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KEY COMPETENCIES OF ECONOMICS AND BUSINESS ADMINISTRATION GRADUATES

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KEY COMPETENCIES OF ECONOMICS AND BUSINESS ADMINISTRATION GRADUATES

SUMMARY

This doctoral dissertation studies the role key competences play in bridging the gap between labor demand and labor supply in Croatia. Knowledge-based economy and fourth industrial revolution – key features of 21st century economics – brought incremental advances in science and technology and, hence, forced firms to react very quickly to new challenges and opportunities. While these ongoing automation and digitization processes hold great promise for future prosperity and job creation, many of them also pose major challenges requiring proactive adaptations, especially in human resource management.

The main goal of this dissertation is to review the competence-based approach in human resource management and assess how it fits the requirements of modern labor market. A combination of the methodology that emerges from economics of education and production function approach should enable closer examination of the relationship key competences play in individual and firm outcomes. All these issues are examined in three different parts (essays), each dealing with a particular research topic, but connected through their main aim – investigating the link between competences and outputs on both the product and the labor market.

The first essay presents the recent literature review of the competence-based approach in the knowledge-based economy of the 21st century. Fourth industrial revolution brought a decline in lower-skilled, manual labor, and an increase in knowledge work and service occupations. In these circumstances, increasing emphasis is given to "soft" factors of production such as employees' competences and how are those connected to firm performance and individual labor market outcomes. Firms are thus increasingly starting to utilize competence-based approach when assessing the fit of their workforce. This holistic approach aims to identify set of desired competences, needed for successful job performance, which are then matched to their potential employees. This essay starts with a brief introduction on development of this approach, especially delineating the difference between "competency" and "competence". It then investigates different ways and key challanges of empirically measuring competences, both those required by employers and those possessed by workforce. Discussion is then directed towards latest available insights on degree this factor of production is associated with firm performance and individual labor market outcomes. These sections also introduce and discuss different publicly available datasets (such as Programme for the International Assessment of Adult Competencies – PIAAC) used in such analyses. The final part of this essay is reserved for analysis of recent work in competence mismatch literature, which also serves as a good introduction into the following two essays.

The second essay concentrates on employers and investigates the effects of a match between their competence requirements and competence development of their workforce on firm

performance. This essay concentrates on Croatia which, due to its high cost of labor and wage adjustments and low rates of on-the-job training, is a perfect laboratory environment for studying competence-based topics. Analysis is focused on positions within firm that require competences in economics and business domain, with a threefold aim: 1) to identify key competences for positions held by workers with economics and business background and their importance for the firm; 2) to identify development level of those key competences among the current workforce of a particular firm; and finally 3) to associate this competence (mis)match to firm performance. Empirical analysis is conducted on primary, questionnaire data, and secondary data of firms' financial and structural characteristics. Key competences were identified using factor analysis which were then associated with firms' performance via production function in both static and dynamic environment using standard regression model, Heckman selection model and Arellano-Bond estimation. Results indicate that *motivation and organization*; *project management and professionalism;* and *collectedness, presentation and teamwork* are most important competences required by employers while *business communication* is most developed competence among their existing workforce. Further analysis indicates that gaps in gaps in competences *quantitative-economics algebra*; *collectedness, presentation and teamwork*; and *motivation and organization* are all negatively associated with firm performance, with the latter having the greatest effect.

Final essay concentrates on employers and gradutes and analyses the effect of (mis)match between competences possessed by graduates and those required by employers. Analysis is performed on a sample of economics and business graduates and a sample of firms hiring those graduates in Croatia during 2016. The aim of this essay is threefold. Firstly, using economics and business graduates' data, it indicates which competences are mostly developed through their tertiary education. Results show that tertiary education curricula is highly skewed towards acquisition of economics-and-business practical competences at the expense of equipping graduates with competences of general type. The next goal is to assess the degree of proximity between the competences acquired at universities and those required on the labor market. These results indicate that employers put greater emphasis towards possessing general competences, instead of economics-and-business practical ones, and hence indicate to a mismatch between competence attainment and requirements of those young workers. Third and final goal is to investigate how does this proximity between acquired and required competences affect labor market status of a graduate. Results here point at a penalty of having a competence mismatch towards graduates' probability of being employed and their wages.

Keywords: key competences, competence measurement, competence matching, competence shortage, firm performance, graduates, Croatia

KLJUČNE KOMPETENCE DIPLOMANTOV NA PODRUČJU EKONOMISKIH IN POSLOVNIH VED

POVZETEK

Doktorska disertacija se ukvarja z vlogo, ki jo imajo ključne kompetence pri premoščanju vrzeli med povpraševanjem in ponudbo na hrvaškem trgu dela. Na znanju temelječe gospodarstvo in četrta industrijska revolucija – ključni značilnosti ekonomije 21. stoletja – sta prinesli postopen napredek na področju znanosti in tehnologije ter sta posledično prisili podjetja, da se zelo hitro odzivajo na nove izzive in priložnosti. Medtem ko potekajoči procesi avtomatizacije in digitalizacije veliko obetajo glede prihodnje blaginje in ustvarjanja delovnih mest, številni med njimi predstavljajo velike izzive, zahtevajoč proaktivno prilagajanje, še zlasti pri upravljanju človeških virov.

Glavni cilj te disertacije sta pregled pristopa na podlagi kompetenc pri upravljanju človeških virov in ocena ujemanja glede na zahteve sodobnega trga dela. Kombinacija metodologije, ki izvira iz ekonomije izobraževanja in proućevanja uspešnosti delovanja podjetij, bi morala omogočiti podrobnejšo preučitev vpliva ključnih kompetenc na uspešnost delovanja posameznika ter podjetja. Vsa ta vprašanja preučujemo v treh različnih delih (esejih); vsak del obravnava posebno raziskovalno temo, vendar so vsi trije deli povezani s svojim glavnim ciljem – raziskavo povezave med kompetencami in rezultati tako na trgu proizvodov kot trgu dela.

Prvi esej predstavlja pregled pristopa na podlagi kompetenc v gospodarstvu 21. stoletja, ki temelji na znanju, kot ga ponuja najnovejša literatura. V okviru razprav o četrti industrijski revoluciji je vse več pozornosti namenjene “mehkim” proizvodnim dejavnikom, kot so kompetence zaposlenih in temu, na kateri način so le-te povezane z uspešnostjo podjetja in rezultati posameznika na trgu dela. Podjetja torej vedno bolj uporabljajo pristop na podlagi kompetenc pri ocenjevanju primernosti svojih zaposlenih. Ta celostni pristop je usmerjen k identificiranju želenih kompetenc, potrebnih za uspešno opravljanje dela, ki se potem povezuje s svojimi potencialnimi zaposlenimi. Esej se začne s kratkim uvodom o razvoju predmetnega pristopa, pri čemer je poseben poudarek na identifikaciji razlike med “sposobnostjo” in “kompetenco”. Nato raziskuje različne načine in ključne izzive empiričnega merjenja kompetenc tako tistih, ki jih zahtevajo delodajalci, kot tudi tistih, s katerimi razpolagajo zaposleni in iskalci zaposlitve. Razpravo nato usmerjamo k najnovejšim razpoložljivim vpogledom glede obsega, v katerem je ta proizvodni dejavnik povezan z uspešnostjo podjetja in rezultati posameznega trga dela. Ti odstavki uvajajo in obravnavajo tudi različne javno dostopne zbirke podatkov, ki se uporabljajo za tovrstne analize. Zadnji del tega eseja je rezerviran za analizo najnovejših del iz literature o neujemanju kompetenc in služi tudi kot dober uvod v naslednja dva eseja.

Drugi esej je osredotočen na delodajalce in raziskuje učinke ujemanja med njihovimi zahtevami po kompetencah ter kompetencami njihovih zaposlenih na uspešnost podjetja. Ta

esej je osredotočen na Hrvaško, ki je zaradi svojega togega trga dela in nizke stopnje usposabljanja na delovnem mestu popolno laboratorijsko okolje za preučevanje tem, ki temeljijo na kompetencah, pridobljenih v času izobraževanja. Analiza je osredotočena na tiste položaje v podjetju, ki zahtevajo kompetence s poslovnih in ekonomskih področij s trojnim ciljem: 1) identificiranje ključnih kompetenc za tista delovna mesta, na katerih so zaposleni delavci ekonomske in poslovne izobrazbe ter njihov pomen za podjetje; 2) identificiranje ravni razvoja teh ključnih kompetenc med trenutno delovno silo posameznega podjetja; in končno 3) povezovanje (ne)ujemanja kompetenc z uspešnostjo podjetja. Empirična analiza je izvedena na podlagi primarnih podatkov iz vprašalnika in sekundarnih podatkov o finančnih in strukturnih značilnostih podjetja. Ključne kompetence so bile ocenjene z uporabo faktorske analize in bile nato vključene kot pojasnjevalna spremenljivka uspešnosti podjetja prek proizvodne funkcije tako v statičnem kot v dinamičnem okolju z uporabo standardnega regresijskega modela, Heckmanovega modela izbire in Arellano-Bond cenilke GMM. Rezultati kažejo, da so *motivacija in organizacija*, *upravljanje projektov in profesionalizem* ter *zbranost, predstavitev in timsko delo* najpomembnejše kompetence, ki jih zahtevajo delodajalci, medtem ko se je *poslovna komunikacija* izkazala za najbolj razvito kompetenco med njihovimi zaposlenimi. Nadaljnja analiza kaže, da so vrzeli med kompetencami *kvantitativno-ekonomska algebra, zbranost, predstavitev in timsko delo* ter *motivacija in organizacija* negativno povezane z uspešnostjo podjetja, pri čemer ima slednja največji vpliv.

Zadnji esej je osredotočen na delodajalce in diplomante oziroma na analizo učinka (ne)ujemanja med kompetencami, ki jih imajo diplomanti, in tistimi, ki jih zahtevajo delodajalci. Analiza je bila izvedena na vzorcu diplomantov ekonomske in poslovnih šol ter vzorcu podjetij, ki zaposlujejo te diplomante na Hrvaškem v letu 2016. Cilj eseja je trojen. Najprej, z uporabo podatkov o diplomantih ekonomske in poslovne izobrazbe kaže, katere kompetence so večinoma razvite skozi njihovo terciarno izobraževanje. Rezultati kažejo, da je študijski program terciarnega izobraževanja bolj usmerjen k pridobivanju kompetenc, značilnih za ekonomsko in poslovno izobraževanje (specifične kompetence), ne razvija pa splošnih kompetenc. Naslednji cilj je oceniti stopnjo ujemanja med kompetencami, ki so bile pridobljene na univerzah, in tistmi, pridobljenimi na trgu dela. Ti rezultati kažejo, da delodajalci dajo več poudarka kompetencam splošnega tipa, namesto tistim posebnim za ekonomsko in poslovno področje, zaradi česar se kaže neujemanje med povpraševanjem in ponudbo kompetenc pri mladih. Tretji in končni cilj je raziskati, kako ta bližina med pridobljenimi in zahtevanimi kompetencami vpliva na status diplomanta na trgu dela. Rezultati kažejo, da obstoj kompetenčne vrzeli vodi v nižjo verjetnost zaposlitve diplomantov ter nižjo plačo.

Ključne besede: ključne kompetence, merjenje kompetenc, ujemanje kompetenc, pomanjkanje kompetenc, uspešnost podjetja, diplomanti, Hrvaška

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LIST OF ABBREVIATIONS

2SLS – 2 Stage Least Squares

ALL – Adult Literacy and Life Skills survey

CBS – Croatian Bureau of Statistics

CEE – Central and Eastern European Countries

CEO – Chief Executive Officer

CHEERS – Careers after Higher Education – A European Research Survey

CSR – Corporate Social Responsibility

EU – European Union

EUR – EU currency – euro

FINA – Croatian Financial Agency

GDP – Gross Domestic Product

GMM – General method of Moments

GPA – Grade Point Average

HE – Higher Education institutions

HR – Human Resources

HRK – Croatian national currency – kuna

HRM – Human Resources Management

HSSM – Heckman Sample Selection Model

HUP – Croatian Employers' Association

IALS – International Adult Literacy Survey

ICT – Information and Communication Technology

IMR – Inverse Mills Ratio

LFS – Labor Force Survey

MCI – Management Charter Initiative

MSE - Ministry of Science and Education of the Republic of Croatia

MZOS – Ministry of Science, Education and Sports of the Republic of Croatia

NACE – Nomenclature generale des Activites economiques dans les Communautes europeennes

NCF – National Curriculum Framework

NCVQ – National Council for Vocational Qualification

OC – organizational capital

OECD – Organization for Economic Cooperation and Development

OLS – Ordinary Least Squares

PIAAC - Programme for the International Assessment of Adult Competencies

PISA - Programme for International Student Assessment

R&D – Research and Development

REFLEX – International Survey of Higher Education Graduates

SCANS – Secretary's Commission on Achieving Necessary Skills

SEM – Structural Equation Modelling

SME – Small and Medium Enterprises

TIMSS – Trends in International Mathematics and Science Study

UK – United Kingdom of Great Britain and Northern Ireland

US – United States of America

1 INTRODUCTION

1.1 Motivation

Emergence of knowledge-based economy, marked by increasing pace of advances in science and technology, has forced both entrepreneurs and individuals to react very quickly to new challenges and opportunities. Rise of the knowledge-based economy was accompanied by the emergence of the Industry 4.0, also referred to as the Fourth industrial revolution (Kagermann et al., 2013; Saniuk, Saniuk, Caganova & Cambal, 2014; Hecklau, Galeitzke, Flachs & Kohl, 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Industry 4.0 concept is used to describe increasing digitization trend of entire value chain and the resulting interconnection of people, objects and systems through real time data exchange (Hecklau, Galeitzke, Flachs & Kohl, 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Although these processes hold great promise for future prosperity and job creation, they also pose major challenges from the human resource (HR) management standpoint.

Due to increasing pace of digitization, simple and monotonous work processes are being automated while other processes involving higher cognitive functions that are not easily automated (at least not yet) become more complex and intertwined. Hence, HR management becomes of crucial importance as employees' competences are in constant need of development, adaptation and upgrading (Leoni, 2012; Hecklau, Galeitzke, Flachs & Kohl, 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). To illustrate this point, World Economic Forum (2016) etimates that as high as 65% of children entering primary school today will end up working in completely new jobs that don't even exist yet, 50% of subject knowledge acquired during the first year of a four-year technical degree will become outdated by the time students graduate, and more than a third of the desired competence set of most occupations by 2020 will be comprised of competences that are not yet considered crucial today. These results only highlight the urge to align the competences required by the contemporary labor market to those being taught during education and/or training process. In fact, World Economic Forum (2016) already reports that 38% of employers reported having difficulties in filling jobs in 2015.

Low proximity of competence alighment between employers and employees (competence mismatch) can have important economic consequences (Quintini, 2011). At individual level, it impacts employability, job satisfaction and wages. At firm level, it dampens productivity and turnover growth and increases on-the-job adjustment and training costs. Finally, at macroeconomic level it increases natural rate (equilibrium rate) of unemployment and reduces GDP growth prospects. Hanushek and Woessmann (2012) show that alignment of competences in mathematics, science and literacy seem to be long-run predictors of economic growth.

Employers response to this increasing pace of change in market conditions is to become more flexible in terms of their organizational structure and quick in anticipation of new customer needs (Cox & King, 2006; Lazarova & Taylor, 2009). In order to become more flexible, they had to change their hiring strategies by placing greater emphasis on fitting into the whole organizations' climate and corporate culture, as opposed to hiring for a fixed job position (Gunz, Evans & Jalland, 2000). This is where the analysis of competences became detrimental for both firms' and individual success on the labor market. Competence models (also known as *competence approach*) are a descriptive tool that identifies the competences, knowledge, skills, abilities and behavior needed to perform effectively in an organization (Felstead & Ashton, 2000; Chung-Herrera, Enz & Lankau, 2003; Hecklau, Galeitzke, Flachs & Kohl, 2016), and are also important for integrating education and training with labor market needs, thus promoting mobility for individuals, especially for workers faced with job insecurity (Van der Klink & Boon, 2002).

Competence models drew their origins to both the US and the UK in 1970s and have since spread into most of developed countries, so much so that most countries apply it on the national level when defining educational curricula and standards. This approach deals with employers, employees and policy-makers: 1) from employers' point of view, the goal is to select the people with a particular set of competences (also known as *competence inventory*) for the positions requiring that particular competence inventory, which should result in better firm performance; 2) from employees' point of view, the goal is to acquire competences demanded by current labor market and increase their employability and their productivity (which would in turn increase their wages); and 3) from policy-makers' point of view, the goal is to create appropriate curricula for acquisition of those competences through education process, thus reducing competence mismatch on labor market, which should increase growth prospects of entire economy.

Hence, the main motivation of this doctoral dissertation is to study the effects of competences and their mismatch on both firm performance and individual outcomes in Croatia with the help of production function approach and human capital model. Moreover, this dissertation should determine which competences are considered most important by contemporary employers and assess whether educational institutions are equipping their students with the same. In this way, this doctoral dissertation should both contribute to the comprehension of the issues in the Croatian labor market, and also obtained results should be interpreted as general policy recommendations for improving labor market efficiency.

1.2 Institutional setting

1.2.1 Croatian labor market

Croatian contemporary labor market was heavily influenced by country's transition from planned to market economy, as can be seen in its market institutions, demographic structure of the labor force, structure of the educational system and the expectations on both supply and the demand side on the labor market (Bićanić & Babić, 2008). There are also certain peculiarities in this transition specifically tied to Croatian case. Hoffman, Bićanić and Vukoja (2012) argue that Croatian previous central decision-making system was far more decentralized and market-related, compared to other transition economies. In addition, Croatian transition and disintegration from Yugoslavia was accompanied by the homeland war, which delayed formation of solid administrative structure to establish a new, lawful independent state. Čučković (2011) argues these were the main reasons in weaker-than-expected economic transition outcomes and efficiency gains from economic reforms, privatization and restructuring.

Labor market reform, as well as all other reforms, depended on the successful privatization process which did not played out as expected. Vehovec and Domadenik (2003) argue that privatization in the early transition years (early 1990s) was governed by the need to change the ownership structure, while in the latter part of 1990-ies and early 2000-s the main motive was to finance budget deficit. Katić (2006) explored Croatia's unemployment trends in 1990-97 period and concluded that labor market adjustment in transition period was more governed by lower participation rates rather than higher unemployment, emphasizing the low job-creating rate as the main problem. Others (Čučković, 2011) also argue that Croatian privatization process was accompanied by numerous illegal, or at least very suspicious, activities.

Specifically tied to labor market, Škare (2001) showed that in 1960-98 period unemployment trend was mainly determined by a change in the price level, the structure of GDP with respect to shares of capital and labor, changes in wages and exchange rate policy. Matković (2003) analyzes employment structure and growth in pre- (1970-1990) and post-transition (1990-2001) phase. In the former period, employment and occupational structure was very rigid due to stability of political and institutional effects and employment continuously grew, while in the latter period employment figure plunged initially since the offset of transition only the stabilize towards the end of 1990s.

Transformation process also required establishment of labor market institutions to ease the gradual shift to market driven supply and demand of labor. Even though some institutional arrangements existed prior to transition process, they were ill-suited for the new market economy – meaning that most of labor market legislation was developed in 1990s. First labor act since Croatia's independence from Yugoslavia was signed in 1995, which still included certain "remnants of the old system" like advanced notice, severance pay and preference for

full-time employment. This meant that Croatia still had higher than average European employment protection legislation for most of the time after the transition process started, thus exposing institutional inflexibilities to turning completely to a new market-driven system (Matković & Biondić, 2003). Only with the revision of labor act in 2003 was labor market brought closer to new market-driven regime – unemployment benefits were reduced, flexibility of wage contracts was introduced, cost of layoffs and right to severance pay was also reduced (Hoffman, Bićanić & Vukoja, 2012). A new labor act that came into force from 2010 further liberalized the labor market in a form of more flexibility through limitations in the application of legal provisions for certain categories of workers; improved social security of employees in atypical forms of employment; stricter rules concerning temporary employment contracts.

However, even after almost thirty years from transition, Croatian labor market is still characterized as rigid with high costs to labor and wage adjustments, very low mobility of workers and continued demographic ageing, further amplified by the effects of economic crisis since late 2008 (Botrić, 2009; Galić & Plećaš, 2012; Obadić & Oršolić, 2012; Tomić, 2012; Tomić & Domadenik, 2014). In a prolonged recession during 2009-14 period, Croatia recorded one of the highest rates of youth unemployment in the EU, with almost every one-in-two young people without a secured work contract (45.1%). In 2016, the year when the data gathering process used in this dissertation was carried out, youth unemployment dropped for the first time since the start of the crisis to 28.8% (Eurostat, 2018). However, many authors (Hornstein Tomić & Taylor, 2018) argue this drop in unemployment was a result of increased emigration rates rather than of rising employment. Šošić (2008) analyzed the pre-crisis period and showed that improvements in aggregate net job creation recorded up to 2008 mainly resulted from decrease in job destruction rate, rather than an increase in job creation rate. Croatian contemporary labor market still continues to be characterized by a distinct duality (Franičević, 2011) – on one side there are protected workers in state sector and on the other are private sector workers without collective agreements, largely on temporary contracts.

Concentrating more on the competence mismatch on Croatian labor market, Obadić (2005) argues that increased structural imbalance on Croatian labor market resulted from changes in the structure of product market during the 1990s when Croatia broke ties from former socialist system, leading to changes in labor demand which was not followed by changes in labor supply. This imbalance entailed a situation in which the characteristics of unemployed workers, particularly in terms of competences, work experience or location, differed from those required for available jobs. Similar conclusion was also found by Botrić (2009), who suggested that probability of long-term unemployment is higher for people that come from certain previous occupations which were, due to fast restructuring and transition process, left with skills no longer required on the labor market. This is also corroborated by Gotovac (2011), who argued that high unemployment and low activity rates were mainly the consequence of insufficient labor demand and the mismatch in labor supply and demand.

Finally, European Commission (2017) also highlighted the fact that Croatia, like many Danube Region countries with a socialist past, faces challenges in negative demographic developments, high youth unemployment, increase in immigration of tertiary-educated young people and the mismatch of prevailing education and training programs with the actual specialist needs and knowledge requirements of domestic labor markets.

1.2.2 Brief outline of Croatian educational system

In light of the 2008 economic crisis that exposed Croatia's structural weaknesses, a public debate has been opened on whether the educational system has played a crucial role in low resilience to negative downturn effects. According to European Commission (2018) figures for 2017, Croatia has the lowest level of early leavers from education and training in the EU (3.1% compared to the EU average of 10.6%). On the other hand, tertiary education attainment (ages 30-34) is lower in Croatia (28.7%) compared to EU average (39.9%) and early childhood education and care participation is also significantly lower (75.1%) compared to EU average (95.3%). However, the most concerning fact, in line with the previous discussion of high youth unemployment, is that only 62.6% of recent tertiary graduates found employment within one to three years after graduation, compared to the EU average of 80.2%. Even though this situation can partly be attributed to recent economic crisis and low economic growth in 2009-14 period, many indications have shown that graduates lack key employability competences required by potential employers such as technical, foreign language, management and problem-solving skills. This mismatch between competences acquired at higher education institutions and the needs of modern-day employers, coupled with rapidly internationalized labor market, continue to dampen country growth prospects and competitiveness (Bejaković, 2014).

Hornstein Tomić and Taylor (2018) argue that change in Croatian education system is key in reducing aforementioned mismatch between prevailing education and training programs curricula with contemporary labor market needs and in improving youth employability. Aside from official EU statistics presented above, this is further backed up by relatively low achievements of Croatian pupils in international surveys, such as the OECD's Programme for International Student Assessment (PISA). European Commission (2018) reports that 32.0% and 24.6% of 15-year-old Croatian pupils were underachieving in mathematics and science skills, respectively, compared to EU average (22.2% and 20.6% for mathematics and science, respectively).

In the mid-2000s Croatian educational system was described by "rigid, hierarchical and opaque governance and management", characterized by conflicting authorities, high costs to labor and wage adjustments, poor transparency in budget allocation and a lack of synergy (legislative, professional and institutional) for system change (Lowther, 2004, p. 19–20). These circumstances necessitated ground-up reforms to allow better alignment between

educational institutions and employer needs. In 2010, Ministry of Science, Education and Sports (MZOS)[1] proposed a much needed reform in a form of new National Curriculum Framework (NCF), which set out "Knowledge, competences, success and competitiveness" as strategic goals in the transition to a system based on student achievement and learning outcomes rather than content (MZOS, 2010, p. 5). This reform was also back up by the representatives from the private sector, who have also emphasized the necessity to align contemporary labor market needs to educational outcomes. Amongst others, Croatian Employers' Association (HUP) have frequently emphasized the shortage of competences among young school-leavers and graduates and the difficulties they face when trying to fill vacancies.

In 2015 this NCF reform was operationalized through a comprehensive Strategy for Education, Science and Technology, which gave an in-depth analysis of the Croatian education system from pre-school to tertiary level, also covering adult education and the concept of life-long learning, and presented an ambitious agenda for improving educational outcomes in all these sectors linked to the parallel development of the science system. In addition, government also appointed a working group, comprised of several stakeholders (secondary school teachers, university professors, field experts…), that was given a task of drafting a document for implementation of this Strategy, which was to be implemented on an experimental basis in certain institutions for one year before its full implementation in entire country. Draft version of this document, entitled "Cjelovita kurikularna reforma" [The whole curriculum reform] (MZOS, 2016) was presented in 2016. This document clearly defined what the learning outcomes should be, and has put greater emphasis on critical thinking and development of problem-solving competences which should better prepare pupils and students for further education and challenges on the labor market. Even though the proposed reform had to be delayed throughout the bigger part of 2016 due to conflicts between the working group and the ruling coalition, the experimental phase of this proposed reform set out at the beginning of 2018/19 school year. It will take some time before its effects will be ready for evaluation, but nevertheless, a shift from purely content-driven educational process towards goal-oriented one with a strong emphasis on development of certain competences is a move in the right direction. This dissertation fits very nicely into this line of reasoning, as its main goal is to better understand competences needed in labor market and align their requirements and acquisition.

The dissertation itself will deal (in Chapter 4) with economics-and-business gradutes from 2010-15 period. There are three main reasons as to why these particular graduates were chosen as subjects of analysis – first two reasons explain why gradutes were chosen in general (as opposed to tenured workers), and third reason explains the focus on economics-and-business gradutes. Firstly, after the 2008 financial crisis, young highly educated graduates (25 to 29 years) were the most vulnerable group on the labor market, with record-high unemployment rates ranging from 24.1% in 2014 to 20.1% in 2016 (Eurostat).

[1] In 2016 this Ministry was renamed in Ministry of Science and Education (MZO).

Furthermore, Obadić and Majić (2013) report that about every third higher education graduate did not have a secured job position, particularly those with economics-and-business background. Secondly, graduates were perfect candidates for this study as their competences were not yet influenced by tenure nor have become obsolete, at least not to a great degree (Van Loo & Toolsema, 2005) – thus, this allows for empiricall assessment of how do the universities prepare them for challenges on the labor market. Finally, the reason behind focusing on economics-and-business graduates was because their competences, both general and practical, are not universally tied to a certain industry branch as they are needed across wide range of sectors and between different departments within certain enterprise (e.g. almost every firm has an accounting department where economics-and-business graduates may find employment).

List of all the higher education (HE) institutions that provide economics and business programs (obtained from Ministry of Science and Education, hereafter MSE) was combined with Croatian Bureau of Statistics (CBS) data, who publish the number of graduates from those institutions on yearly basis. Unfortunately, CBS do not go into details on specific study programs, meaning that only the numerical distribution of graduates within a certain institution is seen, but without giving details about the different undergraduate and/or gradute programs completed. For this reason, certain higher education institutions had to be excluded from analysis – for example, Faculty of Organization and Informatics in Varaždin (northern part of Croatia) offers both Informatics and Economics undergraduate and gradute programs, but as there was no way to differentiate between these two types of graduates, they were excluded from analysis. After this data cleaning remained a list of 12 institutions that offer only economics-and-business related undergraduate and graduate programs, and their distribution is presented in Table Table 1.

Table 1: Distribution of economics and business graduates in selected HE institutions

Year / Higher education institution	**2011**	**2012**	**2013**	**2014**	**2015**
Schools of professional higher education and Polytechnics					
Polytechnic of Međimurje in Čakovec	19	77	99	101	193
Zagreb School of Economics and Management	228	317	353	378	364
Minerva Business College, Dugopolje	5	25	19	29	15
RRiF School of Professional Higher Education for Financial Management, Zagreb	19	9	18	23	17
Business School Par, Rijeka	n.a.	17	6	12	15
Nikola Šubić Zrinski School of Economics, Zagreb	n.a.	n.a.	31	n.a.	23
University College Effectus – College for Law and Finance, Zagreb	n.a.	n.a.	25	n.a.	50
Faculties					
Professional study					
Faculty of Economics, Osijek	245	260	172	180	89
Faculty of Economics, Split	642	500	398	304	267

Faculty of Economics, Zagreb	323	200	172	136	321
Faculty of Tourism and Hospitality Management, Opatija	227	244	186	176	49
University study					
Faculty of Economics, Osijek	781	923	829	844	666
Faculty of Economics, Rijeka	1,031	1,243	1,015	801	593
Faculty of Economics, Split	696	698	524	523	515
Faculty of Economics, Zagreb	2,421	2,232	2,213	2,015	2,035
Faculty of Tourism and Hospitality Management, Opatija	1,020	1,044	916	685	624
TOTAL	**7,657**	**4,519**	**6,976**	**6,207**	**5,836**

Source: MSE, CBS.

As expected, most of these graduates come from faculty study programs, with greatest concentration in Zagreb and Rijeka region. This table also nicely illustrates that majority of business and economics gradutes come from university study programs, that may particularly be prone to neglect practical needs of employers, as opposed to polytechnics who greatly emphasize their connection to the business sector (Obadić & Majić, 2013). Finally, much like the Coratian labor market, Croatian educational system was also heavily influenced by transition process, meaning that much of what was thaught about economics and business in planned economy still lingers in the current curricula (Bićanić & Babić, 2008). As the market needs changed at a much quicker pace, this may also partly explain competence mismatch between employers' requirements and worker attainments.

1.3 Purpose and goals

Over the last two decades, economic literature (Babić, Matković & Šošić, 2006; Botrić, 2009; Galić & Plećaš, 2012; Obadić & Oršolić, 2012; Tomić, 2012; Tomić & Domadenik, 2014) have characterized Croatian labor market with rigid legislation, high costs to labor and wage adjustments, regional disparities, mismatch in terms of competences, age and education attainment. All these are viewed as determinants of relatively low value added of domestic firms and their low competitiveness on international market as well as low employability of higher education graduates and reduced wages levels (compared to their EU peers). Most of the studies mentioned thus far have only partially examined this problem, and have done so from macroeconomic perspective or using Labor Force Survey (LFS) data, thus neglecting the key role of competences on individual, micro-level.

Hence, the main purpose of this doctoral dissertation is to assess the role competences play both on firm performance and on labor market status of an individual. In order to do this, this dissertation moves away from analysis based on macro-level data and delve into individual-level data, which is combined with appropriate methodology to investigate effects

of competence alignment proximity on both firm performance and individual labor market outcomes. Thus, this dissertation focuses on matching employer-required competences with worker-acquired competences and assesses the effects of this proximity.

The goal is to use relevant methodology and apply it to the specific case of Croatian labor market, but also to pave a way of how this kind of analysis can be performed in other post-transition neighboring economies. Such analysis may expose some important institutional drawbacks but also fine-tune certain policy recommendations necessary to improve labor market effectiveness and increase competitiveness of the overall economy. This is particularly relevant for Croatian case, whose economy was shown to be very weak in terms of dealing with the latest economic crisis effects. In contrast to other Central and Eastern European (CEE) countries, Croatia fought the effects of recession for five long years, since its offset in beginning of 2009 until late 2014. Dataset used in this dissertation concentrates on the aftermath of the crisis, where Croatian economy returned on positive growth trajectory, but still crippled of the lasting negative effects of prolonged crisis, especially in terms of high youth unemployment figures.

This dissertation should provide valuable insights into the role of competences for both employees and employers of the labor market. Primarily, it should provide answer to what the modern-day employers are expecting from their workforce in terms of required competences needed for successful and effective job performance. With the emergence of Industry 4.0, increasing emphasis has been placed on competences of general type, rather than those practical i.e. specific to certain industry or to a certain firm. Additionally, this dissertation should also assess how well do the higher education institutions prepare their graduates for future labor market challenges, in terms of equipping them with competences currently sought after on the labor market. Finally, this dissertation also assesses the competence proximity, and then estimates its effect on firm performance, on one side, and individual employability and wages, on the other.

1.4 Research questions and main hypotheses

This dissertation identifies key competences for employers and graduates and then investigates how this proximity is associated with firm performance and individual labor market outcomes. In order to do this, both aspects of the labor market are examined – namely, the employers – who are requiring their workforce to be equipped with certain competence sets – and employees – who are offering their competences acquired through education process and previous working experience. These issues are examined in three different chapters (essays) of this dissertation. The first chapter presents an overview of the recent investigations regarding the competence-based models development and their application in practice whilst second and third essay are focused on competence proximity effects on firm performance and individual outcomes in Croatia, respectively. Issues related

to competence assessment and their role in firm performance and individual labor market outcomes are only marginally explored in the existing literature (Babić, Matković & Šošić, 2006; Obadić & Oršolić, 2012; Tomić, 2012; Tomić & Domadenik, 2014) and thus this research provides a novelty in the literature.

The aim of the first essay (Chapter 2) is to present the literature review of the competence-based approach in the knowledge-based economy, focusing on both labor demand and labor supply. This essay reviews the development of competence-based approach, it briefly summarizes problems involved in defining and measuring competences, and presents recent investigations on how competences are linked to both firm performance and individual employability and wages. As this is literature review essay without empirical analysis, serving as an introduction into the following two chapters of this dissertation, research hypotheses are not formulated here.

The second essay (Chapter 3) deals with employers' side of the story and investigates the effects of proximity between their competence requirements and competence development of their workforce on firm performance. The main objective of this essay is to identify key competences critical for successful performance of an enterprise, and investigate the role those competences play, among other factors of production, on the value added created by firms. Also, with the emergence of Industry 4.0, modern-day employers are placing more emphasis on competences of general type, rather than those practical i.e. specific to certain industry or to a certain firm. The main research question in this essay is thus: What is a connection between a degree of proximity of competences required by employers and those possessed by their workforce on firm performance? The main hypotheses of this essay are:

H.3.1: Mismatch between competences required by employers for successful job performance and competences currently developed by their workforce is higher for general than practical competences.

H.3.2: Firms with smaller mismatch (higher proximity) between competences required by employers and those currently developed by their workforce show better performance.

A final essay (Chapter 4) concentrates on economics and business graduates and firms in Croatia, and explores the association of competence proximity (mismatch) between those that graduates acquire during their study and those that employers require and labor market outcomes of graduates – their employability and wages. This essay can be considered as a general policy evaluation of current curriculum contents as it assesses to what extent are higher educational institution curricula in line with the contemporary needs of labor market and how well do they prepare their students for future labor market challenges. Hence, the main research question is: To what extent does a proximity (mismatch) between competences developed during higher education and those demanded by employers influence graduate employability and their wage level? Two research hypotheses are:

H.4.1: Graduates with greater proximity (lower mismatch) between competences acquired during higher education and those demanded on labor market are more likely to be employed.

H.4.2: Graduates with greater proximity (lower mismatch) between competences acquired during higher education and those demanded on labor market receive higher wages.

1.5 Structure of the doctoral dissertation

This dissertation is written in the form of three publishable papers (essays) involving competence-based approach and its application on firm and individual outcomes, using the evidence from post-transition economy of Croatia. As discussed previously, focus on these topics is important as it enables deduction of important policy actions regarding improving the effectiveness of Croatian labor market. The structure of the dissertation follows the structure of the three essays, where each of them constitutes a separate chapter while their sub-sections deal with the specificities of each essay.

In addition to the three essays, introductory chapter is added at the beginning that introduces the overall topic, the link between the three essays and provides some background information about the history and current state of the Croatian labor market and educational system. Following the three essays, concluding chapter of this dissertation summarizes the main findings, discusses the relevance of the hypotheses and describes the main contributions to the existing literature.

The first essay (Chapter 2) of this dissertation presents the literature review of the competence-based approach development. With the rise of the fourth industrial revolution markets are becoming highly interconnected due to advances in science and technology, and increasing emphasis is given to the labor competences as one of the crucial production factors. Firms are thus increasingly starting to utilize competence-based approach when assessing the fit of their workforce. This holistic approach aims to identify set of desired competences which are then compared to that of their potential employees. This chapter is divided into six sections, including the introductory and concluding part. After introduction, the second section gives a brief summary on development of this approach, especially emphasizing problems in defining competences and delineating the difference between "competency" and "competence", as this terms' dual origins can be traced to both the US and the UK. Third section investigates different ways of empirically measuring competences, both those that required by employers and those possessed by workforce, and key challenges involved in collection of such data. In the following two sections, discussion is directed towards the impact of competence-based human resource management on firm performance and on individual outcomes. These two sections present available insights on degree labor competences are associated with outputs like added value to the firm or

employability and higher wages for an individual. The next part of this essay is reserved for analysis of recent work in competence mismatch literature, before giving concluding remarks in final, sixth section.

The second essay (Chapter 3) concentrates on employers and investigates the effects of a proximity between their competence requirements and competence development of their workforce on firm performance. Empirical analysis is conducted on primary data, collected through questionnaires, and secondary data of firms' financial and structural characteristics. Key competences are identified using factor analysis which were then associated with firms' performance via production function in both static and dynamic environment using standard regression model, Heckman sample selection model and Arellano-Bond model. This chapter is also structured into six different sections. After a brief introduction, the second section presents a background for the topic in the form of a relevant literature review, dealing with different definitions of competences and previous research linking them to firm performance. The third section of this chapter presents the theoretical framework and methodology used in subsequent analysis. The following section describes data collection procedure and presents descriptive statistics of gathered data. Estimation results together with the discussion are presented in the fifth section while the final section gives concluding remarks.

The third essay (Chapter 4) focuses both on employers and workers and analyses the effect of competence mismatch on workers' employability and their remuneration (their wages). More concretely, this essay investigates a mismatch on the labor market between set of competences possessed by young workers that have just finished their education and those required by employers. Analysis is performed on a sample of economics and business graduates and a sample of firms hiring those graduates in Croatia during 2016. After an introductory section, this chapter presents a literature review of different ways of measuring competence mismatch and the effect they have on individuals, firms and the whole economy, both in international literature and that focused solely on Croatia. Third section presents theoretical framework and describes data collection procedure from both firms and graduates. Estimation results are given in fourth section and final conclusion in fifth section

At the very end of the dissertation, concluding chapter (Chapter 5) summarizes the findings from three essays, discusses the importance of this dissertation to literature, and gives some policy recommendations. After the list of references, there are appendices that contain more specific data for each of the three main chapters (essays). This part consists of additional statistics showing a more comprehensive picture of the issue studied in a specific essay or even additional results that should serve as a robustness check.

2 REVIEW OF COMPETENCE-BASED APPROACH IN KNOWLEDGE-BASED ECONOMY[2]

2.1 Introduction

In a knowledge-based economy, marked by advances in science and technology and highly interconnected processes, both firms and individuals are forced to react very quickly to new challenges and opportunities. Many authors relate this change in market conditions to emergence of Industry 4.0, also referred to as the Fourth industrial revolution (Kagermann et al., 2013; Saniuk, Saniuk, Caganova & Cambal, 2014; Hecklau, Galeitzke, Flachs & Kohl, 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Industry 4.0 concept is used to describe increasing digitization trend of entire value chain and the resulting interconnection of people, objects and systems through real time data exchange (Hecklau, Galeitzke, Flachs & Kohl, 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). This interconnection is manifested by developments in previously disjointed fields, such as artificial intelligence, machine learning, robotics, nanotechnology, 3D printing, genetics and biotechnology, which are all building on and amplifying one another. Furthermore, nowadays companies face competition throughout the globe with markets becoming progressively more volatile and heterogeneous due to constantly changing customer expectations and needs (Grzybowska & Łupicka, 2017).

Although these Industry 4.0 processes hold great promise for future prosperity and job creation, they also pose major challenges requiring proactive adaptations, especially in human resource management. Simple and monotonous processes are being automated while other processes become more complex and intertwined, thus shortening the shelf-life of employees' existing competences (Borghans, Green & Mayhew, 2001; Stasz, 2001; Leoni, 2012; Hecklau, Galeitzke, Flachs & Kohl, 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Furthermore, World Economic Forum (2016) states that as high as 65% of children entering primary school today will end up working in completely new jobs that don't even exist yet, 50% of subject knowledge acquired during the first year of a four-year technical degree will become outdated by the time students graduate, and more than a third of the desired core competences of most occupations by 2020 will be comprised of competences that are not yet considered crucial today.

Competence mismatch can also have serious effect on economic growth, as it increases structural unemployment and hinders future GDP growth prospects (Quintini, 2011). Hanushek and Woessmann (2012) combine the country-specific results from several international student achievement tests, like PISA or TIMSS, to get one measure of cognitive competences for each country and then test its causal relationship to annual growth rates between 1960 and 2000. Their results reveal high relevance of competences in mathematics,

[2] Joint work with Polona Domadenik. This chapter is in the reviewing process in Economics and Business Review journal with a title " Review of competence-based approach in organizational and individual context".

science and literacy that seem to be long-run predictors of economic growth, and much more significant than some quantitative measures, such as years of schooling.

Thus, firms' organizational structure and processes have to become more flexible, enabling quick anticipation of new consumer values and translating those into product offerings to preserve market share (Van Dam, 2004; Cox & King, 2006; Lazarova & Taylor, 2009). This increased flexibility is manifested in job positions becoming more diffuse without clear boundaries, and in change of hiring policy that put more emphasis on fitting into the whole organizations' climate and corporate culture, as opposed to hiring for a fixed job position (Lawler, 1994; Sparrow, 1997; Gunz, Evans & Jalland, 2000). As a prerequisite for this process to work, it became necessary to determine which individual characteristics are most important for organizations' success. Instead of focusing on personality traits, which are usually hard to measure accurately (American Compensation Association, 1996), these characteristics are expressed through a prism of competences[3], thus shifting the focus away from crude job position requirements towards individual competence inventory when assessing the fit of potential employee (Mikkelsen, NybØ & GrØnhaug, 2002; Rodriguez, Patel, Bright, Gregory & Gowing, 2002). These competence models (also known as competence approach) are a descriptive tool that identifies the knowledge, skills, abilities and behavior needed to perform effectively in an organization (Felstead & Ashton, 2000; Chung-Herrera, Enz & Lankau, 2003; Hecklau, Galeitzke, Flachs & Kohl, 2016), and are also important for integrating education and training with labor market needs, thus promoting mobility for individuals, especially for workers faced with job insecurity (Van der Klink & Boon, 2002).

2.2 Development and issues of competence-based approach

2.2.1 Short history of competence-based approach

Competence-based approach originated in the US and the UK during 1970s and has since spread into most of developed world, so much so that most countries apply it on the national level when defining educational curricula and standards, especially since the introduction of the so-called "Bologna process" (Cappellari & Lucifora, 2009; Farčnik & Domadenik, 2012). The goal of this approach is: 1) from employers' point of view, to select the people with a particular set of competences (competence inventory) for the positions requiring that particular competence inventory and to manage them (through training, seminars…), 2) from employees' point of view, to acquire those competences and increase their employability and their productivity (which would in turn increase their wages); and 3) from policy

[3] Although the definitions and meanings of skills and competences vary in literature, in this essay we regard competences and skills as synonyms and use them interchangeably.

makers' point of view, to create appropriate curricula for acquisition of those competences through education process.

Origins of competence-based approach can be traced to McClelland (1973), who criticized classical intelligence and ability tests by claiming that, apart from school success, they do not envisage essential life events and outcomes. As a result, all correlations and causations based on such metrics suffer from cultural and social bias. Instead, he suggested competence-based approach which starts from observing successful and effective job performers to determine how they differ from less successful ones. Ten years later Boyatzis (1982) conducted a study on 2.000 managers at various corporate levels from 12 different organizations, aiming to identify characteristics determining their success. Assuming that organizations' efficiency depended on its managers' characteristics, he compared managers' behavior in critical situations and identified over 100 competences, divided in two groups: 1) basic competences (e.g. logical thinking, self-esteem, spontaneity); and 2) superior competences (e.g. efficiency orientation, group process management, persistence, adaptability).

While both McClelland and Boyatzis based their models starting from individuals, Prahalad and Hamel (1990) start off at organizational level and introduce core (key) competences as the capacity to coordinate diverse production skills and integrate various streams of technologies across organizational boundaries. Their study looked at two similar organizations that went along different paths – first one structured its business around a group of core competences while the other one structured it around strategic business units (which under-invest in core competences and bind innovation), and show former to be more successful. These core competences, from organizations' point of view, should: 1) provide potential access to a wide variety of markets; 2) make a contribution to the customer; and 3) be difficult for competitors to imitate.

From 2000 onwards competence-based human resource management has become widespread in the processes of selection, retention and remuneration. Delamare le Deist and Winterton (2005) list several factors for rising popularity of this approach, among which they emphasize: 1) shift from traditional supply-driven (knowledge-absorptive) to more demand-driven (goal-oriented) educational system; 2) increase in adaptive training, work-based and non-formal learning (Stasz, 2001; Heckman, 2011); and 3) greater orientation towards *learned outcomes* (irrespective of acquisition method), as opposed to *outcomes in terms of time spent in education*, providing "ladders" for those who have had fewer educational opportunities but have nonetheless developed required competences.

Robertson, Callinan and Bartram (2003) present contemporary competence-based model where they distinguish four different determinants for successful job performance: 1) competence potential; 2) competences; 3) context; and 4) outcome. Competence potential encompasses individual characteristics needed for realization of certain outcomes which include dispositional potential (traits, motives, values) and other accomplishments

(knowledge, skills, qualifications and experience). Competences are a set of desired behaviors, defined through outcomes to which these behaviors are directed. The difference between these two terms comes from third element – context – referring to organizational characteristics and social relations within organizations determining desirable behaviors and outcomes. A final set of variables deals with desirable results and outcomes the individual behavior is directed towards. A good example of this holistic approach to competence-based modeling is that of Hecklau, Galeitzke, Flachs and Kohl (2016), who concentrate on human resource management in Industry 4.0. Their approach consists of three vital steps: 1) identification of emerging challenges (divided into political, economic, social, technical, environmental and legal factors); 2) deduction of competences to face those challenges (aggregated into technical, methodological, social and personal competences); and finally 3) visualization of required competences development levels (using radar charts).

2.2.2 Issues with defining competences

However, one of the major challenges in contemporary competence literature is defining the term as abstract as *competence* (Shippmann et al., 2000; Hayton & McEvoy, 2006). Not only are there multiple definitions, but every author has its own picture of what they are, what they include and how to measure them. This confusion is deepened by the often usage of two terms – "*competence*" (plural "competences") and "*competency*" (plural "competencies"). Additionally, terms like "skills", "abilities", "expertise", "acumen" and "competency" are all interrelated and oftentimes used interchangeably (Courtis & Zaid, 2002; Smith & Morse, 2005; Jackling & Calero, 2006; Jackling & De Lange, 2009). While skill concerns the execution of a single task, competence deals more with the execution of a whole series of different tasks in a certain (occupational) domain.

Origins of this debate are traced to the fact that "*competency*", in the American sense, complements "*competence*", as used in the UK occupational standards (Elkin, 1990; Boak, Mitchell & Thompson, 1991). The term "*competency*" originated in education to describe trainee-teacher behaviors, but was later adopted in management domain in the US, as part of an initiative by the American Management Association to identify the characteristics which distinguish superior from average management performance. Competencies are not seen as the task of the job, but rather that which enables people to do the task (Kurz & Bartram, 2002; Mitchelmore & Rowley 2010). Spencer and Spencer (1993, p. 4) in this sense defined competencies as "motives, traits, self-concepts, attitudes or values, content knowledge, or cognitive or behavioral skills – any individual characteristic that can be measured or counted reliably that can be shown to differentiate significantly between superior and average performers, or between effective and ineffective performers". Rieckmann (2012, p. 131) characterizes competencies as "… individual dispositions to self-organization which include cognitive, affective, volitional (with deliberate intention) and motivational elements; they are an interplay of knowledge, capacities and skills, motives and affective dispositions".

Thus, American school emphasized the underlying characteristic of a person (resulting in effective action in a job) in their concept of competency.

On the other hand, the UK-based approach put more focus on "*competence*" – ability to apply knowledge, understanding and skills in performing to the standards required in employment. The term competence was first coined by White (1959) to describe personality characteristics responsible for effective interaction (of the individual) with the environment (workplace), associated with superior performance and high motivation. The focus here is on the task-oriented analysis which reflects the expectations of attitudes at workplace. Competence is seen as a description of an action, behavior or outcome which an employee should be able to demonstrate (Cheng, Dainty & Moore, 2005). This approach, worked out through government sponsored bodies such as the Management Charter Initiative (MCI) and the National Council for Vocational Qualification (NCVQ), was centered around securing standards for occupational competence and vocational qualifications for different groups, such as nurses (Philipsen, Lamm & Reier, 2007), project managers (Cheng, Dainty & Moore, 2005) or global leaders (Brownell & Goldsmith, 2006). Other authors who have embraced this approach focused more on their role in final outcomes by defining them as "… measurable working habits and personal skills that are used to achieve work goal" (Green, 1999, p. 5) or as "… sets of behaviors that are instrumental to achieve the desired results and outcomes" (Kurz & Bartram, 2002, p. 229).

All these definitions have one thing in common – both *competencies* and *competences* are transcending simple skills or abilities and are actually encompassing both of those. This is also corroborated by OECD (2005, p. 4), who define competences as "... more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context". Haddadj and Besson (2000) nicely summarize this debate by saying that competence is polarized into two distinct directions: an individual approach, centered on individual behaviors, and a collective approach, centered on requirements for organizational performance. Most definitions of competence fall somewhere between these two extremes: *competency* as a universal attribute, such as literacy, and *competence* in terms of individual capacity, which is found only in the work context.

2.3 How competences are measured

Measuring competences is vital to both researchers and practitioners, as any competence-based models will heavily depend on it. Used approaches vary in terms of different definitions and methods used, which explains inconsistent results across different studies (Borghans, Green & Mayhew, 2001). The most common technique to measure competences is through questionnaires with a list of working behaviors where respondents are required to tick if, and to what extent, these are implemented (Leoni, 2011). This list of behaviors should aim to cover the whole range of work actions in a given context, paying attention to refer to

the smallest units of observations that are both directly comparable and sufficiently distinguishable. Brief description of previous studies used to define competences in various fields (including countries and industries covered, data sources, number of respondent, data analysis methods and list of competences defined) is presented in Table 15 of Appendix 2.

2.3.1 Different methods of measuring competences

Traditionally, the competence-measuring unit was some indicator of educational (qualifications) attainment, which was then linked to performance. This relationship was, however, far from perfect for several reasons. First, equal educational (qualifications) attainment can lead to different competence quantity and/or quality which can differ in their market value (Desjardins & Rubenson, 2011). In fact, utilizing Adult Literacy and Life (ALL) Skills survey, Murray, Owen and McGaw (2005) found that in some countries returns to competences are far higher than returns to education, suggesting that education is only rewarded when associated with these competences. Second, due to mismatches, labor market does not always fully utilize available competences. Several studies have confirmed a very weak correlation between qualifications mismatch and competences mismatch (Allen & Van der Velden, 2001; Mavromaras, McGuinness & Fok, 2009; Allen, Levels & Van der Velden, 2013). Finally, acquisition of competences continues long after schooling, through learning-at-work and accumulation of work experience (Biesma et al., 2008; Green & Riddell, 2013). These are important empirical findings highlighting the need for additional qualifications that go beyond the standard education.

In general, the empirical expression between skills, $S_n, n \in \{1, \dots, N\}$, and different performance measures, Y, can be expressed in the following way:

$$Y_i = \beta_0 + \beta_1 S_{1i} + \cdots + \beta_N S_{Ni} + \epsilon_i \quad (1.1)$$

However, including all relevant skills into a single equation potentially leads to estimation problems, as typically a number of skills tends to be quite large and highly correlated. Circumventing this problem requires reduction in dimensionality of skills dataset by grouping several skills in competences. Most commonly used methods include factor analysis (Van der Heijde & Van der Heijden, 2006; García-Aracil & Van der Velden, 2008; De Vos, De Hauw & Van der Heijden, 2011; Ahn, Annie & Kwon, 2012; Leoni, 2012; Yusof, Mustapha, Mohamad & Bunian, 2012; Delia Davila Quintana, Mora Ruiz & Vila, 2014) or cluster analysis techniques (Gabe, Stolarick & Abel, 2012; Kusumastuti, 2014) to compress highly correlated skills into several competences. Van Loo and Toolsema (2005) take a slightly different approach – they start by analyzing the contributions of each skill to all other skills, before summing up these contributions and defining key competences if this sum exceeds certain threshold.

Some authors take a more direct approach when defining key competences, such as Delphi group rounds, panel studies, focus groups or semi-structured interviews. Owen (2001) explores competences required by potential employers of geography graduates by organizing a focus group of six managers who were asked to describe their perfect employee, which was then translated into key competences. Rieckmann (2012) performs a Delphi group rounds with experts from Europe and Latin America to explore competences crucial for sustainable development. Other studies use previous literature to define starting list of competences, which is then amended based on their professional experience or using semi-structured qualitative interviews with industry professionals and, in some instance, recruitment agencies and the university faculty (Hodges & Burchell, 2003; Azevedo, Apfelthaler & Hurst, 2012; Pan & Perera, 2012). Similar studies were performed for public health workforce (Allegrante, Moon, Auld & Gebbie, 2001; Kreitner, Leet, Baker, Maylahn & Brownson, 2003; Biesma et al., 2008), HR managers (Jamshidi, Rasli & Yusof, 2012), R&D managers (Dreyfus, 2008), academic librarians (Rehman, Majid & Baker, 1997; Mahmood, 2003), managers in higher education (Spendlove, 2007), tourism industry (Zehrer & Mossenlechner, 2009), construction industry (Ahn, Annie & Kwon, 2012), automotive and pharmaceutical industry (Grzybowska & Łupicka, 2017), casting and machinery manufacturing (Acar, 1993), high-technology manufacturing (Wang, Lo & Yang, 2004), lodging industry (Chung–Herrera, Enz & Lankau, 2003), industry 4.0 sectors (Hecklau, Galeitzke, Flachs & Kohl, 2016) and nursing sector (Cowan, Wilson-Barnett, Norman & Murrells, 2008). However, although these qualitative approaches are very useful in identifying perceived key competences, they preclude firm conclusions and have limited representativeness.

Although rare, estimation of key competences was also implemented in experimental design. One such study is that of Biesma, Pavlova, van Merode and Groot (2007) which utilizes explicit questions and choice-based conjoint analysis to identify employers' key competences preferences for Dutch public health graduates. Their methodology involved defining different hypothetical profile of workers (each with different combinations of competences) which was then presented to employers who had to assess employability of workers based on these characteristics. Their results suggest that employers put greater emphasis on general competences as opposed to field-specific, practical competences.

Other studies utilized available national or international competence frameworks in their assessments of key competences. Marthandan, Jayashree and Yelwa (2013) identify key competences for 239 Malaysian management graduates using Malaysian Qualifications Framework domains and found that communication and teamwork competences and managerial and entrepreneurial competences are most highly developed among those students. Husain, Mokhtar, Ahmad and Mustapha (2010) and Yusof, Mustapha, Mohamad and Bunian (2012) use Secretary's Commission on Achieving Necessary Skills (SCANS, 2001) model framework to investigate employers' view of key competences of engineering students. Former study shows that employers in civil electrical and mechanical engineering

place greatest importance on personal quality, interpersonal and resources competences, while the latter study stressed the importance of critical thinking, problem solving and information management competences. Past research was also based on Careers after Higher Education – A European Research Survey (CHEERS) competence framework to evaluate impact of competence gaps on job satisfaction and monetary rewards to newly employed graduates (Mora, García-Aracil & Vila, 2007; García-Aracil & Van der Velden, 2008). Similar research was conducted at European level in the 2004–2007 period in 16 countries with the so-called REFLEX study, highlighting the role of following competences associated with graduates' success: professional expertise, functional flexibility, innovation and knowledge management, mobilization of human resources, and international orientation (Arthur, 2006; Allen et al., 2007).

Since concept such as competence lacks a concrete measuring unit, in practically all quantitative studies they were measured using Likert scales. Most authors used five-point Likert scale (Van Loo & Toolsema, 2005; Biesma, Pavlova, van Merode & Groot, 2007; Husain, Mokhtar, Ahmad & Mustapha, 2010; De Vos, De Hauw & Van der Heijden, 2011; Chiru, Ciuchete, Lefter & Paduretu, 2012; Marthandan, Jayashree & Yelwa, 2013), while others have used three (Wilton, 2008), six (Van der Heijde & Van der Heijden, 2006), seven (Hodges & Burchell, 2003; Azevedo, Apfelthaler & Hurst, 2012; Leoni, 2012) or even nine-point Likert scale (Mahmood, 2003).

2.3.2 Limitations in measuring competences

All the methods mentioned above carry certain limitations in measuring competences. The first one is the direction of causality, which stems from the fact that many studies have neither prior assumptions on the direction of causality between competence and the measured outcome, nor a time series dataset (Van Loo & Toolsema, 2005; De Vos, De Hauw & Van der Heijden, 2011). Hence, most of the results are interpreted only in terms or correlations or associations, rather than causations.

Another shortcoming is concerned with actual act of measuring competences, which is mostly self-reported measure, thus resulting in leniency effect - bias associated with situation when respondent rate their characteristics too positively (Arnold & MacKenzie Daveys, 1992). Notable exception in this case is the work of Van der Heijde and Van der Heijden (2006), where they reduce aforementioned bias by measuring employees' competences both directly from themselves and from their supervisors. Furthermore, Leoni (2012) argues that workers are capable of assessing their own competences, and any self-appraisal error, either over- or under-estimation, is assumed to be unrelated to other variables. Other studies justify self-reporting approach by arguing that workers' assessments were very similar to those made by external observers and suggest that leniency effect can be curbed to a minimum simply by paying attention to the language used in questionnaires – by asking respondents

not for an assessment of the competences they possess but for the degree of competences they have to demonstrate on their job position (Fried & Ferris, 1987; Spenner, 1990).

Third group of limitations are concerned with the generalizability of the findings. Two factors emerge here – small sample sizes and overemphasized focus on graduates. Examples of the former include Dreyfus (2008), who uses 35 respondents to explore highly effective performance of R&D managers; Chiru, Ciuchete, Lefter and Paduretu (2012), who use a sample of only 44 companies to assess the key competences for agro-food sector; Zehrer and Mossenlechner (2009), using 48 employers to define key competences for tourism sector. In terms of the latter, majority of the studies have focused solely on graduates (Van Loo & Toolsema, 2005; Husain, Mokhtar, Ahmad & Mustapha, 2010; Chiru, Ciuchete, Lefter & Paduretu, 2012; Bailey & Ingimundardottir, 2015), thus compromising the generalizability of the findings for employees with longer tenures (Altonji & Pierret, 2001; Haider & Solon, 2006).

Finally, the approaches suggested above (mix of qualitative and quantitative methodologies), do not allow for a *direct demonstration* of competences such as in, for example, the assessment of performance in specific competence-based exercises (e.g. making a presentation to an audience; leading a team in a work project) (Azevado, Apfelthaler & Hurst, 2012).

Smith and Morse (2005) nicely sum this up by acknowledging a challenge to measure something elusive (competences) that manifests itself differently in different contexts, something that changes and evolves over time, and is not directly observed. Nevertheless, further research of this type should focus on generalizing the findings by looking at various groups of workers, expanding the set of competences used in the analyses, using different definitions of key competences and developing alternative models to assess their impact on performance. If a number of these models corroborate the direction effect of the same competence, it would imply a significant advance in the relevance of the competence-based models and their application in shaping educational curricula, government policies and career management practices.

2.4 Competence-based approach and firm performance

Research on firm performance can generally be divided into two broad categories – highlighting either external factors or the internal aspects of the firm. Studies in the former group typically examine the impact of different (government) policies on firm performance, starting with a premise that lack of financial and/or training support is the greatest obstacle to firms' success (Bartlett, 2016; Srhoj, Škrinjarić & Radas, 2018). However, these studies neglect the important contribution of business owners and firms' workforce, as the ones creating added value, to account for final outcomes (Stokes & Blackburn, 2002; Baum &

Locke, 2004). The latter group of studies emphasizes the role of internal organizations' resources, competences, culture and organizational behavior on firms' performance (Beaver & Jennings, 2005; Markman, 2014). Studies of this type, however, are very scarce and those that exist suffer from variety of methodological weaknesses (Ananiadou, Jenkins & Wolf, 2004; Psacharopoulos & Schlotter, 2010).

We first concentrate on the role of entrepreneurs and managers in business success. The entrepreneur's psychological and behavioral characteristics and their competence inventory are often listed as contributing the most to SMEs performance. Research of this type originated from Theory of Entrepreneurial Competency (Bird, 1995) to describe the link between the behaviors and attributes of business owner for future business success, arguing that those who hold key positions in organization have a significant influence on the organization's success. Man and Lau (2005) find the dual origins of entrepreneurial competences: 1) components more deeply rooted in entrepreneurs' background, i.e. "internalized elements" (e.g. personality traits, attitudes…); and 2) components acquired at work/training, i.e. "externalized elements" (skills, knowledge and experience). Entrepreneurs' greatest challenge is that required competence inventories change as firm moves from one development stage to another – hence they need to identify competences necessary at each stage (Mitchelmore & Rowley, 2010).

Gerli, Gubitta and Tognazzo (2011) use a sample of 97 Italian SMEs to investigate the impact of entrepreneurial owners' competence portfolio on business performance. Their results suggest that competences like Efficiency orientation, Planning, Persuasiveness, Self-confidence, Organizational awareness, Directing others, Teamwork, Leadership and Benchmarking are related to a higher firm performance. Man, Lau and Chan (2002) suggest that ensuring entrepreneurial competences is more important issue than directly providing them with more resources or a positive external environment in the long term. Furthermore, they argue that entrepreneur needs a good balance between various competences, given their strong interaction and their descendants (e.g. lack of organizing competences hinders the development of organizational capabilities, which in turn limits the use of strategic and commitment competences). Entrepreneurial competences bear even greater importance in negative external environment, as indicated by Hazlina Ahmad, Ramayah, Wilson & Kummerow (2010), who investigate their impact on firm performance in Malaysia. Using a sample of 212 SME owners they show that entrepreneurial competences were strong predictors of business success, especially evident in hostile and dynamic environments, indicating that entrepreneurs can to some degree mitigate negative environment impacts by equipping themselves with appropriate competences.

In terms of managerial competences, Bloom, Propper, Seiler and Van Reenen (2015) examine whether increased competition can increase management quality in UK public hospitals. Their results indicate that more hospital competition leads to improved hospital management practices, which are in turn responsible for higher performance in terms of quality, productivity, and staff satisfaction. Bloom, Sadun, and Van Reenen (2016) construct

an index of advanced managerial practices that they interpret as "managerial capital" and argue that it can account for on average a fifth of the TFP spread within countries and a third of the productivity gap between the United States and 33 other nations. On a more-micro level, Bloom et al. (2013) investigate relationship between management practices and firm productivity in Indian textile plants. Their experiment involved providing free consulting on management practices to randomly chosen treatment plants which were then compared to a set of control plants. Obtained results suggest that adopting these management practices raised productivity by 17% in the first year through improved quality and efficiency and reduced inventory, and within three years led to the opening of more production plants. In a similar study, Bender et al. (2018) investigate the extent to which management, which they proxy by an index of adoption of advanced management practices, influences productivity through workforce selection and pay on a middle-sized German manufacturing firms. Their analysis concluded that plants with higher management scores: (1) have higher average worker skills; (2) pay higher wages relative to the market as a whole, controlling for the quality of their workforce; and (3) are able to build up a superior stock of employees through selective hiring and attrition.

Moving on to the effects of workforce competences on firm performance, Stevens (2007) found considerable heterogeneity across industries in how competence shortages affect employment practices – some industries experience only intermittent competence shortages in the workforce, while others, like the metal manufacture and metal products sector experience "pro-cyclical competence shortages." This heterogeneity suggests that industry-specific practical competences play a part in explaining labor market behavior and influence firms' employment practices. Benson and Lawler (2011) investigate employees' high-involvement practices (i.e. general competences) such as teamwork, employee development, gain sharing plans, and participative leadership in the US. These measures are found to be positively associated on firms' performance such as return on assets, sales, customer satisfaction or productivity. However, improving individuals' general competences may sometimes hamper productivity growth if job positions are not designed to cope with that. Utilizing International Adult Literacy Survey (IALS) data, Murray, Owen and McGaw (2005) note that improving general competences might actually increase competence inventory mismatch for particular positions – on one hand there are medium and high skilled workers occupying low-paying positions (thus suffering a wage penalty), and on the other low to medium skilled worker who are well paid (thus enjoying a wage premium). Green, McIntos and Vignoles (2002) nicely illustrate this problem for the UK, using a university graduate employed in a secretarial role (a case of over-education) where her skill will be under-utilized, thus resulting in lower productivity level and lower wage than in a "graduate-suited job". Felstead, Gallie, Green & Zhou (2007) present the scale of this problem in UK where 2 out of every 5 workers reported they were over-qualified for their jobs, reflecting a large increase in the number of university graduates, but also casting doubt on the extent to which employers have created jobs that demand high skill levels.

Regarding the issue of competence-to-job-position mismatch on a more international scale, Bevan and Cowling (2007) compared EU-15 countries between 1996 and 2000 waves of European Working Conditions Survey and found an overall reduction in the rate of over-skilling from 8.8% to 7.4%, respectively. Differences in over-skilling among EU-15 were accredited to differences in educational systems, especially in degree to which students can voluntarily prolong education, and different success rate of reforms to decrease such a mismatch. Mason and Finegold (1997) investigated firm productivity in US and Western Europe, by comparing the relatively low-skilled yet highly productive manufacturing sector of the US with matched samples from Dutch and British metal working firms and food manufacturers in Britain, Netherlands, Germany, and France. They found that much of the US lead in labor productivity is owed to economies of scale of production while Western European firms used greater supplies of skilled workers to produce smaller batches of higher-value-added products. Another cross-county comparison between competences and productivity was done by Carr (1992) by analyzing vehicle manufacturing in Japan, the US, UK and Germany. His conclusions suggest that Japan fell behind other countries in terms of technical qualifications of shop-floor workers and newly employed graduates. However, Japan made up for it by subsequent in-company training which enabled workers to switch easily between jobs and gain experience of different production and technical fields, providing a general skill set that helped foster quality and flexibility.

From 2013 onwards, international comparisons were mainly based on Programme for the International Assessment of Adult Competencies (PIAAC) survey data, as it covers more countries, obtains larger sample sizes per country and extends the depth and range of measured skills to include literacy, numeracy and problem solving in technology-rich environments. Due to its nature, most of the studies using PIAAC data are focused on the labor market outcomes and returns to education and/or skills. Notable exceptions are McGowan and Andrews (2017), who analyze the link between skill and qualification mismatch and labor productivity by combining PIAAC and industry data for 19 OECD countries. Their main results show that higher skill and qualification mismatch is associated with lower labor productivity, with over-skilling and under-qualification accounting for most of these impacts. Also, Le Mouel and Squicciarini (2015) use PIAAC data to develop methodology for the measurement of employment and investment in organizational capital (OC) in 20 OECD countries. OC was defined as firm-specific organizational knowledge resulting from the performance of tasks affecting the long-term functioning of firms (e.g. developing strategies; organizing, planning and supervising production; and managing human resources), and estimates at the aggregate level suggest the share of OC occupations in total employment to represent between 9.5% (Denmark) to 26% (United Kingdom), with an average of 16%.

Competence inventories need not *directly* impact firm performance, but rather act as a medium between other factors of production and final outcomes. Forth and Mason (2006) investigated returns on competences of ICT companies in UK and found that employees'

ICT competence shortages are correlated with negative firm performance, albeit indirectly – these competence deficiencies restrict companies both in terms of ICT adoption and the intensity of use of ICTs once they have been installed, which then negatively manifests on performance. Leoni (2012) analyzes the extent to which competences (dependent on high performance workplace practices) act as a mediating variable between high performance work organization and the economic outcomes of firms, and finds that development of such competences result in more efficient production. Ozkaya, Droge, Hult, Calantone and Ozkaya (2015) compare US to Chinese firms and show that market knowledge competences are mediators of positive relationships between customer and competitor orientations and market-based innovation, especially in the US. On the similar note, Bai and Chang (2015) draw on stakeholder and institutional theory and investigate the impact of corporate social responsibility (CSR) on firm performance on 295 Chinese manufacturing firms. Their results suggest that CSR is a source of competitive advantage that can enhance firms' marketing competences, which in turn leads to superior performance. Similar results are also found for core-technology competences as crucial mediator in relationship between technological diversification and firm growth (Kim, Lee & Cho, 2016) and for core competences as mediator between firm innovation output and performance (Gokkaya & Ozbag, 2015).

Finally, some research stresses out the complementarity between different competences, arguing their failure to produce significant impact on firms' performance in isolation, but succeed to do so when paired with other competences. Lokshin, Van Gils and Bauer (2009) base their analysis on fast moving consumer goods industry and find that organizational competences (e.g. team cohesiveness and slack time to foster creativity) improve firms' innovative performance only when complemented with both customer and technological competences. In a similar study, Song, Droge, Hanvanich and Calantone (2005) focused on complementarity between marketing and technological competences using a sample of 466 firms and concluded that only their synergetic effects lead to improved firm performance in high-turbulence business environment. Similar research was also done for high-technology markets (Dutta, Narasimhan & Rajiv, 1999) and food manufacturing (Moorman & Slotegraaf, 1999).

2.5 Competence-based approach and individual outcomes

Many authors acknowledge that competences are generally viewed as key production factor in knowledge-based economy (Hanushek & Woessmann, 2008), but the results point to very complex and contested relationship. This is further complicated by inconsistent measures of competences across different surveys, thus making generalized statements about labor market outcomes somewhat difficult. Unlike the case of estimating returns to schooling impact on wages or estimating the impact of a mismatch in qualifications on firm performance, impacts of competences and their mismatch relied mostly on a small number

of specialized datasets, namely European Working Conditions Survey (Bevan & Cowling, 2007), Adult Literacy and Life Skills (ALL) Survey (Murray, Owen & McGaw, 2005; De Anda & Hernandez, 2008; Ryan & Sinning, 2009), International Adult Literacy Survey (IALS) (Boothby, 2002; Ananiadou, Jenkins & Wolf, 2004; Barone & Van der Werfhorst, 2011; Green & Riddell, 2013), Careers after Higher Education – A European Research Survey (CHEERS) (Mora, Garcia-Aracil & Vila, 2007; García-Aracil & Van der Velden, 2008), International Survey of Higher Education Graduates (REFLEX) (Arthur, 2006) and Programme for the International Assessment of Adult Competencies (PIAAC) (Allen, Levels & Van der Velden, 2013; Hanushek, Schwerdt, Wiederhold & Woessmann, 2015). However, these tests, aside from being costly and time consuming, require a separation from workplace, and thus focus mainly on academic competences (like literacy and numeracy) and are not able to measure competences required at workplace (Borghans, Green & Mayhew, 2001).

The most common type of assessment is using early graduates (mostly up to five years after graduation) and associating competences they accumulated during university education to their labor market outcomes (García-Aracil & Van der Velden, 2008; Kelly, O'Connell & Smyth, 2010; Leoni, 2011; Hanushek & Rivkin, 2012). There are however, two potential problems related to this approach – these estimates, based on early career earning, are likely to be downward biased as people with longer tenure show steeper earning growth (Haider & Solon, 2006) and it may also take up some time to be compensated for individual competences (Altonji & Pierret, 2001).

Policymakers all agree on the need for basic skills and competences, however less is known about the most efficient way of their acquisition. Some research suggests that the process of acquiring competences may be as important as competences themselves. For example, Crebert, Bates, Bell, Patrick and Cragnolini (2004) looked at competence acquisition of undergraduate students and concluded that university setting was the best place to develop certain competences (like oral and written communication, critical analysis and evaluation, problem solving and teamwork), but the employment-based learning experience was the most crucial in labor market success after graduation. These results are further corroborated by Bishop and Mane (2004) and Mason, Williams and Cranmer (2009). Using data from national Educational Longitudinal survey of 1988, former study showed that collaboration between schools and businesses significantly reduced unemployment in two years after leaving high school and leads to positive effects on annual earnings and hourly wage rates. Latter study was performed on 3.589 UK university graduates and reported a 29% increase in probability of graduates finding employment appropriate to their level within six months of graduation if they participated in structured work experience programs.

When it comes to practical *competence development* impact, two of the most-researched individual outcomes are employability and wage premium analysis – this is presented in the following two subsections. This section is concluded by reviewing a literature on impacts of *competence mismatch* on various labor market outcomes.

2.5.1 Competence effects on employability

Focusing on the competences required on modern labor market in OECD countries, Dickerson and Green (2004) suggest that future job growth is projected to be in services and knowledge occupations that usually require higher levels of general competences, as many lower-skilled jobs may be outsourced. These trends in OECD countries are governed by a rapid pace of technological advancement whose effects are magnified by Fourth industrial revolution. Focusing on technological development, Kirby and Riley (2006) use Labor Force Survey to estimate the impact of ICT on general and occupational-specific competence returns in different industries in the UK between 1994 and 2001. Their results suggest a greater premium on general skills in contrast to occupation-specific skills. They argue that former set of competences are very useful in acquiring new skills for performing a broad range of activities while the latter competences are less transferable between jobs, thus making them less desirable. However, this trend of increasing emphasis on general competences is not limited only to jobs requiring high levels of education for entry, like those in ICT industry. Maxwell (2006), for instance, using Bay Area Longitudinal Study dataset argues that even low-skilled jobs require English, math, communication, and problem-solving skills, along with certain job-specific skill sets. Similar results were found for West Germany, where Spitz-Oener (2006) showed that service tasks are also increasing in complexity, with analytical and interactive tasks overtaking routine and manual tasks.

Competence development is also indirectly associated with achieving personal outcomes. De Vos, De Hauw and Van der Heijden (2011) use data from 561 employees of one Belgian company to investigate the relationship between competence development and career success as being fully mediated by employability. Utilizing structural equation modeling (SEM) technique, their estimations suggest that participation in competence development initiatives as well as organizational support for competence development is positively associated with employability and thus with career success. Similarly, Bailey and Ingimundardottir (2015) explore the effects of students taking a free extra-curricular competence development program on their subsequent employability estimates and find positive associations. Van Der Heijde and Van Der Heijden (2006) perform a similar study in one Dutch firm where they propose a competence-based approach to measure employability, based on five-dimensional conceptualization complemented with practical and general competences, which is found to be positively associated with both individual career and firm outcomes. Delia Davila Quintana, Mora Ruiz and Vila (2014) use SEM to find both direct and indirect of competence profile and its determinants on leadership behavior at work.

However, importance of a certain competence (in a very similar job) may differ in different social contexts. Finegold and Notabartolo (2010) mention an example of childcare and home health workers who, in France or in Scandinavia, are being treated as professionals who require special qualification while in the US their competences are unrecognized and unrewarded. Similarly, some jobs may only seem to require “high-skilled” employees, when

in reality these "high-skills" may only mask the ability to be able to cope with badly designed jobs and stressful working conditions (Lloyd & Payne, 2008; Appelbaum, Bernhardt & Murnane, 2003).

2.5.2 Competence effects on wages

There are several studies linking individual competence inventory with wage premiums. By analyzing the National Longitudinal Study of the High School Class of 1972 and the High School and Beyond survey of 1980, Murnane, Willett, Duhaldeborde and Tyler (2000) found that the increasing wage premiums between 1972 and 1980 were tied to the increase in cognitive skills/competences.

However, these effects may be heterogeneously distributed across workforce, depending on various socio-economic aspects. Ananiadou, Jenkins, and Wolf (2004) undertook an expansive literature review of work derived from the UK on the effects of literacy and numeracy on individual workers' wages and employment probability. Based on analysis of IALS and the longitudinal National Child Development Study, they found both numeracy and literacy to be positively associated with higher wages, with the former have greater effect for men and the latter for women. In terms of return to practical skills, De Anda and Hernandez (2008, p. 240) utilize National Adult Literacy Survey data to show heterogeneous effects of literacy on different races and genders. They find "the effect of literacy skills on the earnings of black males [in the US] is bifurcated: literacy skills seem to be more significant for less-educated black males than those with college degrees". Black males are seen to benefit most from literacy competency, which is accompanied by weekly earnings increase of 18%. This is compared to the return on literacy skills for white females (13% earnings increase), white males (12% earnings increase), and black females (9.8% earnings increase). Kelly, O'Connell and Smyth (2010) look at the economic returns to different fields of study and also the value placed on various job-related competencies, accumulated on completion of higher education, in the Irish labor market. Their results suggest that competence returns vary across the wage distribution and that, apart from Medicine & Veterinary and technical graduates, competence returns diminish as one moves up the earnings distribution.

Not all kinds of qualifications and competences carry the same wage premium. Using UK data Dearden, McIntosh, Myck and Vignoles (2002) show evidence that academic qualifications, rather than vocational qualifications, correspond to higher earnings. They also performed an analysis of time required to obtain those qualifications and found that return per year on vocational education moves, on average, towards those with academic qualifications. Van Loo and Toolsema (2005) analyze a sample of 1.702 employed Dutch vocational graduates and the effect of five key skills: problem-solving, independence, oral presentation/speaking, accuracy/carefulness, and initiative/creativity. Their results suggest that independence, accuracy/carefulness, and initiative/creativity are positively associated

with higher wages. Finally, some authors emphasize the complementarity of different competences towards the same outcome. Heijke, Meng and Ramaekers (2003) investigate the impact of general-academic, field-specific and management competences on wage distribution of higher education graduates in northern Italy. They show that management competences have a direct positive wage-effect while general-academic and field-specific competences do not show a direct pay off, but rather play a supportive role in development of other skills which are in turn highly associated to higher pay off.

2.6 Effects of competence mismatch

As part of Industry 4.0, many firms are rapidly updating their technologies in the context of shorter product life cycles to become more market-driven and able to adapt quickly to new customer needs (Yang, You & Chen, 2005). As result, these employers are increasing demand for new or updated qualifications and the intensity of usage of new technologies. That is why more and more emphasis is given to a degree of match between employers' requirements and workers' development of competences.

Competence mismatch can have important economic consequences (Quintini, 2011). At individual level, it impacts job satisfaction and wages. At firm level, it dampens productivity and turnover growth and increases on-the-job training costs. Finally, at macroeconomic level it increases natural rate (equilibrium rate) of unemployment and reduces GDP growth prospects. It is also important to stress out that competence mismatch may emerge not just between contemporary competence requirements and development but also between today's competence inventories and future competence requirements, which is way this topic is growing in importance. In fact, World Economic Forum (2016) already reports that 38% of employers reported having difficulties in filling jobs in 2015.

This mismatch is most often measured in two ways: 1) directly measuring employees' acquired competences and those required by employers (involving both sides of the labor market); and 2) self-assessment by only either employees or employers, who are asked whether they are able to use all their competences in their job (competence underutilization) and whether they would carry out their job better if they had additional competences (competence gaps or shortages).

Some authors have focused solely on graduates and have evaluated their "fit" on the labor market, i.e. how well do the universities prepare them for future job challenges. Mora, García-Aracil and Vila (2007) use a Careers after Higher Education – A European Research Survey (CHEERS) data to estimate job satisfaction of higher education graduates and find that a surplus of qualifications and competences is one of the most relevant causes of dissatisfaction. Using the same dataset, García-Aracil and Van der Velden (2008) also estimate competence gaps impacts on gradutes' monetary rewards, indicating heterogeneous

effects between different competence set, i.e. they find that jobs with higher participative and methodological competence requirements are better paid (by 4% to 6%). Nicolescu and Paun (2009) conduct a study in Romania to identify the extent to which graduates expectations in terms of abilities and skills developed through higher education are convergent to employers' requirements. Their results suggest that both graduates and employers have to large extent similar types of expectations of higher education services, but the degree to which they emphasize different aspects varies. Graduates emphasize the most on getting practical knowledge, skills, and abilities while employers emphasize the most on moral and psychic qualities of the individual, some of which are not in the university domain to teach in the first place (Arthur, 2006). Hodges and Burchell (2003) perform similar study for business graduates in New Zealand and find that traditional undergraduate degrees, that focus more on cognitive and technical development within a narrow discipline, may not be able to produce the well-rounded, multi-skilled, flexible and adaptable graduates demanded by today's business organizations. Similar work was also done for other graduate fields (Davies, Csete & Poon, 1999; Coll, Zegwaard & Hodges, 2002a, 2002b; Wilton, 2008; Azevedo, Apfelthaler & Hurst, 2012).

Other studies have gone a step further and investigated competence mismatch impact on wage premiums and job satisfaction. Allen and Van der Velden (2001) investigate skill mismatch impacts on labor market outcomes on Dutch university and tertiary vocational graduates. They exploit Higher Education and Graduate Employment in Europe database, specifically the cohort who graduated in 1991 and study their labor market situation seven years later, in 1998. Competence mismatches were found to be present in half of the graduates in each group, and were found to be associated with 6% decrease in wages and 14% decrease in job satisfaction. Mavromaras, McGuinness and Fok (2009) perform a similar study in Australia using Household, Income and Labor Dynamics survey and found that about 11.5% of working age employees in full-time employment were severely over-skilled and are found to be paid less, on average, than their equally skilled, well-matched, counterparts. Green and McIntosh (2007) study competence mismatch in Britain using the second Skill Survey conducted in 2001. The authors calculate that 35% of UK employees were over-skilled in 2001 and 13% were under-skilled, both of which effected negatively their wages, by 9.9% and 0.6%, respectively. Similar results were also found for Portugal (Vieira, 2005), Belgium (Verhaest & Omey, 2006; Verhofstadt, De Witte & Omey, 2007), Denmark (Nielsen, 2007), Spain (Badillo-Amador, García-Sánchez & Vila, 2005), Sweden (Böhlmark, 2003).

More recently, Yamaguchi (2012) and Postel-Vinay and Lise (2015) investigate effect of mismatches in cognitive, manual and interpersonal skills using a combination of *National Longitudinal Survey of Youth* (NLSY79) and O*NET program. Their results suggest that cognitive skills have much higher return than manual skills, but are slower to adjust to market requirements. Interpersonal skills have moderate returns, and are very slow to adjust over a worker's lifetime. They also found that the cost of mismatch is the highest for

cognitive skills in relation to two other skills, but also asymmetric: employing a worker who is under-qualified in cognitive skills is costlier than employing an over-qualified worker. Fredrikson, Hensvik and Skans (2018) examine the direct impact of mismatch on wages and job mobility using unique Swedish data containing information on talents, occupations, and wages. Their empirical analysis is based on idea that tenured workers are selected based on having the right skills for the job. Thus, to measure mismatch, they compare the talents of recently hired workers to the talents of incumbent workers performing the same job. Their results show that mismatch reduces annual earnings by 13 on average.

Another stream of literature explored effects of this mismatch on labor mobility and additional (on-the-job) training. Regarding the former, many studies have found that mismatch is positively associated with labor mobility, as possible means of reducing this problem (Allen & Van der Velden, 2001; Verhaest & Omey, 2006) while, regarding the latter, over-skilled employees are less likely to take part in training programs than well-matched or under-skilled employees (Büchel & Mertens, 2004; Verhaest & Omey, 2006).

Effects of competence mismatch were also estimated, although much rarely, on firm performance. Tsang (1987) utilizes data on 22 US Bell companies during 1981-1982 period and finds that over-skilled mismatch is negatively associated to firms' output – one-year reduction in the level of over-qualification of employees is associated with an 8.4% gain in additional output. In recent times, Kampelmann and Rycx (2012) investigate the Flemish employee-employer data and finds that over-qualification actually raise productivity (measure as real valued-added per worker).

Finally, research of this kind also took place on the national level where it was argued that mismatches will likely lead to higher structural unemployment (Marsden, Lucifora, Oliver-Alonso & Guillotin, 2002; Skott & Auerbach, 2005; Olitsky, 2008). Using the US data, Slonimczyk (2009) finds that a substantial fraction (11% for men and 32% for women) of the increase in wage dispersion during the 1973-2002 period was due to the increase in over-qualification rates and over-qualification premium. Along the same reasoning, Budría and Moro Egido (2008) use Spanish data to show that the incidence of mismatch contributes to increase wage differences within education groups by driving a wedge between matched and mismatched workers.

2.7 Conslusion

Fourth industrial revolution will continue to increasingly demand a broad spectrum of new or updated competences in order for markets to function effectively. This is already recognized by numerous organizations, governments and firms worldwide, who have taken action towards equipping their workforce with contemporary competences required by labor market. World Economic Forum (2016) estimates that about two thirds of global multi-national organizations tend to invest in the reskilling of current employees as part of their future workforce planning efforts. This is also backed up by initiatives such as Partnership

for 21st Century Skills or the new OECDs' PIAAC framework, designed to assess meta-level competences and suggest the areas for possible improvements.

Today, almost every organization uses some form of competence-based management, especially those with separate Human resource departments. Simplicity and concreteness of competences as the common language of the whole organization makes them understandable to all employees, regardless of their position in hierarchy structure or level of education, and therefore allows for a very concrete way of expressing organizational culture and values (Green, 1999; Kurz & Bartram, 2002). In addition to allowing the assessment of individuals' strengths and weaknesses, competence-based models enable the assessment of the overall human potential and emphasize the areas in need of further development, thus becoming basis for education and training, and, coupled with a rewarding scheme, play an important role to direct and modify employee's behavior. Finally, despite the fact that it comprises of more than just thought, knowledge, skill or ability, a competence itself can be learned within a favorable environment (OECD, 2005) and, unlike abilities and talents, can be learned and developed in adulthood (Boyatzis, 2008).

On a downside, there is still confusion and disagreement about what exactly competences are and how to accurately measure them – inconsistent, unmeasurable, discriminating, too numerous and poorly classified behaviors in measuring competences resulted in many bad practical models (Kurz & Bartram, 2002; Finegold & Notabartolo, 2010; Psacharopoulos & Schlotter, 2010; Kucel, Vilalta-Bufi & Robert, 2011). In addition, implementing competence-based approach in an organization for the very first time can be problematic and lead to resistance and increased fluctuations of both output and workforce (Lawler, 1994). This is especially pronounced in a situation with intercultural transfer of competences, since in different socio-economic context the same behavior does not have to point to the same competence or its relevancy (Sparrow, 1997; Dooley, Paprock, Sun & Gonzalez, 2001).

Furthermore, since most analysis methods are based on behavior in critical situations until now, current competence-based models are exposed to dangers of shaping future organizations based on what has worked in the past – i.e. successful and unsuccessful workers until now may be different in some currently irrelevant characteristics that may increase their importance in the future (Wood & Payne, 1998). Even more so, by only hiring workers based on the characteristics of those successful until now, organization is in danger of creating their clones, thus diminishing its workforce diversity and jeopardizing the potential for creativity, innovation and difference in approach to dealing with problems (Sparrow & Bognanno, 1993). Competences are dynamic by their very nature, especially practical ones, and the employers' expectations are always adjusting to the market, particularly in the Industry 4.0 environment where pace of technological change is ever increasing (Owen, 2001; World Economic Forum, 2016). Also, it is likely that workers will improve the competences they use regularly and will tend to lose some of those they do not use so much (Postel-Vinay & Lise, 2015).

Finally, even though competence-based literature has recently grown in volume, very few studies have offered concrete solutions to bridging the gap between requirements and development of competences on labor market. Although some indicators can already be measured by existing data, much has to be done to improve established data sources and to create new ones, especially in terms of longitudinal design, that provide further insights in important competence dimensions (Psacharopoulos & Schlotter, 2010). Growing number of analysts call for better guidance services to match the two – adult learning, work-based training and training in the context of active labor market policies for the unemployed are also deemed important to prevent competence obsolescence and upgrade competence inventories in light of new technology-driven requirements. Recent studies have also identified that higher educational institutions mostly focus on technical and practical competences development, which is often in opposition with emphasis on general competences demanded by employers, (Marthandan, Jayashree & Yelwa, 2013), thus pointing towards better coordination between policy makers, educational system and employers' needs. Furthermore, traditionally high costs of labor and wage adjustments and stringent regulations (especially in Europe) have to allow greater wage adjustability and easier workforce policies to resolve mismatch by adapting workforce structure.

3 EXAMINING THE ROLE OF KEY COMPETENCES OF ECONOMICS AND BUSINESS GRADUATES ON FIRM PERFORMANCE [4]

3.1 Introduction

A rise of knowledge-based economy was accompanied by a decline in lower-skilled, manual labor, and increase in knowledge work and service occupations (Autor, Levy & Murnane, 2003; Finegold & Notabartolo, 2010). In these circumstances, increasing emphasis is given to "soft" factors of production such as possessing the right combination of competences for the job position or having a desired set of personality characteristics (Spencer & Spencer, 1993; Heckman & Kautz, 2012). Employers seek workers with not only a particular combination of academic skills and knowledge, but also with capability to be proactive and to resolve problems creatively and autonomously (Fallows & Steven, 2000). Taking this into account, performance of a firm will be influenced not only by, among others, the *quantity* of workers, but also by the *quality* of its workforce, such as in terms of competences they possess. Semeijn, Boone, van der Valden and van Witteloostuijn (2005) argue that these requirements have not yet been fully integrated into labor market performance models and this paper aims to fill this gap.

Analysis in this research is focused on a degree of match between employers' competence requirements and competences possessed by their workforce, and the effect of this match on firm performance. Analysis is focused on positions that require competences in economics and business domain, with a threefold aim: 1) to identify and quantify key competences required for positions held by workers with economics and business background; 2) to quantify development level of those competences among the current workforce; and finally 3) to investigate how this (mis)match is then connected to firm performance. In order to mitigate the problems with different competence inventories of different occupational profile or workers, this analysis is performed only for employees with economics and business background as they are employed in almost every firm, regardless of firms' industry. Through the literature review and a pilot study, we have identified a list of skills and abilities which were then sent to employers for evaluation via online questionnaires. Using exploratory factor analysis, we extracted eight key competences and calculated the competence shortage, i.e. the gap between the highest possible representation of each competence and their current representation among existing workforce for each firm. For the robustness check, this shortage was also calculated as the gap between the relative importance and current representation of each competence. Finally, these shortages (gaps) were then incorporated in production function to explore their effects on firms' performance.

[4] Joint work with Polona Domadenik. This chapter (with some modifications) is accepted for publication in International Journal of Manpower with a title "Examining the role of key competences in firm performance".

Our contribution to the literature is threefold. First, we address the importance of competences for the performance of an enterprise, an under-researched area. Kucel, Vilalta-Bufi and Robert (2011) argue that studies on skill or competence mismatch are scarce because most of these studies were undertaken by consultants with little patience for acquiring extensive datasets. Finegold and Notabartolo (2010), on the other hand, argue the main reason behind the scarcity of these studies is the lack of sound and clear methodology, especially when it comes to common measure of competences. Next, instead of defining competences *a priori* (Lokshin, Van Gils & Bauer, 2009), we start with an extensive list of skills and abilities (defined through literature review, but corroborated and amended using pilot study and expert opinion) which were sent for evaluation and then combined into competences. By doing this, respondents had no idea which skills and abilities would later be grouped into which competences, thus eliminating their potential bias towards favoring certain type of competence. Finally, our study concentrates on Croatia which, due to its high costs to labor and wage adjustments, is a perfect laboratory environment for studying competence-based topics. High rigidity of labor market (high costs to labor and wage adjustments), coupled with very low rates of on-the-job training of about 25% (Eurofound, 2017), implies relatively time-invariant competences of labor force that suits our methodology of investigating their relation to firm performance.

3.2 Literature review

We start-off by analyzing the differences between skills, abilities and competences. Sonntag and Schmidt-Rathjens (2004) define skills as automated components of tasks, which are undertaken with a relatively low mind control and include powered routine jobs as well as cognitive activities. Abilities are defined as all kinds of innate skills of a person which are necessary to perform tasks and services. Competence, the subject of our study, is a relatively new term in the literature without a comprehensive definition. For example, Spicer (2009) defines competences as the skills, knowledge, abilities, motivation, and other requirements, which are needed in order to perform the job successfully. Rieckmann (2012, p.131) elaborates on this definition by saying that "competences can be characterized as individual dispositions to self-organization which include cognitive, affective, volitional and motivational elements; they are basically an interplay of knowledge, capacities and skills, motives and affective dispositions." Finally, OECD (2005) defined competences as "... more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context.“. All these competence definitions have one thing in common – competences are transcending simple skills or abilities and are actually encompassing both of those. This multidimensionality approach in defining competences is adopted in this research as well.

Furthermore, competences in this study were divided into practical (technical, field-specific) competences and those of general (theoretical) type (similar division was used in Biesma et al. (2008) or Leoni (2011))[5]. Former cluster consists of practical knowledge and methods specific to a certain domain or to a certain firm, while the latter included higher cognitive (such as learning abilities, analytical skills, problem-solving abilities) and interpersonal (such as team working skills, planning and organizing skills and decision making skills) skills and abilities that can be used at any workplace. This division draws it origins to the seminal work of Becker (1962), who argues that, firm- (or occupation-) specific knowledge is useful only in the firms (occupations) providing it, whereas general knowledge is useful across all occupations and all firms. In his Nobel Prize speech, Becker (1992) uses the example that teaching someone to operate personal computer is general training, while learning the authority structure and the talents of employees in a particular company is specific knowledge. In his human capital model, this distinction helps explain why workers with highly practical skills are less likely to quit their jobs and are the last to be laid off during business downturns. It also explains why most promotions are made from within a firm rather than through hiring - workers need time to learn about a firm's structure and "culture". However, Becker (1962) also acknowledged that any practical skill is first developed in the firm, since firms tend to be first aware of its value, but as demand develops, training of these skills is shifted to educational institutions.

Research in the identification of key competences has already been performed for a number of different industries. Zehrer and Mossenlechner (2009) looked at key competences of tourism graduates and found that activity and action-oriented competences have the greatest importance, followed by social and communicative competences. Dreyfus (2008) looked at what competences predict the efficiency of R&D managers in the US. On a sample of 35 scientists and engineers working as first level managers at a US government research center in the Mid-West she identified two competences – managing groups and interpersonal sensibility – to be associated with highly effective managers. Jamshidi, Rasli and Yusof (2012) looked at competences of 75 HR administrators and professionals in top ranked Iranian universities and, using Delphi method, found that competences "empowering and delegating", "team working" and "impact and influence" are most important for their performance. Rehman, Majid and Baker (1997) conducted research to determine key competences of library and information professionals in Malaysia for entry-level positions in academic libraries. On a sample of 60 participants they identified six operational areas for which they identified key competences. Other similar research was done for academic librarians (Mahmood, 2003), lodging industry (Chung-Herrera, Enz & Lankau, 2003), public health industry (Biesma et al., 2008), construction industry (Ahn, Annie & Kwon, 2012), disaster managers (Kusumastuti, 2014), automotive and pharmaceutical industry

[5] This is not to be confused with Beckerian trichotomy of skills: general ones, which can be learned in the class room; general work related competences which are to be learned in the firm and in any kind of firm; job-specific, practical work related competences which can be learned by gaining experience in a given type of firms.

(Grzybowska & Łupicka, 2017), general leadership competences (Delia Davila Quintana, Mora Ruiz & E. Vila, 2014), accounting industry (Pan & Perera, 2012), agriculture and tourism (Chiru, Ciuchete, Lefter & Paduretu, 2012).

Brocklesby (1995) shows how competence profiling was used on a case study in one company in New Zealand that experienced difficulties when recruiting and retaining suitable candidates as project managers. Using the soft system methodology, he was able to identify several "softer" relationship-building competences that were added to firms' competences portfolio. Vakola, Eric Soderquist and Prastacos (2007) performed a case study on a Greek bank with a goal of developing competence model to implement corporate restructuring they were undergoing and to change supporting communication, employee understanding of business goals and the incorporation of new behaviors. By focusing on competences needed for organization to reach their short- or long- term objectives, rather than on competences of successful individuals, they were able to identify core competences for business to compete successfully in the banking sector.

On the other hand, research on key competences and firm performance is still in its infancy. According to Leoni (2012), organizations adopting competence approach are characterized by low levels of hierarchy, high levels of discretionary powers, broad skills, team working, participation in problem-solving groups, multiple incentives to boost motivation and performance related pay and, finally, increasing emphasis on key competences. Bartel, Freeman, Ichniowski and Kleiner (2003) examine whether workplace attitude among its employees affects economic outcomes. Analysis is based on employee survey of over 2000 US bank branches from 1994 – 1996, and results show that branches with less favorable attitudes have higher turnover, lower levels of sales and sales growth than branches with more favorable worker attitudes. Forth and Mason (2006) looked into ICT skill shortages among existing employees and found an indirect negative impact on performance through the restrictions that such deficiencies place on ICT adoption and on the intensity of ICT use post-adoption. However, there is only weak evidence of skill shortages impinging directly on performance at given levels of ICT adoption and utilization. Radzi, Nor and Ali (2017) analyzed 199 small Malaysian companies under the Federal Land Development Authority scheme and found that only entrepreneurial competences and technology usage are related to success of small businesses. Wang, Lo and Yang (2004) decomposed the impact of core competences, which they divide into marketing competences, technological competences and integrative competences, on firm performance and found a positive impact of all three of them. Lokshin, Van Gils and Bauer (2009) concentrated on studying relationship between organizational competences (e.g. improving team cohesiveness and providing slack time to foster creativity) and innovative output of a firm. Their results do not show evidence of a direct effect on innovative performance, but rather that these competences have to be combined with customer and technological ones to create innovations. Concentrating more on employment dynamics as the main outcome, Stevens (2007) shows that skill shortages have significant effect on firms' employment behavior by increasing adjustments costs.

Gokkaya and Ozbag (2015) show how all three dimensions of core competences (uniqueness, extendibility and customer value) and positive and significant effect on firms' innovation output.

In terms of managerial competences and firm performance, Bloom, Propper, Seiler and Van Reenen (2015) examine whether increased competition can increase management quality in UK public hospitals. Their results indicate that more hospital competition leads to improved hospital management practices, which are in turn responsible for higher performance in terms of quality, productivity, and staff satisfaction. Bloom, Sadun, and Van Reenen (2016) construct an index of advanced managerial practices that they interpret as "managerial capital" and argue that it can account for on average a fifth of the TFP spread within countries and a third of the productivity gap between the United States and 33 other nations. On a more-micro level, Bloom et al. (2013) investigate relationship between management practices and firm productivity in Indian textile plants. Their experiment involved providing free consulting on management practices to randomly chosen treatment plants which were then compared to a set of control plants. Obtained results suggest that adopting these management practices raised productivity by 17% in the first year through improved quality and efficiency and reduced inventory, and within three years led to the opening of more production plants. In a similar study, Bender et al. (2018) investigate the extent to which management, which they proxy by an index of adoption of advanced management practices, influences productivity through workforce selection and pay on a middle-sized German manufacturing firms. Their analysis concluded that plants with higher management scores: (1) have higher average worker skills; (2) pay higher wages relative to the market as a whole, controlling for the quality of their workforce; and (3) are able to build up a superior stock of employees through selective hiring and attrition.

Finally, some information on the impact of skill gaps is also available from national surveys. One such survey for the UK is analyzed by Shury et al. (2010) who find that skill shortages increase the workload of other staff, increase operating costs and delay product development. Brief summary of methods, samples and results on impact of competences and skills on firm performance is presented in Table 16 of Appendix 3.

3.3 Methodology and empirical model

3.3.1 Theoretical framework

Although many past studies used the terms *skill*, *ability* and *competence* interchangeably (Belasen and Rufer, 2007), we opted to base our analysis on competences, for both conceptual and methodological reasons. As for the former, competences are strongly associated to mastering complex situations (contradictory information, informal collaboration, and abstract, dynamic and highly integrated processes) demanded by modern-day employers, and that those are transcending the level of knowledge and skills, given their

synergistic and inter-related nature (Jackson, 2009). This is further corroborated by OECD (2005) and Belasen and Rufer (2007), who also emphasize that competences are transcending simple skills or abilities and are actually encompassing both of those. As for the methodological reasons, Van Loo and Toolsema (2005) warn against using too many skill/ability items as that introduces estimation bias, and hence recommend reducing the dimensionality of skills/ability dataset by combining them into competences.

To investigate the connection between key competences and performance of an enterprise we use the production function approach in both static and dynamic environments. Cobb-Douglas production function is defined as

$$Y_{it} = A_{it} K_{it}^{\beta_K} L_{it}^{\beta_L} \tag{3.1}$$

where Y_{it} represents the firm i's output in time t, K_{it} and L_{it} are labor and capital inputs of firm i in time t, and A_{it} is usually defined as total factor productivity (Hicks-neutral efficiency level) of firm i in time t. While both K_{it} and L_{it} are observable, A_{it} is unobservable and is inferred as residual. Equation 3.1 is linearized by taking natural logarithm to obtain

$$y_{it} = \beta_0 + \beta_K k_{it} + \beta_L (l_{it} + c_i) + \zeta_i + u_{it} \tag{3.2}$$

where lower case letters correspond to the natural logarithms of the variables in Equation 3.1, and $lnA_{it} = \beta_0 + \beta_L c_i + \zeta_i + u_{it}$. β_0 measures the mean efficiency level across all firms over time, while ζ_i and u_{it} capture firm-specific deviations from the mean—the former refers to time-invariant (or at least very rigid) firm characteristics, such as corporate culture or demographics, while the latter is an i.i.d. component that captures unobserved factors and hence affect output but not the choice of inputs (it also represents a measurement error in output or errors due to functional form discrepancies). c_i refers to competence inventories of the workforce of firm i and are also assumed to be time invariant[6].

Competences $c, c \in \{1, 2, \dots, C\}$ are considered to be latent variables measured using the observable indicators – the skill/ability items. The underlying relationship is assumed to be

$$X_i = c_i + \varepsilon_i \tag{3.3}$$

where the observed indicator (skill/ability) X_i consists of the latent ("true") part, c_i and the error term, ε_i. To extract these latent, underlying factors (i.e. competences) exploratory factors analysis is performed.

Each employee, l, possesses unique set of acquired competences, where development of each competence is influenced by the family socio-economic status, educational choices,

[6] Croatian labor market is very rigid in terms of competence development with high costs of labor and wage adjustments. Most of workers and graduates do not acquire new competences after their educational process simply because of lack of mobility on labor market and very low rates of on-the-job training (Eurofound, 2017). Because of this, we can assume that competences are relatively time-invariant.

previous experience on the labor market, any on-the-job training of the individual. Any firm usually comprises of employees with different competence inventories – even in a situation where two workers have the same competences in their inventory, the difference among them may be the development (the "mastery") level of each competence. Current development level of each competence among firms' f workforce is labeled as $C_f = \{c_{1f}, c_{2f}, \dots, c_{Cf}\}\ \forall f, f \in \{1, 2, \dots, F\}$, and optimal competence inventory (the one seen as most important by employers) is approximated by the relative importance placed on each competence by each firm, $C^*_f = \{c^*_{1f}, c^*_{2f}, \dots, c^*_{Cf}\}\ \forall f, f \in \{1, 2, \dots, F\}$. Note that c^*_{cf} represents the importance placed on competence c by firm f, and c_{cf} represents the current development level of competence c among the workforce of firm f. Let variable G be the approximation of the mismatch (gap) between importance and currently developed level of each competence for each firm

$$G_{cf} = \left|c^*_{cf} - c_{cf}\right|, \quad \forall c, c \in \{1, 2, \dots, C\}, \forall f, f \in \{1, 2, \dots, F\} \tag{3.4}$$

Since both the current representation and importance of each competence is measured on Likert scale, the calculated mismatch is without measurement unit. Hence, we standardize these gaps to be interpreted in terms of standard deviations i.e. deviations from their average values.

3.3.2 Methodology

Static production function in empirical form is defined as follows:

$$y_i = \beta_0 + \beta_1 k_i + \beta_2 l_i + \sum_{c=1}^{C} \gamma_c G_{ic} + \sum_{k=1}^{K} \delta_k X_{ik} + u_i \tag{3.5}$$

where y represents the output – real value added, l is labor (approximated by the real cost of personnel), k is the real capital (approximated by the real value of fixed tangible assets), G are mismatches (gaps) in each of key competences c and X are other firm k characteristics: ownership, region and industry.

Equation 3.5 is first estimates using the OLS technique. However, since we cannot ignore the self-selection of firms to respond to our questionnaire, thus introducing bias into our preliminary estimates, initial results are also amended using Heckman selection model (Heckman, 1979). This model is estimated in two steps. In first step, a *participation* or *selection* equation is estimated by maximum likelihood Probit regression, in which decision to respond to our questionnaire (i.e. to be selected into sample) or not is used as response variable that depends on different explanatory factors. From the coefficients estimated in this regression, Inverse Mills Ratio (IMR) is calculated. Second step involves estimation of *performance* equation with IMR as an additional regressor that will account for the bias due to non random nature of the sample of respondents. A significance of IMP coefficient points

at the presence of sample selectivity. This model is estimated on entire population of firms in 2016. Performance equation in Heckman selection model is the same as in OLS model (Equation 3.5) amended with calculated IMR, while the selection equation is the following:

$$select_{it} = \beta_0 + \beta_1 lnry\_sector_{it-1} + \beta_2 lnrw_{it-1} + \beta_3 exporter_{it-1} + \beta_4 lnrstliab_{it-1} + \sum_{k=1}^{K} \delta_k X_{ik} + \varepsilon_{it} \quad (3.6)$$

where $select$ represents the dummy variable of selection into "treatment" i.e. the firms that have responded to questionnaire, $lnry\_sector$ is the real total revenues of the NACE Rev. 2 2-digit sectors (proxy for demand of sector output), $lnrw$ is the real total cost of labor, $exporter$ is the dummy for exporting firms, $lnrstliab$ is the real current liabilities of the firm and X are other firm characteristics k which include: firms ownership, region of the firm and industry sector. All the regressors enter the selection equation with a lag of one period as we assume the willingness of the firm to participate in the survey will depend on the financial results from the previous year (which is known to the firm). Intuition behind this is that firms that have finished previous fiscal year with clean balance sheets and without any unpaid liabilities will be more inclined to provide answers.

However, we also cannot ignore the possibility that some time invariant (or at least very rigid) firm characteristics, such as corporate culture or demographics, may be correlated with the explanatory variables, thus acting as further source of bias in our static results. Dynamic GMM panel data models (Arellano & Bond, 1991; Blundell & Bond, 2000) are among the most popular approaches to tackling the problem of endogeneity by exploiting instruments based on lagged output variables. We use the Arellano–Bond approach as an alternative to OLS and Heckman estimation and specify our Model in Equation 3.5 as a dynamic augmented production function. Here we make an assumption that competence mismatches are time-invariant, at least in short and mid term, as most of workers and graduates don't acquire new competences after their educational process simply because of lack of mobility on labor market and very low rates of on-the-job training (Eurofound, 2017). Because of this, competence mismatches are assigned the same values for entire analyzed 2011-16 period (only for the firms for which we have calculated gaps). This assumption is further corroborated by the fact that Croatian economy was in recession for the major part of analyzed period, and many firms further reduced their investment in on-the-job training. As Arellano-Bond technique transforms the model using first differences (and thus all fixed effects are dropped), these time-invariant competence mismatches are introduced in the first difference equation.

Dynamic production function in empirical form is defined as follows:

$$y_{it} = \beta_0 + \beta_1 y_{it-1} + \beta_2 k_{it} + \beta_3 k_{it-1} + \beta_4 l_{it} + \beta_5 l_{it-1} + \sum_{c=1}^{C} \gamma_c G_{ic} + \sum_{k=1}^{K} \delta_k X_{itk} + \varepsilon_{it} \quad (3.7)$$

In both static and dynamic environment case we expect that low competence shortage (gap), implying that employees possess exactly the right combination and mastery of competences their work environment is demanding, lead to increase in firms' performance.

3.4 Data collection process and dataset description

This research used two datasets: i) primary data collected through questionnaires, which provided data on competence inventory in particular firm; and ii) Financial agency (FINA) dataset containing financial and structural firm data for all Croatian firms in period 2011-2016. Questionnaire was based on a list of skills and abilities identified from previous research (Biesma, Pavlova, van Merode & Groot, 2007; Biesma et al., 2008; Kelly, O'Connell & Smyth, 2010; Leoni, 2011) and amended with comments from the pilot study and field experts. The final version included 58 skills and abilities[7] of both practical and general type, relevant for positions with economics and business background, sent for self-evaluation[8]. Respondents (firms) had to answer two questions related to these, thinking only of positions requiring economics and business background: 1) they had to assess the importance of each skill for their firm; and 2) they had to assess the current level of skill development among their current workforce. These answers were recorded on a Likert scale from 1 (unimportant/not developed at all) to 5 (extremely important/extremely well developed). Questionnaire was administered in on-line version, which is quite standard in this type of research (Cowan, Wilson-Barnett, Norman & Murrells, 2008; Zehrer & Mossenlechner, 2009).

Firms (respondents) were represented either by their owner (or CEO) or the head of human resource (HR) department. This is also quite standard in this type of study (Nicolescu & Paun, 2009), and is important for two reasons. First, respondents had to be able to assess the

[7] Although this number might seem quite high, it sits somewhere in the middle of number of skills evaluated in other similar studies – it ranges from 24 (Chiru, Ciuchete, Lefter & Paduretu, 2012), 25 (Hodges & Burchell, 2003), 34 (Biesma et al., 2008), 44 (Leoni, 2012) all the way to 75 (Mahmood, 2003), 80 (Gerli, Gubitta & Tognazzo, 2011), 99 (Chung-Herrera, Enz & Lankau, 2003) and 108 (Cowan, Wilson-Barnett, Norman & Murrells, 2008).

[8] While acknowledging the problems associated with self-evaluation of skills and abilities, given the available time and resources, this turned out to be the most appropriate and practical. Literature also supports this method of assessment (e.g. Spenner, 1990; Watson, Calman, Norman, Redfern & Murrells, 2002; Cowan, Norman & Coopamah, 2005) and even suggest that continual self-assessment will not only provide the opportunity to reflect on their practice but also to request resources to address perceived deficits (Waddell, 2001).

current and anticipate the future needs of the firm in relation to their competitors and general business environment, and thus evaluate how important each of these skills is for their firm. Secondly, respondents had to be able to evaluate the current development of skills for their employees, something HR managers are particularly good at.

Following and adapting a sampling strategy from Iootty, Correa, Radas and Škrinjarić (2014), our sample of firms to participate in the survey was set to be representative in terms of firm size, NACE 2-digit sectors and 21 Croatian counties, and we have sent 1,000 invitations in total. Time frame for questionnaire was from April to July 2016. The completion rate was 15.6%, thus obtaining 156 responses. This is quite usual – in fact, Agle, Mitchell & Sonnenfeld (1999) estimate that typical response rate of CEOs of the companies is between 13% and 20%[9]. After data cleaning our sample was reduced to 112 firms[10] (Table 17 in Appendix 3). Table Table 2 shows descriptive statistics of firm characteristics, while Table 18 in Appendix 3 presents descriptive statistics of all skill/ability-items. Average firm in our sample is small (42%), private (85%), service-sector (50%) firm from Central Croatia (38%) that does not export their products and services (53%). It has about 90 employees on average, 47 mil. HRK of real value capital (deflated using PPI) and generates 35 mil. HRK of sales revenue. If we look at the population of firms in 2016, average firm there is a micro (89%), private (98), service-sector (73%) firm from Central Croatia, and is also a non-exporter (86%).

Table 2: Descriptive statistics of firms in sample

Variable	Questionnaire respondents		All firms in 2016	
	n	Mean	*N*	Mean
Size				
Micro	35	0.31	85,171	0.89
Small	47	0.42	9,160	0.10
Medium	21	0.19	1,515	0.02
Large	9	0.08	313	0.00
Region				
Central Croatia	43	0.38	42,711	0.44
North-western Croatia	19	0.17	8,757	0.09
East Croatia	16	0.14	8,741	0.09
North Adriatic and Lika	21	0.19	17,176	0.18
Central and South Adriatic	13	0.12	18,774	0.20
Ownership				
State	14	0.13	787	0.01

[9] Response rates in similar studies range from 11% (Azevedo, Apfelthaler & Hurst, 2012) to 17.2% (Hodges & Burchell, 2003) or 18.6% (Chung-Herrera, Enz & Lankau, 2003).

[10] Somewhat low number of respondents is quite standard in this type of study. For example, Chiru, Ciuchete, Lefter and Paduretu (2012) analyze tourism and agricultural industry using data from 44 firms, Zehrer and Mossenlechner (2009) base their analysis of tourism sector on 48 firms, Gerli, Gubitta and Tognazzo (2011) assess key competences of family-owned SMEs in Italy using 97 respondents, and Pan and Perera (2012) assess the competences in accounting field using 106 firms' responses.

Private	95	0.85	94,210	0.98
Mixed	3	0.03	1,162	0.01
Exporter				
Exporter	53	0.47	13,931	0.14
Non exporter	59	0.53	82,228	0.86
Industry sector				
Industry and Manuf.	56	0.50	12,355	0.13
Services	56	0.50	70,644	0.73
Financial variables (in real terms)				
Personnel cost (mil. HRK)	112	9.52	96,159	7.51
Capital (mil. HRK)	112	47.89	96,159	1.77
Value added (mil. HRK)	112	25.87	96,159	2.68
Turnover (mil. HRK)	112	35.21	96,159	3.19

Source: Author's own work.

3.5 Findings and discussion

3.5.1 Estimation of key competences

Key competences were extracted using exploratory factors analysis on a list of 58 skill/ability items. Respondents (owners, CEOs or HR managers) average working experience is 18.9 years while the average tenure is 10.5 years, which adds some validity to results. Using the criteria of eigenvalue greater than one and based on the list of skills/abilities loadings on each factor (Table 19 in Appendix 3), eight factors/key competences were defined, explaining 80% of original variance: 1) economics and business theory and practice; 2) collectedness, presentation and teamwork; 3) IT proficiency; 4) business communication; 5) project management and professionalism; 6) advocacy, language fluency; 7) motivation and organization; and 8) quantitative-economics algebra. This is in line with previous studies who have focused on a small set of key competences (Biesma et al., 2008; Cowan, Wilson-Barnett, Norman & Murrells, 2008; Azevedo, Apfelthaler & Hurst, 2012; Grzybowska & Łupicka, 2017) rather than, what Whitston (1998) refers to as, the temptation to adopt an ever-growing list of competences. Kaiser-Meyer-Olkin sampling adequacy measure of 0.88 justifies the usage of exploratory factor analysis. In light of Biesma, Pavlova, van Merode and Groot (2007) and Biesma et al. (2008), competences 1, 3, 4 and 8 were labelled as *practical* (job-specific), while competences 2, 5, 6 and 7 were labelled as *general*. This assignment of skills/abilities into eight factors (i.e. key competences) was tested using confirmatory factor analysis. The Root mean squared error of approximation of 0.062 indicates a good fit of the model.

Afterwards, for each key competence a sum score of all its items was calculated and divided by the total number of items (Table Table 3). *Motivation and organization* and *project management and professionalism* turned out to be the most important competences for

employers while *business communication* was shown to be the most developed among their existing labor force. These results support existing evidence that has also put emphasis on development of general competences such as professionalism, project management and teamwork (Biesma et al., 2008; Cowan, Wilson-Barnett, Norman & Murrells, 2008; Azevedo, Apfelthaler & Hurst, 2012; Chiru, Ciuchete, Lefter & Paduretu, 2012; Leoni, 2012; Grzybowska & Łupicka, 2017). In fact, Weisz (1999) found that employers expect general competences to be developed prior to employment.

The last column of Table Table 3 shows the mismatch between current competence requirement level (importance) and competence representation (development) in the current workforce. This difference is expressed in terms of competence importance (requirement), i.e. a negative sign indicates competence shortage (its importance is higher than its current development), and vice versa. These differences were tested using t-tests for unpaired data with unequal variance. This shortage is the lowest for *economics and business theory and practice* and *quantitative-economics algebra* competences indicating that workers are somewhat in line with what is expected of them by employers. The same cannot be said for *project management and professionalism* and *motivation and organization* competences, which have recorded the highest competence shortages. Overall, the mismatch is more pronounced for general competences as opposed to practical ones.

Table 3: Importance and current development of key competences among sampled firms

Key competences		Importance (requirements)	Currently developed	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	3.6 (0.9)	3.3 (1.1)	-0.3***
	IT proficiency	3.0 (1.0)	2.6 (1.0)	-0.4***
	Business communication	4.3 (0.7)	3.9 (0.9)	-0.4***
	Quantitative-economics algebra	3.7 (1.1)	3.4 (1.2)	-0.3***
	Practical competences (total)	3.6 (0.8)	3.2 (0.9)	-0.4***
General	Collectedness, presentation and teamwork	4.2 (0.6)	3.6 (0.8)	-0.6***
	Project management and professionalism	4.4 (0.6)	3.5 (0.9)	-0.9***
	Advocacy, language fluency	3.9 (0.7)	3.3 (0.8)	-0.6***
	Motivation and organization	4.6 (0.5)	3.8 (0.8)	-0.8***
	General competences (total)	4.2 (0.5)	3.5 (0.8)	-0.7***

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

3.5.2 Estimation of production function

3.5.2.1 Production function estimation using competence development

Before presenting the main results of this Chapter using *competence mismatches* to explore the variation in real value added of firms, analysis if first focused on exploring the effects of *competence development* levels on real value added. Empirical model is presented in Equation 3.5 but with competence development levels (instead of competence mismatches) as covariates of interest. Estimation results, presented in Table 4, indicate the significance of *business communication; quantitative-economics algebra; collectedness, presentation and teamwork; project management and professionalism* and *motivation and organization* competences. However, competence development alone is not enough to assess the effect of firms output. According to theory of Assignment models (Koopmans & Beckmann, 1957), additional investments in human capital depend in part on the match between the worker and the job – although education raises productivity in general, the actual productivity is determined by the job complexity. Working in a job below one's own competences limits the potential use of those competences and results in lower wages, lower job satisfaction and lower productivity. Conversely, working in a job that require more competences, raises the productivity ceiling, however, the worker's own competences are the limiting factor. Thus, productivity is maximized when workers are allocated top-down according to their competences, whereby the most competent are assigned to the most complex job and the least competent to the simplest job – in other words, employers' competence requrements are trying to be as close as possible to employees' competence development. For this reason, the main analysis, presented in thre remainder of this chaper, is focused on competence mismatch.

Table 4: Results of Static and Dynamic Models using competence development

	Dependent variable: real value added				
	Static model		Dynamic model		
	(1)	(2)	(3)	(4)	(5)
	OLS	Heckman	OLS	Heckman	Arellano-Bond
Competence development					
Economics and business theory and practice	0.093	0.088	0.088	0.138*	0.163**
	(0.086)	(0.079)	(0.096)	(0.072)	(0.069)
IT proficiency	0.105	0.108	0.102	0.104	0.027
	(0.094)	(0.098)	(0.098)	(0.088)	(0.034)
Business communication	0.157**	0.164*	0.168**	0.153*	0.135*
	(0.059)	(0.094)	(0.063)	(0.079)	(0.061)
Quantitative-economics algebra	0.169***	0.149**	0.143**	0.151**	0.165***
	(0.056)	(0.058)	(0.057)	(0.256)	(0.048)
	0.177**	0.172*	0.126*	0.175**	0.115*

Collectedness, presentation and teamwork	(0.085)	(0.098)	(0.091)	(0.086)	(0.081)
Project management and professionalism	0.041	0.192*	0.135	0.197**	0.133
	(0.095)	(0.092)	(0.099)	(0.085)	(0.091)
Advocacy, language fluency	0.013	0.019	0.011	0.120	0.027
	(0.114)	(0.110)	(0.145)	(0.117)	(0.059)
Motivation and organization	0.254***	0.267***	0.256***	0.257***	0.212***
	(0.051)	(0.049)	(0.050)	(0.048)	(0.048)
Lagged (ln) real value added					0.752***
					(0.147)
(ln) real capital	0.211***	0.164***	0.274**	0.252**	0.058**
	(0.033)	(0.037)	(0.124)	(0.104)	(0.028)
(ln) real personnel cost	0.380***	0.229***	0.280**	0.243**	0.212***
	0.211***	0.164***	0.274**	0.252**	0.058**
Lagged (ln) real capital			-0.077	-0.094	-0.016
			(0.120)	(0.101)	(0.024)
Lagged (ln) real personnel cost			0.132	0.011	-0.101*
			(0.143)	(0.128)	(0.054)
Ownership	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes
Constant	7.327***	14.681***	7.039***	14.198***	1.717*
	(0.596)	(2.217)	(0.698)	(2.431)	(0.925)
Inverse Mills ratio (lambda)		-1.057		-1.088	
		(0.988)		(0.916)	
N	112	69,054	98	69,054	368
Adjusted R^2	0.791		0.778		
Sargan test for overid. restric.					2.77
Arellano-Bond AR(1) test					-2.45
Arellano-Bond AR(2) test					0.58
Sargan test excluding group					1.23

Note: * p<0.10, ** p<0.05, *** p<0.01.

3.5.2.2 Production function estimation using competence mismatch

Static production function model is defined in Equation 3.5 and estimations are presented in first two columns of Table 5[11]. OLS results indicate a statistical significance of mismatches in key competences *quantitative-economics algebra*; *collectedness, presentation and teamwork*; and *motivation and organization*, while mismatches in other competences don't carry any statiatical significance in explaining the variation of real value added. Nevertheless, all these other non-significant mismatches have the expected negative

[11] All the variables used in both static and dynamic models are explained in Table 20 of Appendix 3.

direction of effect i.e. mismatches in any of those competences still have negative effects on real value added, and we should not conclude that these regressors can be cancelled or not considered at all. Their estimated coefficients could still be consistent with the expectations but, due to small dataset, the degree of variation is not sufficient to guarantee statistical significance (Amrhein, Greenland & McShane, 2019).

Mismatch in competence *motivation and organization* shows the greatest effect, where an increase of one standard deviation from the average mismatch in this competence is associated with a decrease in real value added by 29.1 percent, on average. Similarly, increase of one standard deviation from the average mismatch in *collectedness, presentation and teamwork* and *quantitative-economics algebra* competences is associated with a decrease in real value added by 10.4 and 18.1 percent on average, respectively. It is interesting to notice that effects of competence mismatches are more pronounced than the effect of real capital, suggesting that these firms are more labor intensive. Results are also suggesting positive premium for private firms, for firms situated in Zagreb region and operating in manufacturing industry (results are not displayed here to conserve space but are available from authors upon request).

Results of Heckman selection model[12] are consistent with OLS estimates in both the direction and magnitude of correlation as they indicate a real value added penalty of 30.3 percent in case of *motivation and organization* competence. Inverse Mills ratio is shown to be statistically insignificant indicating no selection issues of firms who opted to respond to our questionnaire.

Dynamic production function model is defined in Equation 3.7, and its estimations are presented in the final three columns of Table 5. When accounting for both the present and past value of regressors, OLS and Heckman estimates indicate a statistical significance of competence mismatch in *quantitative-economics algebra*; *collectedness, presentation and teamwork*; and *motivation and organization*. In addition to these, Arellano-Bond estimations[13] also point towards a statistically significant effect of competence mismatch in *business communication* and *advocacy and language fluency* by about 7.2 and 6.8 percent, respectively.

These results are in line with previous findings of key competences (some authors referred to it as "core competences") on firm performance (Wang, Lo & Yan, 2004). However, previous studies mostly focused on the innovation output of a firm (Lokshin, Van Gils & Bauer, 2009) or employment dynamics (Stevens, 2007), while this study concentrated on added value as the overall metric of firm performance. Also, this methodology did not assume any *a priori* key competences but rather derived them from skill and ability items

[12] Results of Heckmand selection model selection equation are presented in Table 21 of Appendix 3.

[13] Appropriatness of instruments used in this approach was tested using Sargan test for overidentifying restrictions, Arellano-Bond AR(1) test, Arellano-Bond AR(2) test and Sargan test excluding group, as presented in Table 5.

sent for evaluation. Also, this analysis covers eight different key competences of both practical and general type while similar studies deal with either lower number of competences (Lokshin, Van Gils & Bauer, 2009) or only focus on practical competences (Acar, 1993).

Table 5: Results of Static and Dynamic Models using competence mismatches

	Dependent variable: real value added				
	Static model		Dynamic model		
	(1)	(2)	(3)	(4)	(5)
	OLS	Heckman	OLS	Heckman	Arellano-Bond
Competence mismatches					
Economics and business theory and practice	-0.108 (0.071)	-0.129 (0.082)	-0.163 (0.093)	-0.147* (0.083)	-0.110*** (0.031)
IT proficiency	-0.022 (0.076)	-0.042 (0.079)	-0.069 (0.090)	-0.061 (0.079)	-0.012 (0.029)
Business communication	-0.083 (0.062)	-0.053 (0.058)	-0.060 (0.067)	-0.058 (0.060)	-0.072*** (0.023)
Quantitative-economics algebra	-0.181*** (0.073)	-0.165** (0.071)	-0.151* (0.080)	-0.129* (0.072)	-0.177*** (0.030)
Collectedness, presentation and teamwork	-0.104* (0.060)	-0.110* (0.057)	-0.071 (0.070)	-0.024 (0.065)	-0.099*** (0.025)
Project management and professionalism	-0.021 (0.069)	-0.085 (0.068)	-0.072 (0.078)	-0.091 (0.069)	-0.035 (0.026)
Advocacy, language fluency	-0.064 (0.069)	-0.099 (0.075)	-0.083 (0.084)	-0.071 (0.073)	-0.068** (0.030)
Motivation and organization	-0.291*** (0.062)	-0.303*** (0.062)	-0.325*** (0.069)	-0.301*** (0.062)	-0.245*** (0.040)
Lagged (ln) real value added					0.618*** (0.166)
(ln) real capital	0.205*** (0.033)	0.174*** (0.037)	0.216 (0.130)	0.190* (0.110)	0.056** (0.027)
(ln) real personnel cost	0.344*** (0.048)	0.193*** (0.061)	0.135 (0.137)	0.122 (0.114)	0.199*** (0.039)
Lagged (ln) real capital			0.003 (0.123)	0.017 (0.103)	0.010 (0.025)
Lagged (ln) real personnel cost			0.217 (0.143)	0.096 (0.128)	0.048 (0.064)
Ownership	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes
Constant	7.921*** (0.630)	14.683*** (2.062)	7.646*** (0.698)	13.999*** (2.210)	2.984** (1.170)
Inverse Mills ratio (lambda)		0.326 (0.263)		0.347 (0.262)	
N	112	69,054	98	69,054	368

Adjusted R^2	0.912	0.935	
Sargan test for overid. restric.			2.56
Arellano-Bond AR(1) test			-2.42
Arellano-Bond AR(2) test			0.54
Sargan test excluding group			1.32

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

3.5.3 Robustness check

For the robustness check we opted to define the competence mismatch (gap) based on the difference between the maximum possible development of each competence (instead of importance placed on each competence) and its current development among the firms' workforce. In this case, let variable G be the approximation of the competence shortage i.e. the gap between the maximum development of each competence, $\bar{c}_c$ (since this was measured on a Likert scale from 1 – 5, it was set to be equals to „5"), and the currently represented level of each competence for each firm

$$G_{cf} = \bar{c}_c - c_{cf}, \quad \forall\, c, c \in \{1, 2, \dots, C\}, \forall\, f, f \in \{1, 2, \dots, F\} \tag{3.8}$$

These gaps are then also standardized to be interpreted in terms of standard deviations. Results of this check, presented in **Error! Not a valid bookmark self-reference.**, increase the validity of initial results. Mismatches in competences *quantitative-economics algebra*, *collectedness, presentation and teamwork* and *motivation and organization* have been confirmed to negatively affect the real value added of the firms, regardless of the time setting of the model or the estimation method. These results also suggest that employers correctly evaluated the importance of these competences for their own business (since the results do not change much regardless of how we define competence mismatch) which reinforces the reliability and validity of their answers.

Table 6: Results of robustness check

	Dependent variable: real value added				
	Static model		Dynamic model		
	(1)	(2)	(3)	(4)	(5)
	OLS	Heckman	OLS	Heckman	Arellano-Bond
Competence mismatches					
Economics and business theory and practice	-0.017	-0.006	-0.012	-0.011	-0.051*
	(0.039)	(0.039)	(0.044)	(0.039)	(0.028)
IT proficiency	-0.043	-0.043*	-0.043	-0.045*	-0.006
	(0.029)	(0.026)	(0.029)	(0.026)	(0.019)

Business communication	-0.015	-0.043	-0.044	-0.061	-0.025
	(0.054)	(0.051)	(0.056)	(0.051)	(0.036)
Quantitative-economics algebra	-0.235***	-0.203***	-0.246***	-0.216***	-0.302***
	(0.090)	(0.092)	(0.096)	(0.091)	(0.095)
Collectedness, presentation and teamwork	-0.185*	-0.196**	-0.154*	-0.200**	-0.169**
	(0.096)	(0.093)	(0.102)	(0.093)	(0.067)
Project management and professionalism	-0.031	-0.061*	-0.058	-0.068**	-0.071**
	(0.034)	(0.034)	(0.038)	(0.034)	(0.030)
Advocacy, language fluency	-0.039	-0.035	-0.035	-0.039	-0.022
	(0.031)	(0.029)	(0.033)	(0.030)	(0.021)
Motivation and organization	-0.189**	-0.202**	-0.178*	-0.190**	-0.100**
	(0.090)	(0.086)	(0.096)	(0.086)	(0.061)
Lagged (ln) real value added					0.594***
					(0.156)
(ln) real capital	0.181***	0.132***	0.246**	0.215***	0.058**
	(0.029)	(0.031)	(0.098)	(0.078)	(0.025)
(ln) real personnel cost	0.309***	0.158***	0.166*	0.136*	0.201***
	(0.038)	(0.048)	(0.099)	(0.077)	(0.035)
Lagged (ln) real capital			0.083	0.091	0.005
			(0.093)	(0.075)	(0.022)
Lagged (ln) real personnel cost			0.183*	0.065	0.045
			(0.107)	(0.094)	(0.058)
Ownership	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes
Constant	8.994***	16.593***	8.831***	15.694***	3.605***
	(0.554)	(1.768)	(0.603)	(1.920)	(1.271)
Inverse Mills ratio (lambda)		0.215		0.217	
		(0.142)		(0.141)	
N	112	69,054	98	69,054	368
Adjusted R^2	0.975		0.963		
Sargan test for overid. restric.					2.41
Arellano-Bond AR(1) test					-2.62
Arellano-Bond AR(2) test					0.58
Sargan test excluding group					1.37

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

3.6 Conclusion

The goal of this essay was to analyze the extent to which the mismatch (gap) in key competences of workers with economics and business background affects the performance of the firm. Dataset contained both primary data, collected on a representative sample of Croatian firms, and secondary data of financials and firm characteristics for population of Croatian firms in period 2011-2016.

In the first part of analysis we extracted eight key factors i.e. key competences based on a list of skills and abilities which were sent for evaluation to firm owners (CEOs) or the Heads of HR department. *Motivation and organization, project management and professionalism* and *collectedness, presentation and teamwork* turned out to be most important competences for employers while *business communication* was shown to be developed the most among their existing labor force. Although it was somewhat surprising that practical competences like *business communication* or *economics and business theory and practice* were not ranked the most important by employers, previous studies in labor economics confirm that communication and team working competences in general are widely recognized as one of the most important competences currently demanded by labor market (Green, Ashton & Felstead, 2001; Stasz, 2001). Possible explanation may lay in the fact that increasing complexity of tasks due to globally growing knowledge economy require professionals with broadly transferable competences, such as problem solving and creative thinking capabilities, rather than the ability to reproduce factual knowledge (Saunders & Machell, 2000; Satish et al., 2001). This results also bears some policy recommendations. A high degree of emphasis placed on general competences suggests that traditional educational curricula that focus more on cognitive and technical development within a narrow discipline-based theoretical framework may not be seen as able to produce the well-rounded, multi-skilled, flexible and adaptable employees demanded by today's business organizations.

For the second part of analysis we have calculated two competence mismatches (shortages/gaps) indicators: 1) mismatch between the maximum development and the currently represented level of each competence; and 2) mismatch between relative importance placed on a certain competence and its current representation among workforce. Former was used in our main results while the latter was used in robustness check. Greatest mismatch was found for *project management and professionalism* and *motivation and organization* while the lowest recorded mismatch was found for *economics and business theory and practice* and *quantitative-economics algebra* competences.

These mismatches were then linked to the performance of a firm, measured by real value added. These effects were explored using production function approach in both static and dynamic environments with three different methods. OLS regression was our starting method which yielded initial results. However, to account for selection bias of firms choosing to respond to questionnaire, initial results were checked using Heckman selection

model. Finally, relaxing the assumption of exogeneity of all regressors, we ran Arellano-Bond Dynamic GMM estimation.

All three empirical specifications were consistent in pointing to mismatch in competences *quantitative-economics algebra*; *collectedness, presentation and teamwork*; and *motivation and organization*, to be of statistical significance in explaining the variation in firm performance. The greatest effect was found for the mismatch in *motivation and organization* competence, indicating that highly motivated and well organized workforce plays a crucial role in performance of an enterprise. Mismatches in other competences were shown not to be significant.

This research is not without limitations. The most obvious one is rather low number of respondents. This was mostly due to a fact that we specifically asked that only owners (CEOs) or heads of HR department can fill this questionnaire, which significantly reduced the probability of high response rate. Nevertheless, this was needed due to the nature of the research. Although on-line questionnaires show a wide range of advantages (cost savings, ease of editing and analysis, and potentially quicker response time with wider magnitude of coverage), some disadvantages exist, such as sample demographic limitations, lower levels of confidentiality, layout and presentation issues of a computer questionnaire, missing additional orientation/instructions, potential technical problems with hardware and software, and the probability of discontinuation halfway through the questionnaire. Finally, these results are specific to job positions that are demanding economics and business background and should not be generalized elsewhere. Additionally, it is expected that ratio of workfrce with economics and business background will decline with increase in firm size, so these results will be more applicable to small- and medium-sized enterprises, rather than large ones. Nevertheless, two out of three key competences that were shown to be statistically significant for firms' performance were of general type –*collectedness, presentation and teamwork*; and *motivation and organization* – which does shed some light on what may be most important in any job position, regardless of firm size.

4 AN EMPIRICAL STUDY INTO LABOUR MARKET SUCCESS AND PROXIMITY TO EMPLOYERS' REQUIREMENTS OF ECONOMICS AND BUSINESS GRADUATES

4.1 Introduction

Modern day employers are increasing demand for new or updated qualifications and the intensity of new technologies usage, which caused instrumental shifts on the labor market. Shorter product life cycles and increased pace of technological change caused many firms to become more market-driven and quicker in their adaptations to new customer needs (Yang, You & Chen, 2005). To achieve that, employers invest heavily in human capital of workers to acquire the competences needed in the arena of globalization. However, since the cost of developing human capital is increasing, employers expect educational institutions to equip workers (graduates) with employability competences required by the market without additional training from the industry (Husain, Mokhtar, Ahmad & Mustapha, 2010). That is why more and more emphasis is given to "soft" factors of production (Spencer & Spencer, 1993; Heckman & Kautz, 2012) and to a degree of match between employers' demands and workers' acquisition of needed competences. This competence mismatch can cause negative economic consequences on individual, firm and macroeconomic level. At individual level, this mismatch is shown to reduce job satisfaction and wages (Allen & Van der Velden, 2001; Green & McIntosh, 2007; Mavromaras, McGuinness & Fok, 2009). At firm level, it dampens productivity and turnover growth and increases on-the-job search costs (Tsang, 1987; Kampelmann & Rycx, 2012). Finally, on macroeconomic level it translates into elevated levels of structural unemployment and can hinder future GDP growth prospects (Marsden, Lucifora, Oliver-Alonso & Guillotin, 2002; Skott & Auerback, 2005; Budría & Egido, 2008; Olitsky, 2008; Slonimczyk, 2009; Quintini, 2011). Furthermore, World Economic Forum (2016) reports that 38% of employers reported having difficulties in filling jobs in 2015 with workers possessing adequate combination of required competences.

Aforementioned issue of high unemployment is one of the most persistent problems in Croatian economy, further amplified by the financial crisis effects from late 2008 (Galić & Plećaš, 2012). Croatian labor market is traditionally characterized with high costs to labor and wage adjustments, with extremely low mobility of workers – both occupationally and geographically. The same holds true for difference in skills, occupations or different sectors of economic activity. Obadić (2005) argues that increased structural imbalance on Croatian labor market resulted from changes in the structure of product market during the 1990s when Croatia broke ties from former socialist system, leading to changes in labor demand which was not followed by changes in labor supply. This imbalance entails a situation in which the characteristics of unemployed workers, particularly in terms of skills, work experience or location, differ from those required for jobs that are available. Similar conclusion was also found by Botrić (2009) who suggests that probability of long-term unemployment is higher

for people that come from certain previous occupations which were, due to fast restructuring and transition process, left with skills no longer required on the labor market.

Concentrating on the case of Croatia, the aim of this paper is threefold. Firstly, using the data from Business and economics graduates, we aim to indicate which competences are mostly developed through their tertiary education process. The results show that tertiary education curricula is highly skewed towards acquisition of economics-and-business practical competences, at the expense of equipping graduates with competences of general type, which corroborates results found in similar studies (Nicolescu & Paun, 2009; Chiru, Ciuchete, Lefter & Paduretu, 2012). The next goal is to assess the degree of proximity between the competences acquired at universities and those required on the labor market. These results indicate that employers put greater emphasis towards possessing general competences, instead of economics-and-business practical ones (Biesma et al., 2008; Cowan, Wilson-Barnett, Norman & Murrells, 2008; Azevedo, Apfelthaler & Hurst, 2012; Chiru, Ciuchete, Lefter & Paduretu, 2012; Leoni, 2012; Grzybowska & Łupicka, 2017), and hence indicate to a mismatch between competences being taught at universities and those demanded on the labor market. This measure of proximity is assessed in two different ways, taking in account the fact that different individuals may use different yardstick to measure their own competence level. Third and final goal of the paper is to investigate how this proximity between acquired and required competences affects graduates' outcomes on the labor market. Obtained results point at a penalty of having a competence gap towards graduates' probability of being employed and on their wages, which is also in line with previous research (Van Loo & Toolsema, 2005; Kelly, O'Connell and Smyth, 2010; Teijeiro, Rungo & Freire, 2013).

The rest of the essay is organized as follows. The next subsection explains how this study builds on prior research that has examined investigation into key competences. Subsection 4.3 presents data and methodology used. In subsection 4.4, the key results of the analyses are presented. The last subsection contains summary of the main conclusions and discusses potential directions for future research.

4.2 Literature review

Before plunging into review of recent work regarding competence mismatch and individual labor market outcomes, we start off by analyzing terms such as skills, abilities and competences, which are often used interchangeably (Courtis & Zaid, 2002; Colombo & Grilli, 2005; Smith & Morse, 2005; Jackling & Calero, 2006; Jackling & De Lange, 2009). In light of Sonntag and Schmidt-Rathjens (2004) skills are defined as automated components of tasks, which are undertaken with a relatively low mind control and include powered routine jobs as well as cognitive activities. Abilities, on the other hand, are defined as all kinds of innate skills of a person, which are necessary to perform tasks and services.

Competences, the subject of this study, are a relatively new term in the literature without a comprehensive definition. For example, Spicer (2009) defines competences as the skills, knowledge, abilities, motivation, and other requirements, which are needed in order to perform the job successfully. Rieckmann (2012, p.131) elaborates on this definition by saying that "competences can be characterized as individual dispositions to self-organization which include cognitive, affective, volitional and motivational elements; they are basically an interplay of knowledge, capacities and skills, motives and affective dispositions." OECD (2005) defined competences as "... more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context.“. All these competence definitions have one thing in common – competences are transcending simple skills or abilities and are actually encompassing both of those. This multidimensionality approach in defining competences is adopted in this study as well, and includes capability and characteristics (such as knowledge, technical skills and personal qualities) that an individual may utilize in performing required tasks.

Study and identification of competences is relevant to both employers and workers as their synchronization would reduce the mismatch on the labor market and increase welfare. Majority of previous studies have focused on investigating competence mismatch impact on wage premiums and job satisfaction. Allen and Van der Velden (2001) investigate competence mismatches impacts on labor market outcomes on Dutch university and tertiary vocational graduates. They exploit Higher Education and Graduate Employment in Europe database, specifically the cohort of youth who graduated in 1991 and study their labor market situation seven years later, in 1998. Competence mismatches were found to be present in half of the graduates in each group, and were found to be associated with 6% decrease in wages and 14% decrease in job satisfaction. Mavromaras, McGuinness and Fok (2009) perform a similar study in Australia using Household, Income and Labor Dynamics survey and found that about 11.5% of working age employees in full-time employment were severely over-skilled and are found to be paid less, on average, than their equally skilled counterparts. Green and McIntosh (2007) study competence mismatch in Britain and find that 35% of UK employees were over-skilled and 13% were under-skilled, both of which effected negatively their wages, by 9.9% and 0.6%, respectively. Mora, Garcia-Aracil and Vila (2007) and García-Aracil and Van der Velden (2008) use a Careers after Higher Education – A European Research Survey (CHEERS) data to estimate job satisfaction and monetary rewards of higher education graduates. Former study found that a competence over-development for their current position to be one of the most relevant causes of dissatisfaction, while the latter study indicated at heterogeneity between different competence requirements, i.e. jobs with higher participative and methodological competence requirements are better paid (by 4% to 6%).

Hodges and Burchell (2003), concentrating on business graduates in New Zealand, show that traditional undergraduate degrees, focusing more on cognitive and technical

development within a narrow discipline, may not be able to produce the well-rounded, multi-skilled, flexible and adaptable graduates demanded by current labor market. Similar work was also done for graduate fields other than economics and business (Davies, Csete & Poon, 1999; Coll, Zegwaard & Hodges, 2002a, 2002b; Wilton, 2008; Azevedo, Apfelthaler & Hurst, 2012; Chiru, Ciuchete, Lefter & Paduretu, 2012). Similar results were also found for Portugal (Vieira, 2005), Belgium (Verhaest & Omey, 2006; Verhofstadt, De Witte & Omey, 2007), Denmark (Nielsen, 2007), Spain (Badillo-Amador, García-Sánchez & Vila, 2005), Sweden (Böhlmark, 2003).

More recently, Yamaguchi (2012) and Postel-Vinay and Lise (2015) investigate effect of mismatches in cognitive, manual and interpersonal skills using a combination of *National Longitudinal Survey of Youth* (NLSY79) and O*NET program. Their results suggest that cognitive skills have much higher return than manual skills, but are slower to adjust to market requirements. Interpersonal skills have moderate returns, and are very slow to adjust over a worker's lifetime. They also found that the cost of mismatch is the highest for cognitive skills in relation to two other skills, but also asymmetric: employing a worker who is under-qualified in cognitive skills is costlier than employing an over-qualified worker. Fredrikson, Hensvik and Skans (2018) examine the direct impact of mismatch on wages and job mobility using unique Swedish data containing information on talents, occupations, and wages. Their empirical analysis is based on idea that tenured workers are selected based on having the right skills for the job. Thus, to measure mismatch, they compare the talents of recently hired workers to the talents of incumbent workers performing the same job. Their results show that mismatch reduces annual earnings by 13 on average.

Concentrating more on former south-east European transition countries (like Croatia), studies on skill, competence, or occupational mismatch are scarce mainly due to lack of adequate data and/or common measure of competences (Finegold & Notabartolo, 2010; Kucel, Vilalta-Bufi & Robert, 2011). One notable exception is work by Nicolescu and Paun (2009) for Romania, who aimed at identifying the extent to which graduates' expectations in terms of competences developed through higher education are convergent to employers' requirements. Even though both graduates and employers have to a large extent similar types of expectations of higher education services, degree to which they emphasize different aspects varies – graduates emphasize the most on getting practical competences while employers emphasize the most on moral and psychic qualities of the individual (general competences). Other recent studies for south-east European transition economies mostly cover transition from work to school, differentiating between vertical and horizontal mismatch (Matković, 2010; Domadenik, Drame & Farčnik, 2010; Farčnik & Domadenik, 2012; Matković, 2012; Tomić, 2012; Domadenik, Farčnik & Pastore, 2013; Tomić & Domadenik, 2014). Furthermore, several recent studies on the transition from centrally planned economy towards market economy shed important insights on how the mismatch could have developed in CEE or Western Balkan countries (Lamo & Messina, 2010; Kucel, Vilalta-Bufi & Robert, 2011; Bartlett, 2013; Teijeiro, Rungo & Freire, 2013).

Focusing now explicitly on Croatia, Tomić (2014) studies the importance of the phenomenon of mismatch on the labor market in Croatia via matching function which incorporates the effect of occupational mismatch on the flow of filled vacancies for aggregate markets and different submarkets based on grouping of similar occupations in 2004 – 2011 period. Her results indicate that although occupational mismatch does not have an impact on the aggregate flow of filled vacancies, portion of total unemployment that can be attributed to occupational mismatch is up to 6% in total, and it varies greatly across different markets. Obadić (2006a, 2006b) investigates the problem of the structural unemployment on a regional level for Czech Republic, Croatia, Poland, Slovakia and Slovenia. The existence of structural unemployment in this case is defined as mismatch between the demand in the labor market and the location of workers seeking employment. Results point towards the existence of this mismatch in Czech Republic, Croatia and Slovakia and towards decrease in total employment with an increase in mismatch indicator. There are only two papers that have tried to estimate a degree of skills mismatch for Croatia. Obadić (2005) estimated disaggregated matching functions based on qualification level and economic activity for Croatia in the 1992 – 2002 period. This research pointed towards the existence of a mismatch in secondary-school and non-university level and also with skilled and highly-skilled workers. As far as specific industries are concerned this mismatch in concentrated in the manufacturing industry, wholesale and retail trade and other social and personal service activities. Obadić and Oršolić (2012) also measured the presence of educational and skill mismatch of highly educated individuals on the labor market of the City of Zagreb using the primary data collected through questionnaires. Results show a presence of educational mismatch with over-education being more frequent than under-education and also the presence of skill mismatch with over-skilling being more frequent than under-skilling, especially in communication skills, mother tongue and foreign languages. Babić, Matković and Šošić (2006) have analyzed the dynamics of Croatian labor market and tertiary education system using aggregate data on employability of university graduates. They found that publicly financed entry quotas for different faculties were not in line with trends and demands in the labor market, but instead mostly reflected revenue maximization strategy of each faculty board (mainly in social and humanistic fields), thus creating some distortions in the university-educated segment of the Croatian labor market. Vujčić and Šošić (2007) look at the dynamics of wage premiums in Croatia and estimate how much the return to education has changed between 1996 and 2004. They concluded that premiums for education in Croatia began to grow only at the end of the 1990's, indicating a delay in wage adjustment, and then reaching the level of premiums found in other transition countries and advanced market economies in 2004, thus creating market incentives for investment in education.

Though a growing number of papers are dealing with these issues, there is still no general agreement about the best set of competences for ensuring labor market success (Stasz, 2001; Semeijn, Boone, van der Valden & van Witteloostuijn, 2005; Biesma, Pavlova, van Merode & Groot, 2007; Kelly, O'Connell & Smyth, 2010). Possible reasons range from different approaches in defining, measuring and comparing competences, and also due to the fact that

some competences are non-transferable among different industries. This research hopes to contribute in development of that topic.

4.3 Methodology and data description

4.3.1 Theoretical framework

Although many past studies used the terms *skill*, *ability* and *competence* interchangeably (Belasen & Rufer, 2007), we opted to base our analysis on competences, for both conceptual and methodological reasons. As for the former, competences are strongly associated to mastering complex situations (contradictory information, informal collaboration, and abstract, dynamic and highly integrated processes) demanded by modern-day employers, and that those are transcending the level of knowledge and skills, given their synergistic and inter-related nature (Jackson, 2009). This is further corroborated by OECD (2005) and Belasen and Rufer (2007), who also emphasize that competences are transcending simple skills or abilities and are actually encompassing both of those. As for the methodological reasons, Van Loo and Toolsema (2005) warn against using too many skill/ability items as that introduces estimation bias, and hence recommend reducing the dimensionality of skills/ability dataset by combining them into competences.

Each person on the labor market is endowed with a set of acquired competences – their competence inventory. This set is not static, and it changes throughout individuals' life (Owen, 2001). This research focuses on individuals' competence inventory upon graduation (completion of tertiary education). Building on OECD's (2005) and Rieckman's (2012) definition of competences as an *interplay* of skill and abilities, this study considers competences to be latent variables measured using the observable indicators – the skill and ability items, with their relationship given in following equation:

$$X_i = c_i + \varepsilon_i \tag{4.1}$$

where the observed indicator (skills and abilities) X_i consists of the latent ("true") competence-part, c_i and the error term, ε_i.

These competences enter the analysis via employability and wage equations. Assume there are n graduates and C competences. By the end of their studies each graduate $i, i \in \{1, 2, \dots, n\}$ develops set of competences $c, c \in \{1, 2, \dots, C\}$, which in total determines their competence inventory, $\boldsymbol{C}_i = \{c_{i1}, c_{i2}, \dots, c_{iC}\}$. The extent to which each competence c is developed depends on several factors including individual personal preferences, educational and family socio-economic background, but also the institutional environment of attended university[14]. A mix of these factors results in graduates with different set of competence

[14] Asfani, Suswanto and Wibawa (2016) and Mushtaq and Khan (2012) analyze factors influencing development of competences among students. They divide them in three categories: 1) students' factors (self-

inventories, $\boldsymbol{C}_i$ (even if two graduates develop the same set of competences, a degree to which they have mastered each individual competence may differ).

On the other side we have F firms wishing to employ workers that best suit their requirements in terms of competences. In each firm there are multiple job positions that require different set of competences. With a reasonable assumption that each firm is looking to maximize productivity, they will only employ the most (from their point of view) productive workers (graduates). Assume that firms have reached a consensus about the optimal development degree of each competence, i.e. there is an optimal (in terms of expected future productivity) competence mix, $C^* = \{c_1^*,\ c_2^*, \dots, c_C^*\}$, ensuring the highest probability of being a productive worker among particular group of workers (workers who work at similar positions within a company). Note that c_{ic} represents the graduate (potential future employee) i's acquired level of competence c, and c_c^* represents the optimal required level of the same competence agreed upon by employers for certain group of employees. A match on the labor market will occur when employers' required competence inventory, $\boldsymbol{C}^*$, is in line with a competence inventory of a worker to fill in that position, $\boldsymbol{C}_i$. Hence, from a firm's point of view, the expected productivity of graduates depends, among other factors, on the "proximity" of the graduate's set of acquired competences $\boldsymbol{C}_i$ to the mix of optimal competences $\boldsymbol{C}^*$. There is no unanimous consensus on how this proximity should be measured, although the current literature suggests three possible ways.

First measure involves defining a measure of the mismatch (gap) between the two as a measure of this proximity (lower values of this measure indicate greater proximity), labeled here as variable $\boldsymbol{G}$ ("G" for gap/mismatch), which is calculated by taking absolute value of the difference between self-reported assessment of development of each competence by graduates, c_{ic}, and optimal required level of that same competence, c_c^*, and then adding it across all competences for each graduate i:

$$G_i = \sum_{c=1}^{C} |c_{ic} - c_c^*| \tag{4.2}$$

Since these mismatches (gaps) have no measurement unit, they are transformed in their standardized form (in units of standard deviations), and are hence interpreted as standard unit deviations from their average values.

However, these self-reported measures of development and requirement of certain competences may suffer from non-objectivity of the person evaluating them. As is highlighted in Teijeiro, Rungo and Freire (2013), different individuals may have different response styles and may use a different yardstick to measure their own competence level –

regulated learning, communication skills, achievement motivation and learning satisfaction); 2) teachers' factors (teaching performance, proper guidance, teaching experience and each teacher's competence); and 3) environmental factors (adequate facilities and infrastructure, parental involvement and a positive classroom environment).

some may indicate that their competence level is very high, although in fact it is not higher than the level of other individuals. One was of resolving this issue is to use a rank order of their competence importance/attainment, which is then compered across individuals. Following and modifying approach of Teijeiro, Rungo and Freire (2013), we proceed by ordering a list of competences and consider the number of competences that are given the same rank by both employer and graduate as a measure of proximity between ranking orders. Graduates' rank ordering signals which competences have been developed most, independently from the actual level acquired.

Hence, second way of measuring proximity of the graduate's set of acquired competences $\boldsymbol{C_i}$ to the mix of optimal competences $\boldsymbol{C^*}$ is by introducing variable $PROX$. Competence importance to employers and their attainment by graduates is represented in a rank vector, giving a highest value to the highest required/attained competence. Let $\boldsymbol{R_i} = \{r_1, r_2, \dots, r_{C-1}, r_C\}$ and $\boldsymbol{R^*} = \{r_1^*, r_2^*, \dots, r_{C-1}^*, r_C^*\}$ be the ranking vectors of graduate i and for firms, respectively, where r_c and r_c^* represent the ranks assigned to competence c. We then define a "proximity" parameter ρ ($\rho \geq 0$) to serve as a measure of proximity between r_c and r_c^*:

$$\rho_i = |r_{ci} - r_c^*| \tag{4.3}$$

In best case scenario $\rho = 0$, implying that employers' importance ranking of particular competence c is identical to graduates' development ranking of that same competence, and rankings are considered as equivalent. However, since this is seldom the case, employers often hire workers with their competence ranking being "as close as it can be" to their requirements. In this sense, $\rho > 0$ entails a situation of weak equivalence, that is, ranks given to a particular competence c are considered equivalent when they are approximately the same (and parameter ρ is thus a measure of the allowed approximation). Since our results will depend on the value of ρ, we will study the sensitivity of the main results to changes in the value of the parameter.

From Equation 4.3 we obtain binary variable P_{ic}, assuming value 1 when competence c is assigned the same rank order by both the firms and graduate i or if the difference between ranks is less than proximity parameter ρ, and zero otherwise:

$$P_{ic} = \begin{cases} 1, & \text{when } |r_{ci} - r_c^*| \leq \rho \\ 0, & \text{when } |r_{ci} - r_c^*| > \rho \end{cases} \tag{4.4}$$

Finally, we obtain a measure of the proximity between the optimal employers' competence set and the graduates' attained competence set by adding variable P for each graduate across all competences:

$$PROX_i = \sum_{c=1}^{C} P_{ic} \tag{4.5}$$

Hence, we obtain one ranking vector for all firms and one vector for each graduate in our dataset. We then assess the proximity between these orders by using Equations 4.3, 4.4 and 4.5. In this case, higher values of variable $PROX$ indicate higher proximity.

Third and final approach to measuring the proximity between the firms' competence requirement and graduates' competence attainment is by measuring the distance ($DIST$) between ranking vectors of each graduate and a general consensus of firms across all competences for each graduate (higher values of variable $DIST$ indicate lower proximity):

$$DIST_i = \sum_{c=1}^{C} |r_{ci} - r_c^*| \tag{4.6}$$

First measure of proximity, $\boldsymbol{G}$ (given in Equation 4.2), will be used for main set of results, and the two remaining measures of proximity, $\boldsymbol{PROX}$ and $\boldsymbol{DIST}$ (given in Equations 4.5 and 4.6, respectively), will be used in robustness check section.

The probability of graduate i to find employment (employability), E_i, is assumed to be, among other factors, a function of G:

$$E_i = f(\boldsymbol{G}_i, \boldsymbol{X}_i) \tag{4.7}$$

where $\boldsymbol{G}$ is a measure of proximity between firms' required and graduates' acquired competence inventories, $\boldsymbol{X}$ is a matrix of other explanatory variables that may influence this probability, and f is a functional form of proposed relationship. Because firms are only seeking to employ productive workers, graduate i will be employed if $E_i > 0$ and will stay unemployed if $E_i \leq 0$. In best case scenario, required and acquired competence inventories would match one-to-one, i.e. $G = 0$ (no mismatch, or "zero competence gap"). However, since this is rarely the case, employers often hire workers with their competence inventory being as close as it can be to suit firm's needs (with as low mismatch as possible).

The relationship between individuals' wages, W_i, and the accumulated human capital, which includes developed competences and their mismatch, G, is also important indicator of graduate labor market success. To investigate this relationship Mincerian (Mincer, 1958, 1974) model is used, which uses the main components of accumulated human capital as determinants of the wages earned by individuals in the labor market. Due to its broad range of applicability, simplicity and availability of relevant data in labor economics and economics of education as a research tool, many studies have used Mincerian earnings function in order to estimate the rates of returns to schooling (Card, 1999, 2001; Belzil, 2008). These models were used to estimate effects of different factors to individual wage level, for example ethnicity (Kimmel, 1997; Mwabu & Schultz, 2000), employers'

ownership type (Psacharopoulos, Velez & Patrinos, 1994; Lassibille, 1998), religion (Ewing, 2000; Korsun, 2010; Dilmaghani, 2011), type of settlement (urban/rural) of individual (Johnson & Chow, 1997), different political transitions (Orazem & Vodopivec, 1994; Pastore & Verashchagina, 2006; Burger, 2011).

In this research, Mincer equation is augmented to include competence-based mismatch. The augmented version of the Mincerian wage model is given as:

$$lnW_i = \beta_0 + \beta_1 SCH_i + \sum \gamma_c \boldsymbol{G}_{ci} + \sum \delta_k \boldsymbol{X}_{ki} + \varepsilon_i \quad (4.8)$$

where W_i represents (ln) monthly wage of individual i, SCH represents educational attainment measured in number of years of schooling, where $\boldsymbol{G}_{ci}$ is a measure of proximity between firms' required and graduates' acquired competence sets for c^{th} competences, $\boldsymbol{X}_{ki}$ is the value of ith individual for k^{th} explanatory variable believed to affect the wage determination process for each individual and ε_i is error term of the model assumed to follow normal distribution with zero mean and a constant variance.

Firms' competence requirements are of dynamic nature, especially since today's labor market is characterized by rapidly changing technological and work environment. New methods of performing certain tasks are updated very frequently and workers need to be able to expand and/or adapt their competences to meet the latest firms' needs. Some, if not most, of workers' competences acquired during their education get outdated at an increasing pace. World Economic Forum (2016) states that 65% of children entering primary school today will end up working in completely new job types that don't even exist yet, 50% of subject knowledge acquired during the first year of a four-year technical degree will become outdated by the time students graduate, and more than a third of the desired core competences of most occupations by 2020 will be comprised of those not yet considered crucial today. Thus, in knowledge-based economy employers are looking for individuals with not only practical competences, but also with capability to be proactive and respond to problems creatively and autonomously (Fallows & Steven, 2000).

4.3.2 Empirical methodology

4.3.2.1 Empirical model

Impact of competence proximity on graduates' employability is empirically investigated using a Probit model with a binary outcome variable (being employed or unemployed) and a set of covariates, with the variable of interest being the proximity between acquired and required set of competences. High competence proximity implies that employees possess the right combination and development level of competences that their job position is demanding, and employers view them as more productive, thus increasing the chance of

providing employment. The opposite is true for low competence proximity. Theoretical model, presented in Equation 4.7, is empirically estimated using Probit model, defined as follows:

$$P_r(E_i = 1|X) = \Phi([\boldsymbol{GX}]'\beta) \tag{4.9}$$

where E_i represents a dummy variable indicating labour market status of a graduate i (employed or unemployed), $\boldsymbol{G}$ is a matrix of competence proximity (mismatches), $\boldsymbol{X}$ is a matrix of other socio-economic graduates' characteristics (personal, household and education information), Φ is a standard normal cumulative distribution function, and β is a vector of parameters to be estimated. Matrix X contains the following variables: personal information (age, sex, region, type of settlement, marital status, proximity of HE institution), household information (number of household residents, total household income, number of cars owned by household) and educational information other than years of schooling (foreign education, GPA at graduation, student status, HE institution ownership type and whether or not student worked during studies). Graduates with higher competence proximity (i.e. those that fit the best in their workplace requirements) are expected to have higher probability of being employed (Teijeiro, Rungo & Freire, 2013; Bailey & Ingimundardottir, 2015).

On the other hand, impact of competence proximity on graduates' wages is empirically investigated using an augmented Mincerian model with a logarithmic outcome variable monthly wages and a set of covariates, with the variable of interest being the proximity between acquired and required set of competences. As before, high competence proximity implies that employees possess the right combination and development level of competences that their job position is demanding, and employers view them as more productive, thus increasing their renumeration i.e., their wages. Theoretical Mincerian wage model, presented in Equation 4.8, is empirically estimated on a subsample of employed graduates using ordinary least squares (OLS) method to get initial estimates:

$$lnW_i = \beta_0 + \beta_1 SCH_i + \sum_{c=1}^{C} \gamma_c G_{ic} + \sum_{k=1}^{K} \delta_k X_{ik} + \varepsilon_i \tag{4.10}$$

where W_i represents (ln) monthly wage of individual i, SCH represents educational attainment measured in number of years of schooling, G_{ci} is a measure of proximity between firms' required and graduates' acquired competence inventories for c^{th} competence, X_{ki} is the value of i^{th} individual for k^{th} explanatory variable and ε_i is error term of the model assumed to follow normal distribution with zero mean and a constant variance. Matrix X contains the following variables: personal information (age, sex, region, type of settlement, marital status, proximity of HE institution), household information (number of household residents, total household income, number of cars owned by household), educational information other than years of schooling (foreign education, GPA at graduation, student status, HE institution ownership type and whether or not student worked during studies) and labor market information (total work experience, employers' ownership type, employers'

size, workers position within firm and total duration of training received at work). Graduates with higher competence proximity (i.e. those that fit the best in their workplace requirements) are expected to be rewarded a higher salary, as they are expected to be more productive (Van Loo & Toolsema, 2005; Kelly, O'Connell & Smyth, 2010)

However, despite the wide-ranged applications of the Mincerian wage model, its simple OLS estimation may suffer from bias caused by endogeneity of schooling and attained competences during schooling, self-selection of graduates to employment and measurement error in terms of self-reporting of required and/or acquired competences (Ashenfelter & Krueger, 1994; Card, 1999, 2001; Chevalier, 2003, Marvomaras et al., 2013). Regarding the latter, we don't have any complementary information on individuals' schooling attainments nor his/hers competence set, so it is not possible to address biases due to this type of error. While acknowledging the problems associated with competence self-evaluation, given the available time and resources, this turned out to be the most appropriate and practical. Literature also supports this method of assessment (Spenner, 1990; Watson, Calman, Norman, Redfern & Murrells, 2002; Cowan, Norman & Coopamah, 2005), and even suggest that self-assessment will not only provide the opportunity to reflect on their practice but also to request resources to address perceived deficits (Waddell, 2001). We have, however, introduced a methodology (described in previous section) to somewhat mitigate competence self-assessment problems by looking at their rank rather than absolute values.

4.3.2.2 Dealing with endogeneity

Endogeneity problem describes the situation when some unobserved determinants of dependent variable (part of the error term) are also correlated with explanatory variable(s). As an example in this particular case, ability can be seen as a determinant of both wages and it may also be correlated with acquired competences (and thus competence proximity), i.e. abler graduates tend to grasp certain competences easier and with less effort, and also abler graduates tend to be more productive at their workplace and hence better paid. Thus, in this case competences are labeled as endogenous variable, while other regressors (not suffering from endogeneity) are labeled as exogenous variables. If this unobserved ability correlates to both competences and wages, OLS estimation will yield biased results (Card, 1999, 2001). If somehow this unobservable variable can be made available, their inclusion in wage equation would be sufficient to eliminate endogeneity problem. However, as this is not the case in this research (nor in many others), this problem is tackled using instrumental variables two-stage least squares (2SLS) estimation method. To use this estimation technique, one must find suitable instruments, Z, which affect competence acquisition (the endogenous regressor) but are unrelated to dependent variable – wages. The basic estimation premise is that endogenous regressor is replaced by its estimate obtained by regressing it on its instrument(s) and all other exogenous regressors in the model.

Previous research has seen different kinds of instruments used in Mincerian wage model estimation via 2SLS method: family background (Trostel, Wlaker & Woolley, 2002; Zhang, 2011), availability of educational institutions nearby (Bhalotra & Sanhueza, 2004; Warunsiri & Mcnown, 2010), exogenous variation due to educational system reforms (Oreopoulos, 2003; Meghir & Palme, 2003; Ismail, 2007), quarter or month of birth (Bono & Galindo-Rueda, 2004; Webbink & Wassenberg, 2004), smoking status (Fersterer & Winter-Ebmer, 2003) and many others. In this research possible variables set to be used as instruments include graduates' mother and father highest obtained education level to control for inate abilities of the gradutes, which is also a important factors when it comes to employability and wages[15]. The intuition behind the two instrumental variables says that more educated families provide better education-friendly environment and/or greater financial aid for their children during their schooling process, which would lead to better guess about the competence requirements on the current labor market and greater help in their children's acquisition of those competences.

In the first stage of 2SLS procedure, endogenous regressor (competence proximity) are regressed on the other exogenous k regressors and the instruments:

$$G_i = \beta_0 + \sum_{k=1}^{K} \delta_k X_{ik} + \sum_{z=1}^{Z} \theta_z Z_{iz} + u_i \tag{4.11}$$

where Z represents the instrumental variables and X_k is vector of all other explanatory variables. From this equation we obtain predicted values of dependent variable, $\widehat{G_i}$, which are then inserted into second stage of 2SLS procedure:

$$lnW_i = \beta_0 + \beta_1 SCH_i + \sum_{c=1}^{C} \gamma_c \widehat{G_{ic}} + \sum_{k=1}^{K} \delta_k X_{ik} + \varepsilon_i \tag{4.12}$$

4.3.2.3 Dealing with sample selection bias

Another commonly addressed problem in the Mincerian wage model literature is bias arising due to sample-selection, first prompted by Gronau (1974) and commonly used in similar research (Chen & Hamori, 2009; Agrawal, 2011; Kim, 2011). The problem here arises due to non-random selection of the sample (sub-population) used in analysis, where the differences in characteristics observed in individuals may simply be due to sample selection problem, which would render OLS estimates biased. Our research is also vulnerable to this kind of bias, as the Mincerian wage model was estimated only on a sub-sample of those individuals who earn wages. To overcome this bias, Heckman (1979) proposed a sample selection model (Heckman sample selection model, HSSM), implemented in two steps. First

[15] A good overview of parental education as family background indicator used in IV estiamtion is presented in Carr (1999).

step involves estimating a *participation* or *selection equation* using maximum likelihood Probit estimation, where the dependent binary variable, indicating whether an individual chooses to work in the labor market or not, is regressed on different explanatory factors. This equation is already given in Equation 4.9. This first step gives an indication which factors influence the probability of an individual to receive wage, and estimated coefficients are used in calculation of Inverse Mills Ratio (IMR), which is then added as additional regressor in *performance equation* in the augmented Mincerian wage model:

$$lnW_i = \beta_0 + \beta_1 SCH_i + \sum_{c=1}^{C} \gamma_c G_{ic} + \sum_{k=1}^{K} \delta_k X_{ik} + \eta IMR_i + \varepsilon_i \qquad (4.13)$$

A significant coefficient for IMR indicates a presence of sample selection bias.

4.3.3 Project design and data description

Data for this research come from two datasets, one for the firms and the other for graduates.

4.3.3.1 Data collection from firms

Firm dataset consists of primary data collected through questionnaire[16], amended with secondary financial and characteristics data from Croatian Financial Agency database (FINA). Questionnaire was developed from previous similar research (Biesma, Pavlova, van Merode & Groot, 2007; Biesma et al., 2008; Kelly, O'Connell & Smyth, 2010; Leoni, 2011) and amended with the results of pilot study, which preceded the main study[17]. In the end, a final list of 58 skills and abilities[18] was sent out for self-evaluation[19]. Similar to studies of

[16] Questionnaire was developed by the author who greatly appreciates advices from other researchers at The Institute of Economics Zagreb and also from Pamela Campanelli from the Social Research Association in the UK. Implementation of these questionnaires, along with this entire paper are part of the project KOMPEKO - Analysis of Key competences in Economics and Business Field (HR.3.2.01-0179) that has been funded with the support of the European Social Fund (ESF) which is a part of the European Union (EU) Structural Funds.

[17] Pilot study was carried out on randomly selected sample of 10 firms from each NACE one-digit industry and amended with semi-structural interviews with important Croatian policy-makers: Croatian Chamber of Commerce, Ministry of Labor and Pension System and Ministry of Science, Education and Sports. Questionnaires were then sent in paper form with the instructions to write as many comments as respondents can think of, with aim of improving question relevance to current labor market situation. Pilot study was conducted in four counties (Zagreb county, Split-Dalmatia county, Osijek-Baranja county and Primorje-Gorski Kotar county) and the City of Zagreb in March 2016.

[18] Although this number might seem quite high, it sits somewhere in the middle of number of skills evaluated in other similar studies – it ranges from 24 (Chiru, Ciuchete, Lefter & Paduretu, 2012), 25 (Hodges & Burchell, 2003), 34 (Biesma et al., 2008), 44 (Leoni, 2012) all the way to 75 (Mahmood, 2003), 80 (Gerli, Gubitta & Tognazzo, 2011), 99 (Chung-Herrera, Enz & Lankau, 2003) and 108 (Cowan, Wilson-Barnett, Norman & Murrells, 2008).

[19] While acknowledging the problems associated with self-evaluation of skills and abilities, given the available time and resources, this turned out to be the most appropriate and practical. Literature also supports this method of assessment (e.g. Spenner, 1990; Watson, Calman, Norman, Redfern & Murrells, 2002; Cowan, Norman &

Biesma et al. (2008) or Leoni (2011), this list included both general skills and abilities and those practical i.e. specific to economics-and-business field. The former includes higher cognitive skills and abilities (e.g. learning abilities, analytical skills, problem-solving abilities) and interpersonal skills and abilities (e.g. team working skills, planning and organizing skills and decision making skills), while the latter include practical knowledge as well as methods and procedures unique to economics and business domain (e.g. writing business letters, compiling financial reports, calculating costs and budgets, etc.).

Questionnaire was administered in on-line version (quite standard in this type of research, e.g. Cowan, Wilson-Barnett, Norman and Murrells (2008) or Zehrer and Mossenlechner (2009)) from April to July 2016. Respondents were asked to: 1) provide basic information about their firm; and 2) rate how important each skill or ability is for positions occupied by employees with business and economics background on a five-point Likert scale ranging from 1 (unimportant) to 5 (extremely important). Firms (respondents) were represented either by their owner (or CEO) or the head of human resource (HR) department. This is also quite standard in this type of study (Nicolescu & Paun, 2009), and is important for two reasons. First, respondents had to assess the current and anticipate future needs of the firm, and thus evaluate how important particular skill/ability is for their firm. Secondly, respondents also had to assess current development of particular skills/abilities of their employees.

Following and adapting sampling strategy from Iootty, Correa, Radas and Škrinjarić (2014), final questionnaire was sent out to 1,000 Croatian companies. This sample was representative in terms of firm size, NACE one-digit industry and Croatian counties. For each size category, a stratified sample was constructed within each one-digit industry sector and county as control variables. First stage included creation of the table containing data on the size of each county-sector stratum. After that, a share of each stratum in the population was calculated and then used to compute the number of firms from each stratum to be selected in the sample. Invitations were send out to 275 large, 360 medium and 365 small enterprises, thus capturing 77.6% of large firms, 29.5% of medium firms, and 0.51% of small firms. 156 responses came back, giving a 15.6% completion rate. Estimates state that typical CEOs' response rate is between 13% and 20% (Agle, Mitchell & Sonnenfeld, 1999), so this return rate is quite standard[20]. Following a data cleaning process, sample was reduced to 112 firms[21] (Table 22 in Appendix 4). Table 7 shows descriptive statistics of firm characteristics. Average firm in obtained sample is small (42%), private (85%), service-sector (50%) firm

Coopamah, 2005) and even suggest that continual self-assessment will not only provide the opportunity to reflect on their practice but also to request resources to address perceived deficits (Waddell, 2001).

[20] Response rates in similar studies range from 11% (Azevedo, Apfelthaler & Hurst, 2012) to 17.2% (Hodges & Burchell, 2003) or 18.6% (Chung-Herrera, Enz & Lankau, 2003).

[21] Somewhat low number of respondents is quite standard in this type of study. For example, Chiru, Ciuchete, Lefter and Paduretu (2012) analyze tourism and agricultural industry using data from 44 firms, Zehrer and Mossenlechner (2009) base their analysis of tourism sector on 48 firms, Gerli, Gubitta and Tognazzo (2011) assess key competences of family-owned SMEs in Italy using 97 respondents, and Pan and Perera (2012) assess the competences in accounting field using 106 firms' responses.

situated in Central Croatia (38%) that does not offer their products and services on international market (53%). It has about 90 employees on average, 47 mil. HRK of capital (fixed tangible assets) and generates 35 mil. HRK of sales revenue[22]. On the other hand, if we look at the population of firm in 2016, average firm there is a micro (89%), private (98), service-sector (73%) firm from Central Croatia, and is also a non-exporter (86%).

Table 7: Descriptive statistics of firms in sample

Variable	Questionnaire respondents		All firms in 2016	
	n	Mean	*N*	Mean
Size				
Micro	35	0.31	85,171	0.89
Small	47	0.42	9,160	0.10
Medium	21	0.19	1,515	0.02
Large	9	0.08	313	0.00
Region				
Central Croatia	43	0.38	42,711	0.44
North-western Croatia	19	0.17	8,757	0.09
East Croatia	16	0.14	8,741	0.09
North Adriatic and Lika	21	0.19	17,176	0.18
Central and South Adriatic	13	0.12	18,774	0.20
Ownership				
State	14	0.13	787	0.01
Private	95	0.85	94,210	0.98
Mixed	3	0.03	1,162	0.01
Exporter				
Exporter	53	0.47	13,931	0.14
Non exporter	59	0.53	82,228	0.86
Industry sector				
Industry and Manuf.	56	0.50	12,355	0.13
Services	56	0.50	70,644	0.73
Financial variables (in real terms)				
Personnel cost (mil. HRK)	112	9.52	96,159	7.51
Capital (mil. HRK)	112	47.89	96,159	1.77
Value added (mil. HRK)	112	25.87	96,159	2.68
Turnover (mil. HRK)	112	35.21	96,159	3.19

Source: Author's own work.

[22] 1 EUR = 7.529 HRK (2016 average).

4.3.3.2 Data collection from graduates

This dataset consists of only primary data collected through questionnaire from economics and business graduates[23]. There are several reasons these particular graduates were the subject of analysis. First reason stems from the fact that, following the financial crisis of 2008, young highly educated graduates (25 to 29 years[24]) were the most vulnerable group on the labor market, with record-high unemployment rates from 24.1% in 2014 to 20.1% in 2016 (Eurostat figures). Furthermore, Obadić and Majić (2013) report that about every third higher education graduate did not have a secured job position, particularly those with economics-and-business background. Secondly, graduates were perfect candidates for this study as their competences were not yet influenced by tenure nor have become obsolete, at least not to a great degree (Van Loo & Toolsema, 2005) – thus, we can empirically asses how do the universities prepare them for challenges on the labor market. Finally, the reason behind focusing on economics-and-business graduates was because their competences, both general and practical, are not universally tied to a certain industry as they are needed across wide range of sectors and between different departments within certain enterprise.

List of all the higher education (HE) institutions that provide economics and business programs (obtained from Ministry of Science and Education, hereafter MSE) was combined with Croatian Bureau of Statistics (CBS) data, who publish the number of graduates from those institutions on yearly basis. Unfortunately, CBS does not provide data on specific study programs, which prompted exclusion from analysis of graduates from HE institutions that provide programs not related to economics and business (e.g., Faculty of Organization and Informatics in Varaždin offers both informatics and economics programs, but as there was no way to differentiate between these two graduates, they were excluded from analysis).

In order to ensure consistency and comparability of responses between firms and graduates, this questionnaire used the same list of skills and abilities as the one sent out to firms, where graduates had to evaluate their development level in each of given skill or ability during their studies. Other sections of questionnaire were accommodated to collect their personal and socio-economic data. On-line version was sent to a sample of 10,000 economics and business graduates. This graduate sample was representative in terms of type of higher educational institution (Schools of professional higher education, Polytechnics and Faculties), types of studies (professional and university studies) and by higher education institutions themselves. Following the similar logic to firms' sample, for each type of HE institution, a stratified sample was constructed within each type of study and each HE institution as control variables. First stage included creation of the table containing data on the HE institution type of each study type-faculty stratum. After that, a share of each stratum

[23] Here too, the pilot study was conducted before actual data collection process on a randomly selected sample of 20 economics and business graduates in four counties (Zagreb county, Split-Dalmatia county, Osijek-Baranja county and Primorje-Gorski Kotar county) and the City of Zagreb. As with the firms, pilot study was executed in March 2016 and obtained comments were incorporated in the final version of questionnaire.

[24] This was the age group primarily targeted by this study (also based on availability of MSE and CBS data), which meant that analyzed period for graduates spanned from 2011 to 2015.

in the population was calculated and then used to compute the number of graduates from each stratum to be selected in the sample. Invitations were send out to 736 graduates from Schools of professional higher education and Polytechnics, and to 9,264 graduates from Faculties, thus capturing 28.9% and 30.1% of both graduates, respectively. This questionnaire was implemented from April to July 2016 and it recorded a return rate of just over 10%, with 1,009 ready-to-use observations.

Table 8 shows the final distribution of collected data[25] from graduates. Average graduate in this sample is 28 years old and is slightly more likely to be a woman (56%). She comes from Central Croatia region (72%) and lives in urban settlement (70%). She is likely to live in a settlement that has higher education institution (51%) and has 42% chance of being married. In terms of household information we obtained from respondents, the average size of household is three people with average total income of about 14,300 HRK[26]. Another proxy for household wealth is the number of cars a household owns, and on average this amounts to 1.5 cars per household. Educational degree of respondents' parents might be another important factor when analyzing status on the labor market. Most of respondents' parents in our sample obtained high school degree at most (45% of fathers and 46% of mothers), followed by university degree (40% of fathers and 37% of mothers). Moving to education information, years of education range from 15, minimum number of years needed to complete a tertiary education professional degree and some university degrees (eight years of elementary school, followed by 4 years of high school and a three-year professional or university degree), to 20. With the introduction of so-called "Bologna process" to Croatian education system in 2004 (Farčnik and Domadenik (2012) give a good overview of Bologna reform on employability), most students opted to complete their graduate degree upon completion of undergraduate studies. This extended the university education for up to two years (which varied among different faculties) and increased the minimum total years of education (needed for graduate degree) up to 16 or 17 years. In our sample the average respondent had just over 17 years of total education meaning that she obtained graduate degree (63%). About a quarter (23%) of graduates spent at least one semester abroad during their studies. Average grade point average (GPA) in our sample was 3.56[27], thus presenting a good balance between over- and under-achievers, and reducing bias to estimated results. Even though 63% of graduates studied as full-time students, roughly half (48%) of all respondent reported to have worked during their tertiary education.

Finally, labor market information reveals that 648 (64%) graduates were employed with an average salary of 6,040 HRK, which is slightly under Croatian average salary for university graduates in 2016 (8,367 HRK according to CBS), but this can be attributed to small average working experience of roughly 2 years. This leaves 361 (36%) of sampled graduates unemployed. Those who secured job contract work for a private employer, in most cases

[25] Description of these variables can be found in Table 23 of Appendix 4.
[26] To increase the response rate, when asking for the amount of household income and wage, respondents were asked to round a number to nearest 50 HRK or 100 HRK.
[27] Grades in Croatian educational system range from 1(fail) to 5 (excellent).

either a medium (40%) of a small (33%) firm, and two-thirds of respondents are regular employees while 26% work at managerial position and 10% are self-employed as business owners. One in two employed graduates (55%) participated in various training and seminars at their workplace. When asked how they would describe the usage of competences they acquired during studies at their work position the average consensus grade was 3.81 (on a Likert scale from 1 to 5). Employed graduates were also asked to rate their competence inventory in relation to competence inventory of their colleagues at similar work position – 46% mentioned to possess same level of competences as others, 37% reported having lower and only 17% believed they have higher competences than their co-workers.

Table 8: Descriptive statistics of data collected from graduates

Variable	**N**	**Mean**	**S. d.**	**Min**	**Max**
Personal information					
Age	1009	28.09	1.05	27	32
Gender					
Male	444	0.44	0.50	0	1
Female	565	0.56	0.52	0	1
Region					
Central Croatia	727	0.72	0.45	0	1
North-western Croatia	91	0.09	0.29	0	1
East Croatia	101	0.10	0.30	0	1
North Adriatic and Lika	50	0.05	0.23	0	1
Central and South Adriatic	40	0.04	0.19	0	1
Living in urban settlement	707	0.70	0.46	0	1
Married	424	0.42	0.49	0	1
Household information					
Members of household	1009	2.99	1.04	1	5
Household income	1009	14,335	5,359	2,300	29,650
Cars owned by household	1009	1.54	0.77	0	4
Father highest education level					
Elementary	151	0.15	0.35	0	1
Secondary	454	0.45	0.50	0	1
Tertiary	404	0.40	0.49	0	1
Mother highest education level					
Elementary	172	0.17	0.38	0	1
Secondary	464	0.46	0.50	0	1
Tertiary	373	0.37	0.48	0	1
Education information					
Years of education	1009	17.32	0.98	15	20
Foreign education	1009	0.23	0.42	0	1
Graduation GPA	1009	4.26	0.59	2.9	5

Student status					
Full-time student	636	0.63	0.48	0	1
Part-time student	373	0.37	0.28	0	1
Education institution ownership					
Private institution	161	0.16	0.37	0	1
Public institution	848	0.84	0.37	0	1
Work during HE studies	1009	0.48	0.50	0	1
Labor market information					
Unemployed	361	0.36	0.21	0	1
Employed	648	0.64	0.48	0	1
Work experience	648	1.91	0.81	0	5
Employer ownership					
Private	434	0.67	0.47	0	1
State	214	0.33	0.27	0	1
Employer size					
Micro firm	91	0.14	0.35	0	1
Small firm	214	0.33	0.47	0	1
Medium firm	259	0.40	0.49	0	1
Large firm	84	0.13	0.34	0	1
Employee status					
Owner	65	0.10	0.30	0	1
Manager	168	0.26	0.44	0	1
Worker	415	0.64	0.48	0	1
Training at work	648	0.55	0.50	0	1
Wage	648	6,040	1,421	2,550	12,000

Source: Author's own work.

4.4 Findings and discussion

4.4.1 Estimation of key competences

In order to determine key competences, exploratory factor analysis was performed on firm dataset (as firms are the ones creating demand on labor market), with goal of identifying common underlying factors of 58 skill/ability items (Table 24 in Appendix 4). Using standard criteria of eigenvalue greater than one and based on the list of skills/abilities loadings on each factor (Table 25 in Appendix 4), eight factors/key competences were extracted, explaining over 80% of original variance: 1) economics-and-business theory and practice; 2) collectedness, presentation and teamwork; 3) IT proficiency; 4) business communication; 5) project management and professionalism; 6) advocacy, language fluency; 7) motivation and organization; and 8) quantitative-economics algebra. This division is in line with previous studies that have focused on a small set of key competences (Biesma et al., 2008; Cowan, Wilson-Barnett, Norman & Murrells, 2008; Azevedo,

Apfelthaler & Hurst, 2012; Postel-Vinay & Lise, 2015; Grzybowska & Łupicka, 2017) rather than, what Whitstons (1998) refers to as, the temptation to adopt an ever-growing list of competences. Kaiser-Meyer-Olkin sampling adequacy measure of 0.88 justifies the usage of exploratory factor analysis. Competences 1, 3, 4 and 8 were labelled as economics-and-business *practical* (specific), while competences 2, 5, 6 and 7 were labelled as *general* (similar division is found in Biesma, Pavlova, van Merode and Groot (2007) or in Biesma et al. (2008)). This assignment of skills/abilities into eight factors (i.e. key competences) was tested using confirmatory factor analysis (Figure 1 in Appendix 4). The Root mean squared error of approximation of 0.062 indicates a good fit of the model.

To quantify these competences a sum score of all of its items was calculated and divided by the total number of items per each factor. Table 9 shows the results of relative ranking of key competences for firms and for graduates. In light of Saavedra and Saavedra (2011), relative rank (importance) of each competence was calculated using Wilcoxon's signed ranked test (if no such differences were found each competence was assigned the same rank). Competences employers view as the most important are *motivation and organization*, *project management and professionalism* and *collectedness, presentation and teamwork*. On the other hand, graduates felt the most confident in acquisition of the *quantitative-economics algebra*, *business communication* and *economics-and-business theory and practice* competences.

These differences between required and acquired competences are calculated in last column, which presents competence proximity from employers' point of view - a positive sign indicates a positive mismatch (positive gap) of graduates' development of certain competence in relation to firms' requirements, while a negative sign indicates negative mismatch ("negative gap" or a "competence shortage"). These differences were tested using t-tests for unpaired data with unequal variance. Results shows that practical competences are mostly in positive mismatch, i.e. in excess development (apart from *business communication* competence) while those of general type are in negative mismatch, i.e. in competence shortage (this is also confirmed by their total scores). All the differences are shown to be statistically significant, with the greatest competence shortage in *motivation and organization* and *project management and professionalism* competences. These results are in line with previous research suggesting that employers place greater emphasis on genral competences such as professionalism, project management and teamwork (Biesma et al., 2008; Cowan, Wilson-Barnett, Norman & Murrells, 2008; Azevedo, Apfelthaler & Hurst, 2012; Chiru, Ciuchete, Lefter & Paduretu, 2012; Leoni, 2012; Grzybowska & Łupicka, 2017). On the other hand, HE institutions are more concerned with equipping their graduates with practical, job-specific competences (Nicolescu & Paun, 2009; Chiru, Ciuchete, Lefter & Paduretu, 2012). Of course, one could argue this is their primary role. However, it is important to note that practical competences may become obsolete, or at least outdated, as technological development progresses (World Economic Forum, 2016). Instead, future labor market requires that graduates should be equipped with competences enabling quick

adaptation to latest methods of doing business available on the market. This rather simple analysis points to a high degree of competence mismatch (low competence proximity) on the labor market, especially in terms of general competences.

Table 9: Descriptive statistics and rank order of key competences by firms and graduates

	Key competence	Required by firms		Acquired by graduates		Mean Diff.
		Mean (S.d.)	Rank	Mean (S.d.)	Rank	
Practical	Economics and business theory and practice	3.6 (0.9)	7	4.0 (0.4)	3	0.3***
	IT proficiency	3.0 (1.0)	8	3.2 (0.9)	8	0.2**
	Business communication	4.3 (0.7)	2	4.0 (0.5)	2	-0.3***
	Quantitative-economics algebra	3.7 (1.1)	6	4.1 (0.8)	1	0.4***
	Practical competences (total)	3.6 (0.8)		3.8 (0.4)		0.2***
General	Collectedness, presentation and teamwork	4.2 (0.6)	4	3.7 (0.8)	4	-0.5***
	Project management and professionalism	4.4 (0.6)	2	3.6 (0.8)	6	-0.9***
	Advocacy, language fluency	3.9 (0.7)	5	3.6 (0.7)	6	-0.3***
	Motivation and organization	4.6 (0.4)	1	3.6 (1.0)	4	-0.9***
	General competences (total)	4.2 (0.5)		3.6 (0.7)		-0.6***

Note: Based on the sign test competences 3 and 6 are not statistically different for firms, and competences 5, 6, 7 and 8 are not statistically different for graduates. (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectively.

Source: Author's own work.

Table 26, Table 27, Table 28 and Table 29 of Appendix 4 present summary of key competences' importance for economics and business job positions by different industries, different firm size, different firm ownership and by different educational attainment of firm representatives, respectively, and finds no significant differences between importance placed on any of analyzed competences. In addition, Table 30 of Appendix 4 present summary of key competences' development for economics and business graduates by their employment status, and finds significant differences between development levels of each competence between employed and unemployed graduates. Overall, the difference is greater for general rather than practical competences, with the greatest difference in *motivation and organization* competence. Furthermore, heterogeneous analysis of competence development according to ownership type of institutions where graduates are employed (Table 31 of Appendix 4) reveals that there are significant differences in competence acquisition between graduates employed in public and private sector. Graduates who are employed in public institutions on average have higher development of almost all identified competences, with the greatest difference in *advanced math and IT knowledge* competence. In terms of

competence type, recorded differences are greater for general than from practical competences.

4.4.2 Graduates' employability

Table 10 shows the estimation results of employability model presented in Equation 4.9. First two columns present Probit estimation results – column (1) presents the results when this mismatch is calculated for all 58 skill/ability-items together (without combining them into competences) and column (2) presents results when these skill/ability-items are grouped in competences. These two columns present *average marginal effects*, while columns (4) and (5) present *marginal effects estimated at the means*.

When looking at results for all skill/ability items together (without combining them into competences), increase in mismatch by one standard deviation from the mean reduces the probability of being employed by 4.9% on average. Switching to competences as focus of analysis, it is evident that mismatch increase in *economics-and-business theory and practice* reduces the probability of being employed by 5.7% and mismatch increase in *business communication* by 3.4% on average. Other two practical competences show no statistical significance in explaining the variation in being employed. Furthermore, none of the general set of competences seem to be statistically significant in relation to employability of a graduate. Nevertheless, all these other non-significant mismatches have the expected negative direction of effect i.e. mismatches in any of those competences still have negative effects on employability of a graduate. Their estimated coefficients could still be consistent with the expectations but, due to small dataset, the degree of variation is not sufficient to guarantee statistical significance (Amrhein, Greenland & McShane, 2019).

Endogeneity of acquired graduates' competences and hence the calculated proximity (or mismatch, in this case) to employers' requirements is tackled using instrumental variable approach. This exercise is performed on a single variable – mismatch in all skill/ability-items. 1st stage results of 2SLS estimation method (presented in column (1) of Table 32 in Appendix 4) reveal that education of both graduates' parents is negatively associated with mismatch in skills/abilities. For example, providing that graduates father and mother have obtained secondary education degree, graduates mismatch in required skills/abilities is expected to be reduced on average by 0.840 and 0.886 standard deviation units, respectively. These results go along in showing that parents' education level matters and that highly educated parents are better able to point their children in the right direction when it comes to acquisition of skills/abilities required on contemporary labor market. Columns (3) and (6) of Table 10 presents results of 2nd stage of 2SLS estimation for *average marginal effect* and *marginal effect estimated at the mean*, respectively. Overall negative effect of mismatch in all skills/abilities on graduate employability is 1.9% on average, which is about 3 percentage points lower than OLS estimates.

4.4.3 Graduates' wage premiums

Table 11 shows the estimation results of augmented Mincerian wage model presented in Equation 4.10. First two columns present OLS estimation results – column (1) present the results when mismatch is calculated for all skill/ability-items together and column (2) when these skill/ability-items are grouped in competences. Results for mismatch in all skill/ability-items grouped together indicate a wage penalty of about 3.9%. As the average wage in our sample amounts to 6,040 HRK, this represents a wage penalty of 235 HRK (~ 32 EUR). Shifting the focus to competences, results are suggesting greater impact of mismatch in general competences. In terms of economics-and-business practical competences, results are suggesting a small negative wage premium for *economics-and business theory and practice* competence of about 1.1%. Mismatch in general competences, on the other hand, indicates a wage penalty of 1.2% in case of *project management and professionalism* competence and 2.0% in case of *motivation and organization* competence. In terms of actual remuneration this penalty ranges between 73 HRK (~ 10 EUR) to 120 HRK (~ 17 EUR). These results are in line with previous results that employers put more emphasis on general type of competences, and that mismatches in those have greater effect on the wage bill. Although mismatches in other competences were shown to be statistically insignificant, all these mismatches have the expected direction of effect but, due to small dataset, the degree of variation is not sufficient to guarantee statistical significance (Amrhein, Greenland & McShane, 2019).

These are interesting results, as it would seem to contradict the results from Probit estimation on the probability of obtaining employment, which put greater emphasis on practical competences. This would suggest that even though employers are putting greater emphasis on the importance of general competences, when deciding to reward an employment contract they are still more focused on the practical competences. Only after someone is employed, general competences seem to become more important in determining their wage level.

Results of instrumental variable procedure using 2SLS estimation method (only 2nd stage results) are presented in column (3) of Table 11. 1st stage results of 2SLS estimation method (presented in column (2) of Table 32 in Appendix 4) are very much in line with previous estimates from Employability model, albeit at smaller sample. Kleibergen-Paap rk LM statistic of 18.721 (p-value = 0.0009) rejects the null-hypothesis of underidentified matrix of reduced form coefficients for instruments while Kleibergen-Paap rk Wald F statistic of 5.082 allows for 10% maximal IV relative bias (compared to Stock-Yogo weak ID test critical values). In terms of interpretation, providing that graduates' father and mother have obtained tertiary degree, graduates' mismatch in required skills/abilities is expected to be reduced on average by 0.373 and 0.269 standard deviation units, respectively. Overall effect of mismatch in all skills/abilities on graduate wage is 13.1% (785 HRK ~ 100 EUR) on average, which is by about 10 percentage points higher than OLS estimates (this is in line with what Carr (1999, p. 1842) reports when comparing OLS and IV results).

Heckman sample selection model is used to accommodate for sample selection bias, more precisely to account for self-selection of graduates into employment. Selection equation in this case is identical to Equation 4.9, whose estimation results are presented in previous section. Performance equation results of Heckman sample selection model, given in Equation 4.13, are presented in columns (4) – (5) of Table 11. Results here are very much in line with initial OLS estimates, which is corroborated by statistical insignificance of Inverse Mill's Ratio, suggesting no self-selection problem. When analyzing mismatch in all skills/abilities, wage penalty is estimated to be 4.8% (290 HRK ~ 40 EUR on average), which is higher by roughly one percentage point than OLS estimate. Very similar situation is presented if we concentrate on the particular competences. In terms of economics-and-business practical competences only *economics and business theory and practice* is showing significant wage penalty effect of 1.7%, slightly higher than OLS's estimated 1.1% penalty. Looking at general competence set, *project management and professionalism* and *motivation and organization* show significant wage penalties of 1.3% and 1.9%, respectively (also slightly higher than OLS estimates). In conclusion, this analysis reveals that initial OLS estimates are quite robust, and indicate no statistically significant problem of self-selection.

Finally, significant differences in competences development between graduates employed at public and private institutions (Table 31 of Appendix 4) warrant heterogeneous analysis on wage effects. Results, presented in Table 34 of Appendix 4, indicate that mismatch in all skill/ability items, as well as in particular competences, is much more pronounced in private employers. Again, the strongest impact on the wages comes from mismatches in *collectedness, presentation and teamwork* and *motivation and organization* competences (2.6 and 2.8 percent, respectively).

Table 10: Results of Employability model

		OLS		2SLS (2nd stage)	OLS		2SLS (2nd stage)
		(1)	(2)	(3)	(4)	(5)	(6)
Mismatch in **all skill/ability-items**		-0.049*		-0.019*	-0.051*		-0.021*
		(0.026)		(0.009)	(0.029)		(0.008)
Mismatch in **practical** competences	Economics and business theory and practice		-0.057***			-0.055***	
			(0.019)			(0.018)	
	IT proficiency		-0.004			-0.005	
			(0.017)			(0.019)	
	Business communication		-0.034**			-0.031**	
			(0.015)			(0.015)	
	Quantitative-economics algebra		-0.020			-0.017	
			(0.019)			(0.021)	
Mismatch in **general** competences	Collectedness, presentation and teamwork		-0.007			-0.005	
			(0.018)			(0.019)	
	Project management and professionalism		-0.026			-0.021	
			(0.030)			(0.032)	
	Advocacy, language fluency		-0.014			-0.011	
			(0.021)			(0.020)	
	Motivation and organization		-0.005			-0.002	
			(0.016)			(0.014)	
Personal characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Household characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Education characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
N		1009	1009	1009	1009	1009	
Pseudo R^2		0.735	0.753	0.732	0.735	0.753	0.732
Sargan score				6.584			6.584

Note: (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectfully. Standard errors in parentheses. Results in columns (1) – (3) are *average marginal effects* while results in columns (4) – (6) are *marginal effects estimated at the means*.

Source: Author's own work.

Table 11: Results of Mincerian wage model

		OLS		2SLS (2nd stage)	Heckman	
		(1)	(2)	(3)	(4)	(5)
Mismatch in **all skill/ability-items**		-0.039***		-0.131***	-0.048***	
		(0.007)		(0.033)	(0.008)	
Mismatch in **practical** competences	Economics and business theory and practice		-0.011**			-0.017***
			(0.005)			(0.005)
	IT proficiency		-0.005			-0.003
			(0.004)			(0.005)
	Business communication		-0.001			-0.003
			(0.004)			(0.004)
	Quantitative-economics algebra		-0.003			-0.002
			(0.004)			(0.004)
Mismatch in **general** competences	Collectedness, presentation and teamwork		-0.012			-0.014*
			(0.008)			(0.008)
	Project management and professionalism		-0.012**			-0.013**
			(0.005)			(0.006)
	Advocacy, language fluency		-0.003			-0.000
			(0.005)			(0.005)
	Motivation and organization		-0.020***			-0.019***
			(0.006)			(0.007)

Lambda (Inverse Mill's Ratio)				0.091 (0.079)	0.092 (0.074)
Personal characteristics	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Household characteristics	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Education characteristics	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Labor market characteristics	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
N	648	648	648	648	648
R^2	0.891	0.892	0.847		
Adjusted R^2	0.885	0.885	0.839		
Sargan score			7.159		
Kleibergen-Paap rk LM statistic			18.721		
Kleibergen-Paap rk Wald statistic			21.552		
Kleibergen-Paap rk Wald F statistic			5.082		
Hansen J statistic			5.022		
ρ				0.972	1.000
σ				0.094	0.092

Note: (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectfully. Standard errors in parentheses.

Source: Author's own work.

4.4.4 Graduates employability and wages using competence development

As in Chapter 3, competences can enter empirical models in their development level, as opposed to their mismatch levels. This is done using previously defined Equations 4.9 and 4.10, with the only change that competences now enter these models in development levels, instead to mismatch levels. Results, presented in Table 12, only give OLS estimated of these two models.

Table 12: Results of Employment model and Mincerian wage model using competence development

		Employment		Wages
		(1)	(2)	(3)
Development in **practical** competences	Economics and business theory and practice	0.018**	0.019**	0.005
		(0.008)	(0.009)	(0.005)
	IT proficiency	0.038**	0.044**	0.003
		(0.015)	(0.021)	(0.008)
	Business communication	0.012**	0.014**	0.011***
		(0.005)	(0.006)	(0.004)
	Quantitative-economics algebra	0.041***	0.048***	0.008
		(0.009)	(0.015)	(0.005)
Development in **general** competences	Collectedness, presentation and teamwork	0.032	0.038	0.029***
		(0.029)	(0.024)	(0.009)
	Project management and professionalism	0.014	0.016	0.031***
		(0.015)	(0.018)	(0.007)
	Advocacy, language fluency	0.010	0.011	0.003
		(0.013)	(0.016)	(0.006)
	Motivation and organization	0.004	0.005	0.014*
		(0.015)	(0.017)	(0.008)
Personal characteristics		**Yes**	**Yes**	**Yes**
Household characteristics		**Yes**	**Yes**	**Yes**
Education characteristics		**Yes**	**Yes**	**Yes**
Labor market characteristics		**No**	**No**	**Yes**
N		1009	1009	648
R^2				0.896
Adjusted R^2				0.865
Pseudo R^2		0.771	0.771	

Note: (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectfully. Standard errors in parentheses. Results in columns (1) – (2) are *average marginal effects* while results in column (3) are *marginal effects estimated at the means*.

Source: Author's own work.

As already seen in the main results, it is practical competences that are most important for employability of the gradutes (particularly *quantitative-economics algebra* and *IT proficiency*), but those with highly developed general competences have higher wages on average (especially those with highly developed *collectedness, presentation and teamwork* and *project management and professionalism* competences). However, as already emphasized in section 3.5.2.1, competence development alone is not enough to be highly sought on the labor market. One also needs to developed those competences required by employers and up to an appropriate degree. According to theory of Assignment models (Koopmans & Beckmann, 1957), working in a job below one's own competences limits the potential use of those competences and results in lower wages, lower job satisfaction and lower productivity. Conversely, working in a job that require more competences, raises the productivity ceiling, however, the worker's own competences are the limiting factor. Thus, productivity (and thus chances of being employed and/or awarded higher wage) is maximized when workers are allocated top-down according to their competences, whereby the most competent are assigned to the most complex job and the least competent to the simplest job – in other words, employers' competence requrements are trying to be as close as possible to employees' competence development. For this reason, this analysis is only suplemntary to original results presented in sections 4.4.2 and 4.4.3 whose focus is on competence mismatch.

4.4.5 Robustness check of main set of results

For the robustness check we opted to define the proximity between employers' competence requirements and graduates' competence attainment as defined in Equations 4.5 and 4.6 of Theoretical framework section. Descriptive statistics of these two additional measures of proximity are presented in Table 33 of Appendix 4.

Results of robustness check for Employability model and Mincerian wage model are presented in Table 13 and Table 14, respectively. First two columns both these tables show the results when competence proximity is measured using Equation 4.6 – the distance between rankings of particular competences – and columns (3) to (8) present the results when competence proximity is measured using approximation parameter ρ (Equation 4.5). As our results will depend heavily on the choice of ρ, we present results with three different values of this parameter. What is also important to stress out is that we are expecting different direction of association between these two competence proximity measures. For the former (distance between ranks) we are expecting negative association – the greater the distance between employers required competence rankings and graduates attained competence rankings, the lower is their expected employability and wages. For the latter, on the other hand, expected relationship is positive – the greater the number of matches of rankings between employers required competence rankings and graduates attained competence rankings (number of matches is determined by approximation parameter ρ), the higher is the probability that those graduates were offered an employment contract and higher wage. Also

worth noting is that as approximation parameter ρ increases (thus allowing greater differences in ranking of particular competences by employers and graduates to still be labeled as weakly equivalent), estimates effects on employability and wage gradually decreases, which is to be expected.

Focusing on the Employability model, robustness checks results for all skill/ability items mainly corroborate our original estimates, but are higher by 1 and 4 percentage points for Distance and PROX1 proximity measures, respectively. In terms of particular competences, practical competences are shown to be more important for graduates' employability, particularly *economics and business theory and practice*; *business communication*; and *quantitative-economics algebra*, which is also in line with our previous results. The story is very much similar for the Mincerian wage model. Robustness check yielded results similar to those of our original scenario, with general competences holding greater importance when it comes to determining wages.

Table 13: Robustness check results for Employability model

		Distance		PROX1 ($\rho = 1$)		PROX2 ($\rho = 2$)		PROX3 ($\rho = 3$)	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance/Proximity in **all skill/ability-items**		-0.063***		0.094**		0.027***		0.012	
		(0.023)		(0.043)		(0.008)		(0.008)	
Distance/Proximity in **practical** competences	Economics and business theory and practice		-0.045***		0.037*		0.012		0.004
			(0.007)		(0.021)		(0.025)		(0.022)
	IT proficiency		0.004		0.032		-0.013		-0.018
			(0.006)		(0.028)		(0.021)		(0.026)
	Business communication		-0.025***		0.028**		0.022*		0.019
			(0.008)		(0.013)		(0.012)		(0.036)
	Quantitative-economics algebra		-0.017***		0.040***		0.048**		0.048***
			(0.006)		(0.012)		(0.020)		(0.017)
Distance/Proximity in **general** competences	Collectedness, presentation and teamwork		-0.005		0.011		-0.014		0.003
			(0.008)		(0.017)		(0.022)		(0.041)
	Project management and professionalism		-0.050*		0.064**		0.063*		-0.009
			(0.022)		(0.021)		(0.039)		(0.018)
	Advocacy, language fluency		-0.009		0.015		-0.015		0.013
			(0.009)		(0.017)		(0.025)		(0.067)
	Motivation and organization		-0.004		-0.022		-0.026		0.006
			(0.005)		(0.023)		(0.022)		(0.021)
Personal characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Household characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Education characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
N		1009	1009	1009	1009	1009	1009	1009	1009
Pseudo R^2		0.745	0.757	0.739	0.755	0.749	0.758	0.740	0.746

Note: (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectfully. Standard errors in parentheses.

Source: Author's own work.

Table 14: Robustness check results for Mincerian wage model

		Distance		PROX1 ($\rho = 1$)		PROX2 ($\rho = 2$)		PROX3 ($\rho = 3$)	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance/Proximity in **all skill/ability-items**		-0.032***		0.025**		0.017*		0.007	
		(0.001)		(0.011)		(0.008)		(0.006)	
Distance/Proximity in **practical** competences	Economics and business theory and practice		-0.016***		0.016**		0.014*		0.005
			(0.003)		(0.006)		(0.007)		(0.008)
	IT proficiency		-0.003		0.009		0.016		0.012
			(0.002)		(0.008)		(0.011)		(0.009)
	Business communication		-0.010		0.031		0.034		0.015
			(0.008)		(0.028)		(0.024)		(0.011)
	Quantitative-economics algebra		-0.001		0.008		0.009		-0.001
			(0.002)		(0.010)		(0.009)		(0.008)
Distance/Proximity in **general** competences	Collectedness, presentation and teamwork		-0.001		0.010		0.007		0.001
			(0.003)		(0.007)		(0.009)		(0.026)
	Project management and professionalism		-0.009***		0.016**		0.010*		0.036
			(0.002)		(0.007)		(0.004)		(0.028)
	Advocacy, language fluency		-0.005		0.009		0.011		0.033
			(0.003)		(0.007)		(0.008)		(0.027)
	Motivation and organization		-0.018***		0.015**		0.009*		0.007
			(0.004)		(0.006)		(0.004)		(0.009)
Personal characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Household characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Education characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
N		648	648	648	648	648	648	648	648

R^2	0.885	0.893	0.885	0.890	0.885	0.890	0.886	0.892
Adjusted R^2	0.745	0.879	0.887	0.879	0.883	0.879	0.884	0.880

Note: (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectfully. Standard errors in parentheses.

Source: Author's own work.

4.5 Conclusion

The aim of this research was to analyze the mismatch on the labor market in terms of competences that employees acquire, on one side, and employers require, on the other. The paper also studies the impact of this mismatch on the probability of being employed and on wages of those who are employed. The subjects of the analysis were economics and business graduates in Croatia, on the labor supply side, and a general sample of firms in Croatia, on the labor demand side. Graduates were chosen to see how well do higher education institutions in Croatia prepare their students for future challenges on the labor market, and we narrowed down the analyzed field of study to economics and business as those graduates can find a job in almost any company, regardless of the industry. Analysis was carried out by combining the two datasets - one for firms and one for graduates, both of which were collected using questionnaires. Both questionnaires contained the same list of skills and abilities which were sent out for evaluation, together with questions capturing other socio-economic characteristics of the respondents. These skills and abilities were then combined in eight key competences using factor analysis, and were divided in general and practical competences.

Obtained results indicate the existence of a mismatch between competence inventory required by employers and that which graduates acquire during their studies. This is particularly emphasized for general set of competences which were all underdeveloped by graduates in relation to employers' requirements. This primarily holds true for the *motivation and organization* competence and *project management and professionalism* competence, where the greatest significant difference was found. Differences in *economics and business theory and practice* competence, although significant, were somewhat smaller and with a reversed direction – meaning that these competences were overdeveloped in terms of employers' requirements. Taking these deviations as a starting point, we have analyzed the impact of competence mismatches on the probability of being employed and the level of wages. This was done via a measure of proximity (mismatch) between competence inventories of each graduate and most desirable competence inventory of employers.

Results confirm that the probability of being employed significantly decrease with the existence of this mismatch (low proximity) by about 5% overall. In terms of particular competences, results are significant only for *economics-and-business theory and practice* and *business communication*. Results for mismatch in all skill/ability-items grouped together indicate a wage penalty of about 3.9%. As the average wage in our sample is 6,040 HRK, this wage penalty amounts to 235 HRK (~ 32 EUR). Shifting the focus to different type of competences, results are suggesting greater impact of mismatch in competences of general type – a wage penalty of 1.2% (73 HRK ~ 10 EUR) in case of *project management and professionalism* competence and 2.0% (120 HRK ~ 17 EUR) in case of *motivation and organization* competence.

Results of this research also carry certain policy implications. They clearly indicate that universities and other higher education institutions need to align their curricula to meet the current demand on the labor market. The greatest mismatch between graduates and employers' competence inventories was found for competences of general type, such as *motivation and organization*, or *project management and professionalism*, which points at parts of curricula in a dire need of reform. Even more so, these results go beyond only tertiary education - pupils in elementary and secondary schools should also be better equipped with these competences as some of them opt to enter the labor market instead of continuing to higher education.

This analysis is focused on economics and business graduates and it would be unwise to generalize these findings to job positions that require other educational background. Even though competences labelled as general may be transferable to positions held by employees with different background, their importance may be somewhat different. Moreover, this analysis was carried in a time of a re-bounce of Croatian economy from the negative effects that started with financial crisis back in late 2008. Another possible limitation may be the method of collecting data using on-line surveys. Even though on-line surveys offer substantial cost-savings, greater options for editing and analysis, wider magnitude of coverage and quicker response time, they may also suffer from questionnaire display issues and lower levels of confidentiality. Also, due to data availability and focus of this research, graduates' data only includes 2011-2015 cohorts. Future research can also work towards prolonging this span as to include business cycle effects. Finally, this research did not respond to how these competences are acquired in the first place and which factors influence the development degree of each competence, which is a valid topic for future research.

5 CONCLUSION

Competence mismatch is one of the most persistent problems in the modern labor market faced by many countries in the world. With new developments in science and technology, brought by the Fourth industrial revolution, many competences depreciate at an accelerating rate and are constantly being replaced by new ones, most tightly connected to prevailing state-of-the-art technology and its numerous applications. In fact, World Economic Forum (2016) states that as high as 65% of children entering primary school today will end up working in completely new jobs that don't even exist yet, 50% of subject knowledge acquired during the first year of a four-year technical degree will become outdated by the time students graduate, and more than a third of the desired core competences of most occupations by 2020 will be comprised of competences that are not yet considered crucial today.

Given that low competence proximity (i.e. competence mismatch) has adverse effects not only on individuals but also on the society as a whole, finding a solution to this problem should be one of the primary aims of economic policy. The first step towards finding the solution involves defining which competences are considered crucial to modern-day employers, given their current needs in maintaining high competitiveness, but also looking in the future and anticipating the new trends set forth by increased digitization proces. The following step involves discovering reasons behind existence and persistence of competence mismatch on the labor market. This is where we turn to the other side of the labor market, the employees, and assess their current development level of those competences deemed highly important to employers. After that, one needs to establish a methodology to measure the degree of this proximity (or mismatch) and assess how it affects both sides of the labor market: employers in terms of their profitability and productivity, and employees in terms of their employability and wages. Only after, and if, this competence proximity is found to significantly affect these outcomes, one may advise important policy recommendations for their better alignment and reduction of mismatch.

This doctoral dissertation focuses on several different aspects of competence proximity in Croatia. The main goal of this dissertation is to review the origins and recent literature exploring competences and their usage in human resource management, to assess the most important competences required on contemporary labor market, to assess the development of those competences by recent graduates to see how well do the higher educational institutions prepare their students for future labor market challenges, to estimate the proximity between competences required by employers and those developed by graduates and, finally, to associate degree of this proximity to both firm performance and the labor market outcomes of graduates. In this sense, both the labor demand side (consisting of employers looking for workers with particular competence inventory) and labor supply side (consisting of workers offering their developed competences to employers) of the labor market have been analyzed. In order to achieve these goals, a combination of the methodology that emerges from the production function approach, Mincerian wage models,

Heckman sample selection model, Arellano-bond dynamic general method of moments model and empirical evidence from Croatia are used. All these issues are explored through three different chapters (essays) of this dissertation, where each of the essays deals with a particular research topic but all three are connected through their main topic – competence-based modelling to human resource management and their application in practice.

First, this doctoral dissertation presents the origins and applications of competence-based approach to human resource management. Namely, the first essay (Chapter 2) presents the recent literature review of the competence-based approach in the knowledge-based economy of 21st century. In a knowledge-based economy, marked by increasing pace of advances in science and technology, enterprises are forced to react quickly to new challenges and opportunities in preservation of their competitiveness. While these ongoing automation and digitization processes hold great promise for future prosperity and job creation, they also require proactive adaptations, especially in human resource management. Simple and monotonous processes are being automated at an increasing pace while other cognitive processes become more complex and intertwined, thus shortening the shelf-life of employees' competences (Borghans, Green & Mayhew, 2001; Stasz, 2001; Leoni, 2012; Hecklau et al., 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017).

Competence models are a descriptive tool that identifies the knowledge, skills, abilities and behavior needed to perform effectively in an organization (Lucia & Lepsinger, 1999; Felstead & Ashton, 2000; Chung-Herrera, Enz & Lankau, 2003; Hecklau et al., 2016), and are also important for integrating education and training with the needs of the labor market, thus promoting mobility for individuals, especially for workers faced with job insecurity (Van der Klink & Boon, 2002).

Many organizations already utilize some form of competence-based human resource management. Simplicity and concreteness of competences as the common language of the whole organization makes this approach easy to implement, regardless of structure or level of education (Green, 1999). Instead of specifying job positions, competences specify desirable characteristics of a person, thus providing deeper insights of the workers' potential in terms of their productivity. In addition to allowing the assessment of individuals' strengths and weaknesses, competence models enable the assessment of the overall human potential and emphasize the areas in need of further development, thus becoming basis for education and training, and, coupled with a rewarding scheme, play an important role to direct and modify employee's behavior. Finally, a competence itself can be learned within a favorable environment (OECD, 2005) and, unlike most of the innate abilities and talents, can be learned and developed in adulthood (Boyatzis, 2008).

However, competence-based approach is not without its limitations. Most notably, there is a considerable deal of confusion and disagreement about what exactly competences are and how they should be measured – inconsistent, unmeasurable, discriminating, too numerous and poorly classified behaviors in measuring competences resulted in many bad models in

practice (Kurz & Bartram, 2002; Finegold & Notabartolo, 2010; Psacharopoulos & Schlotter, 2010; Kucel, Vilalta-Bufi & Robert, 2011). In addition, implementing competence-based approach in an organization for the very first time can be problematic and lead to resistance and increased fluctuations of both output and workforce (Lawler, 1994). This is especially pronounced in a situation with intercultural transfer of competences, since in different countries the same behavior does not have to point to the same competence or its relevancy (Sparrow, 1997; Dooley at al., 2001).

Even though competence-based literature has recently grown in volume, very few studies have offered concrete solutions to bridging the competence mismatch on the labor market. Much has to be done to improve established data sources and to create new ones, especially in terms of longitudinal design, that provide further insights in important competence dimensions (Psacharopoulos & Schlotter, 2010). This research identified that educational institutions generate technical and practical competences, which is often in opposition to what is demanded by employers, especially when it comes to general competence requirements (Marthandan, Jayashree & Yelwa, 2013), thus emphasizing the need to re-evaluate competence requirements of both employees and employers. Furthermore, traditionally rigid wage setting institutions and stringent regulations (especially in Europe) have to allow greater wage adjustability and labor mobility to resolve mismatch by adapting workforce structure.

The second essay (Chapter 3) concentrates on employers and investigates the effect of a proximity between their competence requirements and competence development of their workforce on firm performance of Croatian firms in 2016. A rise of knowledge-based economy has shifted emphasis on "soft" factors of production, such as possessing the right combination of competences for the job position (Heckman & Kautz, 2012; Spencer & Spencer, 1993). Thus, firm performance will be influenced not only by, among others, the quantity of workers, but also by the quality of its workforce such as in terms of competences they possess. This essay is focused on positions that require competences in economics and business domain, with main aim of identifying and quantifying key competences for such position and assessing how their proximity of emplyoers requirements affects overall firm performance. Utilized dataset contained both primary data, collected through questionnaire on a representative sample of Croatian firms, and secondary data on firm financials and characteristics. The analysis is performed using production function approach in both static and dynamic environments. Estimation methods included Cobb-Douglas production function, Heckman sample selection model and Arellano-Bond dynamic GMM estimation.

Before any empirical analysis, a short review of differences between skills, abilities and competences is presented. Skills are defined as automated components of tasks, which are undertaken with a relatively low mind control and include powered routine jobs as well as cognitive activities (Sonntag & Schmidt-Rathjens, 2004). On the other hand, abilities are defined as all kinds of innate skills of a person which are necessary to perform tasks and services. Finally, Rieckmann (2012, p. 131) defines competences as "individual dispositions

to self-organization which include cognitive, affective, volitional and motivational elements; they are basically an interplay of knowledge, capacities and skills, motives and affective dispositions.". This essay adopted multidimensionality approach in defining competences which are transcending simple skills or abilities and are actually encompassing both of those.

Results of the analysis show that *motivation and organization*; *project management and professionalism*; and *collectedness, presentation and teamwork* turned out to be most important competences for employers while *business communication* was shown to be developed the most among their existing workforce. Lowest proximity (greatest mismatch) in competences was found for *project management and professionalism* and *motivation and organization* competences while the highest proximity (lowest mismatch) was found for *economics-and-business theory and practice* and *quantitative-economics algebra* competences. These mismatches were then introduced in production function and linked to firm performance. All empirical specification methods were consistent in pointing to mismatch (shortage) in competences *quantitative-economics algebra*; *collectedness, presentation and teamwork*; and *motivation and organization*, to be of negative statistical significance in explaining the variation in firm performance. The greatest effect was found for the shortage in *motivation and organization* competence, indicating that highly motivated and well organized workforce plays a crucial role in firm performance.

This doctoral dissertation also deals with the other side of the labor market, the workers, and how competence proximity affects their outcomes (Chapter 4). Due to Fourth industrial revolution and increasing pace of technology introduction into doing business, modern day employers are increasing their demands for new or updated competences, and hence invest heavily in their workers' acquisition of those competences to preserve their competitiveness level. However, since the cost of developing human capital is increasing, employers expect educational institutions to produce workers (graduates) already equipped with competences required by the contemporary labor market. This essay analyzed the proximity on the labor market in terms of competences that graduates acquire, on one side, and employers require, on the other, and how it affects graduates' probability of being employed and their wages. Analysis was performed on a sample economics and business graduates, and a general sample of Croatian firms hiring those graduates. Graduates were chosen as subjects of study to see how well higher education institutions in Croatia prepare their students for future challenges on the labor market, and we narrowed down the analyzed field to economics and business graduates as they can find employment in almost any firm, regardless of the industry. Analysis was carried out by combining two datasets - one for firms and one for graduates, both of which were collected using questionnaires. Both questionnaires contained the same list of skills and abilities sent out for evaluation, together with questions capturing other socio-economic characteristics of respondents. These skills and abilities were then combined into practical and general competences using factor analysis and proximity for each competence for each graduate was calculated. Impact of these proximity on graduates'

employability is empirically investigated using a Probit model, and impact on wages was tested using augmented Mincerian wage model.

Obtained results indicate the existence of a mismatch between competences required by employers and those acquired by graduates during their studies. This is primarily emphasized for general set of competences which were all in shortage in relation to employers' demands, particularly *motivation and organization* and *project management and professionalism* competences. Differences in economics-and-business practical competences, although significant, were somewhat smaller and with a reversed direction - meaning that these competences were overdeveloped in graduates from employers' point of view. Further analysis showed that the probability of being employed significantly decreases with increase of competence mismatch by about 5%. In terms of particular competences, results are significant only for *economics and business theory and practice* and *business communication*. Results for mismatch in all skill/ability-items grouped together indicate a wage penalty of about 3.9% (235 HRK ~ 32 EUR). Shifting the focus to particular competences, results are suggesting greater impact of mismatch in competences of general type – a wage penalty of 1.2% (73 HRK ~ 10 EUR) in case of mismatch increase in *project management and professionalism* competence and 2.0% (120 HRK ~ 17 EUR) in case of *motivation and organization* competence mismatch increase.

Several research questions concerning the identification of key competences and their impact on firm and individual outcomes in Croatia were asked in the first chapter of this dissertation. Key competences identified in economics and business field were: (1) economics-and-business theory and practice; (2) collectedness, presentation and teamwork; (3) IT proficiency; (4) business communication; (5) project management and professionalism; (6) advocacy, language fluency; (7) motivation and organization; and (8) quantitative-economics algebra. These were then divided into competences of practical and general type. For each of these competences two kinds of mismatches were calculated: 1) mismatch between employers' competence requirements and competence development of their current workers; and 2) mismatch between employers' competence requirements and competence development of higher education economics and business graduates. Results from the second essay (Table 3 of Chapter 3) reveal that mismatch between competences required by employers for successful job performance and competences currently developed by their workforce (their existing employees) is higher for general than practical competences (hypothesis H.3.1). This was particularly emphasized for *project management and professionalism* and *motivation and organization* competences. Competence mismatches were then linked to firm performance, approximated by the real value added (Table 5 of Chapter 3). All empirical specifications in both static and dynamic environments were consistent in pointing to mismatch (shortage) in competences *quantitative-economics algebra*; *collectedness, presentation and teamwork*; and *motivation and organization*, to be negatively associated with real added value to the firm (hypothesis H.3.2). The greatest negative association was found for the shortage in *motivation and organization* competence,

emphasizing the crucial role of highly motivated and well organized workforce for the firm competitiveness. The third essay (Chapter 4) explored the other type of proximity – between competences required by employers and those developed by graduates during their studies. This analysis revealed the greatest mismatch (lowest proximity) for general competences *motivation and organization* and *project management and professionalism*, thus corroborating the results from second essay (Chapter 3). These two results combined would suggest that higher educational institutions do not equip graduates with sufficient general competences but also that employers are not able (or are not willing) to fill this gap once such workers are hired. On the other hand, economics-and-business practical competences were overdeveloped from employers' point of view. Through additional analysis, this mismatch was then negatively associated both with graduates' employability (hypothesis H.4.1), particularly for *economics and business theory and practice* and *business communication* competences (Table 100 of Chapter 4), and with graduates' wages (hypothesis H.4.2), particularly *project management and professionalism* and *motivation and organization* competences (Table 11Table 10 of Chapter 4).

There are also certain discrepancies in how employers view the importance of certain competence and how much they reward possession of that competence. Analysis in Chapter 3 revelas that employees are lacking *project management* as well as *motivation and organization* competences as compared to what their employers require. On the other hand, as shown in Chapter 4, although employers reward possession of these two competences in employment decisions, they are only partially rewarded in wage premiums (which is only statistically significant for *motivation and organization* competence). Also, lower gaps in quantitative competences are found to be significant for firm's performance (Chapter 3), but these competences are not rewarded by higher employability and higher wage prospects (Chapter 4). This is potentially worrysome as these competences (unlike, for example, *motivation and organization*) can be easily revealed in pre-employment tests and even easier later during employment and wage determination. This begs the question of whether the employers are aware which competences are really important for their business performance? This question, although highly important is out of scope of this dissertation as is left for future research.

Main contributions of this dissertation to the literature can be examined in both local and regional aspect, as well as in methodological novelties. As already stressed out in the introductory chapter, competence based topics are extremely important for Croatia for several reasons. Firstly, this is certainly an underdeveloped and under-investigated topic for the Croatian labor market, but also in general (Finegold & Notabartolo, 2010; Kucel, Vilalta-Bufi & Robert, 2011). Most of the previous local research was done using macro-level data to determine mismatch and causes of unemployment based on educational outcomes, educational mismatches, and occupational and regional disparities (Babić, Matković & Šošić, 2006; Botrić, 2009; Galić & Plećaš, 2012; Obadić & Oršolić, 2012; Tomić, 2012; Tomić & Domadenik, 2014). Furthermore, this dissertation addresses the importance of

competences for the performance of an enterprise, which is neglected area in the literature mainly due lack of clear methodology and lack of adequate datasets (Kucel, Vilalta-Bufi & Robert, 2011). This dissertation utilizes the concept of competence-based mismatch and thus builds upon other research in labor market related issues both on employers and employees side. Secondly, one part of this dissertation (third essay – Chapter 4) deals with competence-based matching of young graduates, which is very relevant for Croatia due to its high youth unemployment rate (in 2016 almost every one-in-three young person was without employment (Eurostat, 2018)) and high rigidity on labor market (higher costs to labor and wage adjustments) (Eurofound, 2017), further emphasized by the effects of recent economic crisis. Results presented in this dissertation may go along in providing useful insights in designing policies aimed at reducing this problem. Finally, Croatia is currently undergoing thorough educational reform (described in introductory section), "The whole curriculum reform" (MZOS, 2016), where a strong emphasis is placed on the role of competences to ease the transition from education process to labor market challenges. With this in mind, results of this dissertation may enable additional methodological perspectives in defining key competences needed on contemporary labor market as well as further highlight key educational areas where reform is needed the most.

On a more regional note, many other transitional economies also face great challenges in aligning their labor market supply and demand. Several recent studies on the transition from centrally planned economy towards market economy shed important insights on how the labor market imbalance could have developed in CEE or Western Balkan countries (Lamo & Messina, 2010; Kucel, Vilalta-Bufi & Robert, 2011; Bartlett, 2013; Teijeiro, Rungo & Freire, 2013). In this respect, keeping in mind that Croatian economy bears great deal of similarities to other south-eastern European economic due to their common past, results of this dissertation may be applicable on the neighboring labor markets as well, or may inspire neighboring countries to perform similar analysis.

The main methodological contributions of this dissertation are reflected in the following: (1) labor market mismatches are defined from the view-point of competences as opposed to mismatch in educational outcomes or occupational mismatches, which should better mirror the reality since educational or occupational attainment does not automatically guarantee acquisition of all needed competences for successful job performance; (2) instead of defining competences *a priori* (e.g. like in Lokshin, Van Gils & Bauer, 2009), we start with an extensive list of skills and abilities (defined through literature review, pilot study and expert opinion) which were sent for evaluation and then combined into competences, thus eliminating potential employers' bias towards favoring certain type of competence; (3) competence-based mismatch was for the first time included in the production function as time-invariant firm-specific variations; (4) dynamic generalized method of moments panel data production function estimation of Arellano-Bond (Arellano & Bond, 1991; Blundell & Bond, 2000) is adjusted to include competence mismatch and applied to assess their impact

to firm performance for the first time; (5) Mincerian semi-log wage model (Mincer, 1958, 1974) was used to include competence mismatch in the wage estimations.

Results of this dissertation also carry important policy implications for educational institutions, firms and workers. For educational institutions, results indicate that universities and other higher education institutions need to align their curricula to meet the current labor market requirements. Even more so, these results are important for other educational levels - pupils in elementary and secondary schools should also be better equipped with these competences as some of them opt to enter the labor market instead of continuing to higher education. High emphasis placed on general competences, particularly *motivation and organization* and *project management and professionalism*, suggests that traditional curricula, focused on technical development within a narrow discipline-based theoretical framework, may not be able to produce the well-rounded, multi-skilled, flexible and adaptable employees required by modern-day employers. This is especially true for Croatia, as well as other South-European transitioning economies, where the competence mismatch, coupled with rapidly internationalized labor market, continue to dampen country growth prospects and competitiveness (Bejaković, 2014). Hornstein Tomić and Taylor (2018) argue that change in education system is key in reducing aforementioned mismatch between prevailing education and training programs curricula with contemporary labor market needs. Furthermore, our results also support the idea of focusing on a small set of key competences rather than a long list of skill requirements, thus putting a clear focus on learning outcomes and performance measures workers are expected to demonstrate. This allows to appropriately tailor and reinforce desired key competences through education or corporate training. For example, collectedness, presentation and teamwork competence may be developed by designing work tasks or modifying work environment that require higher levels of employee collaboration (e.g. implementing a small work project to demonstrate teamwork and presentation skills). These results also go hand-in-hand with the new reform of the Croatian educational system implemented since 2018, which set out "Knowledge, competences, success and competitiveness" as strategic goals in the transition to a system based on student achievement and learning outcomes rather than content.

In terms of policy implications for firms, the key take-out from this dissertation is the need for better cooperation between firms and educational institutions. Firms are operating in a much more dynamic environment that educational institutions and employers need to be able to clearly express their key requirements in terms of workforce characteristics. Furthermore, firms need to be able to identify which competences are key for their performance and increased competitiveness. It is very important to stress out that these competence requirements need to be forward-looking, i.e. firms need to be able to anticipate their reqirements inot the near future. Finally, firms have to acknowledge that there will always be a certain time discrepancy between their competence requirements and educational curricula. Training in a new competence is usually first given on the job, since firms tend to be the first to be aware of its value, but as demand develops, some of the training shifts to

eudational institutions (e.g. engineering skills were initially acquired on the job, and over time engineering schools have been developed). As for the workers (including graduates), they need to be aware of the competences currently sought after by employers and make their best effort to acquire them. Families are also expected to be forward-looking in directing their children towards those fields that would utilize their children's potential and make them competitive on labor market. In practice this would mean selecting the appropriate educational choices, both of formal and informal type.

This dissertation is not without limitations. First of all, one needs to bear in mind that this dissertation focuses only on competence-based related issues, which is just one of the many issues currently associated with the Croatian labor market. Secondly, this dissertation is focused on economics and business graduates and job position requiring economics and business background, so it would be unwise to generalize these findings to positions that require other educational background. Even though competences labelled as general may be transferable to positions held by employees with different background, their importance may be somewhat different. Nevertheless, these general competences were shown to be statistically significant for both firm performance and for graduates' wages and we expect similar results for other professions as well. Next, this dissertation utilized datasets obtained through questionnaires with rather low number of respondents. This is especially true for the firms, where methodology required that only owners (CEOs) or heads of HR department fill questionnaires, which significantly reduced the probability of high response rate. Nevertheless, this was needed due to the nature of the research. Although on-line questionnaires show a wide range of advantages (cost savings, ease of editing and analysis, and potentially quicker response time with wider magnitude of coverage), some disadvantages exist, such as sample demographic limitations, lower levels of confidentiality, layout and presentation issues of a computer questionnaire, missing additional orientation/instructions, potential technical problems with hardware and software, and the probability of discontinuation halfway through the questionnaire. Fourthly, this analysis was carried in 2016, when Croatian economy rebounded from the negative effects that started with financial crisis back in late 2008, and labor market was still crippled with one of the highest unemployment rates (especially youth unemployment) in the whole EU. However, as described in the introductory chapter, Croatian labor market is still characterized as very rigid (high costs to labor and wage adjustments) so the labor force competence portfolio should remain relatively stable as it has been during the crisis. Finally, this dissertation did not respond to how these competences are acquired in the first place and which factors influence development degree of each competence, which is a valid topic for future research. Hence, in order to reduce competence-based mismatch in the Croatian labor market as well as to be able to make boulder policy recommendations, the research of these topics needs to continue further, both domestically and in the remainder of south-eastern European region. Hopefully, the research conducted in this dissertation will give a tailwind for future projects and investigations, by both the academic community and policy-makers.

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APPENDICES

Appendix 1: Summary in Slovenian language / Daljši povzetek disertacije v slovenskem jeziku

Doktorska disertacija se ukvarja z vlogo, ki jo imajo ključne kompetence pri premoščanju vrzeli med povpraševanjem in ponudbo na hrvaškem trgu dela. Na znanju temelječe gospodarstvo in četrta industrijska revolucija – ključni značilnosti ekonomije 21. stoletja – sta prinesli postopen napredek na področju znanosti in tehnologije ter sta posledično prisilili podjetja, da se zelo hitro odzovejo na nove izzive in priložnosti. Medtem ko potekajoči procesi avtomatizacije in digitalizacije veliko obetajo glede prihodnje blaginje in ustvarjanja delovnih mest, številni med njimi predstavljajo velike izzive, zahtevajoč proaktivno prilagajanje, še zlasti pri upravljanju človeških virov. Avtomatizirajo se enostavni in monotoni procesi, drugi procesi pa postajajo bolj zapleteni in prepleteni, kar skrajšuje uporabnost obstoječih kompetenc zaposlenih in povečuje potrebo po njihovi stalni identifikaciji, izboljšavi in ocenjevanju.

Glavni cilj te disertacije sta pregled pristopa na podlagi kompetenc pri upravljanju človeških virov in ocena ujemanja glede nazahtev sodobnega trga dela. Kombinacija metodologije, ki izvira iz ekonomije izobraževanja in proučevanja uspešnosti delovanja podjetij, bi morala omogočiti podrobnejšo preučitev vpliva ključnih kompetenc na uspešnost delovanja posameznika ter podjetja. Široka pojasnitev nekaterih izmed glavnih vidikov hrvaškega trga dela in izobraževalnega sistema prispeva tudi k odkrivanju pomembnih pomanjkljivosti trenutnih institucionalnih struktur ter vodi v predloge potrebnih ukrepov oblikovalcem politik. Vsa ta vprašanja preučujemo v treh različnih delih (esejih); vsak del obravnava posebno raziskovalno temo, vendar so vsi trije deli povezani s svojim glavnim ciljem – raziskavo povezave med kompetencami in rezultati tako na trgu proizvodov kot trgu dela.

PREGLED PRISTOPA NA PODLAGI KOMPETENC V NA ZNANJU TEMELJEČI EKONOMIJI

Prvi esej predstavlja pregled pristopa na podlagi kompetenc v 21. stoletju, tj. v na znanju temelječi ekonomiji, kot ga ponuja najnovejša literatura. Na globalnem trgu, za katerega je značilen napredek na področju znanosti in tehnologije ter visoko prepleteni procesi, so se podjetja prisiljena hitro odzvati na nove izzive in priložnosti. Veliko avtorjev povezuje to spremembo tržnih pogojev s pojavom Industrije 4.0, znanim tudi kot Četrta industrijska revolucija (Kagermann et al., 2013; Saniuk et al., 2014; Hecklau et al., 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Koncept Industrija 4.0 uporabljamo za opis trenda rastoče digitalizacije celotne vrednostne verige in posledično medsebojnega povezovanja ljudi, objektov in sistemov prek izmenjave podatkov v realnem času (Hecklau et al., 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Ta povečana raven medsebojne povezanosti je razširila tudi področje poslovanja, zato se družbe danes soočajo s konkurenco po vsem svetu, medtem ko trgi postajajo vedno bolj nestabilni in

heterogeni zaradi nenehno spreminjajočih se pričakovanj in potreb strank (Grzybowska & Łupicka, 2017).

Medtem ko potekajoči procesi avtomatizacije in digitalizacije veliko obetajo glede prihodnje blaginje in ustvarjanja delovnih mest, številni med njimi predstavljajo velike izzive, zahtevajoč proaktivno prilagajanje, še zlasti pri upravljanju človeških virov. Avtomatizirajo se enostavni in monotoni procesi, drugi procesi pa postajajo bolj zapleteni in prepleteni, kar skrajšuje uporabnost obstoječih kompetenc zaposlenih (Borghans, Green & Mayhew, 2001; Stasz, 2001; Leoni, 2012; Hecklau et al., 2016; World Economic Forum, 2016; Grzybowska & Łupicka, 2017). Poleg tega Svetovni gospodarski forum (2016) navaja, da se bo do 65 % otrok, ki danes vstopajo v šolo, zaposlilo na povsem novih vrstah delovnih mest, ki v tem času niti ne obstajajo, 50 % strokovnega znanja, pridobljenega v prvem letniku štiriletnega tehniškega programa, bo zastarelo do takrat, ko bodo študentje diplomirali, več kot tretjina želenih osnovnih kompetenc večine poklicev pa bo do leta 2020 vsebovala kompetence, ki danes še ne štejejo za ključne.

To so že prepoznale številne organizacije, vlade in podjetja, ki so sprejeli ukrepe za opremljanje svoje delovne sile s sodobnimi kompetencami, ki jih zahteva trg dela. Svetovni gospodarski forum (2016) ocenjuje, da sta približno dve tretjini globalnih multinacionalnih podjetij pripravljeni investirati v prekvalificiranje trenutnih zaposlenih, kar predstavlja del njihovega prihodnjega načrtovanja glede delovne sile. To podpirajo tudi iniciative, kot sta Partnership for 21st Century Skills ali raziskava OECD o kompetencah odraslih (PIAAC), oblikovan z namenom ocenjevanja meta-ravni kompetenc in predlaganja ukrepov za možne izboljšave.

Neujemanje zahtevanih in obstoječih kompetenc na trgu dela lahko resno vpliva tudi na gospodarsko rast, kar v resnici pomeni povečano raven strukturne nezaposlenosti in oviranje prihodnje možnosti rasti BDP-ja (Quintini, 2011). Hanushek in Woessmann (2012) kombinirata rezultate, značilne za posamezno državo iz več mednarodnih preizkusov znanja učencev, kot sta PISA ali TIMSS, da bi dobila eno mero kognitivnih kompetenc za vsako državo in preizkušala vzročno povezavo med to mero in letno stopnjo rasti med leti 1960 in 2000. Njihovi rezultati odkrivajo velik pomen ključnih kompetenc na področju matematike, znanosti in pismenosti, za katere se zdi, da so dolgoročni napovedovalci gospodarske rasti in veliko pomembnejši kot nekatera kvantitativna merila, npr. leta izobraževanja.

Da bi ohranili svoj tržni delež, morajo torej organizacijska struktura in procesi podjetja postati bolj prilagodljivi in imeti zaposlene zzadostnimi splošnimi kompetencami, ki hitro prepoznajo nove tržne priložnosti in prilagodijo svojo ponudbo (Van Dam, 2004; Cox & King, 2006; Lazarova & Taylor, 2009). Ta povečana prilagodljivost se je odrazila v večji razpršenosti delovnih mest brez jasnih mej in v spremembi politike zaposlovanja, ki daje večji poudarek prilagojenosti organizacijski klimi in korporativni kulturi, v nasprotju z zaposlovanjem na vnaprej determiniranadelovna mesta (Lawler, 1994; Sparrow, 1997;

Gunz, Evans & Jalland, 2000). Kot predpogoj učinkovitosti tega procesa je potrebno določiti, katere posamične značilnosti so najpomembnejše za uspešnost organizacije.

Kompetenčni modeli (znani tudi kot kompetenčni pristop) so opisno orodje, ki identificira znanje, spretnosti, sposobnosti in obnašanja, potrebna za učinkovito delovanje v organizaciji (Lucia & Lepsinger, 1999; Felstead & Ashton, 2000; Chung-Herrera, Enz & Lankau, 2003; Hecklau et al., 2016) ter so pomembni tudi za integriranje izobraževanja in usposabljanja s potrebami trga dela, spodbujajoč na ta način mobilnost posameznikov, še zlasti delavcev, ki se soočajo z negotovostjo zaposlitve (Van der Klink & Boon, 2002).

Danes skoraj vsaka organizacija uporablja katero izmed oblik upravljanja človeških virov na podlagi kompetenc, še zlasti tiste, ki imajo ločene oddelke za človeške vire. Enostavnost in konkretnost kompetenc kot skupnega jezika celotne organizacije jih naredi razumljive za vse zaposlene, ne glede na izobrazbeno strukturo, zaradi česar omogočajo zelo konkreten način izražanja organizacijske kulture in vrednosti (Green, 1999). Nadalje ponujajo opis osebe namesto delovnega mesta, medtem ko običajne analize delovnega mesta lahko spregledajo nekatere izmed bistvenih osebnih značilnosti, ki pojasnjujejo velike variacije v delovni izkušnji (Kurz & Bartram, 2002). Poleg tega, da omogočajo ocenjevanje posameznikovih prednosti in pomanjkljivosti, kompetenčni modeli omogočajo ocenjevanje celotnega človeškega potenciala in poudarjajo področja, ki jih je treba nadalje razvijati. Tako postanejo osnova za izobraževanje in usposabljanje ter, združeni s sistemi nagrajevanja, igrajo pomembno vlogo pri usmerjanju in spreminjanju obnašanja zaposlenih. Ne nazadnje, kljub dejstvu, da kompetenco tvori veliko več kot so misel, znanje, spretnost ali sposobnost, se kompetenca sama lahko uči v ugodnem okolju (OECD, 2005) in jo, v primerjavi z večino sposobnosti in talentov, lahko učimo in razvijamo v odrasli dobi (Boyatzis, 2008).

Na negativni strani še vedno obstajata zmeda in nesoglasje glede tega, kaj natančno so kompetence in kako bi jih morali meriti – nedosledna, nemerljiva, diskriminirajoča, preštevilna in nezadostno klasificirana obnašanja pri merjenju kompetenc privedejo do veliko slabih modelov v praksi (Kurz & Bartram, 2002; Finegold & Notabartolo, 2010; Psacharopoulos & Schlotter, 2010; Kucel, Vilalta-Bufi & Robert, 2011). Poleg tega se lahko pri prvem uvajanju pristopa na podlagi kompetenc v organizacijo pojavijo težave, ki izzivajo upor in povečano nihanje tako rezultatov kot tudi delovne sile (Lawler, 1994). To je zlasti izraženo v situacijah z medkulturnim prenosom kompetenc, saj enako obnašanje v različnih državah ne pomeni enake kompetence ali njene pomembnosti (Sparrow, 1997; Dooley at al., 2001).

Ker večina dosedanjih analitičnih metod temelji na obnašanju v kritičnih situacijah, so kompetenčni modeli izpostavljeni nevarnosti, da se prihodnje organizacije oblikujejo na podlagi tistega, kar je delovalo v preteklosti. Uspešen delavec do zdaj torej morda nima kompetenc, pomembnih za prihodnji uspeh, tj. uspešni in neuspešni delavci se do zdaj lahko razlikujejo v nekaterih trenutno nepomembnih značilnostih, ki lahko povečajo njihov pomen v prihodnosti (Wood & Payne, 1998). Z zaposlovanjem delavcev le na podlagi značilnosti

tistih, ki so bili doslej uspešni, organizaciji še toliko bolj grozi nevarnost ustvarjanja njihovih »dvojinikov«, zaradi česar zmanjšuje svojo raznolikost delovne sile in ogroža potencial za ustvarjalnost, inovacijo in različnost v pristopu do obravnavanja težav (Sparrow & Bognanno, 1993). Kompetence so po svoji naravi dinamične, posebej določene kompetence, in se pričakovanja zaposlenih vedno prilagajajo trgu, zlasti v okolju Industrije 4.0, kjer se tempo tehnoloških sprememb vedno povečuje (Owen, 2001; World Economic Forum, 2016).

Ne nazadnje, čeprav se je povečal obseg literature, ki se ukvarja s pristopom na podlagi kompetenc, je zelo malo študij ponudilo konkretne rešitve za premoščanje vrzeli med povpraševanjem in ponudbo kompetenc na trgu dela. Četudi je že možno izmeriti nekatere kazalnike s pomočjo obstoječih podatkov, bo treba storiti še veliko več za izboljšanje vzpostavljenih virov podatkov in ustvarjanje novih, zlasti v okviru longitudinalnega dizajna, ki zagotavlja nadaljnje vpoglede v pomembne dimenzije kompetenc (Psacharopoulos & Schlotter, 2010). Rastoče število analitikov zahteva boljše usmeritve glede merjenje ujemanja. Izobraževanje odraslih oseb, usposabljanje na delovnem mestu in usposabljanje v kontekstu aktivnih politik trga dela za nezaposlene štejejo tudi za pomembne pri preprečevanju zastarelosti kompetenc in posodobitvi kompetenčnih skladov v kontekstu novih, na tehnologiji temelječih zahtev. Predhodne raziskave so pokazale, da izobraževalne institucije ustvarjajo tehniške in posebne kompetence, kar je pogosto v nasprotju z zahtevami delodajalcev, še zlasti, kadar gre za zahteve glede splošnih (generičnih) kompetenc (Marthandan, Jayashree & Yelwa, 2013), poudarjajoč potrebo po ocenjevanju kompetenčnih ravni tako zaposleni kot delodajalcev. Nadalje morajo tradicionalno toge institucije, ki določajo plače, in strogi predpisi (posebej v Evropi) omogočiti večjo prilagodljivost plač in enostavnejše politike, nanašajoče se na delovno silo, da bi rešile neujemanje prek prilagajanja strukture delovne sile.

PREUČEVANJE VLOGE KLJUČNIH KOMPETENC NA USPEŠNOST PODJETJA

Drugi esej je osredotočen na delodajalce in raziskuje učinke ujemanja med njihovimi zahtevami po kompetencah ter kompetencami njihovih zaposlenih na uspešnost podjetja. Vzpon na znanju temelječega gospodarstva je spremljal upad nizko kvalificiranega fizičnega dela in rast intelektualnega dela ter storitvenih poklicev (Author et al., 2003; Finegold & Notabartolo, 2010). V takšnih okoliščinah je vedno večji poudarek na »mehkih« proizvodnih dejavnikih, kot je prava kombinacija kompetenc za delovno mesto (Heckman & Kautz, 2012; Spencer & Spencer, 1993). Sodobni delodajalci iščejo delavce, ne le s svojevrstno kombinacijo akademskih spretnosti in znanja, temveč tudi tiste, ki so sposobni biti proaktivni ter ustvarjalno in samostojno reševati težave (Fallows & Steven, 2000). Zato bo na uspešnost podjetja vplivala ne le, med drugim, količina delavcev, temveč tudi kakovost njihovega dela, npr. v kontekstu kompetenc, ki jih posedujejo. Semeijn et al. (2005) trdi, da te zahteve niso popolnoma vgrajene v modele uspešnosti podjetja in je cilj te raziskave zapolniti to vrzel.

V tem eseju je »kakovost delovne sile« merjena s stopnjo ujemanja med delodajalčevimi zahtevami po kompetencah in kompetencami njegovih zaposleih. Analiza je osredotočena na tista delovna mesta, ki zahtevajo kompetence s poslovnih in ekonomskih področij s trojnim ciljem: (1) identificiranje in kvantificiranje ključnih kompetenc, potrebnih za tista delovna mesta, na katerih so zaposleni delavci ekonomske in poslovne izobrazbe; (2) kvantificiranje ravni razvoja teh kompetenc med trenutno delovno silo; in končno (3) ugotavljanje vpliva (ne)ujemanje kompetenc na uspešnost podjetja. Nabor podatkov je vseboval tako primarne podatke, zbrane prek vprašalnika na reprezentativnem vzorcu hrvaških podjetij (lastniki podjetij /generalni direktorji/ ali vodje oddelkov za človeške vire, ki smo jih prosili za izpolnjevanje), kot tudi sekundarne podatke o finančnem stanju podjetja in značilnostih populacije hrvaških podjetij v obdobju od 2011–2016.

Pred izvedbo empirične analize smo pregledali razlike med spretnostmi, sposobnostmi in kompetencami v literaturi. Sonntag in Schmidt-Rathjens (2004) določata spretnosti kot avtomatizirane komponente nalog, ki jih opravljamo z relativno malo miselnega nadzora in ki vključujejo tako rutinska dela kot tudi kognitivne dejavnosti. Sposobnosti so določene kot različne prirojene spretnosti osebe, potrebne za opravljanje nalog in storitev. Kompetence so določene kot »posamične nagnjenosti k samoorganizaciji, ki vključujejo kognitivne, afektivne, prostovoljne in motivacijske elemente; v bistvu gre za medsebojno vplivanje znanja, zmožnosti in sposobnosti, motiva in afektivnih dispozicij« (Rieckmann, 2012: p. 131). Kompetence so torej presegajoče enostavne spretnosti ali sposobnosti, ki pravzaprav vključujejo oboje. Ta večrazsežnostni pristop določanja kompetenc je sprejet v tem eseju.

V prvem delu analize identificiramo in količinsko določimo osem ključnih kompetenc z uporabo metode faktorske analize. *Motivacija in organizacija*; *upravljanje projektov in profesionalizem*; ter *zbranost, predstavitev in timsko delo* so najpomembnejše kompetence za delodajalce, medtem ko se je *poslovna komunikacija* izkazala za najbolj razvito kompetenco med njihovo obstoječo delovno silo. Čeprav je nekoliko presenetljivo, da določene kompetence, kot so *poslovna komunikacija* ali *ekonomska in poslovna teorija in praksa*, niso ocenjene kot najpomembnejše s strani delodajalcev, predhodne študije potrjujejo, da trg dela na splošno bolj zahteva komunikacijske, oziroma kompetence timskega dela (Green, Ashton & Felstead, 2001; Stasz, 2001). Možna razlaga je lahko v dejstvu, da vedno večja zapletenost nalog zaradi globalne rasti na znanju temelječega gospodarstva zahteva strokovnjake s široko uporabnimi kompetencami, kot sta reševanje težav in sposobnost ustvarjalnega razmišljanja, namesto sposobnosti reprodukcije dejanskega znanja (Saunders & Machell, 2000; Satish et al., 2001). Ta rezultat prinaša tudi nekaj priporočil glede politik. Močan poudarek na generičnih kompetencah kaže, da tradicionalnega izobraževalnega programa, ki se bolj osredotoča na kognitivni in tehniški razvoj znotraj ozkega, na disciplinah temelječega okvirja, ne vidimo nujno kot sposobnega izobraziti zaokrožene, vsestranske in prilagodljive zaposlene, ki jih zahtevajo podjetja.

Za drugi del analize smo izračunali neujemanje dveh kazalnikov neujemanja (pomanjkanje ali vrzeli) kompetenc: 1) neujemanje med maksimalnim razvojem in trenutno ravnijo razvoja

vsake kompetence; ter 2) neujemanje med pomembnostjo vsake kompetence in njenega trenutnega razvoja med delovno silo. Prvi kazalnik smo uporabili v glavni analizi, medtem ko je bil slednji uporabljen pri preverjanju zanesljivosti. Največje neujemanje je bilo ugotovljeno za kompetence *upravljanje projektov in profesionalizem* ter *motivacija in organizacija*, medtem ko je najnižje neujemanje bilo ugotovljeno za kompetence *ekonomska in poslovna teorija in praksa* ter *kvantitativno-ekonomska algebra*.

V zadnjem delu analize smo povezali ta pomanjkanja z uspešnostjo podjetja. Te učinke smo raziskali z uporabo pristopa proizvodne funkcije tako v statičnem kot tudi v dinamičnem okolju s tremi različnimi metodami.

Statična proizvodna funkcija je določena kot

$$y_i = \beta_0 + \beta_1 k_i + \beta_2 l_i + \gamma' \boldsymbol{G_i} + \delta' \boldsymbol{X_i} + u_i \quad (1)$$

kjer *y* predstavlja rezultat – realna dodana vrednost podjetja, *l* je število zaposlenih, *k* je realna vrednost kapitala (merjena z opredmetenimi osnovnimi sredstvi), $\boldsymbol{G}$ je matrika neujemanj v vsaki od osem ključnih kompetenc in $\boldsymbol{X}$ je matrika drugih značilnosti podjetja: lastništvo, regija in panoga. Regresija OLS je bila naša začetna metoda, ki je dala prve rezultate.

Da bi opravičili pristranskost podjetij, ki so se odločila izpolniti naš vprašalnik, smo preverili prve rezultate z uporabo Heckmanovega izbirnega modela, ocenjenega na celotni populaciji podjetij v letu 2016. Heckmanov model je sestavljen iz dveh enačb: 1) »enačbe uspešnosti«, ki je podana z enačbo 1; in 2) »enačbe izbire«, s katero ocenjujemo možnost izbire v vzorec, tj. možnost, da podjetja izpolnijo naš vprašalnik. Enačba izbire je naslednja

$$\begin{aligned} select_{it} = \beta_0 + \beta_1 lnry\_sector_{it-1} + \beta_2 lnrw_{it-1} + \beta_3 exporter_{it-1} \\ + \beta_4 lnrstliab_{it-1} + \delta' \boldsymbol{X_i} + \epsilon_{it} \end{aligned} \quad (2)$$

kjer *izberi* predstavlja navidezno spremenljivko izbire v »obdelavo«, tj. podjetja, ki so izpolnila vprašalnik, *lnry_sector* je realni skupni prihodek po NACE Rev. 2 za 2-mestne panoge (približek za povpraševanje po proizvodih te panoge), *lnrw* je realni skupni strošek dela, *izvoznik* je navidezna spremenljivka za izvozna podjetja, *lnrstliab* so realne kratkoročne obveznosti podjetja in $\boldsymbol{X}$ je matrika drugih značilnosti podjetja, ki vključujejo: lastništvo, regijo in industrijski sektor. Vse neodvisne spremenljivke vstopajo v to enačbo z zaostankom enega obdobja, saj domnevamo, do bo pripravljenost podjetij za udeležbo v anketi odvisna od finančnih rezultatov iz predhodnega leta. V ozadju tega je domneva, da bodo podjetja, ki so končala predhodno fiskalno leto z dobro bilanco stanja in brez nobenih neporavnanih obveznosti, bolj pripravljena sodelovati v anketi.

Ne nazadnje smo opustili predpostavko o eksogenosti vseh neodvisnih spremenljivk in model testirali z Arellano-Bondovo dinamično oceno posplošene metode momentov (angl. GMM), podane v naslednji enačbi

$$y_{it} = \beta_0 + \beta_1 y_{it-1} + \beta_2 k_{it} + \beta_3 k_{it-1} + \beta_3 l_{it} + \beta_3 l_{it-1} + \gamma' \boldsymbol{G_i} + \delta' \boldsymbol{X_i} + u_{it} \qquad (3)$$

z enakimi neodvisnimi spremenljivkami kot v enačbi 1 ter dodatnovključili odloženo vrednost odvisne spremenljivke.

Vse tri empirične specifikacije so dosledno pokazale, da ima neujemanje (pomanjkanje) kompetenc *kvantitativno-ekonomska algebra*; *zbranost, predstavljanje in timsko delo* ter *motivacija in organizacije* statistični pomen pri pojasnjevanju variacij v uspešnosti podjetja. Ugotovili smo največji vpliv pomanjkanja kompetenc *motivacije in organizacije*, kar kaže na to, da ima visoko motivirana in dobro organizirana delovna sila ključno vlogo pri uspešnosti podjetja. Pomanjkanje drugih kompetenc ni pokazalo pomenljive povezanosti z uspešnostjo podjetja.

Ta raziskava prispeva k literaturi na tri načine. Najprej obravnavamo pomembnost kompetenc za uspešnost podjetja, kar je slabo raziskano področje. Kucel et al. (2011) trdi, da so študije o spretnostih ali neujemanju kompetenc redke, saj so majhno število obstoječih študij izvedli svetovalci, ki niso imeli dovolj potrpljenja za pridobitev obsežnih naborov podatkov. Finegold in Notabartolo (2010) na drugi strani trdita, da je glavni razlog maloštevilnosti teh študij pomanjkanje dobre in jasne metodologije, še zlasti, kadar gre za običajno merjenje kompetenc. Nadalje namesto vnaprejšne opredelitve kompetenc (e.g. Lokshin et al., 2009), začnemo s obsežnim seznamom spretnosti in sposobnosti (opredeljenim na podlagi pregleda literature, ampak potrjenega in izboljšanega z uporabo pilotne študije ter strokovnega mnenja), ki so bile poslane na ocenjevanje in potem združene v kompetence. Na ta način anketiranci niso vedeli, katere bodo spretnosti in sposobnosti kasneje razvrščene v katere kompetence, s čimer smo odstranili njihovo nagnjenost k dajanju prednosti določenim vrstam kompetenc. Ne nazadnje je naša študija osredotočena na Hrvaško, ki je zaradi svojega visoko togega trga dela (Eurofound, 2017; European Commission, 2018) popolno laboratorijsko okolje za preučevanje kompetenčnih tem. Visoka togost trga dela, združena z zelo nizko stopnjo usposabljanja na delovnem mestu v vrednosti okoli 25 % (Eurofound, 2017), implicira relativno časovno neodvisne kompetence delovne sile, kar ustreza naši metodologiji raziskave njihove povezanosti z uspešnostjo podjetja.

Ta raziskava ima vseeno svoje omejitve. Najbolj očitna je precej nizko število anketirancev na strani podjetij, saj smo izrecno zahtevali, da lahko le lastniki (generalni direktorji) ali vodje oddelkov za človeške vire izpolnijo predmetne vprašalnike, kar je pomenljivo zmanjšalo verjetnost visoke stopnje odziva. Kljub temu je bilo to potrebno zaradi narave raziskave. Čeprav imajo spletni vprašalniki širok razpon prednosti (prihranek stroškov, enostavnost urejanja in analize ter možno krajši čas odziva s širšo razsežnostjo kritja), obstaja tudi nekaj pomanjkljivosti, kot so omejitve demografskega vzorca, nižja stopnja zaupnosti, težave z razporeditvijo in predstavitvijo elektronskega vprašalnika, pomanjkanje dodatne orientacije/navodil, možne tehnične težave s programsko in strojno opremo ter prenehanje izpolnjevanja pred koncem vprašalnika. Ne nazadnje so ti rezultati značilni za

delovna mesta, ki zahtevajo gospodarsko in poslovno ozadje in jih ne bi smeli generalizirati drugje. Vendar dve od treh ključnih kompetenc, ki so se izkazale za statistično pomenljive za uspešnost podjetja, sodijo v generično vrsto – *zbranost, prestavljanje in timsko delo* ter *motivacija in organizacija* – kar nekoliko pojasni, kaj je lahko najpomembnejše za katero koli delovno mesto.

KLJUČNE KOMPETENCE DIPLOMANTOV EKONOMSKIH IN POSLOVNIH VED: EMPIRIČNA ŠTUDIJA USPEŠNOSTI NA TRGU DELA IN UJEMANJE Z ZAHTEVAMI DELODAJALCEV

Zadnji esej je osredotočen na delodajalce in diplomante ter analizo učinka (ne)ujemanja med kompetencami, ki jih imajo diplomanti, in tistimi, ki jih zahtevajo delodajalci. Sodobni delodajalci zvišajo zahteve po novih ali posodobljenih kvalifikacijah in intenzivnosti uporabe novih tehnologij, kar povzroča instrumentalne spremembe na trgu dela. Zaradi krajše življenjske dobe izdelkov in vedno hitrejšega tempa tehnoloških sprememb so številna podjetja postala tržno usmerjena in se hitreje prilagajajo potrebam novih potrošnikov (Yang, You & Chen, 2005). Za ta namen delodajalci veliko vlagajo v človeški kapital delavcev, da bi obvladali kompetence, ki jih potrebujejo v globalizacijski areni. Vendar delodajalci, glede na to, da se stroški razvoja človeškega kapitala višajo, pričakujejo, da izobraževalne institucije proizvajajo delavce (diplomante) za zaposlitev s potrebnimi kompetencami, ki jih zahteva trg, brez dodatnega usposabljanja s strani industrije (Husain et al., 2010). Zaradi tega se daje vse več poudarka »mehkim« dejavnikom proizvodnje (Heckman & Kautz, 2012; Spencer & Spencer, 1993) in v določeni meri ujemanju potrebnih kompetenc v okviru povpraševanja delodajalcev in ponudbe delavcev. Vsako neujemanje kompetenc lahko povzroči negativne gospodarske posledice na ravni posameznika, podjetja in na makroekonomski ravni. Pokazalo se je, da to neujemanje na posamični ravni zmanjšuje tako zadovoljstvo na delovnem mestu kot tudi plače (Allen & Van der Velden, 2001; Green & McIntosh, 2007; Mavromaras, McGuinness & Fok, 2009). Na ravni podjetja zmanjšuje produktivnost in rast prihodka ter zvišuje stroške prilagoditve na delovnem mestu (Kampelmann & Rycx, 2012; Tsang, 1987). Ne nazadnje na makroekonomski ravni povzroča zvišano stopnjo strukturalne nezaposlenosti in lahko ovira možnosti za rast BPD-ja (Marsden et al., 2002; Skott & Auerback, 2005; Budría & Egido, 2008; Olitsky, 2008; Slonimczyk, 2009; Quintini, 2011). Poleg tega Svetovni gospodarski forum (2016) poroča, da je 38 % delodajalcev poročalo o težavah pri zapolnjevanju delovnih mest v letu 2015 z delavci, ki imajo ustrezno kombinacijo zahtevanih kompetenc.

Predhodno omenjeno vprašanje nezaposlenosti je ena izmed najvztrajnejših težav hrvaškega gospodarstva, okrepljena s posledicami krize s konca leta 2008 (Galić & Plećaš, 2012). Za hrvaški trg dela je značilna velika togost z izjemno nizko mobilnostjo delavcev – tako poklicno kot tudi zemljepisno (Eurofound, 2017; European Commission, 2018). Obadić (2005) trdi, da je povečano strukturalno neravnovesje na hrvaškem trgu dela povzročeno s

spremembami v strukturi proizvodnega trga 90-ih letih prejšnjega stoletja, ko je Hrvaška prekinila vezi z nekdanjim socialističnim sistemom, kar je privedlo do sprememb v povpraševanju po delu, ki ga pa niso spremljale spremembe v ponudbi dela. To neravnovesje vključuje situacijo, v kateri se značilnosti nezaposlenih delavcev, zlasti glede spretnosti, delovnih izkušenj ali lokacije, razlikujejo od tistih, ki jih zahtevajo razpoložljiva delovna mesta.

Tudi z izobraževalnim sistemom ni nič boljše. Stopnja terciarnega izobraževanja (v starosti 30–34 let) je v primerjavi s povprečjem EU (39,9 %) na Hrvaškem nižja (28,7 %), enako kot je v primerjavi s povprečjem EU (95,3 %) pomenljivo nižja udeležba v predšolski vzgoji in varstvu (75,1 %). Najbolj skrb vzbujajoče pa je dejstvo, da je le 62,6 % novih diplomantov terciarnega izobraževanja našlo zaposlitev v enem do treh let po končanem študiju v primerjavi s povprečjem EU, ki znaša 80,2 %. Čeprav to situacijo lahko pripišemo nedavni gospodarski krizi in nizki gospodarski rasti, so številni kazalniki pokazali, da diplomatom primanjkujejo ključne spretnosti za zaposlovanje, ki jih zahtevajo potencialni delodajalci, kot so tehniške spretnosti, tuji jeziki, upravljanje in spretnosti reševanja težav (Lowther, 2004). To neujemanje med spretnostmi in kompetencami, pridobljenimi na visokošolskih institucijah, in potrebami sodobnih delodajalcev s hitro internacionaliziranim trgom dela nadaljuje slabšanje možnosti za rast in konkurenčnost (Bejaković, 2014).

Cilj tega eseja je bil analizirati neujemanje na trgu dela v kontekstu kompetenc, ki jih diplomanti na eni strani pridobijo in delodajalci na drugi strani potrebujejo. Natančneje, raziskovali smo vpliv tega neujemanja na možnost zaposlitve in plače zaposlenih. Subjekti analize so bili diplomanti ekonomskih in poslovnih ved ter splošni vzorec hrvaških podjetij. Diplomante smo izbrali, da bi ugotovili, kako dobro visokošolske institucije na Hrvaškem pripravljajo svoje študente za prihodnje izzive na trgu dela, analizirano področje preučevanja pa smo omejili na ekonomske in poslovne študije, ker lahko ti diplomanti najdejo zaposlitev v skoraj vsakem podjetju, ne glede na panogo. Analizo smo izvedli z združitvijo dveh naborov podatkov – enega za podjetja in enega za diplomante, ki smo jih zbrali s pomočjo vprašalnika. Oba vprašalnika sta vsebovala enak seznam spretnosti in sposobnosti, poslan v ocenjevanje, skupaj z vprašanji, ki so obsegala druge socialno-ekonomske značilnosti anketirancev. Te spretnosti in sposobnosti so bile nato z uporabo faktorske analize združene v kompetence in razdeljene v dve ločeni skupini: generične in posebne kompetence.

Pridobljeni rezultati kažejo na obstoj neujemanja med kompetencami, ki jih zahtevajo delodajalci, in tistimi, ki jih pridobijo diplomanti med svojim študijem. To je predvsem poudarjeno pri generičnem naboru kompetenc, ki so bile pri diplomantih vse nezadostno razvite glede na zahteve delodajalcev, zlasti pa *motivacija in organizacija* ter *upravljanje projektov in profesionalizem*. Razlike pri kompetenci *ekonomska in poslovna teorija in praksa*, čeprav pomenljive, so bile nekoliko manjše in z obrnjeno smerjo – kar pomeni, da so bile te kompetence z stališča delodajalcev preveč razvite. S temi odstopanji kot izhodiščno točko smo analizirali vpliv neujemanja kompetenc (vrzeli) na možnost zaposlitve in raven plače.

Vpliv neujemanja kompetenc na zaposljivost diplomantov smo raziskali z uporabo modela Probit z binarno spremenljivko izida (status zaposlenega ali nezaposlenega) in naborom ostalih spremenljivk, pri čemer je spremenljivka, ki nas zanima, neujemanje (vrzel) med pridobljenim in zahtevanim naborom kompetenc. Nizko neujemanje kompetenc kaže, da zaposleni razpolagajo s pravo kombinacijo in ravnijo razvoja kompetenc, ki jih zahteva njihovo delovno mesto, delodajalci pa jih vidijo kot bolj produktivne, s čimer se povečuje možnost zagotavljanja zaposlitve. Model Probit opredeljujemo kot:

$$P_r(E_i = 1|X) = \Phi([\boldsymbol{GX}]'\beta) \quad (4)$$

kjer E_i navidezna spremenljivka predstavlja status diplomanta na trgu dela in (zaposlen ali nezaposlen) G je matrika neujemanj kompetenc (vrzeli), X je matrika drugih socialno-ekonomskih značilnosti diplomantov (osebne informacije in informacije o izobraževanju ter gospodinjstvu), Φ je standardna normalna kumulativna porazdelitvena funkcija in je β vektor parametrov, ki jih je treba oceniti.

Na drugi strani smo vpliv neujemanja kompetenc na plače diplomantov empirično raziskali z uporabo Mincerjevega modela z logaritemsko spremenljivko višine mesečne plače in naborom ostalih spremenljivk, pri čemer je spremenljivka, ki nas zanima, neujemanje (vrzel) med pridobljenim in zahtevanim naborom kompetenc. Kot predhodno, nizko neujemanje kompetenc kaže na to, da zaposleni razpolagajo s pravo kombinacijo in ravnijo razvoja kompetenc, ki jih zahteva njihovo delovno mesto, delodajalci pa jih vidijo kot bolj produktivne, zaradi česar povečujejo njihovo renumeracijo, tj. plače. Mincerjev model plač je opredeljen kot:

$$lnW_i = \beta_0 + \beta_1 SCH_i + \sum_{c=1}^{C} \gamma_c G_{ic} + \sum_{k=1}^{K} \delta_k X_{ik} + \varepsilon_i \quad (5)$$

kjer W_i predstavlja (ln) mesečno plačo posameznika i, SCH predstavlja stopnjo izobrazbe v letih izobraževanja, kjer je G_{ci} mera neujemanja med zakladom kompetenc, ki jih zahtevajo podjetja in so jih pridobili diplomanti za c^{th} kompetence, X_{ki} je vrednost i^{th} posameznika za k^{th} pojasnjevalno spremenljivko in ε_i je napaka modela, za katerega domnevamo, da spremlja normalno porazdelitev s povprečjem nič in konstantno varianco. X so druge spremenljivke, vključene v ta model, razen izobraževanja in neujemanja kompetenc, zajemajo pa: osebne informacije (starost, spol, regijo, vrsto naselja, zakonski stan, bližino do visokošolske institucije), informacije o gospodinjstvu (število članov gospodinjstva, skupni prihodek gospodinjstva, število avtomobilov, ki jih poseduje gospodinjstvo), informacije o izobraževanju, razen let izobraževanja (izobraževanje v tujini, povprečje ocen ob diplomi, študentski status, lastniška oblika visokošolske institucije in ali je študent delal med študijem) in informacije o trgu dela (skupna delovna izkušnja, delodajalčeva lastniška oblika, velikost delodajalca, položaj zaposlenih v podjetju in skupno trajanje usposabljanja, ki ga je pridobil na delovnem mestu). Pričakujemo, da bodo diplomanti z nižjim neujemanjem kompetenc (tj. tisti, ki najbolj ustrezajo zahtevam delovnega mesta) nagrajeni z višjo plačo in bolj produktivni.

Pridobljeni rezultati potrjujejo, da se možnost zaposlitve pomenljivo zmanjšuje s prisotnostjo neujemanja kompetenc za približno 5 % v celoti. Kadar gre za posamične kompetence, so rezultati pomenljivi samo za *ekonomsko in poslovno teorijo in prakso* ter *poslovno komunikacijo*. Rezultati neujemanja pri vseh postavkah spretnosti/sposobnosti skupaj kažejo na manjše plače za približno 3,9 %. Ker je povprečna plača v našem vzorcu 6.040 HRK, to zmanjšanje plače znaša 235 HRK (~32 EUR). S preusmeritvijo pozornosti na posamične vrste kompetenc rezultati kažejo večji vpliv neujemanja pri kompetencah generične vrste – zmanjšanje plače za 1,2 % (73 HRK~10 EUR) v primeru kompetenc *upravljanje projektov in profesionalizem* ter 2,0 % (120 HRK~17 EUR) v primeru kompetence *motivacija in organizacija*.

Ti rezultati so pomembno za oblikovalce ekonomskih politik in kažejo, da morajo visokošolske institucije uskladiti svoje študijske programe, da bi izpolnili trenutne zahteve trga dela. Največje neujemanje kompetenc je bilo ugotovljeno za kompetence generične vrste, kot so *motivacija in organizacija* ali *upravljanje projektov in profesionalizem*, kar kaže na to, da je nujna reforma določenih delov študijskih programov. Ta priporočila so pomembna tudi za učence v osnovnih in srednjih šolah, ker se nekateri izmed njih odločajo za vstop na trg dela namesto za nadaljevanje izobraževanja.

Predstavljena analiza je osredotočena na diplomante ekonomskih in poslovnih ved, zato teh ugotovitev ne smemo posploševati za delovna mesta, ki zahtevajo drugo izobrazbo. Četudi se kompetence, ki smo jih označili kot generične, lahko prenašajo na položaje, ki jih zavzemajo zaposleni z različno izobrazbo, je lahko pomen le-teh povsem drugačen. Poleg tega je ta analiza izvedena v času okrevanja hrvaškega gospodarstva od negativnih posledic, ki so se začele s finančno krizo konec leta 2008. Druga možna omejitev je lahko metoda zbiranja podatkov z uporabo spletne ankete. Čeprav spletne ankete ponujajo občutne prihranke stroškov, večje možnosti urejanja in analize, širši obseg kritja in hitrejši čas odziva, se prav tako lahko pojavijo težave z reprezentativnostjo vzorcain nižjo raven zaupnosti. Ne nazadnje ta raziskava ni ponudila odgovorov na to, kako so sploh pridobljene te kompetence in kateri dejavniki vplivajo na stopnjo razvoja vsake od kompetenc, kar je dobra tema za prihodnje raziskave.

Appendix 2: Appendix to Chapter 2.

Table 15: Brief description of recent studies exploring competence effects

Reference	Industry / group covered	Data source	Respondents (response rate)	Data acquisition method	Data analysis method	Initial list of skills/abilities (competences defined)	Key competences identified
Studies concentrating on employers only							
Ahn, Pearce & Kwon (2012)	Construction	Author(s) own survey	148 (67.3%)	Postal survey	Factor analysis	14 (4)	General, Affective, Cognitive, Technical
Bai & Chang (2015)	Manufacturing	Author(s) own survey	295 (36.8%)	Face-to-face interviews	Factor analysis, OLS		
Gerli, Gubitta & Tognazzo (2011)	Multiple industries	Master for SME Survey	97	Postal survey	Factor analysis, OLS	80 (4)	Entrepreneurial, Managing, Organizational, Reasoning
Gokkaya & Ozbag (2015)	Multiple industries	Author(s) own survey	138 (52%)	E-mail, face-to-face, postal	PLS SEM	12 (3)	Uniqueness, customer value, extendibility
Hazlina Ahmad, Ramayah, Wilson & Kummerow (2010)	Multiple industries	Author(s) own survey	212		Factor analysis, SEM	7 (7)	Strategic, Conceptual, Opportunity, Relationship, Learning, Personal, Ethical, Familyism
Zehrer & Mossenlechner (2009)	Tourism industry	Author(s) own survey	48 (33.1%)	E-mail interviews	Descriptive statistics	34 (4)	Professional and methodological, Social and communicative, Personal, Activity and action-oriented
Biesma, Pavlova, van Merode & Groot (2007)	Public health	EU Leonardo survey	1040	Postal survey	Conjoint analysis	5 (5)	Communication, Teamwork, Problem solving and creativity, Flexibility, Public health specific knowledge

Biesma et al. (2008)	Public health	EU Leonardo survey	548 (40%)	Postal survey	Factor analysis	34 (7)	Public health specific, Teamwork and communication, Professionalism, Advocacy, negotiation and conflict management, Project management, Deal and respond to changes, Collegiality and reflection
Chung-Herrera, Enz & Lankau (2003)	Lodging industry	Author(s) own survey	137 (18.6%)	E-mail questionnaire	Factor analysis	99 (8)	Self-management, Strategic positioning, Implementation, Critical thinking, Communication, Interpersonal, Leadership, Industry knowledge
Cowan, Wilson-Barnett, Norman & Murrells (2008)	Nursing industry	ETHAN project	588 (40%)	Postal survey	Factor analysis	108 (8)	Assessment, Care deliver, Communication, Health promotion, Personal and professional development, Professional and ethical practice, Research and development, Teamwork
Husain, Mokhtar, Ahmad & Mustapha (2010)	Multiple industries	Author(s) own survey	180 (36%)	Postal survey	Descriptive statistics		SCANS model: Basic skills, Thinking skills, Resource skills, Information skills, Interpersonal skills, System and Technology skills, Personal skills
Hodges & Burchell (2003)	Multiple industries	Author(s) own survey	154 (17.2%)	Postal survey	Descriptive statistics	25 (25)	
Acar (1993)	Casting and machinery manufacturing	Author(s) own survey	96 firms	Postal survey	OLS	3 (3)	Production, Marketing, Management
Wang, Lo & Yan (2004)	High-tech industry	Author(s) own survey	248	Face-to-face questionnaire	PLS SEM	25 (3)	Marketing, Technological, Integrative
Lokshin, Van Gils & Bauer (2009)	Multiple industries	Author(s) own survey	27	E-mail, face-to-face questionnaire	Factor analysis, OLS	16 (3)	Customer, Technological, Organizational
Dreyfus (2008)	R&D managers	Author(s) own survey	35	Face-to-face questionnaire	Descriptive statistics	9 (2)	Managing groups, Interpersonal sensitivity
Jamshidi, Rasli & Yusof (2012)	HR managers	Author(s) own survey	75	Delphi rounds	Descriptive statistics	11 (11)	Empowering and delegating, Team working, Impact and influence, Communication and sociability, Leadership, Building trust, HR proficient knowledge, Strategic thinking, Self-awareness, Change management, Conflict management
Studies concentrating on employers and experts							

Pan & Perera (2012)	Accountants	Author(s) own survey	132 (26.1%)	Postal survey, Focus groups	Descriptive statistics		Accounting ethics, Adaptability, Applying accounting techniques, Applying computer technology, Attributes sharing, Communication, Community involvement, Concerns for sustainability, Critical thinking, Emotional intelligence, Information gathering evaluation, Leadership, Problem solving, Problem setting/identification, Teamwork, Time management, Stress management and life balance
Rieckman (2012)	Multiple industries	Author(s) own survey	70	Delphi rounds	Factor analysis	19 (12)	Systemic thinking and handling of complexity, Anticipatory thinking, Critical thinking, Acting fairly and ecologically, Cooperation in (heterogeneous) groups, Participation, Empathy and change of perspective, Interdisciplinary work, Communication and use of media, Planning and realizing innovative projects, Evaluation, Ambiguity and frustration tolerance
Grzybowska & Łupicka (2017)	Automotive and pharmaceutical industry	Author(s) own survey	20	Postal survey	Descriptive statistics	8	Creativity, Entrepreneurial thinking, Problem solving, Conflict solving, Decision making, Analytical skills, Research skills, Efficiency orientation
Studies concentrating on workers/graduates only							
Yusof, Mustapha, Mohamad & Bunian (2012)	Engineering students	Author(s) own survey	280	Face-to-face survey	Factor analysis	49 (9)	Critical and problem solving, Lifelong learning and information management, Communication, Teamwork, Technology utilizing, Entrepreneurship, Leadership, Ethic and moral, Social
Leoni (2012)	Multiple industries	ISFOL survey	3605	Telephone survey	Factor analysis, OLS, IV	44 (4)	Problem solving, Relation with clients, Relation with collaborators, Teamwork
McGowan & Andrews (2017)	Multiple industries	PIAAC, ORBIS		International survey	OLS	2 (2)	Literacy, numeracy
Rehman, Majid & Baker (1997)	Academic librarians	Author(s) own survey	60	Face-to-face questionnaire	Descriptive statistics	6 (6)	Foundation, Cataloguing, circulation, information services, collection development, serials
Mahmood (2003)	Academic librarians	Author(s) own survey	70	Postal survey	Descriptive statistics	75 (6)	Management, Resource development, Technical service, Reference and information services, Information technology, general

Kusumastuti (2014)	Disaster managers	Author(s) own survey	21	Postal survey	Cluster analysis	14 (3)	Relationship management, Achievement orientation and execution, Self-management
Spendlove (2007)	Multiple disciplines	Author(s) own survey	10	Face-to-face questionnaire	Descriptive statistics	24 (3)	Credibility/reputation/respect, Experience, People skills/Human aspect
Marthandan, Jayashree & Yelwa (2013)	Multiple disciplines	Author(s) own survey	239	Postal survey	Descriptive statistics	18 (9)	Knowledge, Practical skills, Social skills and responsibilities, Values and professionalism, Communication and teamwork, Problem solving and scientific, Information management and life-long learning, Managerial and entrepreneurial, Leadership
Van Loo & Toolsema (2005)	Vocational education	Author(s) own survey	1702	Postal survey	OLS	15 (5)	Problem solving, Independence, Oral presentation/speaking, Accuracy/carefulness, Initiative/creativity
García-Aracil & Van der Velden (2008)	Multiple disciplines	CHEERS survey	36000	Postal survey	Factor analysis, OLS, Ordered probit	32 (6)	Organizational, Specialized, Methodological, General, Participative, Socio-emotional
Kelly, O'Connell & Smyth (2010)	Multiple disciplines	Author(s) own survey	1470	Postal survey	OLS	5 (5)	Communication, Technical, Teamwork, Leadership, Work under pressure
Mora, García-Aracil & Vila (2007)	Multiple disciplines	CHEERS survey	24414	Postal survey	Factor analysis, OLS, Probit	32 (6)	Organizational, Specialized, Methodological, General, Participative, Socio-emotional
Wilton, 2008	Business and management graduates	Class of 99 survey	1060	Postal survey	Descriptive statistics	10 (10)	Problem-solving, Written communication, Spoken communication, Foreign language, Numeracy, Basic computer literacy, Advanced IT or software, Research, Creativity, Ability to work in teams
Heijke, Meng & Ramaekers (2003)	Multiple disciplines	EU TSER survey	734	Postal survey	Clusters, OLS, Logit	36 (3)	Field-specific, Management, General academic
Delia Davila Quintana, Mora Ruiz & Vila (2014)	Multiple disciplines	REFLEX survey	4500	Postal survey	Facotr analysis, SEM	39 (5)	Higher education practice, Competencies for leadership, Competencies for leadership acquired in HE, Tasks-oriented leadership, Change-oriented leadership

Studies concentrating on employers and workers/graduates							
Azevedo, Apfelthaler & Hurst (2012)	Multiple industries	MISLEM project	900	Postal survey	Factor analysis	49 (8)	Influencing and Persuading; Teamwork and Relationship Building; Critical and Analytical Thinking; Self and Time Management; Leadership; the Ability to see the bigger picture; Presentation; and Communication
Chiru, Ciuchete, Lefter & Paduretu (2012)	Agriculture, tourism	Author(s) own survey	44	Face-to-face interviews	Descriptive statistics	24 (24)	
Leoni (2011)	Multiple industries	ISFOL survey	2009	Postal survey	OLS, Probit, IV	5 (4)	Disciplinary knowledge, Cognitive, Managerial, Relational
Nicolescu & Paun (2009)	Multiple industries	Author(s) own survey	955	E-mail questionnaire	Descriptive statistics	12 (12)	Theoretical scientific knowledge, Adaptability, Ability to work independently, Communication skills, Team-working abilities, Ability to solve the problems, Learning ability, Self-esteem, Perseverance, Power to concentrate, Capacity to make decisions, Loyalty and integrity
Davies, Csete & Poon (1999)	Construction	Author(s) own survey	297	Postal survey	Descriptive statistics	17 (17)	
Van der Heijde & Van der Heijden (2006)	Construction	Author(s) own survey	314	Face-to-face questionnaire	Factor analysis, SEM	47 (5)	Occupational expertise, Anticipation and optimization, Personal flexibility, Corporate sense, Balance

Source: Author's own work.

Appendix 3: Appendix to Chapter 3.

Table 16: Reviewed literature on competences and firm performance

Reference	**Sample**	**Estimation method**	**Results**
Heijke, Meng & Ramaekers (2003)	734 Italian graduates	Hierarchical clustering, OLS wage regression	Discipline-specific competences carry a premium for those graduates working inside discipline-specific domain. Management competences are also associated with a positive premium. General competences, do not pay off directly, but have a significant role when learning other competences.
Bartel, Freeman, Ichniowski & Kleiner (2003)	3684 bank workers and 196 bank branches	ANOVA model, Panel data fixed effects model	Branches with less favorable attitudes have higher turnover, lower levels of sales, and lower rates of sales growth and are more prone to branch closing. Furthermore, newly hired workers adopt the favorable or unfavorable attitudes that the branches exhibited before they arrived.
Forth and Mason (2006)	Survey and financial data for 345 UK firms in 1999	IV regression, Panel data fixed effects model	Positive correlation that ICT skill shortages have an indirect negative impact on firm performance. However, there is only weak evidence of skill shortages impinging directly on performance at given levels of ICT adoption and utilization.
Acar (1993)	96 firms in Ankara metropolitan area	OLS regression	Positive association was found between firm performance and production competences, which allowed firm to manufacture a broad range of products, build a reputation in the industry, and reduce operating costs.
Radzi, Nor & Ali (2017)	199 Malaysian businesses	Partial least squares	Only entrepreneurial competences and technology usage are related to successes of small businesses.
Wang, Lo & Yan (2004)	248 firms in China	Partial least squares	Positive impact of marketing competences, technological competences and integrative competences on firm performance.
Lokshin, Van Gils & Bauer (2009)	27 fast-moving consumer goods German companies	Factor analysis and OLS regression	Results suggest that firms that craft organizational competences (e.g. improving team cohesiveness and providing slack time to foster creativity) do not directly improve their innovative performance. However, those firms that successfully combine customer, technological and organizational competencies will create more innovations that are new to the market.

Stevens (2007)	595 UK manufacturing firms between 1984-1994	GMM estimation	Results suggest that shortages of skilled labor have positive effect on firms' adjustment costs leading to more sluggish employment decisions. Furthermore, these effects of skill shortages are even greater in periods when firms expect sales to rise.
Shury et al. (2010)	National Employer Skills Survey of more than 79,000 UK employers	Descriptive statistics	The proportion of employers with any staff experiencing skills gaps has risen to 19% in 2009, with these gaps being more common in "lower level" occupations (only 6% of managers and professionals have skill gaps). The most common impacts of skill gaps are increased workload for other staff, increased operating costs. About 20% of employers have lost their business or were forced to delay development of new product or service.

Source: Author's own work.

Table 17: Distribution of firms by counties (NUTS3) and NACE Rev. 2 1-digit sectors

NACE Rev. 2 - 1 digit sector / county (NUTS3)	Zagreb	Krapina-Zagorje	Sisak-Moslavina	Varaždin	Koprivnica-Krizevci	Bjelovar-Bilogora	Primorje-Gorski Kotar	Virovitica-Podravina	Pozega-Slavonia	Brod-Posavina	Zadar	Osijek-Baranja	Vukovar-Srijem	Split-Dalmatia	Istria	Dubrovnik-Neretva	Međimurje	City of Zagreb	**TOTAL**
A								1											**1**
B																		1	**1**
C	5	2		2	2	3	1	1		2	1	2	1	3	4		5	3	**37**
D																		1	**1**
E	1					1	2				1	1	1			1	1		**9**
F		2		1	1									1	1			1	**7**
G	1					1	2							1	1			5	**11**
H											1							1	**2**
I							3							1					**4**
J						1	1		1	1		1		1				3	**9**
K																		1	**1**
L							1												**1**
M					2		1			1	1				1	1		10	**17**
N	1														1			2	**4**
O												1							**1**
P							1		1				1						**3**
Q							1												**1**
S			1														1		**2**
TOTAL	**8**	**4**	**1**	**3**	**5**	**6**	**13**	**2**	**2**	**4**	**4**	**5**	**3**	**7**	**8**	**2**	**7**	**28**	**112**

Source: Author's own work.

Table 18: Importance and current development of skills/abilities

	Skill/ability	Importance Mean (S. d.)	Development Mean (S. d.)
General skills/abilities	Motivate oneself to do work	4.6 (0.6)	3.8 (0.9)
	Organizing and planning	4.6 (0.6)	3.7 (0.9)
	Work towards common goals	4.6 (0.6)	3.8 (0.9)
	Sharing knowledge and experience	4.5 (0.7)	3.8 (1.0)
	Awareness of your actions onto others	4.4 (0.8)	3.6 (1.1)
	Proactive and effective communication	4.3 (0.8)	3.5 (1.0)
	Generating new ideas	4.2 (0.9)	3.4 (1.1)
	Emotional self-control	4.1 (0.7)	3.6 (0.9)
	Applying theory into practice	4.2 (0.9)	3.6 (0.9)
	Long life learning	4.4 (0.8)	3.6 (1.1)
	Adapting to various cultures and religions	3.6 (1.2)	3.7 (1.0)
	Preservation of environment	3.6 (1.1)	3.3 (1.1)
	Negotiation / intermediation towards solution	4.2 (1.0)	3.4 (0.9)
	Effective conflict management	4.2 (0.9)	3.4 (1.0)
	Representing client's interests	4.1 (0.9)	3.7 (0.9)
	Presenting work	4.1 (0.9)	3.6 (1.0)
	Presenting your firm	4.3 (0.9)	3.7 (1.0)
	Work in team	4.6 (0.6)	3.9 (0.9)
	Delegating tasks in team	4.1 (0.8)	3.5 (0.9)
	Motivate other team members	4.2 (0.8)	3.4 (1.0)
	Preparation of projects	4.1 (0.9)	3.4 (1.1)
	Implementing projects	4.4 (0.8)	3.5 (1.0)
	Adaptability to new work conditions	4.5 (0.7)	3.7 (1.0)
	Work under pressure	3.7 (1.1)	3.3 (1.0)
	Persuasion	3.6 (1.0)	3.3 (1.0)
	Active listening	4.2 (0.9)	3.5 (1.0)
	Taking responsibility	4.6 (0.7)	3.4 (1.1)
	Making decisions	4.3 (0.8)	3.4 (1.0)
	Independent work	4.6 (0.6)	3.8 (1.0)
	Taking on different roles	4.1 (0.9)	3.5 (1.0)
Practical skills/abilities	Basic knowledge of theoretical economics	3.4 (1.2)	3.1 (1.2)
	Basic knowledge of accounting	3.6 (1.2)	3.3 (1.2)
	Basic knowledge of finance	3.6 (1.1)	3.3 (1.3)
	Basic knowledge of management	3.5 (1.1)	3.0 (1.2)
	Basic knowledge of marketing	3.4 (1.1)	2.9 (1.2)
	Basic knowledge of Croatian language	4.0 (1.1)	3.6 (1.1)
	Basic knowledge of English language	3.9 (1.0)	3.4 (1.2)
	Basic knowledge of another foreign language	3.2 (1.2)	2.7 (1.2)
	Writing business letters	3.9 (1.1)	3.5 (1.2)
	Writing financial reports	3.6 (1.3)	3.2 (1.3)

Interpreting tables and graphs	3.6 (1.1)	3.3 (1.2)
Calculating prices, costs and budgets	3.9 (1.1)	3.4 (1.2)
Using fractions, decimals and percentages	3.7 (1.2)	3.4 (1.2)
Making tables and graphs	3.6 (1.1)	3.3 (1.2)
Using simple algebra	3.6 (1.2)	3.4 (1.2)
Using advanced math and stats	3.2 (1.2)	2.6 (1.2)
Using calculator	4.1 (1.1)	4.1 (1.0)
Using Internet	4.6 (0.7)	4.4 (1.0)
Using e-mail	4.6 (0.7)	4.4 (1.0)
Money transactions via Internet	3.7 (1.3)	3.8 (1.4)
Work with text files	4.4 (0.9)	4.0 (1.1)
Work with tables	4.3 (0.9)	3.8 (1.2)
Work with presentations	3.8 (1.1)	3.3 (1.3)
Work with databases	3.2 (1.3)	2.6 (1.3)
Work with advanced math and stats programs	2.8 (1.3)	2.3 (1.2)
Programming and writing codes	2.3 (1.3)	2.0 (1.2)
Participation in on-line discussions	2.5 (1.3)	2.4 (1.3)
On-line learning	3.2 (1.3)	2.9 (1.3)

Source: Author's own work.

Table 19: Exploratory factor analysis results

Factors / Key competences	Competence-items (skills/abilities)	F1	F2	F3	F4	F5	F6	F7	F8
Economics and business theory and practice	Basic knowledge of theoretical economics	0.71							
	Basic knowledge of accounting	0.88							
	Basic knowledge of finance	0.86							
	Basic knowledge of management	0.65							
	Basic knowledge of marketing	0.46							
	Writing financial reports	0.76							
	Interpreting tables and graphs	0.53							
	Calculating prices, costs and budgets	0.56							
	Making tables and graphs	0.47							
	Money transactions via Internet	0.70							
Collectedness, presentation and teamwork	Emotional self-control		0.49						
	Preservation of environment		0.58						
	Negotiation / intermediation towards solution		0.69						
	Effective conflict management		0.73						
	Representing client's interests		0.56						
	Presenting work		0.59						
	Presenting your firm		0.63						
	Work in team		0.46						
	Delegating tasks in team		0.53						
	Motivate other team members		0.60						
IT proficiency	Using advanced math and stats			0.54					
	Work with presentations			0.58					
	Work with databases			0.75					
	Work with advanced math and stats programs			0.79					

	Programming and writing codes	0.81				
	Participation in on-line discussions	0.77				
	On-line learning	0.59				
Business communication	Basic knowledge of English language		0.47			
	Writing business letters		0.46			
	Using Internet		0.84			
	Using e-mail		0.83			
	Work with text files		0.80			
	Work with tables		0.70			
Project management and professionalism	Preparation of projects			0.58		
	Implementing projects			0.59		
	Adaptability to new work conditions			0.58		
	Taking responsibility			0.61		
	Making decisions			0.59		
	Independent work			0.56		
Advocacy, language fluency	Awareness of your actions onto others				0.46	
	Proactive and effective communication				0.60	
	Work under pressure				0.57	
	Basic knowledge of Croatian language				0.46	
	Basic knowledge of another foreign language				0.47	
Motivation and organization	Motivate oneself to do work					0.48
	Organizing and planning					0.60
	Work towards common goals					0.67
Quantitative-economics algebra	Using fractions, decimals and percentages					0.57
	Using simple algebra					0.59

Note: Using orthogonal rotation. Factor loadings lower than 0.45 were dropped.

Source: Author's own work

Table 20: Variables used in analysis

Variable name	Description
Firm financial variables	
lnrw	(ln) real costs of personnel
lnrw_avg	(ln) real average costs of personnel
lnl	(ln) number of employees
lnrk	(ln) real capital (real tangible fixed assets)
lnrint	(ln) real intermediate costs (real material cost and real energy costs)
lnrx	(ln) real revenue from exporting goods and services
lnrturn	(ln) real turnover
lnrva	(ln) real value added (defined using the following formula: valued added = business revenue + other revenue + change in inventories – revenue from interests – revenue from dividends – raw materials and consumables – other expenses)
lnry_sector	(ln) real total revenue of NACE Rev. 2 1-digit sector firm belongs to (proxy for demand)
lnrstliab	(ln) real current liabilities
lnrstliab_emp	(ln) real current liabilities towards employees
lnrstliab_emp	(ln) real current liabilities towards state
lnrltliab	(ln) real non-current liabilities
Other firm characteristics	
region	Region of the firm: 1 – Zagreb, 2 – Western Croatia, 3 – Eastern Croatia, 4 –Central Croatia, 5 – Southern Croatia
ownership	Ownership of the firm: 1 – state, 2 – private, 3 – mixed
size	Size of the firm: 1 – micro, 2 – small, 3 – medium, 4 – large
exporter	1 – if percentage of revenue from export is greater than zero, 0 - otherwise
sector	Sector of the firm: 1 – Agriculture, forestry, fishing, 2 – Mining, quarrying, 3 – Manufacturing, Construction, 4 – Services
Competence mismatch variables	
$g_1 - g_8$	Competence mismatch (gap) in each of eight key competences (in s. d. units)

Source: Author's own work.

Table 21: Results of Heckman selection model Selection equation

	Static	Dynamic
Dependent variable: response to questionnaire (dummy)		
Lagged (ln) real total revenue of sector	-0.123***	-0.123***
	(0.026)	(0.026)
Lagged (ln) real total labour cost	0.053**	0.053**
	(0.022)	(0.022)
Lagged exporter dummy	0.153**	0.153**
	(0.077)	(0.077)
laggeg health indicator	-0.026	-0.026
	(0.134)	(0.134)
Lagged (ln) real current liabilities	0.057**	0.057**
	(0.028)	(0.028)
Size of the firm (micro firms benchmark)		
Small	0.388***	0.388***
	(0.101)	(0.101)
Medium	0.447***	0.447***
	(0.161)	(0.161)
Large	0.538**	0.538**
	(0.238)	(0.238)
Sector (manufacturing benchmark)		
Services	-0.141*	-0.141*
	(0.073)	(0.073)
Constant	-1.358**	-1.358**
	(0.691)	(0.691)
N	69.053	69.053

Note: Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Source: Author's own work.

Appendix 4: Appendix to Chapter 4.

Table 22: Distribution of firms by counties (NUTS3) and NACE Rev. 2 1-digit sectors

NACE Rev. 2 - 1 digit sector / county (NUTS3)	Zagreb	Krapina-Zagorje	Sisak-Moslavina	Varaždin	Koprivnica-Krizevci	Bjelovar-Bilogora	Primorje-Gorski Kotar	Virovitica-Podravina	Pozega-Slavonia	Brod-Posavina	Zadar	Osijek-Baranja	Vukovar-Srijem	Split-Dalmatia	Istria	Dubrovnik-Neretva	Međimurje	City of Zagreb	**TOTAL**
A								1											**1**
B																		1	**1**
C	5	2		2	2	3	1	1		2	1	2	1	3	4		5	3	**37**
D																		1	**1**
E	1					1	2				1	1	1			1	1		**9**
F		2		1	1									1	1			1	**7**
G	1					1	2							1	1			5	**11**
H											1							1	**2**
I							3							1					**4**
J						1	1		1	1		1		1				3	**9**
K																		1	**1**
L							1												**1**
M					2		1			1	1				1	1		10	**17**
N	1														1			2	**4**
O												1							**1**
P							1		1				1						**3**
Q							1												**1**
S			1														1		**2**
TOTAL	**8**	**4**	**1**	**3**	**5**	**6**	**13**	**2**	**2**	**4**	**4**	**5**	**3**	**7**	**8**	**2**	**7**	**28**	**112**

Source: Author's own work.

Table 23: Description of variables collected from graduates

Variable	Description
Personal information	
age	age of respondent
sex	sex of respondent
region	region of the firm: 1-Central Croatia, 2-North-western Croatia, 3-East Croatia, 4-North Adriatic and Lika, 5-Central and South Adriatic
urban	dummy for urban settlement
he_inst	dummy for HE institution in respondent's settlement
married	dummy for being married
Household information	
hh	number of people living in same household
hh_y	household total income
car	cars owned by household
educ_dad	father's highest education level: 1-Basic elementary education, 2-High school education, 3-University education
educ_mom	mother's highest education level: 1-Basic elementary education, 2-High school education, 3-University education
Education information	
educ_years	total years of education
educ_foreign	abroad education dummy
educ_highest_gpa	GPA of highest level of education
ft_student	dummy for full time students
priv_educ	dummy for private ownership institution where highest education level was obtained
educ_work	dummy for working during highest education level
Labour market information	
emp_d	employment dummy
work_exp	total work experience
emp_own_priv	dummy for private ownership of employer
emp_l	size of employer based on number of workers: 1-Micro, 2-Small, 3-Medium, 4-Large
position	position of respondent within a company: 1-Owner, 2-Manager, 3-Worker
training	training in last year dummy
wage	income of respondent

Note: All monetary values are expressed in Croatian kuna, HRK (1 EUR = 7.529 HRK, 2016 average). Information about definitions of regions are available on request.

Source: Author's own work.

Table 24: Skill and ability items required by firms and acquired by graduates

	Required by firms		Acquired by graduates	
Skills and abilities	**Mean (S. d.)**	**Rank**	**Mean (S. d.)**	**Rank**
Personal skills and abilities				
Motivate oneself to do work	4.6 (0.6)	2	3.6 (1.4)	43
Organizing and planning	4.6 (0.6)	4	3.7 (1.3)	32
Work towards common goals	4.6 (0.6)	8	3.6 (1.2)	45
Sharing knowledge and experience	4.6 (0.7)	8	3.7 (1.2)	31
Awareness of your actions onto others	4.4 (0.8)	14	3.7 (1.1)	33
Proactive and effective communication	4.4 (0.8)	14	3.9 (1.1)	17
Generating new ideas	4.2 (0.9)	24	3.7 (1.2)	38
Emotional self-control	4.1 (0.8)	26	3.5 (1.3)	49
Applying theory into practice	4.2 (0.9)	21	3.8 (1.2)	28
Long life learning	4.4 (0.8)	13	3.8 (1.3)	24
Citizen and cultural skills and abilities				
Adapting to various cultures and religions	3.6 (1.2)	48	3.6 (1.2)	44
Preservation of environment	3.7 (1.1)	40	3.1 (1.4)	55
Negotiation and problem solving skills				
Negotiation / intermediation towards solution	4.2 (1.0)	22	3.6 (1.2)	42
Effective conflict management	4.2 (0.9)	23	3.8 (1.1)	21
Presentation skills and abilities				
Representing client's interests	4.1 (0.9)	26	3.8 (1.1)	23
Presenting work	4.1 (0.9)	25	3.8 (1.2)	18
Presenting your firm	4.3 (0.9)	17	3.7 (1.2)	34
Teamwork and project skills and abilities				
Work in team	4.6 (0.6)	2	3.8 (1.1)	25
Delegating tasks in team	4.1 (0.8)	26	3.7 (1.1)	29
Motivate other team members	4.2 (0.8)	20	3.7 (1.2)	30
Preparation of projects	4.1 (1.0)	29	3.6 (1.3)	41
Implementing projects	4.4 (0.8)	11	3.6 (1.3)	46
Adaptability skills and abilities				
Adaptability to new work conditions	4.5 (0.7)	10	3.8 (1.2)	19
Work under pressure	3.7 (1.1)	37	3.7 (1.1)	39
Persuasion	3.6 (1.0)	41	3.7 (1.2)	35
Active listening	4.3 (0.9)	19	3.4 (1.2)	51
Professionalism skills and abilities				
Taking responsibility	4.6 (0.7)	5	3.7 (1.1)	36
Making decisions	4.3 (0.8)	18	3.6 (1.2)	47
Independent work	4.6 (0.6)	7	3.5 (1.2)	48
Taking on different roles	4.1 (0.9)	30	3.8 (1.1)	22
Practical skills and abilities				
Basic knowledge of theoretical economics	3.4 (1.2)	51	3.8 (1.1)	27

Basic knowledge of accounting	3.6 (1.2)	47	3.8 (1.0)	26
Basic knowledge of finance	3.6 (1.1)	45	3.9 (1.0)	14
Basic knowledge of management	3.5 (1.1)	49	4.2 (0.9)	8
Basic knowledge of marketing	3.4 (1.1)	50	4.0 (1.0)	12
Basic knowledge of Croatian business language	4.0 (1.1)	32	4.3 (0.8)	5
Basic knowledge of English business language	3.9 (1.0)	34	3.8 (1.1)	20
Basic knowledge of another foreign business language	3.2 (1.2)	53	2.8 (1.4)	57
Writing business letters	3.9 (1.2)	33	4.3 (0.8)	4
Writing financial reports	3.6 (1.3)	45	4.1 (0.8)	10
Interpreting tables and graphs	3.6 (1.1)	41	4.0 (0.9)	13
Calculating prices, costs and budgets	3.9 (1.1)	35	4.0 (1.0)	11
Using fractions, decimals and percentages	3.7 (1.2)	39	4.3 (0.8)	5
Making tables and graphs	3.6 (1.1)	43	4.2 (1.0)	9
Using simple algebra	3.6 (1.2)	43	4.3 (0.9)	3
Using advanced math and statistics	3.2 (1.2)	55	3.2 (1.3)	54
Using calculator	4.1 (1.1)	31	4.4 (0.7)	2
Using Internet	4.6 (0.7)	5	4.5 (0.8)	1
Using e-mail	4.6 (0.7)	1	4.2 (1.1)	7
Money transactions via Internet	3.7 (1.3)	38	3.9 (1.0)	15
Work with text files	4.4 (0.8)	11	3.9 (1.2)	16
Work with tables	4.3 (0.9)	16	3.7 (1.3)	40
Work with presentations	3.8 (1.1)	36	3.3 (1.2)	52
Work with databases	3.2 (1.2)	53	2.7 (1.3)	58
Work with advanced math and statistics programs	2.8 (1.2)	56	3.2 (1.5)	53
Programming and writing codes	2.4 (1.3)	58	3.0 (1.4)	56
Participation in on-line discussions	2.5 (1.3)	57	3.5 (1.3)	50
On-line learning	3.3 (1.3)	52	3.7 (1.3)	36

Source: Author's own work.

Table 25: Exploratory factor analysis results

Factors / Key competences	Competence-items (skills/abilities)	F1	F2	F3	F4	F5	F6	F7	F8
Economics and business theory and practice	Basic knowledge of theoretical economics	0.71							
	Basic knowledge of accounting	0.88							
	Basic knowledge of finance	0.86							
	Basic knowledge of management	0.65							
	Basic knowledge of marketing	0.46							
	Writing financial reports	0.76							
	Interpreting tables and graphs	0.53							
	Calculating prices, costs and budgets	0.56							
	Making tables and graphs	0.47							
	Money transactions via Internet	0.70							
Collectedness, presentation and teamwork	Emotional self-control		0.49						
	Preservation of environment		0.58						
	Negotiation / intermediation towards solution		0.69						
	Effective conflict management		0.73						
	Representing client's interests		0.56						
	Presenting work		0.59						
	Presenting your firm		0.63						
	Work in team		0.46						
	Delegating tasks in team		0.53						
	Motivate other team members		0.60						
IT proficiency	Using advanced math and stats			0.54					
	Work with presentations			0.58					
	Work with databases			0.75					
	Work with advanced math and stats programs			0.79					

	Programming and writing codes	0.81				
	Participation in on-line discussions	0.77				
	On-line learning	0.59				
Business communication	Basic knowledge of English language		0.47			
	Writing business letters		0.46			
	Using Internet		0.84			
	Using e-mail		0.83			
	Work with text files		0.80			
	Work with tables		0.70			
Project management and professionalism	Preparation of projects			0.58		
	Implementing projects			0.59		
	Adaptability to new work conditions			0.58		
	Taking responsibility			0.61		
	Making decisions			0.59		
	Independent work			0.56		
Advocacy, language fluency	Awareness of your actions onto others				0.46	
	Proactive and effective communication				0.60	
	Work under pressure				0.57	
	Basic knowledge of Croatian language				0.46	
	Basic knowledge of another foreign language				0.47	
Motivation and organization	Motivate oneself to do work					0.48
	Organizing and planning					0.60
	Work towards common goals					0.67
Quantitative-economics algebra	Using fractions, decimals and percentages					0.57
	Using simple algebra					0.59

Note: Using orthogonal rotation. Factor loadings lower than 0.45 were dropped.

Source: Author's own work

Table 26: Firm competence importance ranking by industry sector

Key competence requirements		Industry	Services	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	3.6 (1.0)	3.6 (0.8)	0.0
	IT proficiency	3.1 (1.0)	3.0 (1.0)	-0.1
	Business communication	4.2 (0.9)	4.3 (0.5)	0.1
	Quantitative-economics algebra	3.6 (1.1)	3.8 (1.2)	0.2
	Practical competences (total)	3.6 (0.9)	3.7 (0.6)	0.1
General	Collectedness, presentation and teamwork	4.3 (0.6)	4.2 (0.6)	-0.1
	Project management and professionalism	4.4 (0.5)	4.4 (0.5)	0.0
	Advocacy, language fluency	4.0 (0.8)	4.0 (0.7)	0.0
	Motivation and organization	4.6 (0.5)	4.6 (0.4)	0.0
	General competences (total)	4.3 (0.5)	4.3 (0.5)	-0.1

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

Table 27: Firm competence importance ranking by firm size

Key competence requirements		Micro and small firms	Medium and large firms	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	3.6 (1.0)	3.7 (0.9)	0.2
	IT proficiency	3.0 (1.1)	3.2 (0.7)	0.2
	Business communication	4.3 (0.8)	4.3 (0.7)	0.1
	Quantitative-economics algebra	3.7 (1.2)	3.7 (1.0)	0.1
	Practical competences (total)	3.6 (0.8)	3.7 (0.7)	0.1
General	Collectedness, presentation and teamwork	4.2 (0.6)	4.3 (0.6)	0.1
	Project management and professionalism	4.4 (0.5)	4.4 (0.6)	0.0
	Advocacy, language fluency	3.9 (0.8)	4.1 (0.7)	0.2
	Motivation and organization	4.6 (0.4)	4.6 (0.5)	0.0
	General competences (total)	4.3 (0.5)	4.3 (0.5)	0.1

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

Table 28: Firm competence importance ranking by firm ownership

Key competence requirements		Public ownership	Private ownership	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	3.9 (0.8)	3.6 (0.9)	-0.3
	IT proficiency	3.2 (0.7)	3.0 (1.0)	-0.2
	Business communication	4.3 (0.7)	4.3 (0.8)	0.0
	Quantitative-economics algebra	3.7 (1.1)	3.7 (1.1)	0.0
	Practical competences (total)	3.8 (0.7)	3.6 (0.8)	-0.2
General	Collectedness, presentation and teamwork	4.4 (0.5)	4.2 (0.6)	-0.2
	Project management and professionalism	4.5 (0.4)	4.4 (0.6)	-0.1
	Advocacy, language fluency	3.9 (1.0)	4.0 (0.7)	0.1
	Motivation and organization	4.5 (0.4)	4.6 (0.5)	0.1
	General competences (total)	4.3 (0.5)	4.3 (0.5)	0.0

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

Table 29: Firm competence importance ranking by university degree of firm representatives

Key competence requirements		No university degree	University degree	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	3.5 (1.0)	3.7 (0.9)	0.2
	IT proficiency	2.9 (1.1)	3.1 (1.0)	0.2
	Business communication	4.2 (0.8)	4.3 (0.7)	0.1
	Quantitative-economics algebra	3.3 (1.1)	3.6 (1.1)	0.3
	Practical competences (total)	3.5 (0.8)	3.7 (0.8)	0.2
General	Collectedness, presentation and teamwork	4.2 (0.7)	4.3 (0.6)	0.1
	Project management and professionalism	4.5 (0.6)	4.4 (0.5)	-0.1
	Advocacy, language fluency	3.8 (0.7)	4.0 (0.8)	0.2
	Motivation and organization	4.5 (0.4)	4.6 (0.4)	0.1
	General competences (total)	4.2 (0.6)	4.3 (0.5)	0.1

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

Table 30: Graduate competence development by their employment status

Key competence development		Unemployed	Employed	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	3.8 (0.4)	4.1 (0.4)	0.3***
	IT proficiency	2.5 (0.8)	3.6 (0.7)	1.1***
	Business communication	4.1 (0.5)	4.4 (0.5)	0.3*
	Quantitative-economics algebra	3.6 (0.8)	4.3 (0.6)	0.7***
	Practical competences (total)	3.5 (0.4)	4.0 (0.3)	0.5***
General	Collectedness, presentation and teamwork	3.0 (0.6)	4.0 (0.6)	1.0***
	Project management and professionalism	3.0 (0.6)	3.9 (0.7)	0.9***
	Advocacy, language fluency	3.2 (0.6)	3.9 (0.6)	0.7***
	Motivation and organization	2.8 (0.9)	4.1 (0.8)	1.3***
	General competences (total)	3.0 (0.5)	4.0 (0.6)	1.0***

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

Table 31: Graduate competence development by their employers ownership type

Key competence development		Public institutions	Private institutions	Mean difference
		Mean (S. d.)	Mean (S. d.)	
Practical	Economics and business theory and practice	4.1 (0.3)	4.0 (0.4)	-0.1***
	IT proficiency	3.9 (0.6)	3.5 (0.7)	-0.4***
	Business communication	4.0 (0.5)	4.0 (0.5)	0.0
	Quantitative-economics algebra	4.1 (0.7)	4.5 (0.5)	0.4***
	Practical competences (total)	4.0 (0.3)	3.9 (0.3)	-0.1***
General	Collectedness, presentation and teamwork	4.2 (0.4)	4.0 (0.7)	-0.2***
	Project management and professionalism	4.1 (0.5)	3.8 (0.8)	-0.3***
	Advocacy, language fluency	3.9 (0.5)	3.9 (0.6)	0.0
	Motivation and organization	4.2 (0.8)	4.1 (0.8)	-0.1**
	General competences (total)	4.1 (0.4)	3.9 (0.6)	-0.2***

Note: * p<0.10, ** p<0.05, *** p<0.01.

Source: Author's own work.

Table 32: Results of 1st stage of 2SLS estimation procedure for Employability model and Mincerian wage model

	Employability mismatch_all (1)	Wages mismatch_all (2)
Instruments		
Father education (benchmark primary)		
Secondary education	-0.840***	-0.523***
	(0.314)	(0.156)
Tertiary education	-0.499	-0.373**
	(0.334)	(0.164)
Mother education (benchmark primary)		
Secondary education	-0.928***	-0.170*
	(0.234)	(0.100)
Tertiary education	-0.886***	-0.269**
	(0.250)	(0.104)
Personal characteristics	**Yes**	**Yes**
Household characteristics	**Yes**	**Yes**
Education characteristics	**Yes**	**Yes**
Labor market characteristics	**Yes**	**Yes**
N	1009	648
R^2	0.698	0.588
Adjusted R^2	0.655	0.565

Source: Author's own work.

Table 33: Descriptive statistics of distance and proximity measures

Key competence	Distance	PROX1 ($\rho = 1$)	PROX2 ($\rho = 2$)	PROX3 ($\rho = 3$)
Economics and business theory and practice	3.37	0.19	0.32	0.46
IT proficiency	1.70	0.55	0.71	0.82
Business communication	2.15	0.35	0.72	0.79
Quantitative-economics algebra	3.37	0.18	0.32	0.46
Collectedness, presentation and teamwork	1.46	0.56	0.81	0.97
Project management and professionalism	2.99	0.27	0.42	0.59
Advocacy, language fluency	1.54	0.52	0.80	0.97
Motivation and organization	3.33	0.31	0.42	0.52

Source: Author's own work.

Table 34: Results of augmented Mincerian wage model by different ownership of employers

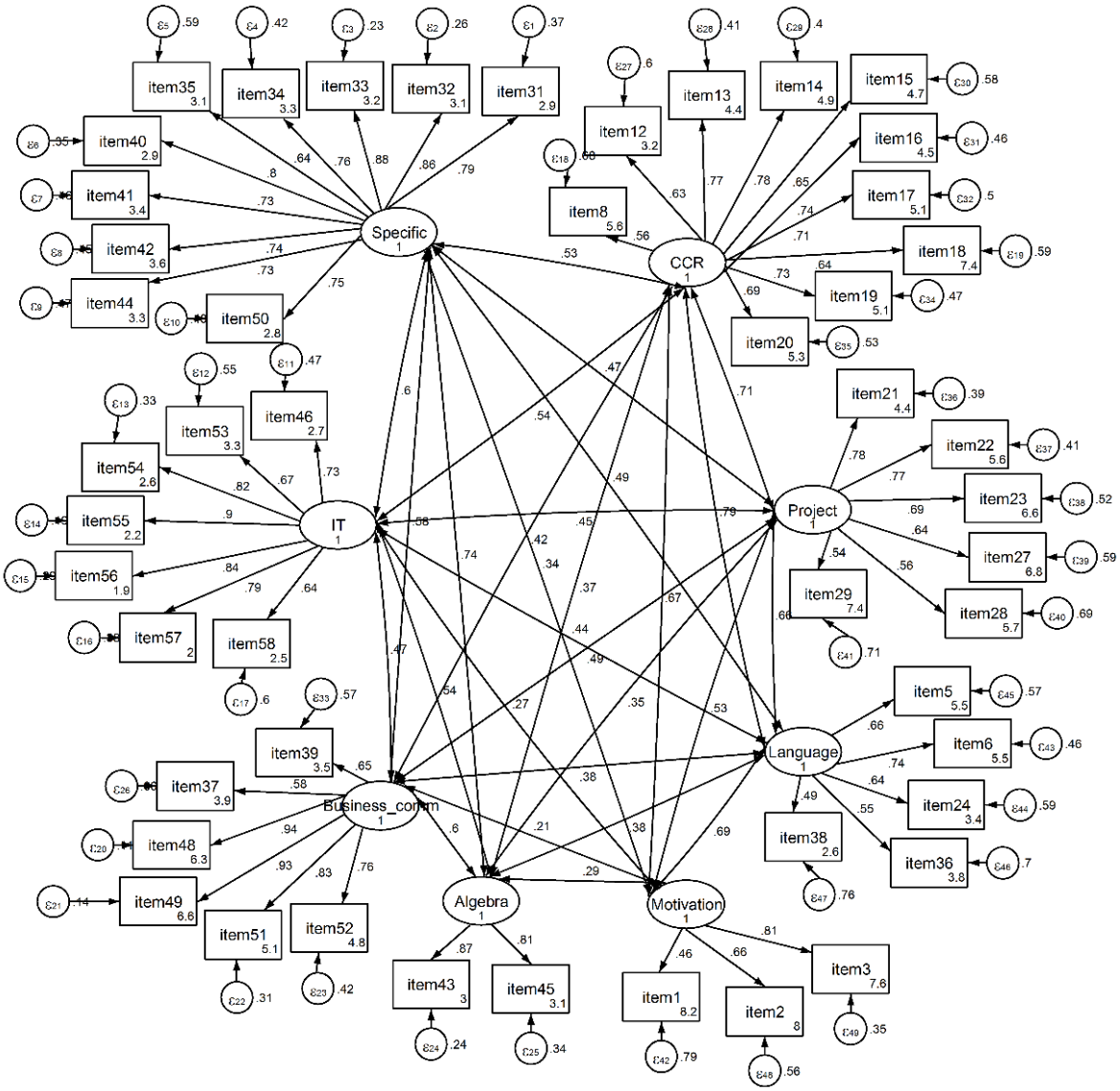
		Graduates employed in public sector			Graduates employed in private sector		
		OLS	2SLS (2nd stage)	Heckman	OLS	2SLS (2nd stage)	Heckman
		(1)	(2)	(3)	(4)	(5)	(6)
Mismatch in all skill/ability items		-0.008[a]	-0.190	-0.007 [a]	-0.050*** [a]	-0.204***	-0.053** [a]
		(0.012)	(0.129)	(0.046)	(0.010)	(0.056)	(0.021)
Mismatch in **practical** competences	Economics and business theory and practice	-0.002		-0.007	-0.019***		-0.022*
		(0.006)		(0.014)	(0.006)		(0.013)
	IT proficiency	-0.010*		-0.005	-0.014**		-0.024
		(0.006)		(0.012)	(0.006)		(0.015)
	Business communication	-0.007		-0.005	-0.005		-0.001
		(0.005)		(0.009)	(0.005)		(0.011)
	Quantitative-economics algebra	-0.001		-0.002	-0.004		-0.008
		(0.006)		(0.011)	(0.005)		(0.010)
Mismatch in **general** competences	Collectedness, presentation and teamwork	-0.023*		-0.014	-0.026***		-0.020
		(0.013)		(0.026)	(0.010)		(0.020)
	Project management and professionalism	-0.002		-0.001	-0.013*		-0.011
		(0.007)		(0.013)	(0.007)		(0.014)
	Advocacy, language fluency	-0.003		-0.002	-0.007		-0.010
		(0.007)		(0.013)	(0.006)		(0.013)
	Motivation and organization	-0.004		-0.007	-0.028***		-0.046*
		(0.010)		(0.019)	(0.008)		(0.023)
Lambda (Inverse Mill's Ratio)				0.105			-0.176
				(0.099)			(0.166)
Personal characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Household characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Education characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Labor market characteristics		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
N		214	214	214	434	434	434

R^2	0.932	0.801		0.898	0.824	
Adjusted R^2	0.917	0.788		0.883	0.796	
Sargan score		4.235			6.186	
Kleibergen-Paap rk LM statistic		11.526			14.592	
Kleibergen-Paap rk Wald statistic		12.725			16.684	
Kleibergen-Paap rk Wald F statistic		3.637			3.827	
Hansen J statistic		4.834			4.952	
ρ			1.000			1.000
σ			0.105			-0.176

Note: (***), (**) and (*) denote 1%, 5% and 10% level of significance, respectfully. Standard errors in parentheses. [a] These models were run without competences as covariates, but are presented in the same column to preserve space.

Source: Author's own work.

Figure 1: Confirmatory factor analysis results



Source: Author's own work.