND NUMERACY
2	9	PERSONAL DEVELOPMENT
1	1	EDUCATION
2	14	TEACHER TRAINING AND EDUCATION SCIENCE
1	2	HUMANITIES AND ARTS
2	21	ARTS
2	22	HUMANITIES
1	3	SOCIAL SCIENCES, BUSINESS AND LAW
2	31	SOCIAL AND BEHAVIOURAL SCIENCE
2	32	JOURNALISM AND INFORMATION
2	34	BUSINESS AND ADMINISTRATION
2	38	LAW
1	4	SCIENCE
2	40	SCIENCE (BROAD PROGRAMMES)
2	42	LIFE SCIENCES
2	44	PHYSICAL SCIENCES
2	46	MATHEMATICS AND STATISTICS
2	48	COMPUTING
1	5	ENGINEERING, MANUFACTURING AND CONSTRUCTION
2	52	ENGINEERING AND ENGINEERING TRADES
2	54	MANUFACTURING AND PROCESSING
2	58	ARCHITECTURE AND BUILDING
1	6	AGRICULTURE
2	62	AGRICULTURE, FORESTRY AND FISHERY
2	64	VETERINARY
1	7	HEALTH AND WELFARE
2	72	HEALTH
2	76	SOCIAL SERVICES
1	8	SERVICES
2	81	PERSONAL SERVICES
2	84	TRANSPORT SERVICES
2	85	ENVIRONMENTAL PROTECTION
2	86	SECURITY SERVICES

Source: SORS, 2011

Appendix 8: An example of all 4 levels for ISCED 1 (Education)

Level of classification	Classification	Description
1	1	EDUCATION
2	14	TEACHER TRAINING AND EDUCATION SCIENCE
3	140	<i>Teacher training and education science (broad programmes)</i>
4	1400	Teacher training and education science (broad programmes)
3	142	<i>Education science</i>
4	1420	Education science (broad programmes)
4	1421	Pedagogic
4	1422	Andragogic
4	1423	Social pedagogic
4	1424	Special pedagogic
4	1425	Didactics
4	1429	Education science (other)
3	143	<i>Training for pre-school teachers</i>
4	1430	Training for pre-school teachers (broad programmes)
3	144	<i>Training for teachers at basic levels</i>
4	1440	Training for teachers at basic levels (broad programmes)
4	1441	Training for class teachers
4	1442	Training for teachers of children with special educational needs
4	1443	Training for teachers for basic literacy of adults
4	1449	Training for teachers at basic levels (other)
3	145	<i>Training for teachers with subject specialisation</i>
4	1450	Training for teachers with subject specialisation (broad programmes)
4	1451	Training for teachers in natural science subjects
4	1452	Training for teachers in social science subjects
4	1453	Training for teachers in foreign languages subjects
4	1459	Training for teachers with subject specialisation (other)
3	146	<i>Training for teachers of vocational subjects</i>
4	1460	Training for teachers of vocational subjects (broad programmes)
4	1461	Training for teachers in arts and crafts subjects
4	1462	Training for teachers in physical education subjects
4	1463	Training for teachers in technical and other vocational subjects
4	1464	Training for teachers in practical courses
4	1465	Training for teachers in adult education
4	1466	Training for instructors and trainers
4	1469	Training for teachers of vocational subjects (other)

Source: SORS, 2011

Appendix 9: Standard classification of occupations used in the analysis

Level	Classification	Descriptor
<i>1</i>	0	<i>ARMED FORCES</i>
2	1	ARMED FORCES
<i>1</i>	1	<i>LEGISLATORS, SENIOR OFFICIALS AND MANAGERS</i>
2	11	LEGISLATORS AND SENIOR OFFICIALS
2	12	CORPORATE MANAGERS
2	13	MANAGERS OF SMALL ENTERPRISES
<i>1</i>	2	<i>PROFESSIONALS</i>
2	21	PHYSICAL, MATHEMATICAL AND ENGINEERING SCIENCE PROFESSIONALS
2	22	LIFE SCIENCE AND HEALTH PROFESSIONALS
2	23	TEACHING PROFESSIONALS
2	24	OTHER PROFESSIONALS
<i>1</i>	3	<i>TECHNICIANS AND ASSOCIATE PROFESSIONALS</i>
2	31	PHYSICAL AND ENGINEERING SCIENCE ASSOCIATE PROFESSIONALS
2	32	LIFE SCIENCE AND HEALTH ASSOCIATE PROFESSIONALS
2	33	TEACHING ASSOCIATE PROFESSIONALS
2	34	OTHER ASSOCIATE PROFESSIONALS
<i>1</i>	4	<i>CLERKS</i>
2	41	OFFICE CLERKS
2	42	CUSTOMER SERVICES CLERKS
<i>1</i>	5	<i>SERVICE WORKERS AND SHOP AND MARKET SALES WORKERS</i>
2	51	PERSONAL AND PROTECTIVE SERVICES WORKERS
2	52	MODELS, SALESPERSONS AND DEMONSTRATORS
<i>1</i>	6	<i>SKILLED AGRICULTURAL AND FISHERY WORKERS</i>
2	61	SKILLED AGRICULTURAL AND FISHERY WORKERS
<i>1</i>	7	<i>CRAFT AND RELATED TRADES WORKERS</i>
2	71	EXTRACTION AND BUILDING TRADES WORKERS
2	72	METAL, MACHINERY AND RELATED TRADES WORKERS
2	73	PRECISION, HANDICRAFT, PRINTING AND RELATED TRADES WORKERS
2	74	OTHER CRAFT AND RELATED TRADES WORKERS
2	79	CRAFT AND RELATED TRADES WORKERS NOT ELSEWHERE CLASSIFIED
<i>1</i>	8	<i>PLANT AND MACHINE OPERATORS AND ASSEMBLERS</i>
2	81	STATIONARY-PLANT AND RELATED OPERATORS
2	82	MACHINE OPERATORS AND ASSEMBLERS
2	83	DRIVERS AND MOBILE-PLANT OPERATORS
<i>1</i>	9	<i>ELEMENTARY OCCUPATIONS</i>
2	91	SALES AND SERVICES ELEMENTARY OCCUPATIONS
2	92	AGRICULTURAL, FISHERY AND RELATED LABOURERS
2	93	LABOURERS IN MINING, CONSTRUCTION, MANUFACTURING AND TRANSPORT
2	99	ELEMENTARY OCCUPATIONS NOT ELSEWHERE CLASSIFIED

Source: SORS, 2011

Appendix 10: An example of a match and a weak match for ISCED 14 education graduates

Level of Classification	Classification	Description	Notes
<i>MATCH</i>			
2	23	TEACHING PROFESSIONALS	
3	231	COLLEGE, UNIVERSITY AND HIGHER EDUCATION TEACHING PROFESSIONALS	
4	2310	University and higher education teaching professionals	
4	2311	College lecturers	
3	232	SECONDARY EDUCATION TEACHING PROFESSIONALS	
4	2321	Secondary education teaching professionals	
3	233	PRE-PRIMARY, FIRST AND SECOND STAGE BASIC EDUCATION TEACHING PROFESSIONALS	
4	2331	First and second stage of basic education teaching professionals	
4	2332	Pre-primary education teaching professionals	
3	234	SPECIAL EDUCATION TEACHING PROFESSIONALS	
4	2340	Special education teaching professionals	
3	235	OTHER TEACHING PROFESSIONALS	
4	2351	Education methods specialists	
4	2352	School inspectors	
4	2359	Other teaching professionals not elsewhere classified	
4	3342	Teachers of practical lessons, organisers of practical lessons and teaching associate professionals	
4	1319	Managers of small enterprises not elsewhere classified	
4	2412	Personnel and careers professionals	1
3	332	PRE-PRIMARY EDUCATION TEACHING ASSOCIATE PROFESSIONALS	
4	3320	Pre-primary education teaching associate professionals	
4	3342	Teachers of practical lessons, organisers of practical lessons and teaching associate professionals	
4	3475	Athletes, sportspersons and related associate professionals	
4	5131	Child-care workers	
<i>WEAK MATCH</i>			
4	1239	Other department managers not elsewhere classified	
4	5132	Institution-based personal care workers	
4	5142	Companions and valets	
4	1143	Senior officials of humanitarian and other special-interest organisations	
4	1210	Directors and chief executives	
4	1229	Production and operations managers not elsewhere classified	2
4	1232	Personnel, administration and industrial relations managers	
4	1319	Managers of small enterprises not elsewhere classified	
5	2111.04	Physicist	3

5	2113.07	Chemist	3
5	2121.05	Mathematician	3
5	2211.02	Biologist	4
5	2211.10	Microbiologist	4
5	2412.03	Consultant for recruitment	4
5	2412.06	Consultant for employment	4
5	2432.04	Librarian	4
4	2444	Philologists, translators and interpreters	
4	2446	Social work professionals	
4	2470	Other public service administrative professionals not elsewhere classified	
4	3111	Chemical and physical science technicians	
5	3116.04	Laboratory assistant for chemistry	3
5	3211.03	Laboratory assistant for biology	3
5	3229.03	Assistant therapist for children with special needs	3
4	3423	Employment agents and labour contractors	
4	3429	Business services agents and trade brokers not elsewhere classified	
4	3460	Social work associate professionals	
4	3475	Athletes, sportspersons and related associate professionals	
4	5132	Institution-based personal care workers	
4	5133	Home-based personal care workers	

Source: SORS, 2011; own calculation

Appendix 11: Ordered logit results for the likelihood of an education-occupation match (marginal effects) for female graduates who took a matriculation exam after secondary school

	Specification 1	Specification 2	Specification 3
Number of observations	9,171	9,171	9,171
Pseudo R ²	0.1349	0.1508	0.1528
Probability of education-Occupation match for base group	0.429	0.417	0.416
Variables			
	<i>Marg. Eff.</i> (<i>Std. Err.</i>)	<i>Marg. Eff.</i> (<i>Std. Err.</i>)	<i>Marg. Eff.</i> (<i>Std. Err.</i>)
<i>Personal Characteristics</i>			
test score	0.001 (0.001)	0.001 (0.001)	0.002 ^b (0.001)
<i>Graduation Characteristics</i>			
year of graduation	-0.173 ^a (0.007)	-0.153 ^a (0.007)	-0.153 ^a (0.007)
<i>Types of Education</i>			
professional 2-year		-0.141 ^a (0.020)	-0.132 ^a (0.022)
professional 3-year		-0.090 ^a (0.016)	-0.105 ^a (0.016)
Bologna professional		-0.206 ^a (0.027)	-0.233 ^a (0.025)
Bologna academic		-0.328 ^a (0.015)	-0.333 ^a (0.015)
<i>Higher Education Institutions</i>			
Public university 2			-0.010 (0.014)
Public university 3			0.127 ^a (0.027)
Private university 1			0.310 (0.202)
Private schools			0.100 ^b (0.041)
<i>Fields of Education</i>			
Education	0.186 ^a (0.015)	0.064 ^a (0.019)	0.065 ^a (0.019)
Arts	-0.041 (0.043)	-0.148 ^a (0.037)	-0.147 ^a (0.037)
Humanities	-0.217 ^a (0.023)	-0.286 ^a (0.018)	-0.301 ^a (0.017)
Social and behavioural science	-0.245 ^a (0.014)	-0.303 ^a (0.014)	-0.304 ^a (0.015)
Journalism and information	-0.099 ^b (0.043)	-0.146 ^a (0.042)	-0.146 ^a (0.042)
Law	0.145 ^a (0.023)	0.019 (0.026)	0.019 (0.026)
Life sciences	0.143 ^a	0.000	-0.003

	(0.041)		(0.043)		(0.043)
Physical sciences	0.107		-0.024		-0.023
	(0.072)		(0.070)		(0.070)
Mathematics and statistics	-0.023		-0.094	c	-0.085
	(0.062)		(0.056)		(0.057)
Computing	0.157		0.057		0.061
	(0.100)		(0.103)		(0.103)
Engineering and engineering trades	-0.037		-0.130	b	-0.124
	(0.067)		(0.058)		(0.058)
Manufacturing and processing	-0.163	a	-0.213	a	-0.209
	(0.026)		(0.022)		(0.023)
Architecture and building	0.236	a	0.119	a	0.121
	(0.034)		(0.039)		(0.040)
Agriculture, forestry and fishery	-0.204	a	-0.240	a	-0.234
	(0.026)		(0.023)		(0.023)
Veterinary	0.240		0.293		0.090
	(0.163)		(0.192)		(0.192)
Health	0.360	a	0.305	a	0.309
	(0.017)		(0.020)		(0.021)
Personal services	-0.061	b	-0.056	c	-0.098
	(0.031)		(0.032)		(0.032)
Transport services	-0.364	a	-0.358	a	-0.356
	(0.017)		(0.017)		(0.017)
Environmental protection	-0.317	a	-0.318	a	-0.359
	(0.064)		(0.056)		(0.046)
Security services	-0.303	a	-0.325	a	-0.317
	(0.024)		(0.019)		(0.020)

1. *y* is a probability a female graduates from Business and Administration who finished old university programme at Public University 1, had an average test score at matriculation exam

2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS (2010), own calculations

Appendix 12: Ordered logit results for the likelihood of an education-occupation match (marginal effects) for female graduates who took a final exam

	Specification 1	Specification 2	Specification 3
Number of observations	6,626	6,626	6,626
Pseudo R ²	0.1163	0.1223	0.1227
Probability of education-Occupation match for base group	0.523	0.524	0.524
Variables			
	<i>Marg. Eff.</i> (<i>Std. Err.</i>)	<i>Marg. Eff.</i> (<i>Std. Err.</i>)	<i>Marg. Eff.</i> (<i>Std. Err.</i>)
<i>Personal Characteristics</i>			
test score	0.010 (0.008)	0.009 (0.008)	0.009 (0.008)
<i>Graduation Characteristics</i>			
year of graduation	-0.106 ^a (0.008)	-0.106 ^a (0.008)	-0.106 ^a (0.008)
<i>Types of Education</i>			
professional 2-year		-0.131 ^a (0.034)	-0.131 ^a (0.034)
professional 3-year		-0.164 ^a (0.019)	-0.167 ^a (0.020)
Bologna professional		-0.009 (0.143)	-0.061 (0.147)
Bologna academic		-0.225 ^b (0.103)	-0.235 ^b (0.102)
<i>Higher Education Institutions</i>			
Public University 2			-0.023 (0.019)
Public University 3			-0.026 (0.051)
Private University 1			-0.130 (0.139)
Private schools			0.065 (0.048)
<i>Fields of Education</i>			
Education	-0.109 ^a (0.021)	-0.206 ^a (0.023)	-0.199 ^a (0.024)
Arts	-0.323 ^a (0.025)	-0.387 ^a (0.021)	-0.387 ^a (0.021)
Humanities	-0.373 ^a (0.016)	-0.441 ^a (0.015)	-0.441 ^a (0.015)
Social and behavioural science	-0.434 ^a (0.013)	-0.488 ^a (0.013)	-0.488 ^a (0.013)
Journalism and information	-0.131 ^b (0.057)	-0.231 ^a (0.051)	-0.232 ^a (0.052)
Law	-0.180 ^a (0.038)	-0.277 ^a (0.026)	-0.272 ^a (0.027)
Life sciences	-0.250 ^a	-0.333 ^a	-0.334 ^a

	(0.034)		(0.029)		(0.029)
Physical sciences	-0.228	a	-0.305	a	-0.306
	(0.047)		(0.040)		(0.040)
Mathematics and statistics	-0.334	a	-0.334	a	-0.334
	(0.050)		(0.051)		(0.051)
Computing	-0.187	c	-0.227	b	-0.221
	(0.100)		(0.094)		(0.096)
Engineering and engineering trades	-0.231	a	-0.298	a	-0.297
	(0.048)		(0.042)		(0.042)
Manufacturing and processing	-0.382	a	-0.383	a	-0.380
	(0.017)		(0.017)		(0.018)
Architecture and building	-0.115	a	-0.173	a	-0.170
	(0.041)		(0.047)		(0.040)
Agriculture, forestry and fishery	-0.382	a	-0.398	a	-0.395
	(0.020)		(0.020)		(0.020)
Veterinary	-0.229	a	-0.316	a	-0.317
	(0.042)		(0.035)		(0.035)
Health	0.129	a	0.092	a	0.093
	(0.027)		(0.028)		(0.028)
Personal services	-0.177	a	-0.141	a	-0.150
	(0.043)		(0.046)		(0.052)
Transport services	-0.467	a	-0.475	a	-0.474
	(0.016)		(0.015)		(0.016)
Environmental protection	-0.433	a	-0.438	a	-0.428
	(0.093)		(0.090)		(0.100)
Security services	-0.493	a	-0.495	a	-0.493
	(0.018)		(0.018)		(0.019)

1. *y* is a likelihood of a female graduates from Business and Administration who finished old university programme at Public University 1, had an average test score at final exam

2. *c* significant at 10%; *b* significant at 5%; *a* significant at 1%

Source: SORS, 2010; own calculations

Appendix 13: Ordered logit results for the likelihood of an education-occupation match (marginal effects)

	Matriculation exam		Final exam	
Number of observations	13,761		10,971	
Pseudo R ²	0.1402		0.1089	
Probability of education- Occupation match for base group	0.418		0.530	
Variables				
	<i>Marg. Eff.</i>		<i>Marg. Eff.</i>	
	<i>(Std. Err.)</i>		<i>(Std. Err.)</i>	
<i>Personal Characteristics</i>				
women	-0.020	b	-0.032	a
	(0.008)		(0.010)	
test score	0.001	c	0.005	
	(0.001)		(0.006)	
<i>Graduation Characteristics</i>				
year of graduation	-0.153	a	-0.090	a
	(0.045)		(0.012)	
<i>Overeducation</i>				
Overeducation	-0.117	a	-0.201	a
	(0.026)		(0.035)	
<i>Types of Education</i>				
Higher Vocational	-0.174	a	-0.114	a
	(0.014)		(0.023)	
Professional higher (former)	-0.200	a	-0.112	a
	(0.012)		(0.015)	
Professional higher (1 st Bologna cycle)	-0.247	a	-0.141	
	(0.021)		(0.102)	
Academic higher (1 st Bologna cycle)	-0.348	a	-0.173	
	(0.012)		(0.112)	
<i>Higher Education Institutions</i>				
Public University 2	-0.033		-0.027	c
	(0.021)		(0.014)	
Public University 3	0.123	a	-0.034	
	(0.018)		(0.043)	
Private University 1	0.216		-0.374	a
	(0.158)		(0.040)	
Independent higher education institutions	0.101	a	0.032	
	(0.029)		(0.041)	
<i>Fields of Education</i>				
Education	0.048	a	-0.157	a
	(0.016)		(0.019)	

Arts	-0.170 (0.018)	a	-0.321 (0.018)	a
Humanities	-0.295 (0.016)	a	-0.410 (0.014)	a
Social and behavioural science	-0.357 (0.054)	a	-0.477 (0.010)	a
Journalism and information	-0.146 (0.029)	a	-0.174 (0.052)	a
Law	0.043 (0.023)	c	-0.231 (0.025)	a
Life sciences	-0.011 (0.043)		-0.287 (0.029)	a
Physical sciences	0.033 (0.049)		-0.260 (0.030)	a
Mathematics and statistics	-0.048 (0.048)		-0.318 (0.047)	a
Computing	0.118 (0.027)	a	-0.018 (0.034)	
Engineering and engineering trades	0.027 (0.017)		-0.111 (0.018)	a
Manufacturing and processing	-0.176 (0.020)	a	-0.327 (0.016)	a
Architecture and building	0.106 (0.026)	a	-0.065 (0.033)	c
Agriculture, forestry and fishery	-0.225 (0.010)	a	-0.382 (0.017)	a
Veterinary	0.247 (0.155)		-0.249 (0.036)	a
Health	0.302 (0.012)	a	0.131 (0.033)	a
Personal services	-0.030 (0.025)		-0.106 (0.048)	b
Transport services	-0.301 (0.017)	a	-0.456 (0.013)	a
Environmental protection	-0.336 (0.034)	a	-0.497 (0.022)	a
Security services	-0.270 (0.025)	a	-0.313 (0.033)	a

1. *y* is a likelihood of a female graduates from Business and Administration who finished old university programme at Public University 1, had an average test score at final exam

2. c significant at 10%; b significant at 5%; a significant at 1%

Source: SORS, 2010; own calculations

DALJŠI POVZETEK DISERTACIJE V SLOVENSKEM JEZIKU

V zadnjih dveh desetletjih tako v Sloveniji kot po svetu naraščajo izdatki za izobraževanje, narašča število študentov in posledično diplomantov, hkrati pa je prehod vse bolj izobraženih zaznamovan z brezposelnostjo in delom, kjer se znanja, pridobljena med študijem, ne uporabljajo. Prav v zadnjem desetletju se je brezposelnost mladih diplomantov povečala v večini evropskih državah, kar poraja številna vprašanja o kakovosti visokošolskih inštitucij, preizobraženosti in neskladju med ponudbo diplomantov in povpraševanjem po visokokvalificirani delovni sili (Teichler, 2002). Prehod diplomantov na trg dela pa je zanimiv tudi z vidika potranzijske države – Slovenije, kjer izobraževalni sistem še vedno zaznamujejo značilnosti predtranzicijskega obdobja, hkrati pa so bile uvedene številne spremembe v skladu z bolonjsko reformo.

Doktorska disertacija poskuša osvetliti prehod slovenskih diplomantov visokošolskih inštitucij na trg dela tako z vidika trajanja brezposelnosti po diplomi kot tudi prvih poklicev, ki jih diplomanti opravljajo. Oba kazalca sta izračunana za posamezno področje izobraževanja, vrsto programa oziroma študija in visokošolsko inštitucijo ter ponujata nov pogled na slovenski visokošolski prostor. Primerjava v zaposlovanju diplomantov med visokošolskimi zavodi pa je eden izmed pokazateljev kakovosti visokošolskih inštitucij. Prav sama kakovost izobraževalnih inštitucij, predvsem visokošolskih, pa pomembno vpliva na gospodarsko rast (Hanushek in Kimko, 2007).

MERJENJE KAKOVOSTI VISOKOŠOLSКИH INŠTITUCIJ: PREGLED LITERATURE

Merjenje kakovosti različnih šol je metodološko zahteven izziv, kajti sama primerjava med diplomanti različnih inštitucij tako zaradi individualnih razlik (v sposobnostih, motivaciji in modelih odločanja) kot zaradi socioekonomskih razlik in vplivov sošolcev ni primerna. Kot rešitev so se razvili različni metodološki pristopi, ki kontrolirajo pristranskost rezultatov. Del študij uporablja velike podatkovne baze, ki kontrolirajo že prej omenjene morebitne vzroke za pristranskost ocen. Večina študij tako med drugim kontrolira sposobnosti oziroma nenaključen izbor inštitucij s strani študentov (med drugim Solmon, 1973; Wachtel, 1976; Dale in Krueger, 2002; Black in Smith, 2004; Long, 2010; Berkowitz in Hoekstra, 2011), preteklo izobrazbo (Wachtel, 1976; Behrman, Rosenzweig and Taubman, 1996), družinske značilnosti (Card in Krueger, 1992; Chevalier and Conlon, 2003) in vpliv sošolcev (Hanushek, 1979; Hoxby, 2000b, Mora and Oreopoulos, 2011). Poleg tega so se uveljavile tudi študije, ki uporabljajo eksperimente (Angrist in Lavy, 1999; Krueger in Whitmore, 2001), propensity score matching (Black in Smith, 2006; Brand in Halaby, 2006) ali inštrumentalne spremenljivke (Angrist in Krueger, 1992). Poleg metodologije pa se poraja tudi vprašanje merjenja latentne kakovosti. Čeprav se večina študij osredotoča na merjenje kakovosti s pomočjo sredstev, namenjenih izobraževanju, se uporabljajo tudi uspešnost študentov na različnih testih in različne lestvice. Predvsem pri merjenju kakovosti osnovnih in srednjih šol se je uveljavila uporaba sredstev, namenjenih izobraževanju, kot mera kakovosti, kjer študije

uporabljajo podatke o sredstvih na učenca (Coleman in drugi, 1966; Welch, 1966; Morgan in Sirageldin, 1968; Hanushek, 1996; Krueger in Whitmore, 2001). Poleg tega se sredstva, namenjena izobraževanju, merijo kot razmerje med številom učencev in zaposlenih učiteljev, kjer naj bi nižje razmerje pomenilo, da se učitelji lahko bolj kakovostno osredotočajo na posamezne učence, hkrati pa so manjši razredi stroškovno manj učinkoviti. Prav zaradi objektivnosti in mednarodne primerljivosti to mero uporabljajo številne študije (Card in Krueger, 1996; Woessmann, 1996; Glass in Smith, 1979; Altonji in Dunn, 1996; Frisvold in Golbstein, 2011). Spreminjanje razmerja med številom učencev in učiteljev je bilo v ospredju ameriškega eksperimenta STAR (Krueger, 1999; Krueger in Whitmore, 2001), vendar pa nekatere študije ugotavljajo, da omenjeno razmerje ne vpliva na dosežke učencev (Hanushek, 1998; Hoxby, 2000), zato se osredotočajo na kakovost učiteljev. Hanushek in Rivkin (2007) ugotavljata, da je prav kakovost učiteljev odraz kakovosti inštitucije in pomembno vpliva na dosežke učencev.

Kljub različnim meram za merjenje kakovosti inštitucij pa je v ospredju predvsem učinek kakovosti na dohodek. Kljub vplivnim študijam, ki ugotavljajo, da kakovost pri osnovnošolcih ne vpliva na njihov dohodek (Coleman in drugi, 1966; Hanushek, 1996; 2003; 2006), pa študije, ki se osredotočajo predvsem na raziskovanje učinka kakovosti visokošolskih inštitucij, ugotavljajo, da kakovost pomembno vpliva na dohodek diplomantov (Wales, 1973; Solmon in Wachtel, 1975; James in drugi, 1989; Loury in Garman, 1995; Hilmer, 2000; Chevalier and Conlon, 2003; Black in Smith, 2006; Hussein, McNally in Telhaj, 2009; Long, 2010). Čeprav študije večinoma ugotavljajo velikost vplivov kakovosti ameriških inštitucij, Chevalier in Conlon (2003) ugotavljata, da v Veliki Britaniji premija za izobraževanje na bolj kakovostni inštituciji (članice skupine Rusell) znaša od 9 do 12 %. Ena izmed novejših študij pa kaže, da je premija v ZDA za generacije diplomantov 1972, 1982 in 1992 znašala od 5 pa do 8 % (Long, 2010). Poleg vpliva kakovosti inštitucij na dohodek pa študije merijo tudi vpliv kakovosti na verjetnost nadaljnjega izobraževanja predvsem po diplomu. Zhang (2003) na primer ugotavlja, da imajo diplomanti, ki so dodiplomski študij zaključili na bolj kakovostni univerzi, za 18 % večjo verjetnost vpisa na podiplomski študij. Podobne rezultate prikazujejo študije avtorjev Brand in Halaby (2006), Strayer (2002) in Black in Smith (2006).

Na drugi strani pa Brasington (1999), Goodman in Thibodeau (1998), Downes in Zabel (2002), Brasington in Haurin (2006) merijo vpliv kakovosti šol na cene nepremičnin, predvsem družinskih hiš. Gibbons in Machin (2008) ugotavljata, da povečanje povprečnega rezultata učencev na testih za en standardni odklon povzroči 3- do 4-odstotno premijo na ceno hiš v Veliki Britaniji. Značilnost korelacije med kakovostjo in ceno nepremičnin pa ugotavljajo tudi v Avstraliji (Davidoff and Leigh, 2008), na Norveškem (Fiva in Kirkeboen, 2008) in v Franciji (Fack in Grenet, 2010). Med drugim pa Long (2010) ugotavlja, da se diplomanti bolj kakovostnih inštitucij v povprečju poročajo kasneje in da se kasneje odločajo za starševstvo. Novejši prispevki pa se osredotočajo tudi na vpliv kakovosti inštitucij na zdravje študentov in njihovo zadovoljstvo. Na podlagi pregleda literature ugotavljamo, da soglasje glede uporabe različnih mer za kakovost inštitucij še ni bilo doseženo, čeprav je razvoj metodologije omogočil preučevanje problema z omejevanjem pristranskosti. Kljub

temu da nekatere študije ugotavljajo, da vpliv kakovosti ni signifikanten, pa na drugi strani študije, ki se osredotočajo predvsem na kakovost visokošolskih institucij, ugotavljajo pozitiven vpliv kakovosti na dohodek, nadaljnji študij, zdravje, zadovoljstvo in cene nepremičnin. Hkrati ugotavljamo, da večina študij meri učinke kakovosti ameriškega izobraževalnega sistema, nekatere tudi učinke v evropskem prostoru, medtem ko so študije o kakovosti azijskih, afriških in južnoameriških držav redke. Ugotavljamo tudi, da zaenkrat še ni študije, ki bi merila kakovost in vpliv kakovosti visokošolskih institucij v tranzicijskih in potranzijskih evropskih državah.

PREHOD DIPLOMANTOV NA TRG DELA S POSEBNO ANALIZO VPLIVA NOVIH BOLONJSKIH PROGRAMOV

Poglavje z naslovom Prehod diplomantov na trg dela s posebno analizo vpliva novih bolonjskih programov se osredotoča na diplomante slovenskih visokošolskih institucij tudi z vidika različnih institucij in na nek način zapolnjuje praznino v raziskovalnem prostoru. Predvsem se poglavje osredotoča na prehod diplomantov na trg dela z vidika trajanja brezposelnosti od diplome do prve zaposlitve. Z uporabo mikropodatkov treh celotnih generacij diplomantov od leta 2007 do 2009, ki so jim pripisani podatki o zaposlovanju, računam verjetnost zaposlitve v prvih treh in devetih mesecih po diplomi za diplomante različnih področij izobraževanja, visokošolskih institucij in programov. Podobne študije namreč ugotavljajo, da se dohodki razlikujejo glede na področje izobraževanja (Kelly, O'Connell and Smyth, 2010, kjer večina študij poroča, da so diplomanti medicine, veterine, inženirstva in arhitekture ter tudi naravoslovnih ved in informatike med tistimi z najvišjimi donosi).

V doktorski disertaciji želim zato preveriti naslednje hipoteze:

H1: Prehod diplomantov na trg dela se razlikuje za diplomante različnih področij izobraževanja in se ob kontroliranju sposobnosti razlikuje glede na diplomante znanstvenih in tehničnih področij, ki so v povprečju po diplomi najmanj časa brezposelni.

Trajanje brezposelnosti po diplomi lahko služi kot ena izmed mer za kakovost visokošolskih institucij (Fiorito, 1981). Zato bom preverila naslednji trditvi:

H2: Prehod diplomantov na trg dela se (ob kontroliranju sposobnosti diplomantov) razlikuje po visokošolskih institucijah posameznega področja izobraževanja.

H3: Diplomanti različnih vrst izobraževanja z enakega področja imajo različne značilnosti prehoda na trg dela.

Številne študije se osredotočajo tudi na preučevanje razlik v plačah med spoloma (na primer: Altonji in Blank, 1999 ter Blau in Kahn, 2000). Kot povzema Napari (2009), študije kažejo, da je razlika v plačah med spoloma majhna ob samem vstopu na trg dela, vendar se z delovno dobo oziroma z aktivnostjo na trgu dela povečuje (na primer Loprest, 1992; Manning in

Swaffield, 2008). Zato bom v nadaljevanju preverila, če obstajajo razlike v prehodu na trg dela med slovenskimi diplomanti, in sicer:

H4: Verjetnost zaposlitve po diplomi se ob kontroliranju sposobnosti ne razlikuje med spoloma.

Slovenski diplomanti lahko dodiplomsko izobrazbo pridobijo z 22 različnih področij izobraževanja, ki so usklajena z Mednarodno standardno klasifikacijo poklicev (ISCED), na treh državnih univerzah, eni zasebni in na enem izmed tridesetih visokošolskih zavodov. Podiplomska izobrazba (tako magistrska kot doktorska) ni predmet analize. Slovenski visokošolski prostor⁷⁶ je v zadnjem desetletju zaznamovalo ustanavljanje novih visokošolskih zavodov in uvedba bolonjske reforme. Prvi zavodi so diplomante bolonjskih programov vpisali leta 2005. V prvi fazi analize se osredotočam na verjetnost zaposlitve diplomantov visokošolskih in univerzitetnih programov tako pred bolonjsko reformo kot po njej, pri čemer so izključeni diplomanti višjih šol. Enako se osredotočam na diplomante, ki so prvo zaposlitev poiskali po diplomi in so študirali redno. V preučevanem obdobju je največ diplomantov diplomno pridobilo s področja poslovnih in upravnih ved (21,29 % leta 2007; 22,06 % leta 2008 in 23,75 % leta 2009). Sledijo jim diplomanti zdravstva ter diplomanti izobraževalnih ved in izobraževanja učiteljev z okoli 11 %, od tega jih je večina žensk (66,29 % v letu 2007, 66,62 % v letu 2008 in 69,38 % v letu 2009), in so zaključili univerzitetni program (68,34 % v letu 2007; 64,56 % v letu 2008 in 64,56 % v letu 2009). Odstotek diplomantov bolonjskih strokovnih in univerzitetnih programov se je v preučevanih letih povečeval in posledično se je zmanjševal odstotek diplomantov starih programov.⁷⁷ Zaradi majhnega števila diplomantov novih bolonjskih programov je analiza omejena zgolj na diplomante poslovnih in upravnih ved.

Večina diplomantov je visokošolsko izobrazbo pridobila na Univerzi 1 (73,73 % leta 2007, 70,73 % leta 2008 in 72,49 % leta 2009). Sledijo jim diplomanti Univerze 2 (okoli petina oziroma četrtnina diplomantov) ter Univerze 3 (2,83 % leta 2007; 2,57 % leta 2008 in 3,83 % leta 2009) in le malenkost je v vzorcu diplomantov Univerze 4. Diplomantov samostojnih visokošolskih zavodov je bilo v vzorcu okoli odstotek oziroma dva. Poleg omenjenih podatkov o zaključenem izobraževanju diplomantov so v analizi uporabljeni še podatki o mesecu diplome, pri čemer pa kontroliram osebne značilnosti (spol, starost, sposobnosti – rezultati na maturi oziroma zaključnih izpitih) in trajanje študija.

Z metodo probit in mejnimi učinki za posamezne spremenljivke je izračunana verjetnost zaposlitve za osnovno skupino, to so diplomanti moškega spola poslovnih in upravnih ved, ki so diplomirali na Univerzi 1 in zaključili univerzitetni program.

⁷⁶ Pod besedo visokošolski prostor v skladu z opredelitvijo Ministrstva za visoko šolstvo, znanost in tehnologijo RS (MVZT, 2011) razumemo inštitucije, ki ponujajo visokošolsko izobraževanje, torej dodiplomsko izobraževanje (visokošolsko in univerzitetno).

⁷⁷ Na tem mestu je treba opozoriti, da se število diplomantov novih bolonjskih programov v vzorcu razlikuje od števila diplomantov novih bolonjskih programov v celotni generaciji. V letu 2007 je 0,56 % diplomantov zaključilo visokošolsko strokovno izobraževanje prve bolonjske stopnje, njihov delež pa je v letu 2008 narasel na 2,41 % in v letu 2009 na 5,35 %. V letu 2007 je 1,69 % diplomantov zaključilo visokošolsko univerzitetno izobraževanje prve bolonjske stopnje, v letu 2008 se je njihov delež povečal na 2,52 % in v letu 2009 na 8,89 %.

Na podlagi Johnston in DiNardo (1997) ter Greene (2008) definiram model probit kot:

$$\Pr(y_i = 1 / X_i) = \int_{-\infty}^{x_i\beta} \phi(x) dx = \Phi(X_i\beta)$$

kjer je Φ standardna kumulativna normalna porazdelitev in $X_i\beta$ probit score oziroma indeks.

Posameznik je zaposlen, če je odvisna spremenljivka enaka ($y_i = 1$) oziroma kadar je indeks propensity večji od nič:

$$X_i\beta + \varepsilon_i > 0,$$

kjer je X_i vektor individualnih in institucionalnih karakteristik, β vektor oziroma koeficient in ε_i je normalno porazdeljen člen napake (Johnston and DiNardo, 1997).

Interpretacija koeficientov, izračunanih na podlagi modela probit, je problematična, ker koeficienti dejansko merijo spremembo y^* , ki je posledica spremembe ene izmed pojasnjevalnih spremenljivk, zato se večinoma uporablja metoda merjenja mejnih učinkov (marginal effects).

Marginalni učinki so nato izračunani kot primerjava z osnovno verjetnostjo za posamezna področja izobraževanja, visokošolske zavode in vrste študija. V analizi so uporabljene različne specifikacije empiričnega modela prehoda diplomantov na trg dela. Na podlagi rezultatov R^2 ima največjo pojasnjevalno moč model, ki vključuje vse osebne značilnosti in podatke o diplomu (mesec, področje, visokošolska institucija in vrste študija).

Analiza diplomantov, ki so zaključili srednješolsko izobraževanje z maturo, kaže, da so diplomanti medicine in diplomanti tehnike, proizvodnih tehnologij in gradbeništva najuspešnejši pri prehodu na trg dela z vidika verjetnosti zaposlitve v prvih treh mesecih. Glede na diplomante poslovnih in upravnih ved, katerih dobra polovica se jih zaposli v prvih treh mesecih po diplomu, je verjetnost njihove zaposlitve večja za 32,16 odstotne točke (za diplomante medicine) oziroma za 19,85 odstotne točke za diplomante tehnike, proizvodnih tehnologij in gradbeništva. Diplomanti področij, kot so pravo, naravoslovje, matematika in računalništvo, ter diplomanti izobraževalnih ved in izobraževanja učiteljev imajo v povprečju podobno verjetnost kot diplomanti poslovnih in upravnih ved. Med manj zaposljive diplomante pa se uvrščajo diplomanti umetnosti in humanistike, družboslovnih ved (ožje opredeljenih), novinarstva in obveščanja ter osebnih storitev in transporta. Pri izračunu verjetnosti zaposlitve po prvih devetih mesecih se rezultati bistveno ne spreminjajo. Med najbolj zaposljivimi diplomanti v preučevanem obdobju ostajajo diplomanti medicine ter tehnike, proizvodnih tehnologij in gradbeništva, med najmanj pa diplomanti umetnosti in humanistike, ki jih je po osnovni specifikaciji zaposlenih zgolj dobra tretjina.⁷⁸

⁷⁸ Ker analiza prehoda diplomantov na trg dela vključuje samo tri generacije diplomantov, in sicer generacije od leta 2007 do leta 2009, se v analizi spremenjeno gospodarsko okolje še ne odraža veliko. Zanimivo bo preveriti, kako se je prehod diplomantov na primer gradbeništva spremenil za kasnejše generacije. Takšna analiza presega okvire doktorske disertacije.

Poleg razlik v verjetnosti zaposlitve po prvih treh in devetih mesecih po diplomi glede na področje izobraževanja pa je verjetnost odvisna tudi od visokošolske inštitucije in vrste študija. Na podlagi izračunov verjetnosti zaposlitve ugotavljam, da so med najbolj zaposljivimi diplomanti Univerze 1 in univerzitetnega programa pred uvedbo bolonjske reforme. Glede verjetnosti zaposlitve po posameznih vrstah programov je v nadaljevanju uporabljena nova metoda, in sicer metoda propensity score matching (Rosenbaum in Rubin, 1983), ki kontrolira nenaključen vpis študentov na različne visokošolske inštitucije in pripiše pogojno verjetnost glede na osnovne značilnosti, vključene v model.

Na podlagi modela Rosenbaum in Rubin (1983) je empirični model verjetnosti zaključka bolonjskega programa definirana pogojna verjetnost na podlagi predhodnih značilnosti.

$$p(X) = \Pr(D = 1|X) = E(D|X)$$

kjer je poskusna binarna spremenljivka opisana kot $D = \{0,1\}$, $D_i = 1$, če je oseba i dodeljena v poskusno skupino, in $D_i = 0$, če je oseba i dodeljena v kontrolno skupino. X je večdimenzionalen vektor značilnosti. Povprečni učinek – Average Effect of Treatment on the Treated (ATT) je izračunan kot:

$$\begin{aligned} ATT &= E\{Y_{1i} - Y_{0i} | D_i = 1\} = \\ &= E[E\{Y_{1i} - Y_{0i} | D_i = 1, p(X_i)\}] = \\ &= E[E\{Y_{1i} | D_i = 1, p(X_i)\} - E\{Y_{0i} | D_i = 0, p(X_i)\} | D_i = 1] \end{aligned}$$

Na podlagi Becker in Ichino (2002) je izračunan povprečni učinek na osnovi iskanja najbližjega sosedu (nearest neighbour matching), ki je izračunan kot:

$$\begin{aligned} ATT &= \frac{1}{N^T} \sum_{i \in T} \left(Y_i^T - \sum_{j \in C(i)} w_{ij} Y_j^C \right) = \\ &= \frac{1}{N^T} \left(\sum_{i \in T} Y_i^T - \sum_{i \in T} \sum_{j \in C(i)} w_{ij} Y_j^C \right) = \\ &= \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum_{j \in C} w_j Y_j^C \end{aligned}$$

Poskusna binarna spremenljivka je vrsta programa, kar pomeni, da poskusno skupino sestavljajo diplomanti novih bolonjskih programov, kontrolno pa primerljivi stari program. To pomeni, da je tako imenovani treatment vrsta programa. Ker predhodni izračuni kažejo, da se verjetnost zaposlitve statistično značilno razlikuje po posameznih področjih izobraževanja in visokošolskih inštitucijah, so nadaljnji izračuni na podlagi modela propensity score matching narejeni posebej za področje izobraževanja in inštitucijo. Analiza je zaradi velikosti vzorca omejena zgolj na diplomante poslovnih in upravnih ved, ki so v preučevanih letih, torej v letih 2008 in 2009, že pridobili diplomo enega izmed bolonjskih programov (ali visokošolski bolonjski ali pa univerzitetni bolonjski). Nadalje so zaradi omejenega števila teh diplomantov v analizo vključeni diplomanti poslovnih in upravnih ved, ki so na Univerzi 1 diplomirali v letih 2008 in 2009, ter diplomanti poslovnih in upravnih ved Univerze 2, ki so diplomirali v letu 2009. Rezultati natančnejše analize uporabe modela propensity score matching potrjujejo,

da so v povprečju preučevani diplomanti poslovnih in upravnih ved bolonjskih programov Univerze 1 in 2 manj zaposljivi kot diplomanti starih programov. Posebna pozornost je namenjena izključno primerjavi verjetnosti njihove zaposlitve in ne razlogom.

Nadaljnja analiza različne kakovosti visokošolskih inštitucij pa je narejena za diplomante poslovnih in upravnih ved, kajti večina slovenskih visokošolskih zavodov ponuja izobrazbo s tega področja. Tokrat so v analizo vključene vse vrste programov in diplomanti generacije 2007 štirih različnih univerz, ki ponujajo izobrazbo na petih različnih fakultetah, posebni skupini pa sestavljajo še diplomanti samostojnih visokošolskih zavodov in diplomanti višjih strokovnih šol. Zaradi različnih trendov prehoda diplomantov na trg dela, predvsem zaradi deleža zaposlenih diplomantov pred diplomo, ki so študirali izredno, je analiza razdeljena na dva dela, in sicer za diplomante, ki so študirali redno, in tiste, ki so študirali izredno. Z uporabo empiričnega modela probit sem izračunala verjetnost zaposlitve za diplomante ene izmed javnih šol, kjer študenti lahko pridobijo izobrazbo s področja poslovnih in upravnih ved⁷⁹, in razlike v verjetnosti za ostale javne in zasebne šole, ki prav tako ponujajo izobrazbo s področja poslovnih in upravnih ved. V letu 2007 je verjetnost zaposlitve v prvih treh mesecih po diplomi za diplomante, ki so študirali redno, znašala 0,529, medtem ko se je verjetnost zaposlitve statistično značilno zmanjšala za vse ostale diplomante šol, ki ponujajo izobrazbo s področja poslovnih in upravnih ved. Analiza med drugim kaže, da razlike v zaposljivosti niso značilne za diplomantke, kar pomeni, da spol statistično značilno ne vpliva na verjetnost zaposlitve, vpliva pa trajanje študija. Analiza kaže, da se verjetnost zaposlitve statistično značilno zmanjša za diplomante, ki so študirali dlje od povprečja. To naj bi kazalo na sposobnost ali motivacijo študentov oziroma dalo delodajalcu neke informacije o tem. Razlike v zaposljivosti so dokaj konstante pri uporabi različnih modelov. Podobni so tudi rezultati analize zaposljivosti diplomantov med prvimi tremi in šestimi meseci po diplomi.

Rezultati analize zaposljivosti za diplomante, ki so študirali izredno, so malenkost drugačni. Verjetnost zaposlitve v prvih treh mesecih za diplomante javne šole 1, ki je ponujala izobraževanje s področja poslovnih in upravnih ved, je znašala 0,056, kar pomeni, da se je le dobrih 5 % vseh diplomantov te šole zaposlilo v prvih treh mesecih po diplomi. Delež teh pa je statistično značilno manjši za diplomante javne šole 4, ki ponuja izobraževanje na področju poslovnih in upravnih ved, ter za tri- in štiriletne zasebne šole, ki prav tako ponujajo izobraževanje s področja poslovnih in upravnih ved. Robustnost rezultatov je preverjena z orodjem Clarify.

UJEMANJE PODROČJA IZOBRAŽEVANJA IN POKLICA DIPLOMANTA

Izbor področja izobraževanja je odvisen od osebnih preferenc in pričakovanja, da bo vsak diplomant opravljal poklic, za katerega se je izobraževal. Vendar pa se področje izobraževanja in poklic vedno ne ujemata, kar pomeni, da specifično znanje, ki ga je diplomant pridobil med študijem, ni uporabljeno na delovnem mestu. Posledica je manjša

⁷⁹ Zaradi Zakona o državni statistiki – ZDSta (1995) so identitete oziroma imena ustanov zakrita in preimenovana.

produktivnost delavca (Sattinger, 1993). Na tem mestu pa je treba definirati razlike v ujemanju stopnje izobraževanja diplomanta in zahtevane stopnje za opravljanje poklica (tako imenovano vertikalno ujemanje) in ujemanje področja izobraževanja in znanj, ki so potrebna za opravljanje poklica (tako imenovano horizontalno ujemanje). Medtem ko je že več študij analiziralo vertikalno ujemanje in definiralo preizobraženost (overeducation) in nezadostno izobraženost (undereducation) (med drugim: Sicherman, 1991; Hersch, 1991; Robst, 1995, Alba-Ramirez, 1993; Sloane, Battu & Seaman, 1999), pa se vse več študij osredotoča na horizontalno ujemanje področja izobraževanja in poklica (Robst, 2007; Nordin, Perrson in Rooth, 2010). Slednje ugotavljajo, da je prav učinek neujemanja področja izobraževanja in poklica statistično značilno večji od vertikalnega neujemanja. Na podlagi omenjenega zato v četrtem poglavju disertacije preučujem obseg vertikalnega ujemanja za slovenske diplomante visokošolskih inštitucij treh generacij, in sicer od leta 2007 do leta 2009. Za vsakega diplomanta je določeno, ali se področje izobraževanja ujema s prvim poklicem, ki ga diplomant opravlja (ujemanje oziroma match), delno ujema (weak match) ali ne ujema s prvim poklicem (mismatch). Glede mehanizma razporejanja delavcev na delovna mesta navajam dve različni teoriji. Najprej teorijo človeškega kapitala, ki pravi, da investicije v izobraževanja povečujejo človeški kapital posameznika, kar posledično omogoča večjo produktivnost. Na drugi strani pa lahko izobrazba služi kot signal delojemalcem o sposobnostih in znanjih posameznika (Arrow, 1973; Spence, 1973). Ne glede na omenjeno teorijo pa študije ugotavljajo, da je neujemanje področja in stopnje izobraževanja povezano z nižjimi zaslužki (Robst, 2007 ter Nordin, Perrson in Rooth, 2010 navajajo rezultate za horizontalno ujemanje oziroma nižje zaslužke pri neujemanju, medtem ko Bauer, 2000; Groot in van den Brink, 2000; McGuinness, 2006; Battu, Belfield in Sloane, 1999; Grazier, O'Leary in Sloane, 2008; Green in Zhu, 2008 analizirajo nižje zaslužke v primeru preizobraženosti).

V doktorski disertaciji tako analiziram neujemanje področja izobraževanja in poklica diplomantov za različna področja izobraževanja, študijske programe in različne visokošolske inštitucije. V nadaljevanju želim preveriti naslednje hipoteze:

H5: Verjetnost ujemanja področja izobraževanja in prvega poklica diplomanta se razlikuje po posameznih področjih izobraževanja.

H5.1: Verjetnost ujemanja področja izobraževanja in prvega poklica diplomanta je večja od povprečja za diplomante področja ISCED 72 (zdravstvo).

H5.2: Verjetnost ujemanja področja izobraževanja in prvega poklica diplomanta je večja od povprečja za diplomante področja izobraževanja ISCED 5 (tehnika, proizvodne tehnologije in gradbeništvo).

V preučevanem obdobju so se gospodarske razmere spreminjale, zato bom nadalje preučevala, ali se je verjetnost ujemanja področja izobraževanja in poklica za različne generacije diplomantov spremenila in kakšne so bile razlike med posameznimi področji izobraževanja.

H6: Verjetnost ujemanja področja izobraževanja in poklica diplomanta se v preučevanih letih ni spreminjala, kar pomeni, da je bila med generacijami konstantna.

Na podlagi teorije o iskanju zaposlitve želim preveriti, ali je na verjetnost ujemanja področja diplomiranja in poklica diplomanta vplivalo trajanje brezposelnosti diplomanta.

H7: Verjetnost neujemanja področja izobraževanja in prvega poklica diplomanta se povečuje s trajanjem brezposelnosti.

Hipoteze preverjam z uporabo statistično zaščitene mikropodatkov Statističnega urada Republike Slovenije in podatkov o treh generacijah diplomantov, ki so študirali redno in so diplomirali v letih 2007, 2008 ali 2009. Podatkom o diplomi so pripisani podatki iz Statističnega registra delovno aktivnega prebivalstva (SRDAP), kjer je zaveden tudi prvi poklic, ki ga diplomant opravlja. Poklici so določeni na podlagi Standardne klasifikacije poklicev (SKP), ki je usklajena z resolucijo Mednarodne organizacije dela (ILO) oziroma Mednarodne klasifikacije poklicev (ISCO). Na podlagi Mednarodne standardne klasifikacije izobraževanja (ISCED) je za vsakega diplomanta navedeno področje izobraževanja. Na podlagi tega področja in prej omenjene Standardne klasifikacije poklicev (SKP) so opredeljeni poklici za vsako področje izobraževanja, ki se z njim ujemajo, delno ujemajo oziroma ne ujemajo. Poleg navedenega in opisanega horizontalnega ujemanja pa je na podlagi navedenih podatkov mogoče določiti tudi vertikalno ujemanje oziroma ujemanje stopnje izobrazbe z zahtevano stopnjo izobrazbe za opravljanje poklica. Tako so določeni poklici, za katere so diplomanti preizobraženi.

Za analizo so izbrani izključno diplomanti, ki so študirali redno, kajti predhodne analize so pokazale, da se diplomanti, ki študirajo redno, in tisti, ki študirajo izredno, med seboj zelo razlikujejo. Slednji so na primer večinoma zaposleni že pred diplomom in tisti, ki dejansko med študijem niso zaposleni, so večinoma študenti, ki zaradi nezadostnega števila točk na zaključnem izpitu oziroma maturi niso bili sprejeti kot redni študenti. To pomeni, da se razlikujejo tudi po sposobnostih in motivaciji. V vzorcu je tako 27.875 diplomantov oziroma za 23.197 diplomantov so dostopni tudi podatki o točkah na maturi.

Najprej analiziram verjetnost ujemanja poklica po posameznih področjih izobraževanja, za kar uporabljam model ordered logit, kajti kakovost ujemanja lahko rangiramo. To pomeni, da je neujemanje slabše od delnega ujemanja in delno ujemanje slabše od ujemanja področja in poklica.

Verjetnost Y_{ij} je definirana kot verjetnost, da je posameznik i v kategoriji j ali višje. Za izračun uporabljam model logit (Cameron and Trivedi, 2005):

$$p_i = Pr[y_i = 1|x_i] = \frac{\exp(\beta_1 + \beta_2 x_i)}{1 + \exp(\beta_1 + \beta_2 x_i)} \quad (4.1.)$$

Kar zagotavlja, da je $0 < p_i < 1$. Model ocenjujem z metodo največje verjetnosti in mejni učinki so izračunani kot:

$$\frac{dp_i}{dx_i} = \frac{\exp(\beta_1 + \beta_2 x_i)}{(1 + \exp(\beta_1 + \beta_2 x_i))^2} \beta_2 \quad (4.2)$$

Ordered model s tremi 3 alternativami je nato definiran kot

$$y_i = j \text{ if } \alpha_{j-1} < y_i^* \leq \alpha_j, \quad (4.3)$$

kjer je $\alpha_0 = -\infty$. Potem

$$\begin{aligned} Pr[y_i = 1] &= Pr[\alpha_{j-1} < y_i^* \leq \alpha_j] \\ &= Pr[\alpha_{j-1} < x_i'\beta + u_i \leq \alpha_j] \\ &= Pr[\alpha_{j-1} - x_i'\beta < u_i \leq \alpha_j - x_i'\beta] \\ &= F(\alpha_j - x_i'\beta) - F(\alpha_{j-1} - x_i'\beta) \end{aligned}$$

Kjer je F cdf od u . Regresijski koeficienti β in 2 parametra α_1, α_2 sta izračunana na podlagi maksimiziranja log-likelihood funkcije, kjer je p_{ij} definirana kot v (4.3). u je logistična distribucija $F(z) = e^z / (1 + e^z)$.

Marginalni učinki so definirani kot

$$\frac{\partial Pr[y_i=j]}{\partial x_i} = \{F'(\alpha_{j-1} - x_i'\beta) - F'(\alpha_j - x_i'\beta)\}\beta, \quad (4.4)$$

kjer je F' odvod od F .

Navedeno najprej izračunam za diplomante, ki so opravljali maturo, in tiste, ki so po končani srednji šoli opravljali zaključni izpit. Nato analizo ponovim za diplomantke. Poleg tega uporabim več različnih specifikacij z dodajanjem spremenljivk in preverjanjem najboljšega modela (Long, 2007; Freese in Long, 2006). Verjetnost ujemanja je izračunana kot

Specifikacija 1:

$$Y_{ij} = f(\text{spol, točke, leto diplomiranja, področje izobraževanja})$$

Specifikacija 2:

$$Y_{ij} = f(\text{spol, točke, leto diplomiranja, študijski program, področje izobraževanja})$$

Specifikacija 3:

$$Y_{ij} = f(\text{spol, točke, leto diplomiranja, študijski program, visokošolska inštitucija, področje izobraževanja})$$

Za preverjanje sedme hipoteze pa uporabim model probit za računanje verjetnosti poklica, ki se ne ujema s področjem diplome v odvisnosti od trajanja brezposelnosti po diplomi (Smith, McKnight in Naylor, 2000; Johnston in DiNardo, 1997). Verjetnost, da se diplomant zaposli na delovnem mestu, za katero ni izobražen (y), je izračunana kot:

$$y = \begin{cases} 1 & \text{z verjetnostjo } p \\ 0 & \text{z verjetnostjo } 1 - p \end{cases} ,$$

kjer je 1 neujemanje in 0 ujemanje oziroma delno ujemanje. Verjetnost neujemanja je izračunana kot

$$p_i \equiv \Pr_i(y_i = 1 | X_i) = \Phi(X_i\beta) ,$$

kjer so neodvisne spremenljivke X_i vektor osebnih značilnosti (spola in sposobnosti), študijskih značilnosti (leto diplome, trajanje študija, področje izobraževanja, visokošolska inštitucija in študijski program) in značilnosti zaposlitve (trajanje brezposelnosti). i označuje posameznika, Φ je standardna kumulativna normalna porazdelitev in $X_i\beta$ je indeks probit. Nato so izračunani mejni učinki.

Rezultati kažejo, da se je odstotek diplomantov, katerih prvi poklic se je ujema s področjem izobraževanja, iz generacije v generacijo zniževal, hkrati pa se je zviševal odstotek tistih, katerih prvi poklic se ni ujema s področjem izobraževanja. Diplomantke so bile v obravnavanih letih manj uspešne pri iskanju zaposlitve, ki se ujema s področjem njihovega izobraževanja, hkrati pa so bile ženske manj pogosto preizobražene. Tudi odstotek preizobraženih diplomantov v generaciji se je v preučevanih letih povečeval za vsako kasnejšo generacijo diplomantov.

Analiza ujemanja področja izobraževanja in poklica kaže, da so diplomanti različnih področij izobraževanja različno uspešni pri iskanju poklica, ki se ujema s področjem njihovega izobraževanja. Med najuspešnejše diplomante sodijo diplomanti zdravstva, arhitekture in gradbeništva, računalništva, prava ter izobraževanja učiteljev. Zanimivo je, da so med njimi diplomanti izobraževanja učiteljev, ki se praviloma zaposlujejo v javni upravi. Najmanj uspešni pa so diplomanti umetnosti in humanistike, družbenih ved, transportnih in varnostnih ved in varstva okolja. Analiza posebej po spolih kaže, da diplomantke tistih področij, kjer prevladujejo diplomanti, nimajo večje verjetnosti ujemanja področja izobraževanja in poklica kot osnovna skupina diplomantov poslovnih in upravnih ved. Še večjo verjetnost od slednjih imajo diplomantke zdravstva, arhitekture in prava. Medtem ko imajo med diplomanti največjo verjetnost ujemanja področja izobraževanja in poklica diplomanti arhitekture in gradbeništva, veterine, tehnike in ostalih naravoslovnih ved.

Verjetnost ujemanja je statistično značilno manjša za diplomantke in se zmanjšuje za diplomante kasnejših generacij. Ob vključitvi daljšega trajanja študija od povprečja se rezultati ne spremenijo, zato sem vključila točke na maturi, ki pa statistično značilno ne vplivajo na verjetnost ujemanja, vendar pa izboljšajo model. Ob vključitvi spremenljivke, ki meri preizobraženost diplomantov za opravljanje poklica, rezultati kažejo, da je verjetnost neujemanja področja izobraževanja statistično značilno povezana tudi s preizobraženostjo. Če povemo še z drugimi besedami, za diplomante, ki so preizobraženi, je večja verjetnost, da se področje njihovega izobraževanja ne ujema s poklicem, ki ga opravljajo.

Rezultati tudi kažejo, da se verjetnost ujemanja področja izobraževanja in poklica diplomanta razlikuje po posameznih visokošolskih inštitucijah in vrstah študija. Tako imajo diplomanti starih univerzitetnih programov največjo verjetnost ujemanja področja izobraževanja in poklica, medtem ko imajo diplomanti novih bolonjskih programov manjšo verjetnost, prav tako diplomanti visokošolskih programov. Najvišjo verjetnost ujemanja imajo diplomanti Univerze 2, sledijo jim diplomanti Univerze 1 in nato ostalih visokošolskih inštitucij.

Pri analizi verjetnosti, da diplomant sprejme službo, kjer ne uporablja svojih specifičnih znanj, pridobljenih med študijem (glede na trajanje brezposelnosti), pa ugotavljam, da dlje kot je diplomant brezposeln, večja je verjetnost, da bo sprejel službo, pri kateri ne bo uporabljal svojih specifičnih znanj. Verjetnost ni odvisna od visokošolske inštitucije, je pa odvisna od področja izobraževanja. Najmanjšo verjetnost imajo diplomanti zdravstva, računalništva in informatike ter poslovnih in upravnih ved. Hkrati ugotavljam, da se je verjetnost, da diplomanti sprejmejo poklic, za katerega nimajo potrebnih specifičnih znanj, z vsako kasnejšo generacijo diplomantov povečuje. To lahko kaže na spremenjene gospodarske razmere oziroma na povezavo med gospodarskimi cikli in neujemanjem področja izobraževanja in prvih poklicev diplomantov.

Na podlagi analize podatkov diplomantov treh generacij, in sicer od leta 2007 do 2009, ugotavljam, da se ujemanje področja izobraževanja in prvega poklica diplomanta statistično značilno razlikuje za preučevane tri generacije diplomantov po področjih izobraževanja. Največjo verjetnost ujemanja področja in poklica v preučevanem obdobju imajo diplomanti zdravstva, arhitekture in gradbeništva, prava in izobraževanja učiteljev. Ugotavljam, da se verjetnost ujemanja spreminja za posamezne preučevane generacije diplomantov in se z vsako naslednjo generacijo diplomantov zmanjšuje. Hkrati pa se zmanjšuje tudi glede na trajanje brezposelnost, kar pomeni, da dlje kot so diplomanti brezposelni, večja je verjetnost, da bodo sprejeli poklic, kjer ne bodo uporabljali specifičnih znanj, pridobljenih med študijem. Hkrati ugotavljam, da je verjetnost neujemanja za preučevane diplomante večja, če je diplomant tudi preizobražen za izbrani poklic, ki ga opravlja.