SSE Riga Student Research Papers

2011: 7 (136)

SKILLS MISMATCH IN LATVIAN MANUFACTURING SECTOR

Authors: Ilze Zumente and Kārlis Putriņš

ISSN 1691-4643

ISBN 978-9984-842-28-8

November 2011

Riga

Skills Mismatch in Latvian Manufacturing Sector

Ilze Zumente

and

Kārlis Putriņš

Supervisor: Oļegs Tkačevs

May 2011

Riga

SSE Riga Student Research Papers 2011: 7 (136)

Skills Mismatch in Latvian manufacturing sector

Ilze Zumente and Kārlis Putriņš

Abstract

Following the economic downturn starting in 2008, the unemployment rate in Latvian labor market has reached unexpected and hazardous peaks. Although theoretically all the workplaces should be taken, the number of vacancies continues to grow. An explanation of the phenomenon is skills mismatch, which refers to a situation when the skills demanded by employers differ from the skills supplied by employees. This research aims at determining the skills that deviate from the labor market equilibrium in Latvian manufacturing sector. By using surveys distributed to 201 employees working in 30 manufacturing companies operating in Latvia and methodology developed by Allen and van der Velden, it is found that only 24% of the workers in the manufacturing sector have adequate skill sets for their jobs. Such skills as responsibility, technical knowledge and problem solving abilities are underprovided, while Russian language skills and time planning are overprovided by the manufacturing workers. OLS regression suggests that skills mismatch results in wage penalty. Having wrong skills decreases wage rate by 17 %, skill shortage - by 21% and skill surplus - by 25% as compared to matching skills. Current strategies employed by Latvian Government should lessen the skills mismatch, if the required funding is found and reforms implemented.

Keywords*:* Skills mismatch, wage penalty, manufacturing sector

Acknowledgments

Authors express their dearest gratitude to the bachelor thesis supervisor Oļegs Tkačevs as well as Zane Cunska for suggestions during the thesis writing process. Authors also would like to thank their families for the support and opposition team for suggestions in order to improve the thesis.

Table of Contents

Introduction 6
Literature Review 9
Causes of the skills mismatch 9
Educational mismatch 10
Skills mismatch impact on wages 11
Skills mismatch in the manufacturing sector 12
Methodology 14
Questionnaire 14
Regression analysis 16
Strategy evaluation 17
Results 18
Data 18
Skills mismatch type 19
Specific skill dispersion 24
Regression analysis 27
Latvian Government strategies 29
Concept 30
Europe 2020 32
Evaluation 33
Conclusion 35
Works Cited ..... **Error! Bookmark not defined.**
Appendices 41
Appendix 1 Employees questionnaire 41
Appendix 2 Employers questionnaire 43
Appendix 3 Lower level occupations in manufacturing sector 44
Appendix 4 Sample distribution 45
Appendix 5 Sample normality testing 46
Appendix 6 Regression results 47
Appendix 7 Descriptive statistics 48
Appendix 8 Variable description 49
Appendix 9 T-tests for skills mean difference testing 51

Introduction

The unemployment rate at the end of 2010 reached 16.7%. More than 193 thousand citizens found themselves without a job. At the mean time, the number of vacancies continued to increase reaching one of the highest levels registered during the last 18 months (CSB Latvia, 2011). Although theoretically the number of vacancies and unemployment rate should be negatively correlated, in the current situation the trend has been inversed, suggesting that the workers seeking jobs do not match the skill profile demanded by employers. The phenomenon is known as skills mismatch. As argued by the Bank of Latvia "the persistence of skills mismatch risk in the labor market, if unresolved, could turn into serious problem for future growth of the Latvian economy" (Bank of Latvia, 2010).

A growing body in the existing academic literature argues that skills mismatch may be one of the most important factors determining the high rates of unemployment especially in the times of economic downturn. Narayana Kocherlakota, the president of the Federal Reserve Bank of Minneapolis has argued that "most" of America's unemployment can be explained by skills mismatch (Kocherlakota, 2010). The view is supported by various academics like Hamm (2000), and institutions as European Center for the development of Vocational training (CEDEFOP, 2009) (Hamm, 2000). Furthermore the issue is currently being discussed not only in countries experiencing decline in growth rates- also Poland, which was the only EU country that experienced growth during the financial crisis, sees skills mismatch as the possible threat to the future growth (Bloomberg, 2011)

CEDEFOP, which has specialized in studying the skills mismatch problem, has differentiated between various types of skills mismatches. In general skills mismatch refers to a situation when employees skill set does not correspond to the skills needed in order to complete the job he is doing (Lundberg, 2007). Additionally, various specific forms of mismatch are identified including ones like overeducation, undereducation, overskilling, underskilling etc. More general way to think about the phenomenon of skills mismatch is in the vertical or horizontal type- the vertical mismatch referring to the situation when the level of skills or education is less or more than required, however, horizontal mismatch occurring when level of skills and education matches job requirements yet type of skills or education is inappropriate for the current position (CEDEFOP, 2010). Skills match is present only when the level of skills and

education matches job requirements. Problem of skills mismatch is found widespread and affecting large share of Europeans. In 2008 the Center estimated that only 21% of workers in Europe hold jobs that fully fit their education, training and skills (CEDEFOP, 2010).

Due to work specifics, not all labor market sectors are affected by the problem equally. A sector where skills mismatch displays significant problems is manufacturing. Because of the nature of manufacturing sector, namely frequent introduction of new technologies and work practices, people constantly have to update their skills to keep up to the rising standards (Gros, 2010). As for the moment manufacturing sector is employing approximately 17 % of the Latvian workforce, which points to the importance of the industry (CSB Latvia, 2011). Furthermore, for a small and open economy as is the case of Latvia the manufacturing sector is essential due to its share of exports. According to the Bank of Latvia Macroeconomic Development Report 2010 the manufacturing sector "has become the key driver of the economic recovery" by rising more than 8 % in year 2010 (Bank of Latvia, 2010). This has also been noted by the Latvian Government, which has given the stimulation of exports and competitiveness one of the top priorities in Latvian Stabilization Program (Ministry of Finance , 2009).

Although factors mentioned above suggest the existence of skills mismatch in Latvian manufacturing sector, so far it has not been confirmed or researched in detail. Moreover, it is uncertain in the overall existing literature, whether there is a negative economic effect associated with skills mismatch and how great it is. The purpose of this bachelor thesis therefore is to explore the skills mismatch existing in the manufacturing sector of Latvia and to identify its economic effect. In order to investigate the issue, authors set their research question as follows:

"Is there a skills mismatch among workers in Latvian manufacturing sector and does it result in a wage penalty?"

The research question tries to emphasize the twofold aim of the bachelor paper. Firstly, authors seek to discover the presence of skills mismatch in Latvian manufacturing sector. In order to do so, list of core skills needed for workers in the Latvian manufacturing sector is developed. It is done by undertaking qualitative approach, namely interviews with industry professionals and employers. Following that, questionnaires for both workers and their supervisors are made and distributed to mentioned parties. Companies are chosen in a way to create sample that represents the true proportion of workers per industry in Latvian manufacturing sector. After gathering responses, methodology developed by Allen and van der

Velden (2001) is applied to discover the level of skills mismatch and its types among the population. Concrete levels of supply and demand in core skills are also identified. This allows for clear illustration of level of core skill mastery desired and actually prevailing in labor market.

Secondly, authors aim at estimating the possible negative effect from having skills mismatch. For this purpose ordinary least square (OLS) regression is employed. By including 200 observations regression allows to determine whether skills mismatch results in wage penalties for the affected workers suffering from skill surplus, skill shortage or wrong skills.

Additionally, in order to explore how skills mismatch issues are addressed by Latvian Government, summary of two major strategies- Concept and Europe 2020 currently in progress is presented. Theoretical aims, practical solutions and funding issues of strategies are discussed.

In order to allow for more explanatory and concrete results the focus is put on lower level employees in the manufacturing companies. We define lower level occupations by including 4 levels of occupations according to Eurostat classification, more specifically: ISCO6- skilled agricultural and fishery workers, ISCO7- craft and related trades workers, ISCO8- plant and machine operators and assemblers and ISCO9- elementary occupations (Eurostat database, 2011).

The rest of paper proceeds as follows. Section 2 reviews the existing literature on the subject. Section 3 explains the methodological approach, while section 4 presents the results and analysis. Section 5 introduces the actions undertaken by the Government of Latvia and provides an evaluation. Section 6 concludes.

Literature Review

The literature in the field of skills mismatch is rather inconsistent due to lack of concrete definitions and unified methodological approach to the issue (CEDEFOP, 2009). As the concept of skills mismatch has an impact not only on the organizational level of companies, but also on higher complicated macroeconomic policies, the academics of the field usually are able to explore the phenomenon only partly or to a limited level. The situation has resulted in a lack of comprehensive understanding. The existing work and research relevant to the bachelor thesis tends to divide the findings into following main subtopics and categories.

Causes of the skills mismatch

A plausible explanation for the skills gap in the labor market is the increase in the job skills requirements that sometimes tend to grow at a higher speed than people are able to adjust. The view is supported by Michael J. Handel, who based on a panel data for the U.S. conclude that job skill requirements have grown over time in the period from 1970 to 1990 (Handel, 2000). Author's view is consistent with the hypothesis developed by Spenner (1979) suggesting that job requirements tend to grow over decades, although only at a moderate rate (Spenner, 1979). Also Katz and Murphy examining the period in the late 20th century based on the simple supply and demand framework conclude that skills demand has increased more dramatically than the skills supply (Kratz & Murphy, 1991).

A concentration on separate social groups is also present in the existing literature. The job skill requirement gap is further developed by McIntosh and Steedman (2000), who concentrate their research of job skill requirement on the low-skill workers and find out that employers demand higher communication and social skills of workers which many of them are still lacking (McIntosh & Steedman, 2000). Handel (2000), on contrary, pays the most attention to the technical skill requirement, which has exceeded the growth in the actual skills leading to increased demand for highly-skilled workers in comparison to low-skill workers. His empirical work finds little shortage of technical or computer skills leading to the idea that current policies used to close the gap may be incorrect (Handel, 2000).

Another cause of the mismatch in the educational and skill level is the so called "Assignment theory", which determines an optimum when workers are allocated in the organization from the top to down according to their skills. As there are not equal distribution of

complex and easily doable jobs in the labor market, mismatch is likely to occur (Allen & van der Velden, 2001)

Educational mismatch

A separate literature section concentrates on the mismatch caused by inappropriate amount of education for a concrete job in the labor market. Over- and under-education has been widely explored due to the relatively easier accessible data and more concrete measures in comparison to the mismatch in concrete skills.

The increase in the amount of university graduates in the latest decades has triggered a new branch of research mostly in the field of overeducation. Green et al (1999) have contributed to the educational mismatch area by providing new methodological approach and concrete definitions. Empirically they find that according to the survey done by the graduates of University of Newcastle (UK) approximately 20 % of employees in the UK labor market have higher education than required by their position (Green, McIntosh, & Vignoles, 1999). A supporting paper by Dolton and Silles (2002) examine the question whether educational investments are later beneficial in the labor market and also conclude an approximate 20 % overeducation rate (Dolton & Silles, 2002). Chevalier and Lindley report a rate of 35 % in year 2007 (Chevalier & Lindley, 2007), while Vaisey mention similar effects in the U.S. for the period from 1972- 2002 (Vaisey, 2003).

A more recent paper by Lindley and McIntosh (2010) adds to the existing literature by measuring the permanence of the overeducation and find that approximately 50 % of workers being over-educated in the 1991 were still over-educated in 2005 and only 25% had improved their situation in terms of a better educational match suggesting that the effect of overeducation seems to be permanent (Lindley & McIntosh, 2010).

All in all, overeducation seems to lead to decreased job satisfaction and relatively lower wages in form of wage penalty (Vaisey, 2003).

Undereducation, on contrary, is reported to lead to lower productivity of the firm and thus again to lower remuneration. Groenevald and Hartog (2003) argue that undereducation in the same way as overeducation leads to wage penalties and disturbed career development (Groenevald & Hartog, 2003). The view is supported by McIntosh and Steedman in the research about low skill workers (McIntosh & Steedman, 2000).

A closer to home study on Estonia done by the European Central Bank for the period from 1997 to 2003 finds large wage penalties associated with educational mismatch as estimated by the Estonian Labor force survey. Authors estimate a regression using log of hourly wage rate as the dependent variable and explanatory variables for overeducation, gender and age and achieve robust results for various model specifications (Lamo & Messina, 2010).

Study about Latvian labor market conducted in 2006 seeks to conclude whether the education programs provided in Latvia correspond to the needs expressed by the labor market. The study is broad and includes all the major industries of the market. The conclusion is drawn that practical skills are lacking in the most of the cases while the skills that are demanded the most are motivation, professionalism and communication abilities. The level of acquires skills is mostly higher than required by employers, which leans in the direction of the phenomena of overeducation (Sloka, 2007). A similar research by Juris Krūmiņš states that there exist serious problems in the vocational school graduates preparation for the labor market demands- the latest technologies are not used sufficiently; the specialization programs are too narrow and the graduates are mostly psychologically unprepared for the labor discipline (Krūmiņš, 2007).

Skills mismatch impact on wages

Education and skills mismatches are often reported to cause wage gaps in form of “wage penalties” for the employees not working in the job appropriate to their education and skills. A serious amount of literature has been dedicated to this topic as the direct contribution from skills mismatch on the economy might be approximated in this manner.

Allen and van der Velden (2001) using data for 11 European countries and Japan conclude that education mismatches is a good predictor of wages, while skills mismatches tend to have a smaller direct impact on the wage rate. When taking into account both effects, both remain significant while the largest impact is created by the educational mismatches. Approval to the assignment theory is thus provided by the authors (Allen & van der Velden, 2001). The results are consistent with Falter (2009), who examines 7 European countries in three measures of skills: prose literacy, document reading literacy and quantitative literacy. The negative skills mismatch impact on wages is present in the analysis (Falter, 2009). Further approval for the theory is provided by Hoppe et al. (2003), who examine the German labor market from 1984-2000 (Hoppe, Muyken, & Rieder, 2002) and Muysken et al.(2002) for USA labor market from 1986 to 1996 ((Muysken, Weissbrich, & von Restorff, 2002).

A contrary insight is provided by Di Petrio et al. (2003), who by examining the Italian graduates find little evidence to the assignment theory and very weak wage effect following the skills mismatch (Pietro & Urwin, 2006). Weak effect of educational and skills mismatch is approved also by Korpi et al. (2006), who in the research for Sweden for the time period from 1974-2000 find little approval to the skills mismatch effect on the wage rates and its growth over time (Korpi & Tahlin, 2006).

A paper examining concrete skills and also estimating the economic effect on wages has been developed by Sgobbi and Suleman (2009) for the Portuguese banking sector. Authors use a survey where banking sector employees are evaluated in industry specific skills and later divided according to the performance in the skills in order to distinguish between various skills (mis)match types. A significant impact of skills mismatch on wages is documented (Sgobbi & Suleman, 2009).

A study about Latvian Labor market conducted in 2006, which tries to document the various factors affecting wages, pay the most attention to the two broad factors impacting the wages of concrete employees- individual characteristics including demographic information and education and firm characteristics that currently employs the person. The paper documents strong positive effect of education, larger enterprises and language skills as proxied by ethnicity (Zepa & Hazans, 2006). No effect of skills mismatch is measured in the paper.

All in all, although the majority of the academic research has documented negative effects on the wage rate following skills and education mismatch, there exists also literature, which finds no support for the hypothesis. It can also be argued that the evidences differ across countries as the contradictory views are not representing the same regions.

Skills mismatch in the manufacturing sector

Although manufacturing sector can be seen as one of the most important ones in terms of the large export potential and contribution to the GDP, there is little evidence about the organizational problems in terms of skills mismatch particularly in this sector.

David Howell (1999) examines the real weekly wages of the production workers in the 1980s. He finds sharp decline since 1970 in the wages of low-skill workers that are not connected to technology invention, but with cost reduction and people willingness to work. By concentrating particularly to the manufacturing sector, he finds less mismatch between skills demanded and skills supplied, but more between skills demanded and wages paid leading to

implications that education and training system should be improved, not the skills (Howell, 1999).A similar time period is investigated by Berman et al. (1994), who use the Annual Manufacturing survey in USA for 1979 to 1989 in order to find a shift towards skilled labor force in the manufacturing sector (Berman, Bound, & Griliches, 1994).

More recent results are presented by Bjørnstad (2000), who has undertaken an econometric analysis based on Norwegian manufacturing sector. Author divides the sample in 5 educational groups according to the level of education and estimates an analysis including producer price index, labor productivity, unemployment rate measured in logarithmic scale and education-specific unemployment binary variables. His analysis shows that skills mismatch has increased and is predicted to be permanent because of low focus on skills mismatch in the wage setting mechanisms (Bjørnstad, 2000).

A unique approach is created by Peters (2000), who develops a skills-mismatch index and applies it to the manufacturing sector in Missouri, USA. Occupational classes followed by estimated educational attainment is summarized in order to gain a skill level needed for a concrete occupation (ranging from 1 to 3). Mismatch index is afterwards expressed as the square sum of percentage of population having the concrete level of skills reduced by the percentage of workers with the concrete skill level in the industry. No specific skills are mentioned in the methodology. The worst skills mismatch is found to occur in industries like transportation and computer equipment production proving that particularly these industries that incorporate lots of new technologies also present the highest share of skills mismatch (Peters, 2000). The measure by Peters is later also employed by the International Monetary Fund measuring the overall skills mismatch in the U.S. after the recession (IMF, 2010).

To sum up, there is not sufficiently developed literature concerning the skills mismatch problem in the manufacturing sector. By taking into account the sector specifics in terms of high technology development and frequent possible changes, the sector is very likely to undergo unemployment problems caused by skills mismatch. This paper therefore aims to fill the gap in the literature and provide an up-to-date data and analysis.

Methodology

Questionnaire

The quantitative study of the issue has been done via survey distributed to workers employed in the lowest levels in the manufacturing sector in Latvia. The surveys have been done anonymous in order to avoid overconfidence and gain possibly true and unbiased results. The survey was translated and distributed also in Latvian and Russian in order to be understandable among the workers employed in Latvia. The English version of the questionnaire can be found in the appendices 1 and 2.

The first part of the survey is based on the methodological questions developed by Allen and van der Velden (2001) and also used by Green and McIntosh (2007) and includes following statements based on which type of skills mismatch may be concluded-

Q1: “In my current job I have enough opportunities to use the knowledge and skills that I have”,

Q2: “In my current job I apply the skills and knowledge that I have”

Q3: “I would perform better if I had additional skills or knowledge”

Q4: “I would like to enhance my knowledge and master new skills” (Allen & van der Velden, 2001).

The agreements to the statements are planned to be self-assessed and evaluated on the 5 points Likert scale. The types of skills mismatch or skills match then could be obtained via cross sectional analysis of the answers provided and measuring underutilization of skills and skills deficit summarized in the table below.

Skills surplus occurs when there is no need for additional skills and the use of the previous knowledge is low. Skills shortage situation is present if there is a need for additional skills although much of the previous knowledge is currently used. Employees have wrong skills if they cannot use the previous knowledge and need additional skills to cope with the job tasks. Finally, skills match is said to be present if an employee does not need additional skills and has low skill underutilization in terms of usable previous knowledge (Allen & van der Velden, 2001). Based on the answers to the previously stated questions number 2 and 3, the mismatch type can be concluded. Answers to questions number 1 and 4 will be later used to additionally conclude trends in the skill usage opportunities in the industry. The answers in range between 1 and 3 are considered to be disagreeing to the statement, while 4 and 5 point evaluation represents

agreeing to the presented statement. Such a point distribution is based on previous studies in the field (Allen & Vries, 2004).

	Low skill underutilization	**High skill underutilization**
High skill deficit	Skills shortage Q2>3; Q3>3	Wrong skills Q2<4; Q3>3
Low skill deficit	Skills match Q2>3;Q3<4	Skills surplus Q2<4; Q3<4

Figure 1 Skills mismatch types, created by authors, based on Allen & van der Velden (2001)

The second part of the survey concentrates on specific skills required in the manufacturing sector. A self-assessment of concrete skills has been asked from the respondents in terms of how good one considers himself at the concrete skill as measured by 5 point scale. Although it might be argued that self assessment might result in bias results because of the overconfidence of the respondents, the approach has been successfully used in previous academic work for instance by Allen and van der Velden (2001). Furthermore, as surveys have been anonymous, people should have no incentive to lie or overestimate their true skills. A similar list of the skills included in the survey is also used in a research by Sgobbi & Suleman (2009). The skill list includes skills like Latvian and Russian language, communication, cooperation, teamwork, responsibility, technical knowledge, standards and procedures, tasks planning, time management, learning skills, adaptability and problem solving. The skill set provided in the questionnaire has been discussed in the interviews with industry professionals as well as partly adjusted to the previous research done by Sloka (2007).

The third and final part of the survey includes general demographic questions like age and gender followed by more concrete questions specifying the industry, education level, marital status and number of children, experience in the labor market, average working time and the wage rate. The demographical questions of the third part in the survey have been used to constitute the basis for the econometric analysis planned to measure the economic impact of skills mismatch.

Before each of the main survey distribution session, another survey was given to the employer or a supervisor in the company in order to detect which skills are the most demanded

by the employer's side. Afterwards, a comparison and analysis was undertaken in order to provide statistics about the most commonly demanded skills and the skills developed by the employees. Employer survey can be found in appendix 2.

Regression analysis

As argued before skills mismatch phenomenon, might result also in direct wage effects, which on aggregate may lead to lower economic returns in general for people suffering from one of the skills mismatch types.

In order to measure this impact from skills mismatch on the economic returns, a model developed by Duncan and Hoffman in 1981 and later used by Sgobbi and Suleman (2009) was used. The model estimates an OLS regression in order to capture the explanatory effect of various skills mismatch types on the wage rate (Duncan & Hoffman, 1980). The model as specified by the previous academics was estimated as follows:

Strategy evaluation

The last goal of the bachelor thesis was to analyze and evaluate the strategies employed by Latvian Government to lessen the skills mismatch. As it is argued that in the Latvian case the mismatch may stem from the unprofessional and old-fashion vocational school system, in depth interviews were conducted in order to find out the different opinions about the situation. Vocational schools that focus on same industries as covered by the questionnaire were chosen in order to have greater explanatory potential.

More concretely, the representatives of Riga Vocational School no.3 were interviewed because of the wide range of offered educational possibilities corresponding to the manufacturing industry of Latvia and representatives of learning center “Buts” (similar to vocational school) were asked because of the presence of this learning center in many cities of Latvia. Higher education establishments such as universities and colleges were not covered during the interviews due to the small share of their graduates working in lower level positions (see appendix 3).

As the situation has been noticed also by the Government representatives and a vocational school reform is in plan for the next years in form of attracting the EU funds in order to reduce the amount, but increase the quality of the vocational education, the representatives’ point of view gained via interviews had to be present in the discussion and analysis (Grīnbergs, 2010). The representatives from Ministry of Education and Science responsible for the vocational education were therefore interviewed allowing us to understand and showcase the Government`s position in the skills mismatch situation in the manufacturing sector of Latvia.

The interviews were held in the premises of interviewee during December 2010. In order to gain deeper insights, interviews were semi-structured and included mostly open-ended questions leaving space for deviations from the core topic and allowing for deeper exploration. No specific set of the questions was used for the interviews because of the different stake-holder parties interviewed. The average time of the interviews was approximately 1 hour in each case. The insights from the interviews have not been described separately; however, they are referred to while explaining the results and analyzing strategies.

Results

Data

In order to answer the research question of the thesis, a new dataset had to be created as no existing data could be used for this purpose. Various datasets were considered yet concluded not yielding the responses to suit the chosen methodology.

A survey was created and distributed to the lower level employees from companies representing the manufacturing sector of Latvia during the period from 16th December, 2010 to 2nd February, 2011. As mentioned before, the major target occupational groups were ISCO6- skilled agricultural and fishery workers, ISCO7- craft and related trades workers, ISCO8 -plant and machine operators and assemblers and ISCO9 representing elementary occupations.

A pilot survey was executed in the beginning of December at the cosmetic production company “Dzintars” and was concluded to be successful as the questions asked were understood correctly and answered in sufficient scope.

The sample was aimed to represent the weighted average number of employees working in any manufacturing sector as part of the whole Latvian manufacturing sector. For example, if the majority of people working in the manufacturing sector are employed in the food industry, also in our sample food industry employees should constitute the largest share of the sample respectively. The preliminary sample distribution as based on the data by CSB for year 2008 can be found in the appendix 4. A sort of stratified sampling technique was applied in order to achieve the aim- subgroups of representative industries were made and particular companies representing the sector were targeted via e-mail addresses found in internet sources like various manufacturing associations, labour unions etc. Preliminary agreements with the companies about the distribution of the surveys were made in case of positive answer to the e-mail sent, so no direct response rate can be calculated. The surveys were sent via e-mail to the companies, were they were printed out on paper and distributed to the lower level employees by their supervisors. A special survey (appendix 2) was accordingly done by the supervisor. The surveys were later collected back from the enterprises and data was summarized in a spreadsheet. All in all, 201 surveys from lower level employees and 30 surveys from employers were gathered from 30 different size companies representing various fields of the manufacturing sector.

The aim of the sample was partly achieved- no concrete percentages of employees were included in the sample in order not to lose any observations in terms of filled questionnaires, yet

overall answers in a sufficient scope were gathered. The possible bias stemming from the fact that precise sample could not be reached is admitted, however as the major groups and percentages have been included, authors believe in the representativeness of the sample.

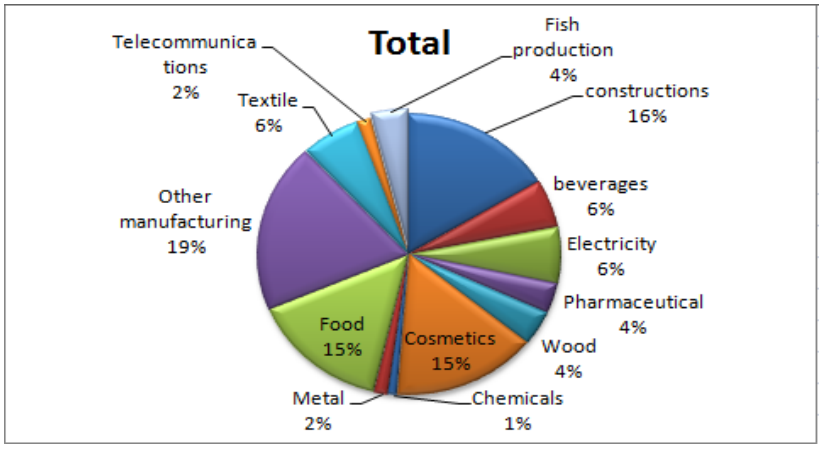


Figure 2 The final sample distribution. Created by authors, based on the data base created

Moreover not only large, well known companies employing hundreds of people, but also small firms with significantly lower worker count were questioned in order to achieve a possibly true sample. Geographically wise, majority of companies questioned were located in the largest cities of Latvia, yet there were numerous smaller businesses running in small cities in the countryside. As the aim was not to represent the geographical distribution of the companies, no graph summarizing the location of the respondents is presented.

The descriptive statistics from the sample obtained can be seen in the appendix 7. The sample consists of almost equal shares of women and men, distribution being 56% and 44% respectively. The average age of respondents is 38 years and ranges from 19 to 69. On average the respondents have 1 child and 57% of them are married. Finally, the average work experience in the current position ranges from 0.5 to 42 years and is almost 9 years on average. The mean remuneration for the employees questioned is 274 LVL per month after the tax payments.

Skills mismatch type

The first aim of the study was to determine whether skills mismatch problem actually exists among the lower level employees working in the manufacturing sector. In order to find it, a method used by Allen and van der Velden (2001) and Green and McIntosh (2007) was employed. According to the compliance to statements presented before the presence of skill

matching type could be determined- person can either have a skills match or a skills mismatch in form of skills shortage, skills surplus or possession of wrong skills.

The results from the sample of 201 observations show that there is significant skills mismatch among the lower level employees of the manufacturing sector. Only 24% of the respondents belong to the skills match group and have adequate skills for their current job, which is a close result to the wider study done in Europe by CEDEFOP, who found 21% skills match in the overall economy (CEDEFOP, 2009). Alternatively, 76% of the employees belong to the one of the skills mismatch types. Majority of them or 41% present a skills shortage which means that employees lack the skills needed to perform their every day duties well and additional education should be carried through in order to improve the effectiveness and performance of these employees. 18% of the respondents have too many skills or an excessively high level of the skills for their current workplaces meaning that they cannot fully use the skills that they possess and thus can be considered over-skilled. Finally, 17% of the respondents have obtained wrong skills for the job they are doing and thus cannot effectively perform their duties. This group would also benefit from additional education or trainings or they could be matched to positions better suited for their skill profiles. The final distribution of the skills mismatch types within the sample can be seen in the graph below.

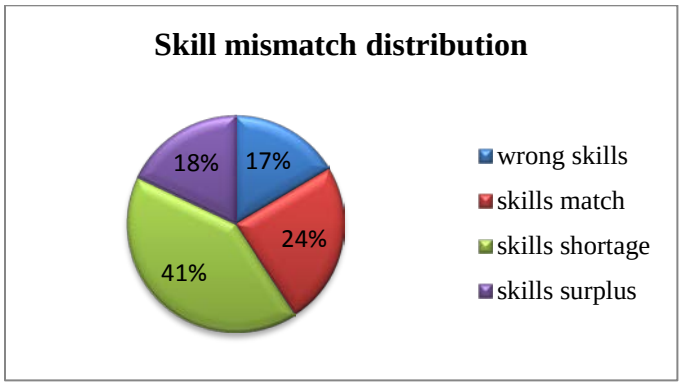


Figure 3 Skills mismatch type distribution, created by authors

When comparing the skills mismatch type distributions between the genders, it can be seen from the graphs below that men employed in the manufacturing sector have more adequate skill levels and higher compliance with the demanded skills. It is supported both- by increased skills match share and increased level of skills surplus among the surveyed men in the sample.

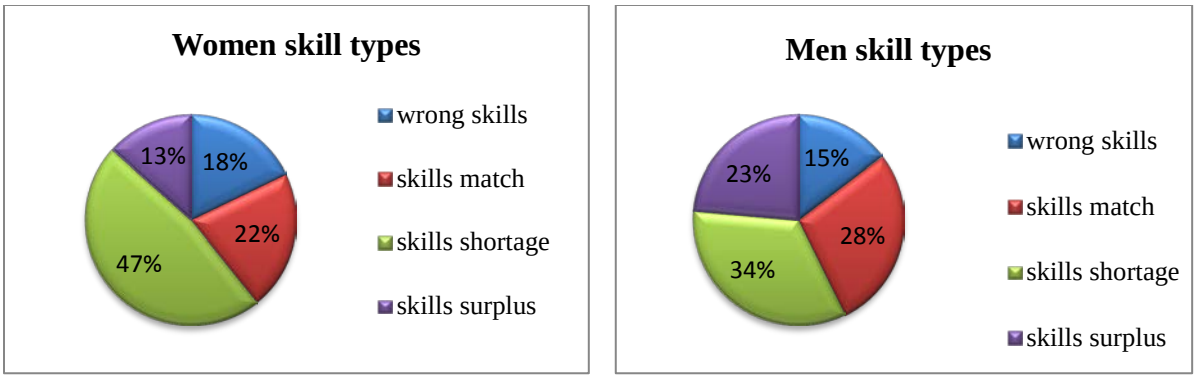


Figure 4 Skills mismatch types for women and men separately, created by authors

When looking at skill adequacy distribution among age groups, the sample was divided into 4 subgroups according to age. It can be concluded that skills match is more attributable to older respondents- 30% of the respondents in the age group of 55 to 69 have skills match while only 21 % have found the correct skills needed among the youngest respondents in the age group between 19 and 25 years. Motivation for the result is that experienced workers have adjusted their skill sets to market damands or had more time and opportunities to find occupation that fits their skills better. Inverse trend can be seen when looking at skills surplus- 31% of the youngest respondents have exceedingly high skills for their positions while only 10% have skills surplus in the oldest age group. Accordingly, an opposite trend is seen when looking at skills shortage, which increases with years based on the sample. Because of modern equipment and constantly evolving work practices half of workers at age of 56 to 69 find themselves unable to update their skill sets as much as demanded by labor market. Wrong skills are probably the mismatch type the best describing skill set issues for young workers. It is often the case that people do not master skills needed for work. This signals a problem in the education system. Medium age groups are similar to each other and find themselves between two extremes of youth and old workers. The graphs showing the skills mismatch distribution according to the age groups can be seen below.

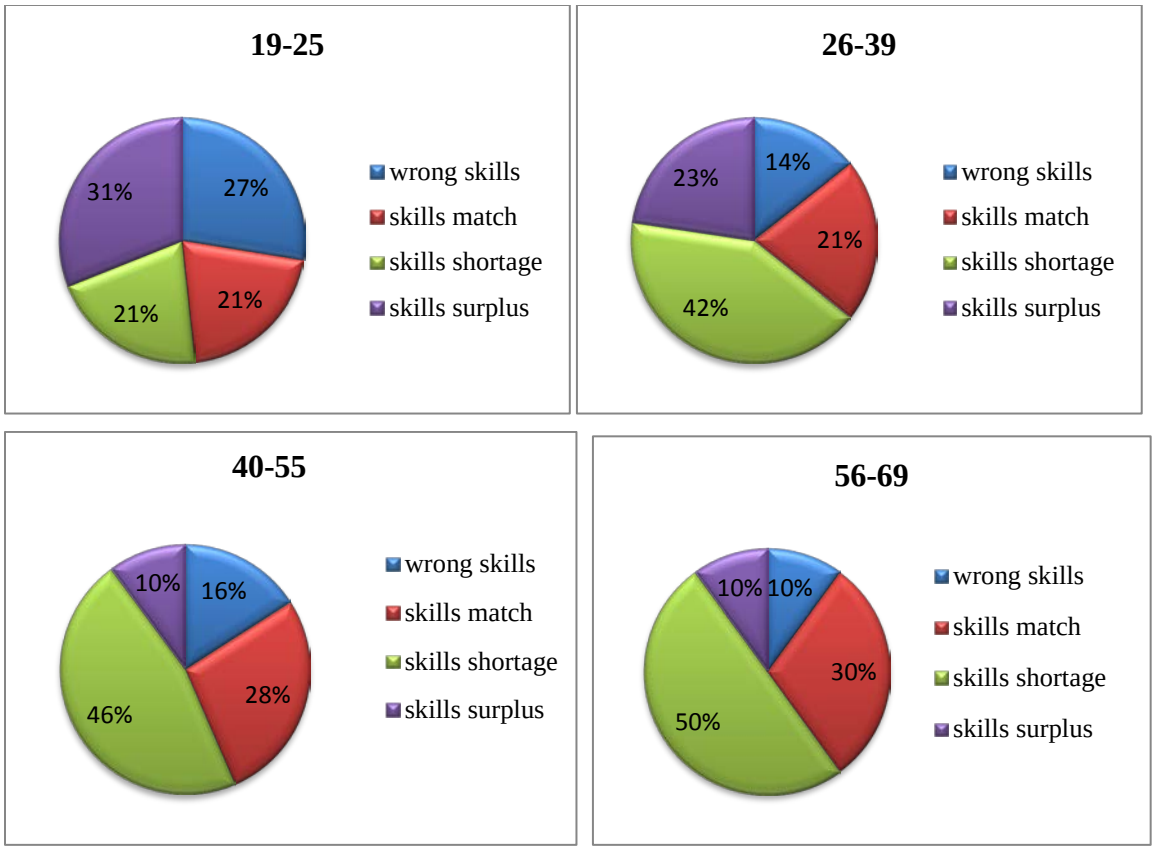


Figure 5 Skills mismatch types for age groups (19-25, 26-39, 40-55 and 56-69) separately, created by authors

When looking at the average response rates to the questions 2.1 to 2.4 in the survey, the willingness to learn, skill usage and self-evaluation could be determined. Based on the methodology, answers given explain, whether employees feel that they are able to use all their skill set in their workplace or they would need additional skills and if they are willing to gain the skills currently lacking. The graph below summarizes the answers given in the range from 1 to 5.

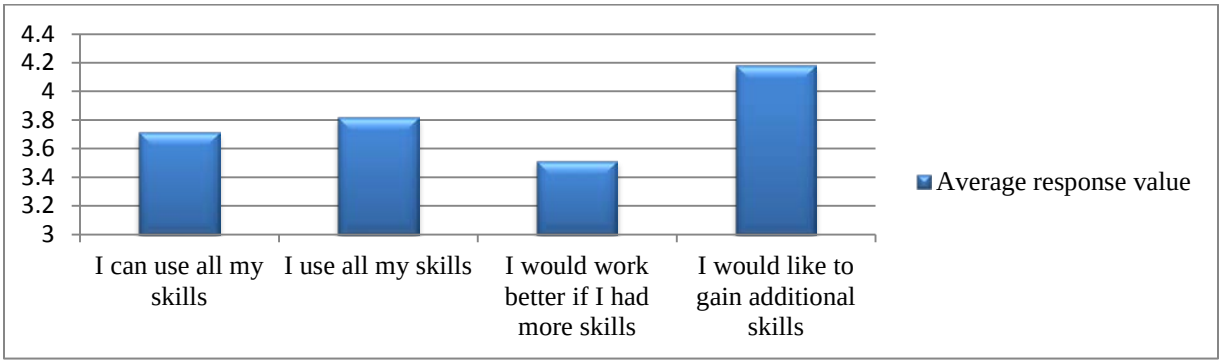


Figure 6 Answer distribution to the general skill assessment questions, created by authors

Firstly, it can be noted that people tend to mostly agree to the statement that they are given the opportunity to use all their skills and they actually use all their skills in workplace. It supports the previously presented findings that the majority of workers (69%) have adequate skills in terms of skills match or insufficient skills in terms of skills shortage. A strong support (average answer value of 4.19) is given to the statement about the willingness to continue the education and trainings in order to gain additional skills, which is also in line with the previous finding that due to inadequate level of skills, people are willing to gain additional skills to be able to work more effectively.

When dividing the answers according to genders, dispersion can be identified.

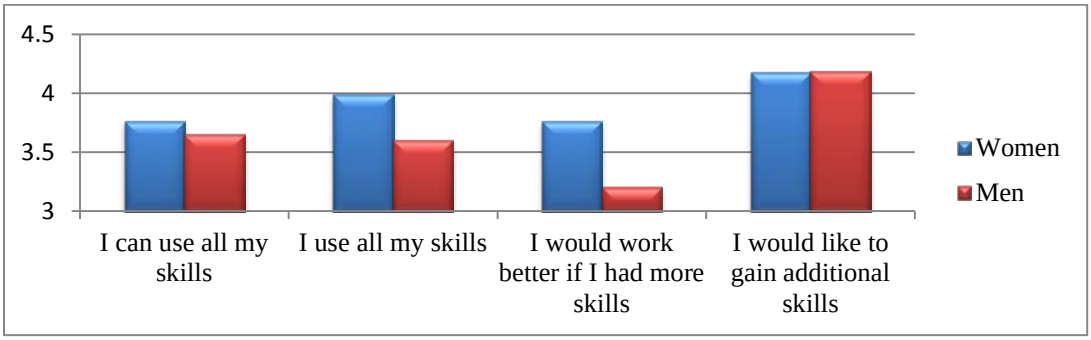


Figure 7 Answer distribution to the general skill assessment questions according to genders, created by authors

From the graph above it can be identified that men are more confident about their skills and express significantly less agreement to the statement that they would work more effectively if they had additional skills. It is also supported by the lower level of skills mismatch among the men in comparison to women surveyed as described before. However, men are equally and even a bit more eager to gain new skills showing that the willingness to gain new skills does not directly depend on the lack of concrete skills in the current work position.

Similarly to the analysis according to respondent genders, results for skills mismatch types and compliance to self evaluation statements are presented between four age groups. The

results for skills mismatch types are summarized below.

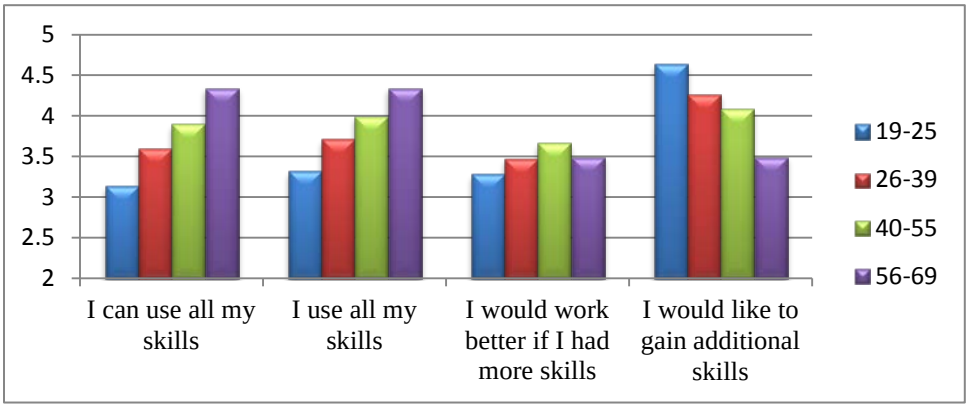


Figure 8 Answer distribution to the general skill assessment questions according to genders, created by authors

When looking at the age group compliance to self-evaluation statements, it can be seen that as expected younger people are more willing to gain new knowledge and additional skills. Furthermore, as supported by the previously presented results youngest age group also faces the largest skills surplus approved by the lowest agreement to the statement that they can use all their skills in their current workplace. On the other hand, oldest group of respondents indicate that in their current jobs they are able to almost fully use their skill sets. Only statement where results do not increase or decrease marginally to age is respondent thoughts on whether additional skills would improve their work efficiency. Here one can see that greater support to this statement is given by medium age groups. This could be explained by the fact that in the prime and towards the end of carriers workers can estimate the value of additional skills better. Older age group presumably also highly value additional skills, yet because of physical constraints they cannot take full advantage of additional skills. Finally, the oldest group of respondents strongly agrees to the statement that they use all skills; consequently, they are not willing to gain additional skills anymore as suggests the results for final statement.

Specific skill dispersion

The second part of the analysis concentrates on specific skill set required in the manufacturing sector. The dispersion between the demand for the concrete skills by the employers and supply of the skill set by the employees is sought. In order to compute the significance of differences, t-tests among means have been calculated (see appendix 9).

The skill set has been constituted on the basis of previous research, for instance Sgobbi & Suleman (2009), as well as updated based on the suggestions received during personal communication and interviews with the employers. The skill list includes skills like Latvian and Russian language, communication, cooperation, teamwork, responsibility, technical knowledge, standards and procedures, tasks planning, time management, learning skills, adaptability and problem solving. The set has also been partly adjusted according to the previous research by Sloka (2007).

The evaluation of the concrete skill possession has been asked from the people surveyed in the range between 1 and 5. It can be noticed that the self evaluation results are rather high, thus there is a reason to believe that overconfidence bias is present in the sample. Similar problems have been addressed also by Allen and van der Velden (2001), who in their research argue that although some of the respondents may suffer from overconfidence bias on average the results should be fairly true.

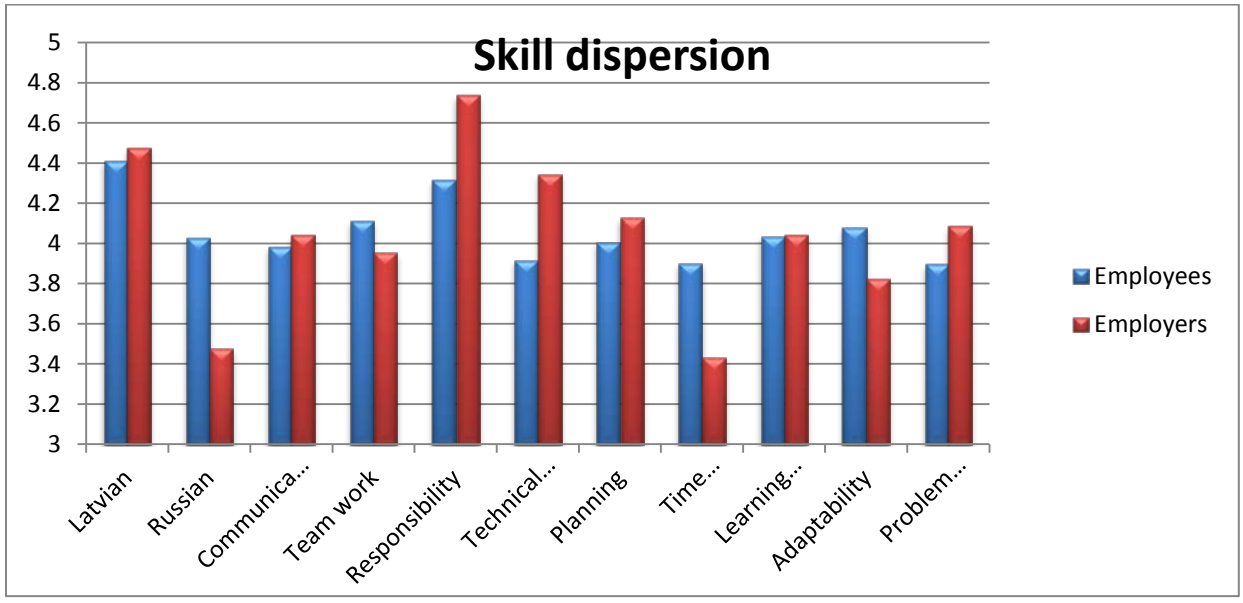


Figure 9 Skill dispersion between employers and employees according to concrete skills, created by authors

From the graph above it can be seen that the skills that are underprovided by the employees are responsibility, technical knowledge and problem solving abilities. When testing for the mean difference significance, the differences are found to be significant at 95% (see appendix 9). The particular skills have been often mentioned by the industry professionals as the ones mostly lacking, which supports the results from the sample (Troicis, personal

communication, December 2010). Responsibility and problem solving skills can be more attributed to the personalities of employees and support the argument by Sloka (2007), who concluded that employees are often not psychologically ready to start working after school or vocational school graduation. The difference in the demand and supply for technical skills is more related to the specific technical education before the work and has been stressed and is supported by the interviews with vocational schools' representatives interviewed. Kaspars Troicis (vocational school "Buts") and Ilgonis Ruņģis (3rd Vocational School of Riga) expressed their concern about the old-fashioned technologies available in the educational institutions and their incompatibility with the real-life technique. Moreover, they have expressed the gap in the communication between employers and vocational school representatives, which results in a situation, when it is not clear for the educational party particularly which technical skills and to what extent are demanded by the employers in the labor market (Ruņģis, personal communication, January 2011).

It should also be noted that Latvian language skills are slightly underprovided, while Russian skills are significantly overprovided by the labor force. The result for Russian language skills difference is significant at 99%. The situation about the language knowledge is mostly the heritage from the recent history of the country and is mostly attributable to the older workers, who seem to prefer and master Russian over Latvian language. Among the younger employees, Russian is mastered at much lower level, which corresponds to the actual situation in the country, when less and less younger people speak Russian.

Other skills that are overprovided by the employees are time planning and adaptability. Time planning difference is significant at 90 %, while difference in means for adaptability slightly fails to present a significant result at 90% (89%). According to interviews with the employers participating in the survey, lower level employees are more aimed to perform similar duties everyday and thus are not asked to be highly adaptable to changes. Also time planning is mainly done by the managers and thus is not asked from the employees. The results, however, show that employees feel ready and skilled enough to plan their own working time although it is not asked in their job descriptions.

Some skills like communication abilities, team work, planning and learning can be seen as being sufficiently mastered by employees and responding to the needs of the employers

presenting fairly matching skills requirements. No significant differences in the means for these abilities are found.

Regression analysis

In order to measure the impact from skills mismatch on the economic returns, a model developed by Duncan and Hoffman in 1981 and later used by Sgobbi & Suleman (2009) has been applied. The model estimates OLS regression in order to capture the explanatory effect of various skills mismatch types on the wage rate (Duncan & Hoffman, 1980) and thus should present whether the presence of a skills mismatch has a direct effect on the wage rate of the employees. The full model with all the explanatory variables used takes the following form.

exceedingly high correlations (above 0.5) are found, thus all variables as specified above are chosen for the analysis.

Firstly, a model specification with the classical "human capital" variables is tested. Because of the low explanatory power of 0.09, the control variables (set of dummies) for industries are added. Explanatory power of R-Squared of 0.38 is reached. Although the majority of the variables do not provide statistically significant results, the signs of coefficients are in line with the previous academic work- positive coefficients are found for men dummy, years of experience in the field and age.

In the third model specification, dummy variables for wrong skills, skills surplus and skills shortage are added. The base variable of skills match is not included in order to provide a basis for comparison. The explanatory power increases to 0.47, which means that approximately 47 percent of the variation in the wage rate variable can be explained by the explanatory variables included. The R-Squared can be seen as reasonable for the regression undertaken and is approximately twice higher than in the regression by Sgobbi &Suleman (2009). This can be explained by the industry effect inclusion in the regression, which is considered to be important determinant of the differences among the wage rates as supported by the first two regression specifications tested. All in all, the increase in the explanatory power from 0.38 to 0.47 after the skills mismatch inclusion shows that the variables indeed have a determining effect on wages.

Significant coefficients for the cosmetics, electronics, food, construction, metal, textile, telecommunication and other manufacturing sectors predict positive wage effect for employees working in these industries in comparison to the base dummy assigned to chemicals industry. The coefficient for men dummy is still positive while the age variable loses its explanatory power and approaches zero. None of the demographic and human capital coefficients seem to present statistically significant effect.

The main results of interest are in line with predictions. Skills mismatch in either skills shortage, skills surplus or wrong skills indeed results in wage penalty. Moreover, coefficients for all skills mismatch types present statistically significant estimates at 99%. Based on the results, all hypotheses are accepted and it can be concluded that any type of skills mismatch will result in a significant wage penalty.

When interpreting the results one must be careful because of the often mistake as expressed by Halvorsen & Palmquist (1980), who argue that dummy coefficients in semi-

logarithmic regressions have to be adjusted in contrary to continuous variables (Halvorsen & Palmquist, 1980). When adjusting the coefficients for the effect, the coefficients of the regression turn out to be -0.1689 for wrong skills, -0.2196 for skills shortage and -0.248 for skills surplus which slightly diminishes the effect as shown by the regression. In terms of real monetary effects, people with wrong skills, skills shortage and skills surplus have by 17%, 21% and 25% lower wage rates respectively. The percentages are significant thus the presence of skills mismatch is found an important determinant of the wage rate and having a real economic effect. The results are in line with the predictions and previous academic research by for instance Allen & Van der Velden, Falter, Hoppe et al. and others.

The result achieved implies that all three skills mismatch types examined really result in lower wages for people suffering from them. The monetary effects in the range from 17% to 25% are supported by previous studies, who also find similar wage decreases in the presence of skills mismatch. Although the highest wage penalty is associated with skills surplus, which at first might seem rather contradictory, the issue has been addressed also by CEDEFOP, who associate skills surplus with lower motivation and job satisfaction that leads to higher absence rate and shirking resulting in lower wages (CEDEFOP, 2010).

The real life implication of the phenomenon found is that in many cases people, who are employed in the manufacturing sector in Latvia, cannot reach their full potential and suffer from wage penalty not because of the lack of experience or the needed knowledge, but because they do not fit the positions they are working in. The explanation, which has also been supported by industry professionals interviewed, is that in many cases the current economic situation with the very high unemployment rate does not allow for frequent job changes in order to adjust to the needs and wants of the employees, thus many workers are forced to continue their current work although it might be causing a skills mismatch.

Latvian Government strategies

From the results of research and analysis it can be concluded that there are several problems existing in Latvian labor market. This has been also noticed by the Government of Latvia and adequate responses to the issues hindering the growth and wellbeing of Latvian economy have been given. Two general sets of actions are the Concept of raising professional

education attractiveness and Europe 2020 a strategy of smart, sustainable and inclusive growth. As noted during the personal interviews, among all strategies employed by Latvian Government particularly these two deal specifically with labor market issues and are more comprehensive than the rest (Brante, personal communication, December 2010).

Concept is a set of goals and strategies aimed to improve the image of professional education; it has been developed by Ministry of Education and Science and aimed for completion at 2015 (Ministry of Education and Science, 2009). Europe 2020 is a general EU27 strategy developed by the European Commission and should be complied with in all of European Union member states with the due date set to be the 20th of December, 2020. In the following sections both strategies will be explored and discussed (Ministry of Education and Science, 2011).

Concept

The official twofold aim of the Concept is to increase the attractiveness of professional education and bring together social partners to ensure professional education quality. Basically, behind the complicated surface is simple response to address two major issues as determined by the Ministry of Education and Science- prestige of the professional education and professional education compliance to the labor market demands (Ministry of Education and Science, 2009).

As it can be understood from the official objective statement, MoES is planning to raise the prestige of professional education by making it more attractive. There are several actions to be implemented to fulfill the objective. Firstly, MoES emphasizes the importance of elastic professional education demand by introducing the credit point system already present in the universities of Latvia. Credit system allows dividing parts of education program in separate models with individual aims, tasks and desired results. The benefit of having model system is the ease of adjusting the study programs to short term labor market demands, this being a great way to lessen the skill shortages in short period of time. Additionally, credit point introduction ought to improve the evaluation process and allow students' transition to other study programs smoother.

The second improvement includes qualification level transition from 5 level system to 8 level European qualification infrastructure. By undertaking such changes professional education would not be constrained by only one level, thus improving the flexibility of study programs and enabling variety of individual study program creation.

The third enhancement is recognition of the unofficially obtained education. Specific procedures have been created to provide skilled people with opportunity to obtain valid qualification without official training. These procedures are designed to be mainly practical knowledge oriented and would take advantage of credit point system mentioned above.

The fourth suggestion from the Concept is to divide professional education in two levels. The first level would include professional education obtained in 3 years. This level would utilize before mentioned model system and include one or more specialization opportunities. The second level professional education would be available after the first level and require 1 to 2 years to be completed. The focus in the second level would be on in depth studies according to chosen professional direction. This education would also provide advantage to student if he decides to continue his studies in relevant study program at a college or university.

Final point regards professional education establishment differentiation. As noted in the interviews this is supposedly the most critical turning point in Concept. The idea is to pool the resources and establish fewer yet in many ways better education establishments named competency centers. The centers would be scattered across Latvia and specialize in particular professions. The main benefit from closing many professional schools or making them a part of competence center is that modern, up to date technologies could be bought specially for the competence centers. Similarly, only the best teachers would be picked to hold classes in the competence centers. General idea of not spending money on many medium quality establishments, but instead concentrating the funds on few top notch education centers seems bold yet effective (Ministry of Education and Science, 2009). As a proof to this statement, a representative of private professional schools expressed his concerns that public professional education might substantially improve competitiveness by undertaking centralization and resource polling strategy (Troicis, personal communication, December 2010).

The second part of the Concept introduces cooperation with the third parties to enhance skill matching with labor market demands. List of action include social partner and professional organization representative participation in education policy development and implementation, and assigning party responsibilities for both formal and informal education. MoES believes that by having closer cooperation with labor unions, regional development institutions, carrier centers and employers would improve education policy quality which would translate to lesser skills mismatch and ultimately lower unemployment rate (Ministry of Education and Science, 2009).

Concept has been in work for over a year and is planned to be finalized in 2015. The total estimated cost for it is 200 million euro of which only 65 million has been granted for now (Brante, personal communication, December 2010).

Europe 2020

Other major initiative that is being implemented by the Government of Latvia, especially with the help of Ministry of Education and Science is Europe 2020. It has been developed by European Commission and provides guidelines and suggestions that should be taken into account for every member state of European Union. Three priorities are set to be smart, sustainable and inclusive growth. Europe 2020 also provided concrete goals that should be met by 2020 acting according to the strategy. These 6 targets are:

- 75% of population aged 20-64 in employment
- 3% of EU's GDP invested in Research & Development
- Meeting climate and energy objectives
- Share of early school leavers under 10%
- 40% of younger generation with a tertiary degree
- 20 million less people at the risk of poverty

(EC Working Document, 2010)

Returning to 3 top priorities, the sustainability concerns usage of nature friendly resources in competitive economies, however, both smart and inclusive growth are directly linked to labor market, thus will be explored in depth.

Smart growth priority encourages innovation, education quality enhancing, lifelong learning and digital society development. Countries are expected to invest in all level education development and study systems. Overall education level should be increased and education should be made more accessible as well as the role of education – more significant. Finally, series of activities should be developed and implemented to ease the transition from learning to working.

Inclusive growth priority aims to achieve economy with high employment rate and economic, social and territorial cohesion. Guidelines to fulfill the goal are investing in skills, battling poverty, modernizing labor market. Several suggestion overlap with the ones mentioned previously as a part of Concept initiative, such as recognition of unofficially obtained skills and cooperation with social partners in education program development.

Besides general Europe 2020 framework, separate stimulus has been developed as a counterpart that focuses purely on issues of professional education. In this strategy 4 priorities are distinguished:

- Lifelong learning and mobility
- Quality and efficiency
- Equality
- Innovation, creativity and entrepreneurship

One of the presets of enabling lifelong learning is flexible access to education. The emphasis should be put on opportunities to learn while working, transitions from professional to higher education or work. Concrete suggestions are given in form of credit point system as well as consulting and advisory services.

Main points regarding quality and efficiency are development of professional education quality policy and ultimately creating quality culture with its own regulations and standards. Competencies of teachers should also be raised and constantly improved in order for them to keep up to date with development in respective subjects. Additionally, emphasis should be put on core skill constant development and effective merging with professional skills or specializations. Last point of emphasis is already mentioned cooperation creation with third parties to enhance education policy development (Ministry of Education and Science, 2011).

Evaluation

After having introduced oneself to these robust and complex strategies one have to think whether they are the best response to current problems and if implemented, will they yield the sought results.

Authors find many perspective ideas in the strategies. To name an example, model system that uses credit points is found more effective among both teachers and students (Brante, personal communication, December 2010). Other suggestions such as e-learning development, recognizing unofficial education, making education more accessible and strengthening relationship between education establishments would also benefit the current education system and lessen skills mismatch (Troicis, personal communication, December 2010). However, there are various criticisms regarding the strategies and their implementation.

Firstly, regarding the Concept strategy, the idea of competency centers incorporate closing many existing professional schools across Latvia in order to pool their financing in fewer

education establishments. Terminating existing schools might cause problems for students that are limited in traveling possibilities, meaning that many students will not continue studies if they will be required to travel greater distance to competency centers than previously to their schools. Another thing this strategy is signaling is widely spread teacher layoffs. Since the number of establishments will be decreased, fewer teachers will be required to operate in them. In times when the unemployment in Latvia is already in critical condition massive layoffs would have significant consequences. Major parties involved such as association of teachers would do their best to stop these changes from happening (Ruņģis, personal communication, January 2011).

Secondly, strategy Europe 2020 provides specific targets, yet very vague suggestions how to meet them. In general, it is up to each country individually to figure out details on implementation of suggestions. What is more, even though ideology of European Union suggests equally strong economies for its entire member states, it is clear that as of today that is far from reality. Both standards of living and economic possibilities vary a lot across 27 countries. Sadly, Latvia finds itself at the bottom of the list of economic performance. This in mind, there are valid reason to doubt that Latvia might employ as effective methods as wealthier member states of EU.

All in all, authors find the guidelines of both strategies beneficial, yet express concerns about their implementation. Latvia is in a very tough position economically and thus whether ideas expressed in initiatives will be realized will greatly depend on ability to obtain extra financing. Granted that external funding is found, there is a chance to see competency centers with modern technology in them as well as to meet the targets of Europe 2020 by mid December 2020.

Conclusion

By undertaking both qualitative and quantitative methods authors have managed to explore the skills mismatch prevailing in Latvian manufacturing sector. Following are conclusions that can be drawn from analysis and thesis altogether.

The first part of the research question was aimed at determining the existence of the skills mismatch affecting the workers in Latvian manufacturing sector. By applying methodology developed by Allen and van der Velden (2001) authors discover significant skills mismatch problem in the Latvian manufacturing labor market. Skills match is found only for 24% of workers in the sample. The rest 76% of workers have either insufficient skills (41%), wrong skills (17%) or exceedingly high skills level (18%). These findings are similar to the ones European Center for the development of Vocational training (CEDEFOP) published in 2008, where skills match was estimated for only 21% of Europeans. Results explain existence of both unemployment and vacancies at the same time.

Besides determining skills mismatch types for workers in the sample, analysis regarding their valuation of skill usage and eagerness to learn more was explored. It was found that people put the majority of their skills in practice, however, not always they are given the opportunity to realize the full potential of their skill sets. A promising finding was that workers wish to gain additional skills, suggesting that they understand the importance of continuous education. On contrary, employees did not express strong belief that additional skills would improve their performance.

Results for mismatch types as well as self evaluation regarding skill sets were explored in depth by dividing them between genders and across 4 age groups. This allowed for couple of interesting insights. Firstly, it was concluded that men possess greater skills match and do not lack as many skills as women, however, they are subject to greater skills mismatch in terms of skills surplus when compared to females. Secondly, older people have better skills match results. Reasoning goes that they have had the most time to adjust their skill sets to market demands as well as find occupation that suits them best. Thirdly, youngest workers suffer from skills surplus and wrong skills mismatches significantly. They do not seem to be given the chance to put their knowledge in practice and often find their skills not suited for their occupation.

Analyzing for dispersion between supply and demands of specific skills it was found that skills that are not supplied in sufficient amount from workers are responsibility, technical knowledge and problem solving abilities. Findings also suggest that Russian language and time planning are significantly overprovided by employees, meaning that level of mastery in them is greater than needed by their supervisors. Not all of skills were in mismatch, for instance, mastery level of communication abilities, team work, duty planning and learning on the job for workers is adequate to the demand of employers.

In order to answer the second part of the research question and measure the possible economic wage penalty of skills mismatch, ordinary least square regression was employed. All three hypotheses are accepted thus it is concluded that regardless of the skills mismatch type, its presence results in significantly lower wage rates. Interpretation of the results suggests that people with wrong skills, skills shortage and skills surplus suffer 17%, 21% and 25% wage penalties in comparison to the skills match respectively.

Two major strategies - Concept and Europe 2020 deal with labor market issues, including skills mismatch. After analysis of these Latvian Government and European Commission incentives it can be concluded that substantial changes to Latvian education system are in process. Innovations such as credit point system, competency centers and closer cooperation between Government, education establishments and employers should improve the overall education and at the same time decrease skills mismatch. However, there are various obstacles to strategies, starting from minor ones such as opposition to terminating many existing vocational schools or ability to develop sustainable education programs to major one - funding. Obtaining financing for full realization of both initiatives is definitely the biggest challenge and as for the moment there are no guarantees that funding can be found.

All in all, authors have tried to fill the gap in the existing literature about skills mismatch in a specific sector. As the topic is of high importance and actuality, authors suggest exploring other sectors and including all levels of workers in the further research.

References

Allen, J., & van der Velden, R. (2001). *Educational mismatches versus skill mismatches: effects on wages, job satisfaction and on-the-job search.* Retrieved November 14, 2010, from http://arno.unimaas.nl/show.cgi?fid=10321

Allen, J., & Vries, R. d. (2004). *Determinants of skill mismatches: the role of learning environment, the match between education and job and working experience.* Maastricht: Research Centre for Education and the Labour Market (ROA).

Bank of Latvia. (2010). *Macroeconomic Development Report.* Riga: Bank of Latvia.

Berman, E., Bound, J., & Griliches, Z. (1994, August). *Changes in the Demand for Skilled Labor within U.S. Manufacturing Industries: Evidence from the Annual Survey of Manufacturing.* Retrieved November 14, 2010, from NBER: http://www.nber.org/papers/w4255.pdf

Bjørnstad, R. (2000, May). *The Effect of Skill Mismatch on Wages in a small open Economy with Centralized Wage Setting: The Norwegian Case.* Retrieved November 14, 2010, from Norway Research Department: http://www.ssb.no/publikasjoner/DP/pdf/dp270.pdf

Bloomberg. (2011, March 21). *Polish Growth Could Stumble on Low Employment, Skills Mismatch.* Retrieved March 31, 2011, from http://www.bloomberg.com/news/2011-03-21/polish-growth-could-stumble-on-low-employment-skills-mismatch.html

CEDEFOP. (2009, May). *Skill mismatch- Identifying priorities for future research.* Retrieved November 5, 2010, from http://www.mkuzak.am/images/intdocuments/5_eng.pdf

CEDEFOP. (2010, June). *Skill Mismatch in Europe.* Retrieved November 15, 2010, from http://www.cedefop.europa.eu/EN/Files/9023_en.pdf

Chevalier, A., & Lindley, J. (2007, August). *Over-education and the skills of UK graduatesCenter for the Economics of Education.* Retrieved November 14, 2010, from Center for the Economics of Education: http://cee.lse.ac.uk/cee%20dps/ceedp79.pdf

CSB Latvia. (2011). *Central Statistics Bureau of Latvia*. Retrieved November- March 2010- 2011, from http://data.csb.gov.lv/

Dolton, P., & Silles, M. (2002, November). *The Effects of Over-Education on Earnings in the Graduate Labour Market.* Retrieved November 14, 2010, from University of Oxford Economics Department: http://www.economics.ox.ac.uk/Research/wp/pdf/paper126.pdf

Duncan, G., & Hoffman, S. (1980, February 8). Retrieved November 20, 2010, from The incidence and wage effects of overeducation: http://www.sciencedirect.com/science/article/B6VB9-468015W-F/2/9d9600fdc958d5a49fd89f91638460e7

EC Working Document. (2010, March 16). *AER Commitee 1 Spring Plennary Session.* Retrieved February 20, 2011, from www.aer.eu/fileadmin/user_upload/.../2010/.../Template-Alba-2010.ppt

Eurostat database. (2011). Retrieved January- March 2011, from ec.europa.eu/eurostat

Falter, J.-M. (2009, April 9). *Mismatch and Skill Utilization: Determinants and Consequences.* Retrieved November 14, 2010, from SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=993358

Green, F., McIntosh, S., & Vignoles, A. (1999, September). *Overeducation and Skills - Clarifying the Concepts.* Retrieved November 14, 2010, from http://ideas.repec.org/p/cep/cepdps/dp0435.html

Grīnbergs, Ē. (2010, October 21). *Reforma rosinās arodskolu atdzimšanu jaunā kvalitātē.* Retrieved November 15, 2010, from LETA: http://www.tvnet.lv/zinas/latvija/350842-reforma_rosinas_arodskolu_atdzimsanu_jauna_kvalitate

Groenevald, S., & Hartog, J. (2003, October). *Overeducation, Wages and Promotions within the Firm.* Retrieved November 14, 2010, from SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=455820

Gros, D. (2010, September 3). *The Skills Deficit.* Retrieved November 5, 2010, from http://www.project-syndicate.org/commentary/gros12/English

Halvorsen, R., & Palmquist, R. (1980). *The Interpretation of Dummy Variables in Semilogarithmic Equations.* Retrieved May 15, 2011, from JSTOR: http://fvela.files.wordpress.com/2010/11/dummyinterpretation.pdf

Hamm, R. (2000, September 1). *Economic Structures and Skills Mismatch as Determinants of Regional Unemployment.* Retrieved December 15, 2010, from University of Applied Sciences Lower Rhine,: http://www-sre.wu-wien.ac.at/ersa/ersaconfs/ersa00/pdf-ersa/pdf/90.pdf

Handel, M. (2000, May). *Is there a skills crisis?* Retrieved November 14, 2010, from The Jerome Levy Economics Institute of Bard College: http://www.levyinstitute.org/pubs/ppb62.pdf

Hoppe, M., Muyken, J., & Rieder, H. (2002, December). *The impact of education and mismatch on wages: Germany 1984-2000.* Retrieved November 14, 2010, from Univesity of Maastricht: http://arno.unimaas.nl/show.cgi?fid=13690

Howell, D. (1999, June 24). *The Collapse of Low-Skill Male Earnings in the 1980s: Skill Mismatch or Shifting Wage Norms?* Retrieved November 14, 2010, from The Jerome Levy Economics Institute: http://129.3.20.41/eps/mac/papers/9906/9906015.pdf

IMF. (2010, July). *United States: Selected Issues Paper.* Retrieved November 20, 2010, from IMF: http://www.imf.org/external/pubs/ft/scr/2010/cr10248.pdf

Kocherlakota, N. (2010, August 17). *Inside the FOMC.* Retrieved November 5, 2010, from http://www.minneapolisfed.org/news_events/pres/speech_display.cfm?id=4525

Korpi, T., & Tahlin, M. (2006, July). *Skill mismatch, wages, and wage growth: Overeducation in Sweden, 1974 – 2000.* Retrieved November 14, 2010, from Swedish Institute for Social Research (SOFI), Stockholm University: http://www2.sofi.su.se/~mta/docs/Skill_mismatch_and_wage_growth.pdf

Kratz, L. F., & Murphy, K. M. (1991, December). *Changes in Relative Wages, 1963-1987: Supply and Demand Factors.* Retrieved November 14, 2010, from NBER Working Paper Series: http://www.nber.org/papers/w3927.pdf

Krūmiņš, J. (2007). *Professional Activities of Graduates of Higher and Vocational Education Institutions after Graduation.* Riga: University of Latvia.

Lamo, A., & Messina, J. (2010). *Formal Education, mismatch and wages after transition.* Frankfurt am Main: ECB Working Paper Series.

Lindley, J., & McIntosh, S. (2010, January). *Is the over-education wage penalty permanent?* Retrieved November 14, 2010, from Sheffield Economic Research Paper Series: http://www.shef.ac.uk/content/1/c6/10/51/03/SERPS2010004.pdf

Lundberg, J. (2007, September 24). *Impact of skills mismatch on gender wage gap.* Retrieved November 15, 2010, from European Working conditions Observatory: http://www.eurofound.europa.eu/ewco/2007/08/SE0708019I.htm

McIntosh, S., & Steedman, H. (2000). *New Perspectives for Learning - Briefing Paper 13.* Retrieved November 14, 2010, from Low Skills: A Problem For Europe: http://www.pjb.co.uk/npl/bp13.htm

Ministry of Education and Science. (2009, September 16). Retrieved February 16, 2011, from „Profesionālās izglītības pievilcības paaugstināšana un sociālo partneru līdzdalība profesionālās izglītības kvalitātes nodrošināšana: http://izm.izm.gov.lv/upload_file/prof_konsepcija_ar-MK-rik-629.pdf

Ministry of Education and Science. (2011, February 19). *Education and Learning.* Retrieved February 20, 2011, from http://izm.izm.gov.lv/es/4312.html

Ministry of Finance . (2009, June 15). *Latvijas ekonomikas stabilizācijas un izaugsmes atjaunošanas programma*. Retrieved November 5, 2010, from http://www.fm.gov.lv/preses_relizes/dok/FMProg_150609.pdf

Muysken, J., Weissbrich, A., & von Restorff, C.-H. (2002, April). *Impact of Education and Mismatch on wages: USA 1986-1996.* Retrieved November 14, 2010, from University of Maastricht: http://edocs.ub.unimaas.nl/loader/file.asp?id=603

Peters, D. J. (2000). *Manufacturing in Missouri: Skills Mismatch.* Retrieved November 14, 2010, from Missouri Economic Research and Information Center: http://www.missourieconomy.org/industry/manufacturing/mismatch.stm

Pietro, d. G., & Urwin, P. (2006). *Education and Skills Mismatch in the Italian Graduate Labour Market.* Retrieved November 14, 2010, from Royal Economic Society: http://repec.org/res2003/DiPietro.pdf

Radbill, L., & Winship, C. (1994). Sampling Weights and Regression Analysis vol. 23.

Sgobbi, F., & Suleman, F. (2009). *Development of Competencies in the World of Work and Education.* Retrieved November 20, 2010, from A methodological contribution to the measurement of skill mismatch: http://www.decowe.com/static/uploaded/htmlarea/files/A_methodological_contribution_to_the_measurement_of_skill_mismatch.pdf

Sloka, B. (2007). *Compliance of Professional and Higher Education programmes with the requirements of labor market.* Riga: University of Latvia.

Spenner, K. I. (1979). Temporal Changes in Work Content. *American Sociological Review* , 239-264.

Vaisey, S. (2003). *Overeducation and Its Consequences, 1972-2002*. Retrieved November 14, 2010, from University of North Carolina, Chapel Hill: http://www.allacademic.com//meta/p_mla_apa_research_citation/1/1/0/0/9/pages110092/p110092-2.php

Zepa, B., & Hazans, M. (2006). *Wages and impacting factors.* Riga: RS group.

Appendices

Appendix 1 Employees questionnaire

Questionnaire for the employees

This survey is a part of the Bachelor Thesis written by Ilze Zumente and Karlis Putrins.
The aim of this survey is to analyze the skills mismatch in the Latvian manufacturing sector.
The survey is anonymous and responses will not be analyzed individually. We thank you for your participation!

Part I
How much do you agree with the following statements (in scale 1- 5 where 1 means strongly disagree and 5 fully agree):

1) “In my current job I have opportunities to use the knowledge and skills that I have”

1	2	3	4	5

2) "In my current job I use my skills and knowledge at full extent"

1	2	3	4	5

3) “I would perform better if I had additional skills and knowledge”

1	2	3	4	5

4) "I would like to enhance my knowledge and master new skills"

1	2	3	4	5

Part II
Please do **critical** self-evaluation in the following areas of knowledge and traits (1 - do not possess, 5 - possess at great extent)

Latvian language

1	2	3	4	5

Russian language

1	2	3	4	5

Communication skills

1	2	3	4	5

Cooperation skills

1	2	3	4	5

Responsibility

1	2	3	4	5

Technical knowledge (required to do your work)

1	2	3	4	5

Task/duty planning

1	2	3	4	5

Time management

1	2	3	4	5

Ability to learn on the job

1	2	3	4	5

Adaptability

1	2	3	4	5

Problem solving skills

1	2	3	4	5

Part III

Choose the answer by **circling** the right option. If there are no options provided write the answer in the place provided.

Age: ...

Gender:	Male	Female		
Marital state:		Married	Single	

Number of children in family: …

Industry of work: …

Experience in industry (years): …

Net salary per month (LVL):

We thank you for your participation!

Appendix 2 Employers questionnaire

Questionnaire for the employers

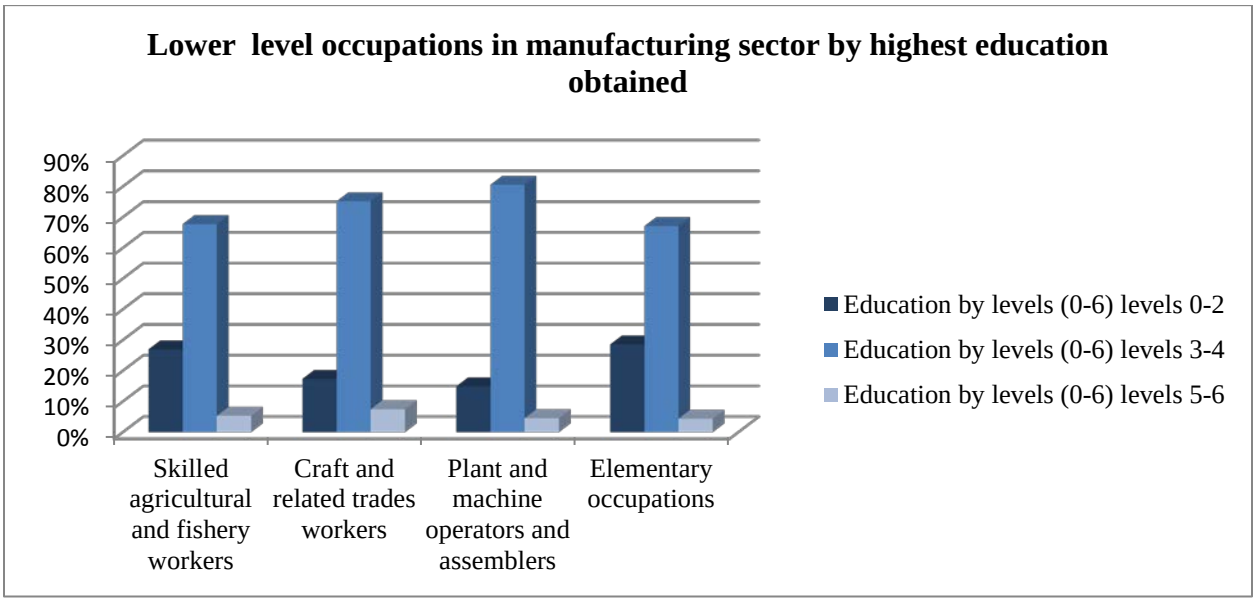
This survey is a part of the Bachelor Thesis written by Ilze Zumente and Karlis Putrins.
The aim of this survey is to analyze the skills mismatch in the Latvian manufacturing sector.
The survey is anonymous and responses will not be analyzed individually. We thank you for your participation!

Please do critically evaluate how important the following skills are for the lower level employees working in your company(1 – not important, 5 – very important

Latvian language				
1	2	3	4	5
Russian language				
1	2	3	4	5
Communication skills				
1	2	3	4	5
Cooperation skills				
1	2	3	4	5
Responsibility				
1	2	3	4	5
Technical knowledge (required to do your work)				
1	2	3	4	5
Task/duty planning				
1	2	3	4	5
Time management				
1	2	3	4	5
Ability to learn on the job				
1	2	3	4	5
Adaptability				
1	2	3	4	5
Problem solving skills				
1	2	3	4	5

Other…….

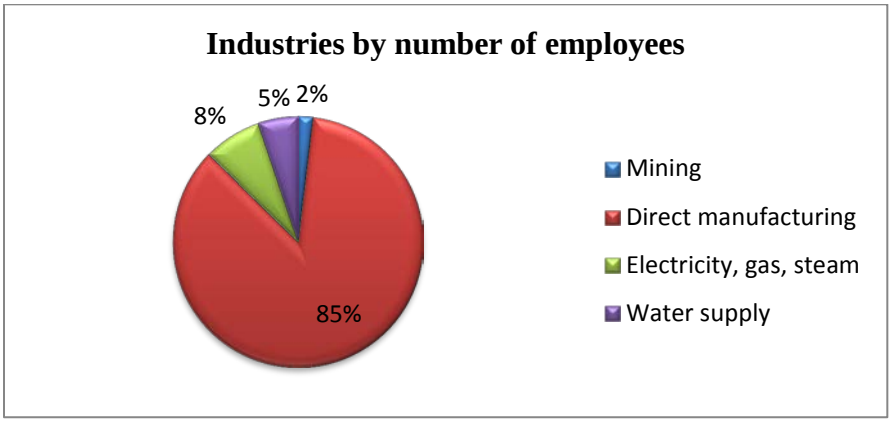
Appendix 3 Lower level occupations in manufacturing sector

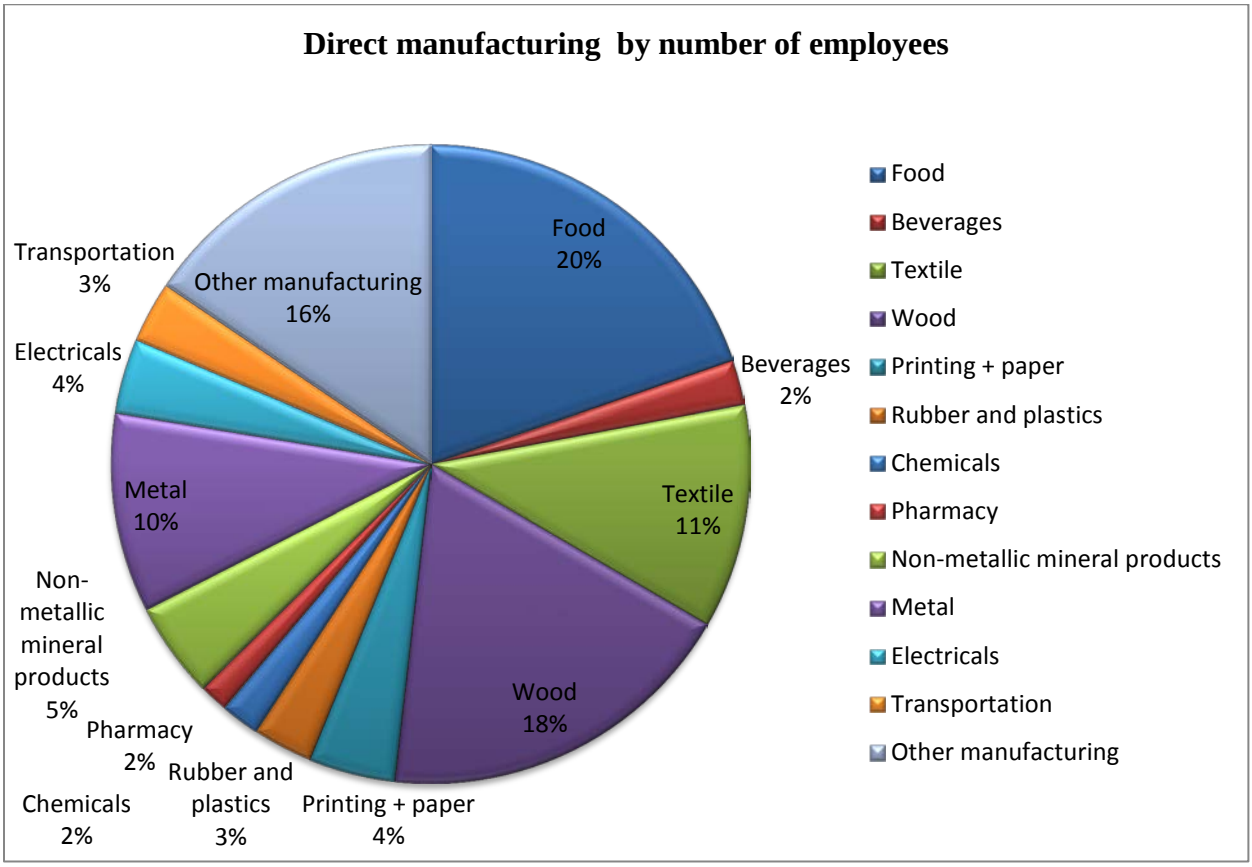


Source: Lower level occupations in manufacturing sector by highest education obtained. Created by authors based on data by Eurostat.

The graph represents the proportion of people with different educational levels working in the lower level occupations represented in the manufacturing industry. Graph is created on the basis on data from Eurostat for year 2009.

Appendix 4 Sample distribution

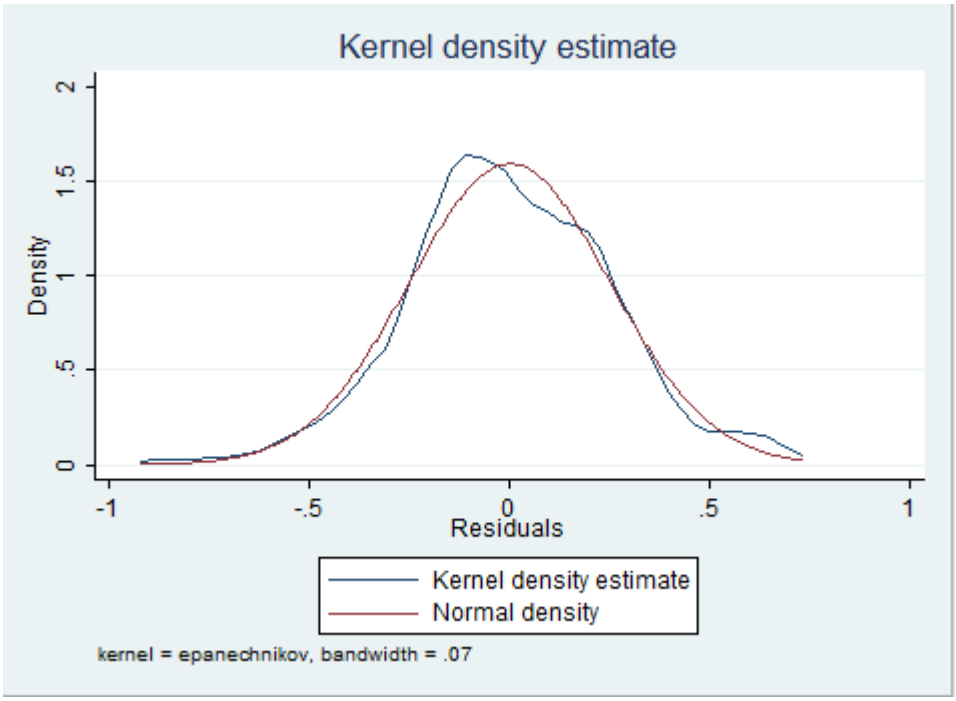




Source: Manufacturing industry distribution into sectors by number of people employed. Created by authors based on data by CSB 2010.

In order to create a representative sample from the whole manufacturing industry, the responses have been divided according to the individual shares of different manufacturing industries in the whole sector. The sample distribution is aimed to correspond to the distribution of the number of employees among various manufacturing industries. The distribution is based on the data by Central Statistics Bureau of Latvia and data stem from year 2008 which was the latest available.

Appendix 5 Sample normality testing



Source: Created by authors based on the sample.

Kernel density estimation has been computed in order to compare the sample distribution with the normal distribution. Small deviation is found, which is considered to be fine because of the self-made sample.

Appendix 6 Regression results

Regression Analysis- Skills mismatch impact on wages

where the dependent variable logarithm of hourly net wage rate. Regressions (2) and (3) are modified by adding industry specific dummies. The model is estimated by OLS with heteroskedasticity robust standard errors. The constant is included in all regressions. Robust standard errors are reported in parenthesis. *, ** and *** denote significance at 10, 5 and 1 percent levels, respectively.

Dependent variable: Ln wage rate	**(1)**	**(2)**	**(3)**
Age	0.002	0.001	-0.001
	(0.003)	(0.003)	(0.003)
Children	0.001	0.017	0.023
	(0.023)	(0.021)	(0.019)
Exp	0.007	0.007	0.008
	(0.007)	(0.008)	(0.007)
Exp2	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Man	0.165***	0.021	0.012
	(0.052)	(0.041)	(0.041)
Married	0.061	0.017	0.014
	(0.052)	(0.047)	(0.046)
Wrong	-	-	-0.185***
			(0.066)
Shortage	-	-	-0.248***
			(0.056)
Surplus	-	-	-0.286***
			(0.068)
Cosmetics	-	0.132	0.24***
		(0.106)	(0.08)
Food	-	0.084	0.14***
		(0.08)	(0.049)
Construction	-	0.411***	0.541***
		(0.086)	(0.067)
Electrics	-	0.527***	0.596***
		(0.097)	(0.063)
Wood	-	-0.125	0.012
		(0.081)	(0.049)
Metal	-	0.329***	0.504***
		(0.081)	(0.073)
Textile	-	0.33***	0.421***
		(0.09)	(0.084)
Telecom	-	0.584***	0.597***
		(0.163)	(0.128)
Otherman	-	-0.005	0.147***
		(0.082)	(0.063)
Pharma	-	0.657**	0.746***
		(0.313)	(0.266)
Cons	0.294***	0.163	0.284***
	(0.111)	(0.1)	(0.088)
R^2	0.088	0. 384	0.47
n	200	200	200

Source: Created by authors

Appendix 7 Descriptive statistics

Descriptive statistics of the sample gathered.

	Age	*Children*	*Exp.*	*2.1.*	*2.2.*	*2.3.*	*2.4.*	*Latvian*	*Russian*	*Commun.*	*Team*	*Respons.*	*Technical*
Mean	38.3682	1.1791	8.9677	3.7164	3.8209	3.5174	4.1841	4.4129	4.0299	3.9851	4.1144	4.3184	3.9204
Standard Error	0.8119	0.0846	0.6889	0.0868	0.0828	0.0962	0.0814	0.0717	0.0791	0.0617	0.0624	0.0594	0.0608
Median	37	1	5	4	4	4	5	5	4	4	4	5	4
Standard Deviation	11.5106	1.1991	9.7670	1.2305	1.1738	1.3642	1.1537	1.0167	1.1221	0.8745	0.8842	0.8415	0.8623
Sample Variance	132.4938	1.4378	95.3952	1.5142	1.3778	1.8609	1.3309	1.0336	1.2591	0.7648	0.7818	0.7081	0.7436
Kurtosis	-0.7363	2.6413	2.6426	-0.3635	-0.1058	-0.8353	1.2927	3.2898	0.2592	2.3399	2.3048	0.9953	0.3088
Skewness	0.3819	1.2138	1.7368	-0.7123	-0.8269	-0.5920	-1.4513	-1.9379	-1.0243	-1.1942	-1.2783	-1.1677	-0.6015
Range	50	7	42	4	4	4	4	4	4	4	4	4	4
Minimum	19	0	0	1	1	1	1	1	1	1	1	1	1
Maximum	69	7	42	5	5	5	5	5	5	5	5	5	5
	Planning	*Time*	*Learning*	*Adapt.*	*Problem*	*Wage*	*Men*	*Married*	*Skill match*	*Shortage*	*Surplus*	*Wrong skills*	*Ln wage*
Mean	4.0100	3.9055	4.0398	4.0846	3.8955	273.8657	0.4428	0.5721	0.2438	0.4129	0.1791	0.1642	0.4673
Standard Error	0.0631	0.0690	0.0680	0.0610	0.0588	8.4589	0.0351	0.0350	0.0304	0.0348	0.0271	0.0262	0.0251
Median	4	4	4	4	4	250	0	1	0	0	0	0	0.4463
Standard Deviation	0.8944	0.9778	0.9635	0.8648	0.8331	119.9258	0.4980	0.4960	0.4304	0.4936	0.3844	0.3714	0.3561
Sample Variance	0.7999	0.9560	0.9284	0.7478	0.6940	14382.2094	0.2480	0.2460	0.1853	0.2436	0.1478	0.1379	0.1268
Kurtosis	2.1620	1.1172	1.4081	0.7333	0.2466	10.2158	-1.9658	-1.9330	-0.5597	-1.8920	0.8523	1.3504	1.1287
Skewness	-1.2055	-0.9758	-1.1640	-0.8674	-0.5875	2.5964	0.2321	-0.2938	1.2025	0.3563	1.6864	1.8268	0.8515
Range	4	4	4	4	4	830	1	1	1	1	1	1	2.0690
Minimum	1	1	1	1	1	120	0	0	0	0	0	0	-0.2877
Maximum	5	5	5	5	5	950	1	1	1	1	1	1	1.7813

Source: created by authors

Appendix 8 Variable description

Variable	Description
lnwage	Logarithm of hourly wage rate (after taxes). Rate is computed by dividing monthly wage rate by approximated 160 hours.
age	Denotes person's age at the time of doing the survey
children	Denotes the number of children person has in the family
married	Dummy variable, which takes value of 1, if the person is married and 0 otherwise
man	Dummy variable, which takes value of 1, if the person's gender is man and 0 otherwise
exp	Years of experience in the field of current working place
exp2	Square of years of experience in the field of current working place
Wrong	Dummy variable, which takes value of 1, if the person is characterized as wrong skills by Allen and Van der Velden (2001) and 0 otherwise
Shortage	Dummy variable, which takes value of 1, if the person is characterized as having skill shortage by Allen and Van der Velden (2001) and 0 otherwise
Surplus	Dummy variable, which takes value of 1, if the person is characterized as having skill surplus by Allen and Van der Velden (2001) and 0 otherwise
Cosmetics	Dummy variable, which takes value of 1, if the person is currently in employed in cosmetics sub-sector and 0 otherwise
Food	Dummy variable, which takes value of 1, if the person is currently in employed in food producing (including bakery, fishing, meat, beverages) sub-sector and 0 otherwise
Constr	Dummy variable, which takes value of 1, if the person is currently in employed in construction (including repairing) sub-sector and 0 otherwise
Electrics	Dummy variable, which takes value of 1, if the person is currently in employed in electricity production sub-sector and 0 otherwise
Wood	Dummy variable, which takes value of 1, if the person is currently in employed in wood (including timber) production sub-sector and 0 otherwise
Metal	Dummy variable, which takes value of 1, if the person is currently in employed in metal production sub-sector and 0 otherwise
Textile	Dummy variable, which takes value of 1, if the person is currently in employed in textile (including apparel and national apparel) production sub-sector and 0 otherwise
Telecom	Dummy variable, which takes value of 1, if the person is currently in employed in telecommunication sub-sector and 0 otherwise

Otherman	Dummy variable, which takes value of 1, if the person is currently in employed in other manufacturing (including candles, small items, toys) production sub-sector and 0 otherwise
pharma	Dummy variable, which takes value of 1, if the person is currently in employed in pharmaceuticals sub-sector and 0 otherwise

Source: Created by authors

Appendix 9 T-tests for skills mean difference testing

t-Test: Two-Sample Assuming Unequal Variances

	Latvian		**Technical**		**Problem solving**		**Russian**		**Learning**		**Adaptability**	
	VarI	*Var2*	*Var I*	*Var 2*	*Var I*	*Var 2*	*Var I*	*Var 2*	*Var I*	*Var 2*	*Var I*	*Var 2*
Mean	4.43	4.41	4.30	3.92	4.23	3.90	3.20	4.03	4.13	4.04	3.80	4.08
Variance	0.60	1.03	0.42	0.74	0.87	0.69	1.48	1.26	1.22	0.93	1.48	0.75
Observations	30	201	30	201	30	201	30	201	30	201	30	201
Hypothesized Mean Difference	0		0		0		0		0		0	
df	45		46		36		37		36		34	
t Stat	0.13		2.84		1.87		-3.52		0.44		-1.24	
P(T<=t) one-tail	0.45		0.00		0.03		0.00		0.33		0.11	
t Critical one-tail	1.68		1.68		1.69		1.69		1.69		1.69	
P(T<=t) two-tail	0.90		0.01		0.07		0.00		0.66		0.22	
t Critical two-tail	2.01		2.01		2.03		2.03		2.03		2.03	

	Planning		**Communication**		**Time**		**Team**		**Responsibility**	
	VarI	*Var2*	*Var I*	*Var 2*	*Var I*	*Var 2*	*Var I*	*Var 2*	*Var I*	*Var 2*
Mean	4.03	4.01	3.97	3.99	3.50	3.91	3.90	4.11	4.80	4.32
Variance	1.34	0.80	1.76	0.76	1.84	0.96	1.96	0.78	0.23	0.71
Observations	30	201	30	201	30	201	30	201	30	201
Hypothesized Mean Difference	0		0		0		0		0	
df	34		33		34		33		59	
t Stat	0.11		-0.07		-1.58		-0.82		4.52	
P(T<=t) one-tail	0.46		0.47		0.06		0.21		0.00	
t Critical one-tail	1.69		1.69		1.69		1.69		1.67	
P(T<=t) two-tail	0.92		0.94		0.12		0.42		0.00	
t Critical two-tail	2.03		2.03		2.03		2.03		2.00	

Source: Created by authors