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WOMEN IN STEM FIELDS, CAREER CHOICES AND GENDER PAY GAP: EVIDENCE FROM THE BALTICS

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently
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ABSTRACT

The aim of this thesis is to shed a light on how the share of women who graduate in science, technology, engineering and mathematics (STEM) fields is affected by the gender wage gap in STEM-related jobs in Estonia, Latvia and Lithuania. Throughout the years, governments have put an emphasis on reducing the gender wage gap in all three Baltic states leaving out the issue of women not engaged in STEM-related fields, which may be negatively correlated with the gender pay gap. The topic has raised debates also in other developed economies such as United States, Germany, United Kingdom but there is still scarce research in Eastern Europe. Using data from the Organisation for Economic Co-operation and Development, Statistics Estonia, Central Statistical Bureau of Latvia and Lithuanian Department of Statistics for the time span 2013 – 2018 and adopting dispersion analysis ANOVA, correlation analysis and regression method, the thesis tries to study the phenomenon. The findings suggest that if the wage gap in STEM-related fields decreases, the share of women graduates in related tertiary education majors decreases also. Controversially, the trend is different for non-STEM related fields where the decrease in pay gap leads to an increase of women graduates, mainly in Latvia and Lithuania (correlation between -11.7% to -81.3%). Estonia's data stands out with positive but of medium or weak strength correlation in all three levels of education.

Keywords: gender wage gap, women in STEM, education, Baltic states

INTRODUCTION

"To change the perception of the traditional women role model is still a revolutionary paradigm shift that requires the willingness of all people and parties involved with an open-mind and awareness of the often subliminal bias between women and men as well as sensitivity for discrimination."
Hildegard Nimmmesgern

There is a widely discussed topic in several developed countries: women are under-represented in science, technology, engineering and mathematics (STEM) fields, so-called "hard" or "manly" fields. Previous researches (Bloom *et al.* 2006; Else-Quest *et al*. 2010) have observed that the step-out rate for women in STEM majors in universities or related tertiary education possibilities is relatively higher than men's. Therefore, women are under-represented in STEM-related jobs and related leading positions. Moreover, women are paid less even if they have the same qualifications as men, promoted less and receive less grants (Fox 2001). A research composed by the European Commission in 2018 states that European women earn on average 16% less than men if all economic activities are included (European Commission … 2018). In addition, women scientists are less hired into those positions compared to men. A survey conducted in the United Kingdom (UK) showed, for example, that women put more effort and hours into teaching and spent fewer hours on doing scientific research, which leads to being in disadvantage for any promotion (OECD … 2008).

The American Association for University Women has concluded in its research that the society is still heavily biased, and people tend to have negative feelings about women in "masculine" fields (STEM-related jobs). People are more likely to judge women in successful positions and women are often undermined (Corbett *et al.* 2010). It all demonstrates that this field is in need of women scientists as role models to diverge the society from being unreasonably biased. There may be multiple reasons why people still have different views on gender equality and thus, an emphasis should be put on what are the factors that have an influence on their careers, outside of academia. One of the most dominant reasons is the orientation for women to have a family, which brings a second role to their lives: being a mother. As the society needs future generations and hence children, it becomes quite clear that a supporting system must come from every side of the society, including from employers, governments and their own families.

The aim of this thesis is to examine whether the gender wage gap in science, technology, engineering and mathematics (STEM) related jobs is affected by the share of women who graduate in STEM fields, in the three Baltic states: Estonia, Latvia and Lithuania, for the time span of 2013 – 2018. This thesis provides a discussion about the gender wage gap from the perspective of the STEM-related fields-based pay gap. The emphasis is to bring attention to the issue of women being underrepresented in "masculine" economic fields to propose a fresh outlook to the reasons behind the overall gender wage gap.

The author proposes the following research questions to reach the objective of the thesis:

- What are the main reasons behind the underrepresentation of women in STEM fields and how have they changed during the years considered in the thesis?
- In which STEM related fields is the gender wage gap the highest and in which the lowest?

The following hypotheses are tested in the empirical analysis chapter:

- The percentage of women graduates in STEM fields is dependent on the gender wage gap in STEM related jobs.
- Gender wage gap is the highest in STEM related jobs.
- The percentage of women graduates in STEM fields is similar in all three Baltic countries.
- The percentage of women graduates in non-STEM fields has a diminishing effect on the gender wage gap in non-STEM related jobs.

In this thesis, the author carries out some analyses based on macrodata from the Organisation for Economic Co-operation and Development (OECD), Statistics Estonia, Central Statistical Bureau of Latvia and Lithuanian Department of Statistics. The methodology is based on dispersion, correlation and regression analyses. The dependent variable is the gender wage gap in STEM-related fields and the independent variable is the percentage of women graduates in STEM fields.

The thesis is structured as following: the first chapter summarizes the theoretical oversight of the gender wage gap and its role in recent history and in today's society. Additionally, a review of the most important studies is summarized. The second chapter provides an overview of the underrepresentation of women in STEM-related fields and STEM majors in universities. Additionally, an emphasis is put on the ongoing fight for equal pay for equal job – issue driven by the biased society, which has a remarkable impact on the topic.

The third chapter of the thesis presents the methodology and data used. The author discusses the empirical method used and how the chosen research method is conducted. The fourth chapter discusses the empirical results derived by correlation and regression analyses adopting ordinary least squares (OLS) method. In sub-section 4.5, the author discusses the results, concludes and proposes further analysis options.

1. THE GENDER PAY GAP

It has been argued that it is explainable why women are paid less than men. During the upcoming paragraphs, the thesis proposes to summarize previous studies, providing some statistical examples and empirical works to show the difference in wages between women and men. Moreover, the thesis plans to shed a light on some reasons for the existence of the gender wage gap.

1.1. Same job but different pay

Differential in earnings between women and men for the same job has been a topic discussed over decades (Webb 1891). The first empirical study, however, is recent and it goes back to early 1970s when Mincer and Polachek (1978) wrote about the human capital theory and Becker (1971) about the discrimination theory. Based on Mincer and Polachek's (1978) work, the gender pay gap exists due to "endowment differences" in gender's personalities. Women put less effort in their own human capital because they already unconsciously predict to take breaks during their career due to childcare. Moreover, they put themselves ready for future responsibilities in front of their family, which leads to having a shorter professional career than men.

Becker (1971) claimed that employers may discriminate a specific group of people or have negative feelings against a member of that group. If the employer feels that hiring an individual of a discriminated bundle adds a psychological cost to the hiring process, the employer will most probably offer a lower wage to the employee to compensate the additional expense. Becker's theory, hence, underlines that the disfavoured worker should approve the offered lower pay compared to other groups.

Some studies have been devoted to the unexplained parts in gender discrimination, which play a part in the overall wage gap. Oaxaca (1973) and Blinder (1973) have completed the so-called "ground-breaking work" naming out issues about wage discrimination against women and going in depth with the obvious and less obvious parts of the pay gap in gender. They argued that the gender wage gap is composed mainly of characteristic differences between genders and in large scales, discrimination of women in the working field.

Going back in time, in 1891 Webb published the paper “The Alleged Differences in the Wages Paid to Men and to Women for Similar Work” in The Economic Journal and economists brought out the problem - after some investigation - that women earn significantly less than their counterparts (Webb 1891). In that work, women’s job was divided into four different sub-categories: manual, routine mental, artistic and intellectual. When comparing average wages in manual work between genders, the Massachusetts Bureau of Statistics of Labour took a deeper look into 24 main manufacturing industries in the United Kingdom (UK) and Massachusetts respectively. There was an average of 17,430 workers in 110 facilities in the UK and 35,902 workers in 210 facilities in Massachusetts (Webb 1891).

The results were astonishing: the wage of employees who were women, was more than 50% lower compared to men, in both regions. The biggest differences were in average lowest weekly wage: in Great Britain, men got paid on average 4.72 dollars (converted from pounds), whilst women got for the exact same job only 2.27 dollars which makes the difference as high as 48%. The same analysis was also conducted in the United States (US), where the difference was 65% within the same category. When taking a look at industries separately, then the picture does not change. For example, on average, when working in clothing manufacture, men were able to earn on average 17.37 dollars a week, while women received almost 10 dollars less, only 7.51 dollars a week. The closest that women reached to men’s pay was in the textile manufactures. Similar patterns could be noticed in other sub-categories of work (Webb 1891).

1.2. Pay gap based on international comparison

Countries have been working on reducing the gender pay gap but a significant improvement to decrease it, started in the 1950s (Blau, Kahn 2007). Even after efforts in minimizing the gap in wages between women and men, the topic still remains an important and discussed one in several industrialized nations. A study conducted by Blau and Kahn (1992) shows that gender-specific factors such as different qualifications, treatment of equally qualified women and wage inequality have the biggest impact on the gender wage gap. Using micro data from eight different industrialized nations (Austria, West Germany, United Kingdom, United States, Switzerland, Sweden, Norway, Australia) for analysing the difference in wages in the 1980s, the authors concluded that a very important aspect of equal pay is the country's wage structure, especially where the inequality is relatively high. There is a paradox where the US has been introducing the most different policies of equal pay and job opportunities. Moreover, women have more qualifications relative to men, but the US still has one of the biggest gender wage gaps compared to other seven countries. Therefore, previously mentioned gender-specific factors may not explain the fairly high pay gap (Blau, Kahn 1992).

The gender wage gap has been under discussion in many countries across the world. Studies have addressed different aspects of the problem, such as Cho (2007) and Miyoshi (2008) put an emphasis on the working environment and experience, Miki and Yuval (2011) focused on education, Chen *et al.* (2013) on productivity. From the part of less obvious reasons, Noonan (2004) brought out the fact that cooking and cleaning had a greater impact on pay gap than other typical household chores. Moreover, in the third world countries, women are often forced to be married at a very young age which limits their mobility and therefore causes the wage gap to increase (Elul *et al.* 2002).

Even though the issue is very relevant in most of the countries, there was an interesting study with different conclusions compared to others, performed by Harris (2015). Data was gathered from the United States, Canada, United Kingdom, France, Germany, the Netherlands and Switzerland and nearly 90% of employed adults were convinced that men and women should have equal pay. (*Ibid.*) According to the European Commission report "Tackling the gender pay gap in the European Union" (2014), narrowing down the gender pay gap could potentially have a good impact on business and the economy. Additionally, it could avoid employers' criticism and lawsuits which would save the entity's time and capital (*Ibid.*).

1.3. Accumulation of wealth

Lower wages might lead to less opportunities. While the gender wage gap exists, women do not have the same conditions, for example in investing or buying their own home. Having a lower income usually means a credit constraint. Investing money in different assets requires having enough savings which, for men, might be easier to achieve due to the wage gap and therefore they are able to earn even more than women (regular pay plus earnings from investments).

The growth of wealth might vary between genders due to multiple reasons. To begin with, the reason might lie under the difference in holding assets which is related to the risk tolerance (Kukk *et al.* 2019). Grable (2000) and Nelson (2015) have concluded that women usually acknowledge risk more and therefore are more conservative. They are, hence, risk averse individuals. As highlighted in other studies, women are not as active in stock markets as men tend to be which is also proved by Hinz *et al.* (1997) and Embrey and Fox (1997). In addition, other works focusing on the level of financial literacy show that men have usually bigger knowledge in finance than women which also has an effect on investment in various assets (Lusardi, Mitchell 2008), which usually leads to accumulating more wealth during the years.

Moreover, wage differences can be affected by career choices. Male-dominated jobs are usually paid higher than women-dominated jobs creating occupational segregation as being one of the many reasons for the gender wage gap to exist (Dolado *et al.* 2002). There is a tendency where men are usually more willing to start their own company and have a job that pays itself (Koellinger *et al.* 2013). Being an entrepreneur carries a higher risk and the benefit of it, generally, is a higher wage.

Finally, women face the risk of being denied of mortgage loans due to regulations and evaluation of risks set by banks – lower income means higher credit constraints (Household Finance and Consumption Network, 2016). Alesina *et al.* (2013) has proved that women undeniably face more rigorous conditions for receiving business credit than men do. Unfortunately, in the bigger picture, it leads to women having less opportunities of building their own businesses or “from the long-term rises in house prices that accrue from homeownership” (Kukk *et al.* 2019).

1.4. Wage differences in the Baltics

Wage discrimination is intensely addressed by all three of the Baltic countries, but based on Eurostat data (2018), the efforts to reduce it are still not enough. Estonia, with its 22.7% gender wage gap (see Figure 1) is one of the leading countries in the European Union (EU). Discrimination against women in Latvia and Lithuania are equally 14 percent (Hedija, Musil 2020).

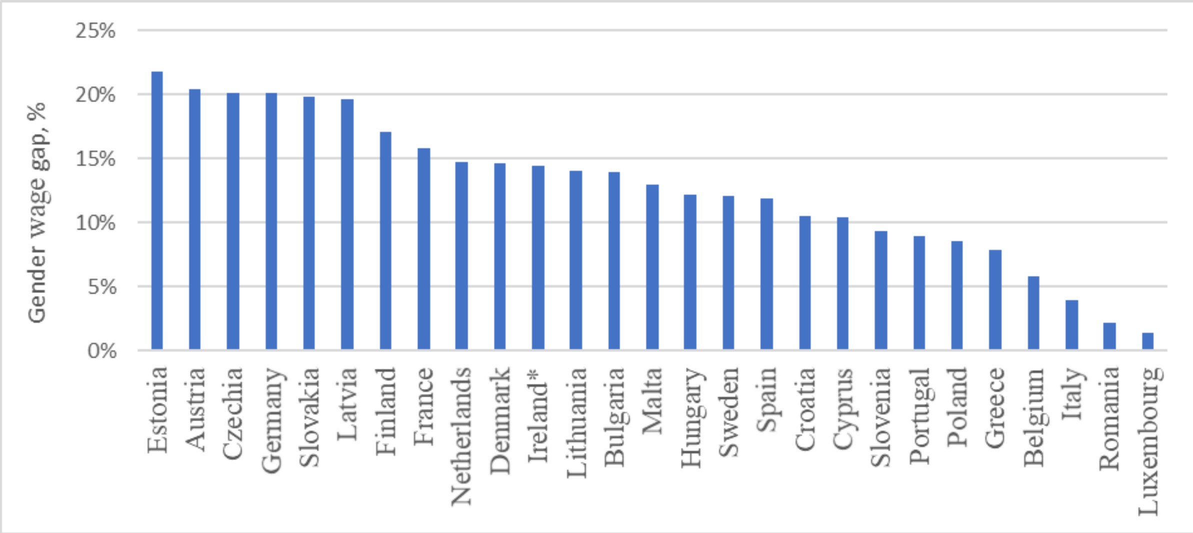

Figure 1. Gender wage gap in European Union, 2018
Source: Eurostat (Table earn_gr_gpgr2), composed by the author
Notes: * 2017 data

Taking a look at the bigger perspective, the intra-household concentration may have a standing part in explaining wage gap between genders. There are empirical studies claiming that women with children gain less money than those without children. In addition, there lies more theoretical views on family gap: various abilities and different preferences by mothers, quite limited flexibility, decreased human capital and direct bigotry against mothers (Felfe 2012). On the other hand, taking care of the household and children may not only have an impact on decreased pay for women, it carries an effect on the earnings of men as well. The studies conclude that on average the "family penalty" for women lies around 10 to 15 percent, but on the contrary, for men it increases the wages by the exact same percentage – 10 to 15 percent (Waldfogel 1998).

Remarkable findings were presented by Weichselbaumer and Winter-Ebmer (2005) and Hedija and Musil (2020), which confirmed that education and overall experience in the labour market play a minor role in explaining the existence of the gender pay gap, in advanced economies. After the revolutionary time at the end of 1980s, when the infamous iron curtain fell, many studies have started to focus more on women working in less paid working fields with lower positions, which overall meant getting paid a lesser amount of money, due to having lower levels of authority and accountability. In Estonia, the gender wage gap issue is covered quite thoroughly by various working papers and studies (Rõõm, Kallaste 2004), but for other Baltic countries, research of wage discrimination has been quite minimal. Due to having different methods and using different data, making assumptions based on completed studies may often be complicated.

A study completed by Hedija and Musil (2020) using European Union Statistics on Income and Living Conditions (EU-SILC) data shows the unexplained part of the wage gap between genders, among Baltic countries, within the range 13% – 26%. Applying Oaxaca-Blinder decomposition, which is used for linear regression models, they concluded that the gender pay gap varies expressively between the Baltic countries. Estonia ranked first with 25.8% percent in the unexplained gender wage gap, followed by Latvia with 14.6% and Lithuania with 12.8%. The differences between Estonia and other two are remarkable. In addition, the empirical analysis shows higher wage gaps for individuals who have a partner – 30% for Estonia, 15 and 17.5% for Lithuania and Latvia accordingly. One of the reasons may be that women are, by social norms, more likely to be "stay-at-home moms" (*Ibid.*).

The study completed by Hedija and Musil (2020) summarized that "unexplained gender pay gap which represents the upper limit of wage discrimination against women vary among Baltic countries, taking into account the intra-household specialization". On average, after using different methodologies, Estonia was at about 21%, whereas other two countries were behind by 11%. If taking intra-household specialization into account, the unexplained pay variances between women and men dropped by 14 – 18%, but it still does not explain the whole situation fully. Even though the Baltic countries are culturally and historically similar and geographically close to each other, empirical studies show that the gender wage gap and the unexplained part differs remarkably, which has also been proven by Christofides *et al.* (2013).

2. UNDERREPRESENTATION OF WOMEN IN STEM FIELDS

The aim of the following chapter is to give an oversight of the reasons why women tend to choose the so-called softer subjects either in high school or university rather than science, technology, engineering, mathematics (STEM) subjects. It is a worldwide problem that needs to be discussed and addressed, if possible. An exhaustive analysis of the literature in the field is, however, not possible. These sub-chapters will summarize some of them.

2.1. Women's ongoing struggle being engaged in STEM fields

"The underrepresentation of women in science, engineering and technology threatens, above all, our global competitiveness. It is an issue for society, for organisations, for employees and for the individual" (Greenfield *et al.* 2012). Governments and politicians have tried to engage women-students to STEM subjects through increasing training and improving the recruitment of the youth. Even though, the issue of not being attractive enough seems to persist on local and also international levels (Smith 2011). It is estimated that the problem might lie in poor quality in teaching STEM subjects, high percentage of non-graduates from science subjects at colleges and universities, low wages and career prospects for people engaged in different STEM fields compared to other professions. There is also a problem related to the global trend where STEM areas are being one of the most important markets in highly developed countries (Bloom *et al.* 2006). In addition, an emphasis is put on the underrepresentation of women in STEM fields and working as professionals in that area. It is concerning that year after year, girls are choosing less science subjects and fewer women scientists are being recruited at the highest levels like universities and private institutions (Blickenstaff 2005).

The level and causes of gender inequality differs by country. Some studies suggest that the underrepresentation of women in STEM is related to the overall gender inequalities and in addition, affected by key macroeconomic structures involved in socio-economic theories (Hanson, Krywult-Albanska 2020). For instance, Charles' (1992, 2003, 2011), Bradley and Charles' (2002, 2009) researches on gender inequality in STEM have been essential in proving the importance of socio-economic, political and also cultural components on gender opportunity structures at the state level. In addition, Else-Quest *et al*. (2010) and Guiso *et al*. (2008) revealed that the discrimination in STEM has roots in the overall gender inequality such as in school enrolment, women's occupation in various research jobs and also in the public sector level as in representation in Parliament. Jain-Chandra (2015) shows that income inequality can be linked to gender discrimination at the country level.

Some empirical studies claim that biological factors have their part in being able to exceed in maths-intensive subjects (Halpern, Miller 2014; Ceci, Valla 2011). On the other hand, Ceci *et al.* (2009) states that "data is not consistent enough to claim that the dearth of women in STEM careers are primarily a result of direct consequence of biological sex differences". In other words, the choices that individuals make are mainly driven by the society – studies have found that women with high mathematical knowledge are more likely not to choose STEM related fields, in comparison with men with similar background (Smith 2011). It is argued that even though science is constitutionally gender-blind, there are still walls that prevent women having equal opportunities as men and women are more than often treated as "strangers" in STEM subjects (Hopkins 1999). Women might encounter legal, political and social hardships which might be institutional, sometimes related to lower probability of being promoted, in some cases also might face less likely of being part of one's institution's research groups (Fox 2001).

2.2. Pressure from the society

Phillips (2002) and Harding (1991) have an alternative way in analysing the underrepresentation of women. They offer a model in which women cause the situation of being perceived as "strangers" in the science field. It has been argued that women are recognisably less successful than their counterparts because of how the overall concept is socialised: STEM fields are viewed as "masculine pursuit" and hence, not suitable for women. To give an oversight to that specific statement, Kelly (1985) and Terzian (2006) have stated in their works that science pedagogy is successful in building up negative connotation in girls in a way that they understand the gender roles pushed on by the society and then fulfil the society's expectations. Science is seen as a field that should be owned by men and, if a woman wants to pursuit equal career, she is seen as "repugnant" and being a scientist would take a toll on femininity. This way of thinking has been broadly criticized by women scientists who argue against STEM fields being dominated under a male-dominated discipline (Sonnert, Holton 1995).

Depending on the country, religion may have a significant influence on gender inequality. Havlicek and Klingorova (2015) proved a connection between religion and discrimination of women, which is positively correlated with the level of religiosity and also with the type of religion people consider important. When considering Else-Quest *et al.* (2010) work, the proof clearly suggests that religion as part of a country's culture and ideologies, has a vast influence on women's equality in the society and in STEM subjects.

2.2.1. Stereotypes as one of the leading issues

Some studies have researched STEM subjects under the agenda of understanding stereotypes. Martignon (2010) and Shapiro and Williams (2012) have brought "stereotype threat" into the context. Within the STEM field and its stereotypes, men are thought to be more talented and successful and hence, more prone to enrol in science and mathematics courses. In a study performed by Martignon (2010), a group of participants was divided into two groups: first one was confronted with the "stereotype threat" and the other was not. Both groups were given a task that was directly related to stereotypes. After comparing the results of both groups, women in the first group scored lower with mathematical tasks while their interest in that subject also made a drop. Those women were directly addressed with the stereotype that women are less gifted in mathematics than men. It can be seen in nearly all studies which have used an identical method (Shapiro, Williams 2012).

Family and teachers in schools also have a significant influence on youths (Beilock *et al.* 2012). Tiedemann (2000) performed a study on primary school students and showed that teachers as well as students' mothers completed their assessments on minors' understanding in mathematics not only taking into account their previous results but also the gender. Mothers were especially prone to assess a child based on his/her gender. Stereotypes had a compelling effect on youngsters' self-concept which arises concerns (Tiedemann 2000). A study completed by Kiefer and Shih (2006) showed that scholars were remarkably receptive to their tutor's feedback that had a connection with gender stereotypes. When analysing the behavioural pattern of girls, Dickhäuser and Meyer (2006) concluded that girls relied on their teacher's assessments more than boys when completing math-related tasks and therefore are more open to trust their close ones' opinions of stereotypes, which has an immediate effect on their self-concept.

2.3. Perceived wages

Pfeifer and Osikominu (2018) in their work for the German youths to the German University for STEM and non-STEM fields analysed wage expectations of young German individuals. The study was completed over the years 2011 – 2012 during which 2,061 students replied to a questionnaire that was divided into three parts: it started with their future plans on what kind of degree are they aspiring for, second part was about questions of monthly gross salaries and thirdly, youngsters had to provide answers of their personal background. With all that information, various regression analyses were performed (*Ibid.*).

As the results came in, they were as predicted – women do have different expectations for wages compared to men, their pay goals are located lower than men's. Moreover, being a man increases the probability of choosing a STEM major in university or college by 8 percent. Adopting the probit model, women are almost 50% less likely to choose STEM subjects compared to men. In addition, an increase of 10 percent in expected wages in STEM related fields caused a 4 percent probability rise that a student chooses one of STEM subjects as its major. When taking account non-STEM fields, higher expectations for wages either did not have an influence on the decision or made a little impact on choosing STEM subjects by a small decrease (*Ibid.*).

2.4. Educational choices

Starting from primary or middle school, according to American Association of University Women Educational Foundation (2008) and a study by Voyer and Voyer (2014), girls tend to achieve higher results in maths than boys, but on assessments on national level or other high-stakes tests, it is usually the other way around. On the other hand, Ellis *et al.* (2008) and Hyde *et al.* (2010) concluded that gender differences in previously mentioned high-stakes tests may vary depending on the sample, grade level and the year when the study was completed. In addition, men are more likely to outscore women on tests of dimensional relations, which include mental rotation tasks (Collaer *et al.* 2010; Maeda, Yoon 2013; Voyer 2011). Women usually have an advantage in object identity and location memory (Brake *et al.* 2007).

Ceci and Valla (2014) proved that not absolute cognitive ability should be taken under consideration when pointing out gender differences in STEM, broadness of cognitive ability is what makes the difference. Gambrell's *et al.* (2008) study demonstrates that being gifted has an effect on having even ability profiles compared to the public, which might affect work-related choices. For example, when taking a look at individuals gifted in mathematics, people with higher maths ability compared to verbal abilities have the tendency to pursue STEM related careers. Individuals with equally high maths and verbal skills are more prone to choosing non-STEM careers (Eccles *et al.* 2013). On the other hand, even mathematically talented women are still more likely pursuing and achieving outstanding accomplishments in non-STEM fields compared to men (Benbow *et al.* 2007). Therefore, due to women having more skills in mathematics and verbal communication, they are, in theory, being offered more diverse career options than men (Degol, Wang 2016).

University major choices plays a significant role in forming better-paid and male-dominant degree fields like information technology and engineering, and lower-paying women-dominant softer fields like schoolteachers and nursing (Graduate Careers Australia … 2014). For example, in 2013, women received 58% of university or equal STEM degrees among OECD countries, but made only 30% of graduates in engineering or even less and, 20% in computer science (OECD 2013). Additionally, according to Bertrand *et al*. (2010) findings in the US, the pay gap is almost 60 log points in an advantage to men after a decade from completing a master's degree from the best business schools. Furthermore, college major choices are directly linked to the subject decisions made already in secondary education (Grodsky *et al.* 2012). Similarly to choices made in university, high school students tend to make decisions based on stereotypes – boys make the majority in physics and computes sciences, girls in life sciences. This pattern has been observed in Australia (Collins *et al.* 2000), in the Netherlands (Buser *et al.* 2014) and also in France (Rapoport, Thibout 2018).

When taking a look into the future job market after university graduation, a recent study completed by Sánchez-Mangas and Sánchez-Marcos (2020) analysed the pay gap when firstly entering the job market, right after graduation and having a job 5 years later. The study was conducted with REFLEX (Flexible Professional in the Knowledge Society) dataset based on the graduates from Austria, Belgium (only Flanders), Finland, France, Germany, Italy, the Netherlands, Spain, the United Kingdom, Portugal, and Norway. At the first job right after graduation, the gap is significant in STEM areas and in health – eight and six log points respectively. Five years later, a considerable wage gap can be detected in economics, business and law (eight log points), and in social sciences (nine log points). On the other hand, in STEM fields a decrease from eight log points to five is recognised (Sánchez-Mangas, Sánchez-Marcos 2020). Furthermore, the growth of gender pay gap remains largely unexplained even after vast and various researches completed with evidence around the world (Manning, Swafield 2008; Goldin 2014; Erosa *et al*. 2016).

3. METHODOLOGY AND DATA

The following chapter describes the methodology and data used in analysing the correlation between the percentage of women who graduate or gained a qualification in STEM subjects, in higher education institutions and colleges and the gender wage gap in the Baltics. Previously set research questions are examined and are succeeded by the description of dataset and its measurements. Empirical section of this thesis relies on previously described literature and theoretical overview.

3.1 Methodology

This thesis aims to determine the impact of women's participation in STEM related fields to the gender wage gap in Estonia, Latvia and Lithuania. The selection of data is primarily related to its availability in three different countries. The data considering the graduates of STEM subjects is taken from OECD's database for the years 2013 – 2018 due to not having earlier information for Estonia and Lithuania. Statistics Estonia, Central Statistical Bureau of Latvia and Lithuanian Department of Statistics do not disclose necessary information for completing this thesis.

OECD reported its analyses and results in "Education at a Glance 2020", which is an "authoritative source of information" that provides valuable knowledge and summarizes some scenarios and trends about education around the world. It includes data of different educational structures used within countries, finances and the outcome of education systems of all OECD countries and many more. OECD publishes the report on a yearly basis in cooperation with related governments, experts and institutions. (Education at a Glance … 2020)

The main focus of the research is on the proportion of women graduates in STEM subjects in post-secondary education, which is divided into education thematic groups. The dependent variable is the natural logarithm of the percentage of the gender wage gap, regressors are also in the natural logarithm and are presented in percentage points: the number of women students is divided by the overall number of students and calculations are performed by the author. Logarithmic forms are used in order to make the distribution of the dependent variable and the regressors closer to the normal distribution (Anspal *et al.* 2010). Information by the offices are provided on yearly basis which makes the analysing process more polished as a lot of different economic indicators are the most precise when presented once a year.

Education thematic groups are divided into five different categories: business and administration; natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction; health and welfare. Additionally, average yearly wages in the three Baltic countries in these specific major fields are used as a second variable for analysing the gender wage gap in STEM related fields, presented in euros. In Latvia, information for 2013 must be converted from lats to euro (1€ = 0.702804 Ls), Lithuania joined the Eurozone in 2015 (1€ = 3.4528 Lt).

The empirical research is based on the data gathered during 2013 – 2018 for making sufficient conclusions beneficial to the society. Current work examines the three Baltic countries due to moderately similar recent history, culture and economic indicators. All of them face the two main issues covered in this thesis: women's underrepresentation in STEM related degrees or qualifications and the gender wage gap, which all leads to women having less opportunities than men.

For the empirical analysis, the author chose to adopt the ordinary least squares (OLS) method that is one of the most common methods for estimation for linear models and is used for regression analysis. Additionally, dispersion analysis is being performed by using ANOVA (Analysis of Variance) method and correlation analysis using Variance Inflation Factor (VIF) for testing multicollinearity. The author performs all necessary tests for testing the legitimacy of the datasets, for example Doornik-Hansen test for controlling the normal distribution, Ramsey RESET (Regression Equation Specification Error Test) test which is used for controlling the existence of non-linear relationships or White's Test used for testing heteroscedasticity (Sauga 2020). All the tests are performed in a statistics freeware Gretl.

The empirical model is presented below, and the estimations are carried out separately for each of the three Baltic countries (subscript c):

$GWG_c = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$

where:

GWG_c – average gender wage gap (dependent variable),

β_0 – constant,

x_1 – first independent variable,

β_1 – natural logarithm of health and welfare/business and administration,

x_2 – second independent variable,

β_2 – natural logarithm of information and communication technologies,

ε – random error term.

There may lie some methodological concerns related to the publishing of graduates with degree or qualification in higher education institutions and colleges. Countries might use different techniques for approaching the coverage of students enrolled which can have an impact on the final result. Appropriate consideration should be given to standard errors and confidence interval. Similar attention should be considered when analysing the data of the gender wage gap in different fields of STEM.

3.2 Data

The methodology described in previous paragraphs is implemented on the datasets provided by OECD, Statistics Estonia, Central Statistical Bureau of Latvia and Lithuanian Department of Statistics. All those offices release data on a yearly basis and collect data on an institutional and personal level. Data of the graduates with a degree or qualification in higher education institutions and colleges represents the women's participation in STEM related subjects and is being surveyed in all OECD economies (37 of them) and three non-OECD economies (Brazil, Costa Rica and Russia). Categories are divided into many different groups, but for this thesis, the author chooses three separate ones related to the purpose of the research (Education … 2020):

1) Bachelor's or equivalent level;
2) Master's or equivalent level;
3) Doctoral or equivalent level.

Each group is divided into five STEM related subject categories: business and administration; engineering, manufacturing and construction; health and welfare; information and communication technologies and natural sciences, mathematics and statistics. Numbers are presented in a way that show how many men and women, separately, have graduated in a certain field under a specific level of education. Results are shown every year as described previously. The format of the survey has not changed during the six years considered in this thesis and this makes the process more fluent.

The data gathered from Statistics Estonia, Central Statistical Bureau of Latvia and Lithuanian Department of Statistics are all presented in percentage points and is a yearly sample survey. They all provide information of average hourly gross wages and salaries of men and women separately and the percentages of the salary gap. The hourly gross wage is calculates as following (Gender … 2020):

$$wage_M = \frac{B_1}{I_{hour}}\ (euros)$$

where

$wage_M$ – average hourly gross wage,

B_1 – payments to employees for time worked,

I_{hour} – hours of work.

The gender pay gap is calculated as following:

$$\frac{\text{hourly gross salaries of man paid employees} - \text{hourly gross salaries of woman paid employees}}{\text{hourly gross salaries of man paid employees}}$$

Gross wages are calculated without taking into account irregular bonuses or allowances. Additionally, the dataset is divided into sections by economic activities. This might be crucial for making conclusions based on the connection between tertiary education and the gender wage gap in STEM fields.

For the regression analysis, a linear model is composed to show the connection between variables. For finalizing the process, a deterministic component is found. The regression analysis is completed based on all the data given by three Baltic countries and is carried out with a 95% reliability. To control the connection between two variables, Pearson correlation coefficient r is considered after the analysis. If $|r| \leq 0.3$, then the connection between two variables is weak. When r is between $0.3 < |r| < 0.7$, connection is of medium strength and in case of $|r| \geq 0.7$, connection is strong. In the case of r being equal to zero, there is no connection and if r is equal to 1, the connection is very strong. (*Ibid.*) To conclude, if the connection is positive, then higher wage gap means higher percentage of women in STEM related majors, and if negative, the situation is the other way around.

To complete the empirical analysis, the author presents the following hypotheses:

- H_0: The percentage of women graduates in STEM fields is not dependent on the gender wage gap in STEM related jobs.
- H_1: The percentage of women graduates in STEM fields is dependent on the gender wage gap in STEM related jobs.
- H_0: Gender wage gap is not the highest in STEM related jobs.
- H_1: Gender wage gap is the highest in STEM related jobs.
- H_0: The percentage of women graduates in STEM fields is not similar in all three Baltic countries.
- H_1: The percentage of women graduates in STEM fields is similar in all three Baltic countries.
- H_0: The percentage of women graduates in non-STEM fields does not have a diminishing effect on the gender wage gap in non-STEM related jobs.
- H_1: The percentage of women graduates in non-STEM fields has a diminishing effect on the gender wage gap in non-STEM related jobs.

In order to control whether the model might be correct, the author chooses to analyse the relationship between women graduates in non-STEM related majors and the gender wage gap in non-STEM related jobs. That may give additional insight to why women tend to choose mostly non-STEM related majors in tertiary education rather than STEM-related majors. It is crucial to analyse if the gender pay gap is, in any way, affected by the career choices made by women for future studies and for third parties in order to improve the current situation of the social injustice.

3.2.1 Descriptive statistics

Descriptive statistics of the two variables (Table 1) are based on the data given of Estonia, Latvia and Lithuania in a time period of 2013 – 2018. For each country, main statistical indicators are calculated without using any special functions or software. The table includes averages, standard deviations, maximum and minimum values of the selected objects.

Table 1. Descriptive statistics of the gender wage gap in STEM-related fields and the percentage of women graduates in relevant majors in the Baltics in 2013 – 2018, %

Country, variable	Average	Standard deviation	Maximum	Minimum
Estonia[1]	54.0%	22.2%	92.8%	0.0%
Estonia[2]	26.3%	6.4%	41.8%	14.9%
Latvia[1]	54.0%	21.0%	92.6%	19.7%
Latvia[2]	16.8%	7.8%	34.8%	2.7%
Lihtuania[1]	52.3%	24.2%	94.7%	0.0%
Lithuania[2]	25.5%	9.3%	39.9%	10.8%

Source: Statistics of Estonia (2020), Central Statistical Bureau of Latvia (2020), Lithuanian Department of Statistics (2020), OECD (2020), on the basis of the data provided by the author in Annex 1 – Annex 4

Notes:

1. Number 1 stands for the percentage of women graduates in STEM majors in tertiary education.
2. Number 2 stands for the gender pay gap in STEM-related fields.

According to the statistics, the average percentage of women graduates in STEM majors in tertiary education is around the same in all three Baltic countries ranging from 52.3% to 54.0%. On the contrary, standard deviation being relatively high with more than 20% indicates to data being more spread out. This assumption is also supported by the differences between maximum and minimum values which ranges from 0% up to 94.7%. Such substantial contrast is mainly affected by the doctor’s or equivalent level of education where the number of graduates is already significantly lower than in other levels, so the percentage of women graduates can also vary from one extreme to another.

When analysing the statistics of the gender wage gap in STEM-related fields, the situation is slightly different due to the variable not having extreme values over time – such fluctuations as in the percentage of women graduates has not been discovered in decades in the Baltics. Standard deviations are around 3-4x lower compared to the other variable, which indicates that the data is clustered more around the mean. Additionally, the differences between the maximum and minimum values support the indicator for standard deviation in all three countries.

4. EMPIRICAL ANALYSIS

The following chapter aims to discuss the results based on the described methodology and draws some conclusions to answer the hypotheses originally presented in the thesis. The empirical analysis takes the participation of women in STEM-related fields under consideration and gives an analytical oversight of the current situation in the Baltic countries.

4.1 Analysis based on Estonian data

When analysing the data of women graduates in STEM-related fields, the highest figure is in health and welfare in all three stages of education – in bachelor's or equivalent on average 92% of all the graduates are women, in master's or equivalent 77% and in doctor's or equivalent 68%. Additionally, the gender wage gap is the second highest in health and welfare – on average 27%. The percentage of women graduates is the lowest in information and communication technologies with the lowest numbers in doctor's or equivalent level – on average only 16% are women and in 2014 all the graduates were men. Moreover, when analysing all five different STEM subjects in three levels of education, the percentage of women graduates has only increased in bachelor's or equivalent level by 2%, in doctor's or equivalent level it has dropped more than 11% (Table 2).

Table 2. Percentage of women graduates in STEM fields in Estonia from 2013 to 2018, %

Level of education	2013	2014	2015	2016	2017	2018	Average
Bachelor's or equivalent	55%	58%	58%	56%	56%	57%	57%
Master's or equivalent	59%	60%	58%	56%	55%	54%	57%
Doctor's or equivalent	52%	43%	54%	49%	53%	40%	48%

Source: Statistics of Estonia (2020), on the basis of the data provided by the author in Annex 1

The average gender wage gap is the highest in business and administration fields (36.6%), where the percentage of women graduates is also rather high in all three levels of higher education. Based on the period of six years, it has decreased by nearly 10 percentage points, but still remains relatively high. The only field where the described variable has increased is health and welfare – more than 6%. Data for the gender wage gap is illustrated in Figure 2, where the lowest gender pay gap almost throughout the six years has been in natural sciences, mathematics and statistics – compared to 2013, it has decreased by nearly 6%.

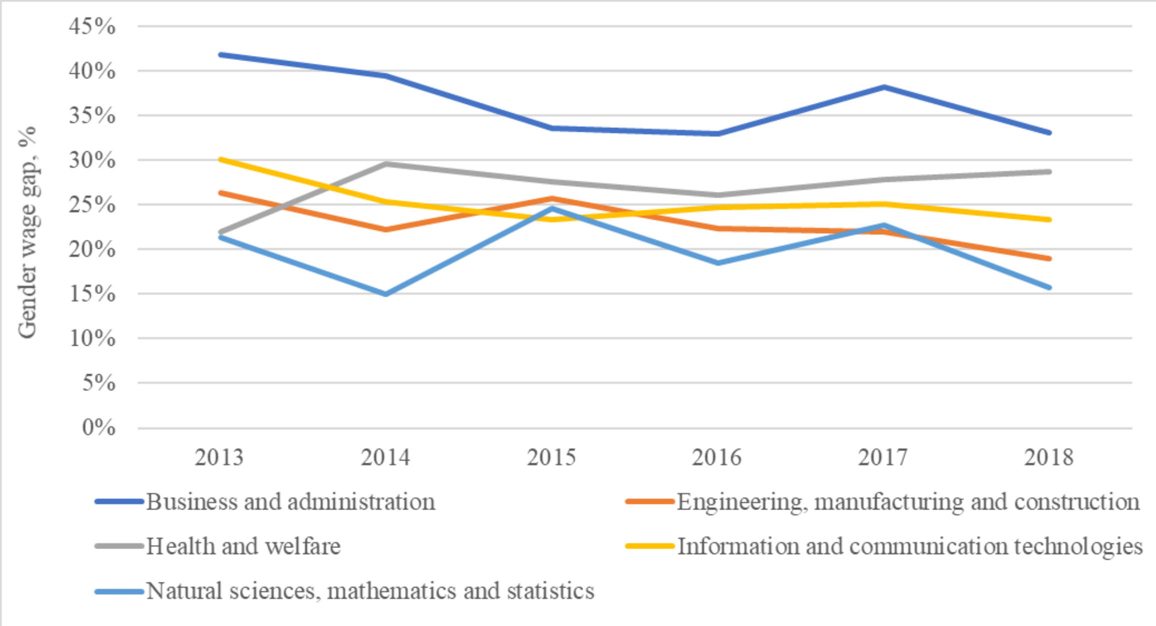

Figure 2. Gender wage gap in Estonia in different STEM-related fields in 2013 – 2018
Source: Statistics of Estonia (2020), on the basis of the data provided by the author in Annex 4

As a next step, the regression analysis is performed using ordinary least squares (OLS) method. The author calculated the average percentage of women graduates in STEM fields in every education field, considering all three levels of education to identify the connection between different variables. In addition, an average percentage of the gender wage gap was calculated on a yearly basis, considering 5 STEM-related fields. The OLS model was composed only with two regressors: natural logarithm of health and welfare, and information and communication technologies due to p-value being higher than 0.1 when adding natural logarithms of other fields of studies and therefore not being statistically significant. Moreover, an increase in the adjusted R-squared was detected and was the highest if the model consisted of the previously explained two regressors.

Table 3. Regression analysis between the gender wage gap and variables based on the Estonian data

Described variable	Coefficient	Standard error	T-ratio	P-value	Statistical significance
Constant	−0.869	0.126	−6.912	0.006	***
ln(Health and welfare)	0.849	0.182	4.651	0.019	**
ln(Information and communication technologies)	0.195	0.075	2.591	0.081	*

Source: Statistics of Estonia (2020), OECD (2020), on the basis of the data provided by the author in Annex 1 and Annex 4

Notes:

1. * $p < 0.1$
2. ** $p < 0.05$
3. *** $p < 0.01$

The coefficient for the health and welfare field in the model is 0.85 (Table 3), which indicates that if the percentage of graduates rises by one percentage point, the average gender wage gap is rising by 0.85%. For women graduates in information and communication technologies (ICT) the situation is comparable – for every percentage, the gender wage gap rises by 0.19%. Such a difference can be affected by the number of graduates: during the analysed six years, the number of female graduates in health and welfare is 991, but in ICT 6,673 – the difference is almost seven times.

According to the model and adjuster R-squared, logarithms of selected regressors explain 80.5% (Appendix 5) of the logarithm of the average gender wage gap, which is comparatively a high outcome. When using ANOVA for dispersion analysis (Appendix 6), the probability of significance of the F-test is 0.04 $<$ significance level $\propto = 0.05$ – H_1 is adopted and the model is statistically significant. The results of VIF (Appendix 7) for testing multicollinearity indicate that no values are superior to 10, which does not indicate to a collinearity problem. Additionally, White's test for heteroskedasticity (Appendix 8) was performed and p-value = 0.247 – H_0 for heteroskedasticity not present must be adopted, which indicates that the model is healthy, and the error variances are constant between individuals.

For the last step, the Pearson correlation coefficient is calculated. There is a positive correlation between two variables in all three education levels during the years of 2013 – 2018, which means that when the percentage of women graduates in STEM fields rises or falls, so does the gender wage gap or the other way around. The highest positive correlation is in master's or equivalent education level – more than 37.4% indicates that the connection between two variables is of medium strength. In bachelor's level or equivalent, the Pearson correlation coefficient is 28.9% and in doctor's or equivalent 23.1% – both connections are lower than 30% meaning, a rather weak correlation. The results of the Pearson correlation coefficient in all three levels of education are rather daunting since higher levels of women graduates leads to a higher gender wage gap.

4.2 Analysis based on Latvian data

Similarly to Estonian data, the average percentage of women graduates in STEM fields is the highest in health and welfare in all three levels of higher education – from 72% in doctor's or equivalent level up to 91% in bachelor's or equivalent. Given percentage has not changed over the course of years remarkably, but the proportion of women graduates in doctor's or equivalent level has dropped by 24% when comparing 2013 to 2018. On the other hand, in information and communication technologies the percentage of women graduates has been one of the lowest ranging from on average 22% in bachelor's or equivalent level up to 34% in doctor's or equivalent. The percentage has been dropping over the six-year period except in master's or equivalent level, where it has risen by 6%. Overall, in all three levels of higher education women's involvement in STEM subjects has dropped, the most in doctor's or equivalent level – 13% (Table 4).

Table 4. Percentage of women graduates in STEM fields in Estonia from 2013 to 2018, %

Level of education	2013	2014	2015	2016	2017	2018	Average
Bachelor's or equivalent	53%	54%	51%	52%	50%	51%	52%
Master's or equivalent	55%	53%	53%	54%	53%	52%	53%
Doctor's or equivalent	58%	58%	48%	52%	54%	45%	52%

Source: Central Statistical Bureau of Latvia (2020), on the basis of the data provided by the author in Annex 2

Women earn on average almost only 2/3 of what men earn in business and administration – the highest gender wage gap in all five categories of STEM-related fields. It has dropped only by 3%

over the course of six years while the highest level was in 2014 – 35%. The lowest gender pay gap exists in natural sciences, mathematics and statistics being only 3% in 2018. Even though the percentage of women graduates in health and welfare was the highest, the pay gap still remains around 20% – during the years it has dropped only about 3% (Figure 3).

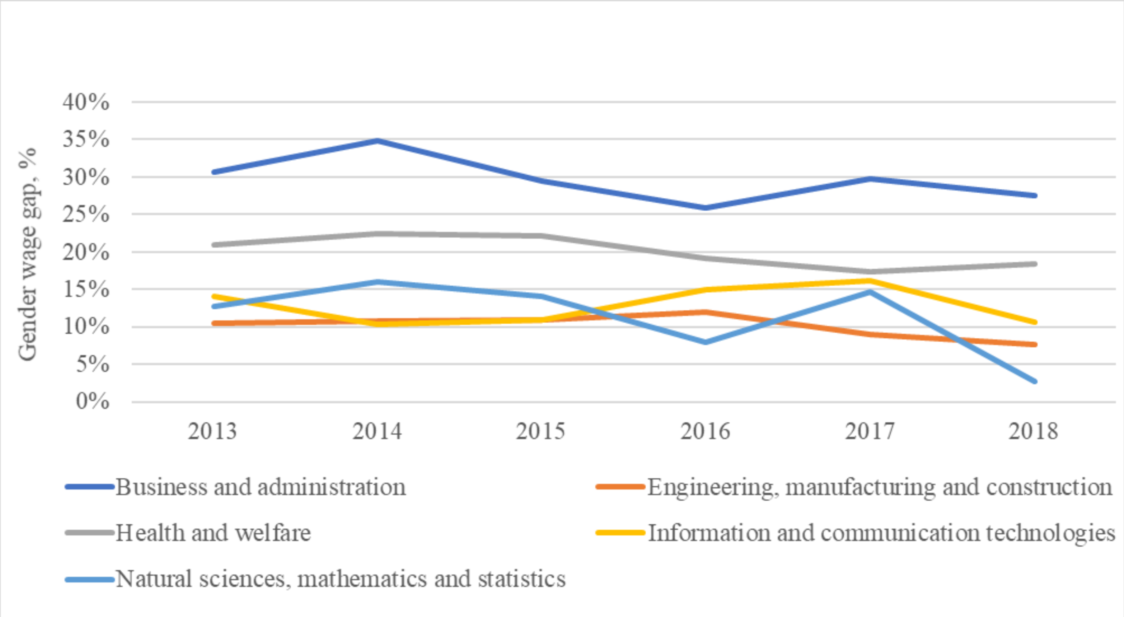

Figure 3. Gender wage gap in Latvia in different STEM-related fields in 2013-2018
Source: Central Statistical Bureau of Latvia (2020), on the basis of the data provided by the author in Annex 4

The OLS regression model, using observations from 2013 – 2018, gives the most accurate outcome when using average gender wage gap as a dependent variable and natural logarithms of the percentage of women graduates in business and administration and information and communication technologies (ICT). Due to the model not being under the significance level of 0.05, $\propto = 0.1$ was used. Therefore, the model could be used for further analysis.

Table 5. Regression analysis between the gender wage gap and variables based on the Latvian data

Described variable	Coefficient	Standard error	T-ratio	P-value	Statistical significance
Constant	0.411	0.079	5.235	0.014	**
ln(Business and administration)	0.121	0.049	2.489	0.089	*
ln(Information and communication technologies)	0.151	0.056	2.716	0.073	*

Source: Central Statistical Bureau of Latvia (2020), OECD (2020), on the basis of the data provided by the author in Annex 2 and Annex 4

Notes:

1. * $p < 0.1$
2. ** $p < 0.05$
3. *** $p < 0.01$

The coefficient for the natural logarithm of business and administration field is 0.12 (Table 5) and indicates that if the percentage of graduates rises by one percentage point, the average gender wage gap is rising by 0.12%. Moreover, for women graduates in information and communication technologies the situation is analogous – for every percentage, the gender wage gap rises by 0.15%. Compared to Estonia, in a time period of 2013 – 2018, the number of women graduates in ICT in three levels of education is smaller by 206 students and it may have an impact on the smaller result. Due to the significance level of 0.1 used in the Latvian model, adjuster R-squared indicates that the logarithms of selected regressors explain 63.8% of the logarithm of average gender wage gap. The outcome is lower than expected and may indicate to having an incomplete model.

As the next step, dispersion analysis by using ANOVA (Appendix 10) method was performed. The probability of significance of the F-test is 0.10 which equals to the significance level $\propto = 0.1$ – H_1 is adopted and the model is statistically significant. The results of VIF (Variance Inflation Factors) for testing multicollinearity (Appendix 11) indicates that all the values are > 10 which indicates to not having a collinearity problem. Moreover, White's test for testing heteroskedasticity (Appendix 12) was performed with p-value = 0.199 – H_0 must be adopted which indicates to not having a heteroskedasticity problem.

As for Estonia, the Pearson coefficient was used for correlation analysis. The Pearson correlation coefficient between the percentage of women graduates in STEM subjects and the gender wage gap in related fields is between 46% to 59% being the highest in master's or equivalent level of degree. The coefficient indicates that the correlation between two variables is of medium strength. The average coefficient is 55.4% which gives an overlook of what is the current situation in Latvia – while the numbers of women graduates in STEM subjects in higher education is falling, so is the gender wage gap.

4.3 Analysis based on Lithuanian data

The percentage of women graduates in STEM subjects in Lithuania has been quite stable throughout the years compared to Estonia and Latvia. Lowest percentage of women graduates are in all three higher education levels in information and communication technologies – on average 13% in bachelor’s or equivalent level, 23% in master’s and equivalent and 32% in doctor’s or equivalent. On the contrary, almost all the graduates in health and welfare are women in bachelor’s or equivalent level – on average 88%. Additionally, the average percentage of women graduates in STEM subjects has a ricing tendency in master’s and doctor’s or equivalent education level (Table 6) which is quite exceptional compared to other Baltic countries.

Table 6. Percentage of women graduates in STEM fields in Lithuania from 2013 to 2018, %

Level of education	2013	2014	2015	2016	2017	2018	Average
Bachelor's or equivalent	51%	51%	50%	50%	50%	52%	51%
Master's or equivalent	52%	54%	52%	52%	53%	53%	53%
Doctor's or equivalent	52%	59%	55%	46%	58%	51%	54%

Source: Lithuanian Department of Statistics (2020), on the basis of the data provided by the author in Annex 3

Even though the percentage of women graduates in STEM subjects is stable or rising in Lithuania, the gender pay gap remains the highest on average compared to Estonia and Latvia – 25.5% (0.2% higher than in Estonia). Pay gap is the lowest in engineering, manufacturing and construction (13%) and the highest in business and administration – surprising 39%. More than 70% of its graduates are women, but the pay gap remains notably high throughout the years, it has dropped only 3% by 2018 compared to 2013 (Figure 4).

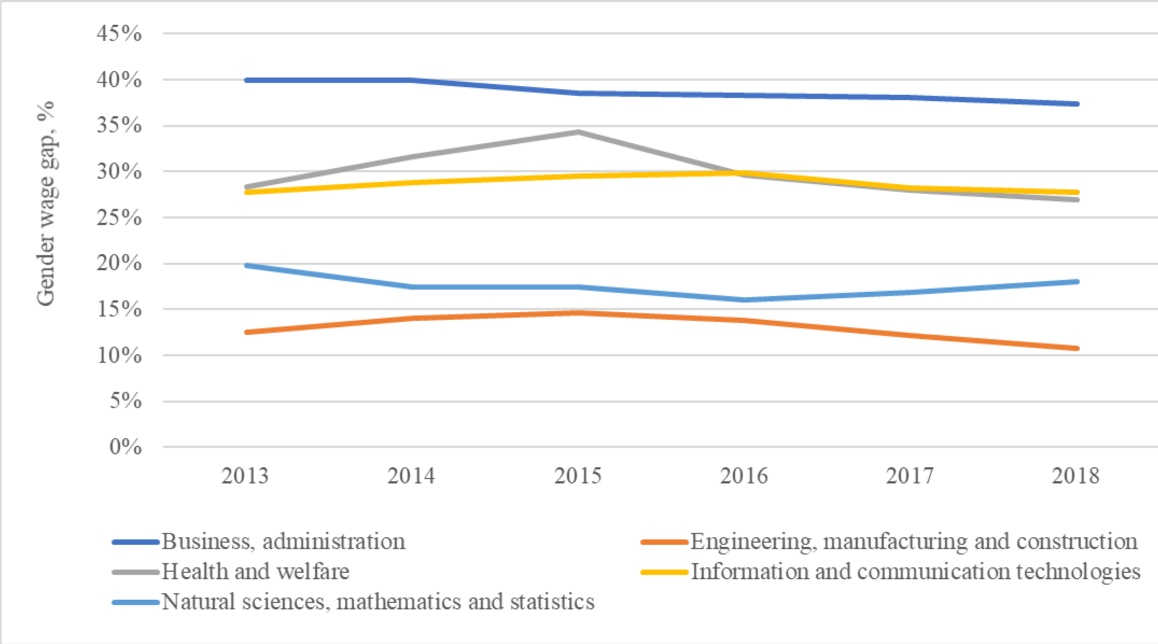

Figure 4. Gender wage gap in Lithuania in different STEM-related fields in 2013-2018
Source: Lithuanian Department of Statistics (2020), on the basis of the data provided by the author in Annex 4

When using the OLS method for Lithuanian data, it was not possible to compose an OLS model based on the dataset. Due to that, regression analysis was not performed and only correlation analysis was conducted. Even though the author reorganized the regressors, every model was above the significance level of $\propto = 0.1$. There may be several reasons for the described situation: for instance, the dependent variable and the regressors do not have any kind of influence on each other or the factors. Additionally, the gender wage gap and the percentage of women graduates over the course of 6 years has been quite stable – minimal change can be recognised and may possibly have an impact on the regression analysis.

Lastly, for the correlation analysis, the Pearson correlation coefficient was found – it is of medium strength in all three higher levels of education ranging from 42% to 51% making it on average 46%. The coefficient indicates that the two variables have a positive correlation – if one is rises, the other variable also rises and *vice versa*. Even though the Pearson correlation coefficient shows an existing correlation, the results may not be 100% reliable.

4.4 Analysis based on non-STEM related fields in the Baltics

For completing the analysis based on the non-STEM related fields in the Baltics, the author analyses four categories: agriculture, forestry, fisheries and veterinary; education; arts and humanities; and services. Categories are analysed in all three levels of education in Estonia, Latvia and Lithuania. Due to non-STEM subjects not being the focus of the thesis but still being useful information for making any further assumptions, only visual and correlation analysis is used.

The Pearson correlation coefficient was calculated by using the gender wage gap in every category and the percentage of women graduates of non-STEM fields in bachelor's or equivalent, master's or equivalent and doctor's and equivalent level. Based on the data of Estonia, the correlation between two variables is quite similar in all education levels (Table 7) – the weakest correlation being in doctor's or equivalent level, but in the other two levels, the coefficient is of positive medium strength.

Table 7. Pearson correlation coefficient based on the three levels of education in the Baltics in 2013 – 2018, %

Country	Bachelor's or equivalent	Master's or equivalent	Doctor's or equivalent
Estonia	42%	41%	19%
Latvia	-80%	-81%	-29%
Lithuania	-60%	-59%	-12%

Source: Statistics of Estonia (2020), Central Statistical Bureau of Latvia (2020), Lithuanian Department of Statistics (2020), OECD (2020), on the basis of the data provided by the author in Annex 13 – Annex 16

On the other hand, the situation is rather different in the other two Baltic countries – in all levels of education a negative correlation can be detected (Table 4). The strongest connection is in bachelor's or equivalent and master's or equivalent level of education similar to Estonia's analysis with a difference in directions. Latvia's results are the most astonishing because the correlation coefficient is of strong negative strength in two levels of education (in bachelor's or equivalent -80% and master's or equivalent level -81%). When there is a negative correlation coefficient, it can be interpreted in a way that: if the gender wage gap is declining, the percentage of women graduates in non-STEM fields is rising and *vice versa*.

Such results may not be adapted without further investigation because the linear correlation coefficient is sensitive to variances. If there is an individual in the data whose attribute values are very different from other individuals, the value of the correlation coefficient can be strongly influenced. On the other hand, the results can give an overview of the current situation and basic knowledge to compare it with STEM-related subjects' correlation analysis.

4.5 Discussion

The aim of this thesis was to examine whether the percentage of women who graduate in science, technology, engineering and mathematics (STEM) fields is affected by the gender wage gap in STEM-related jobs in the three Baltic States: Estonia, Latvia and Lithuania. To reach the objective, the following research questions were proposed: What are the main reasons behind the underrepresentation of women in STEM fields and how have they changed during the years? In which STEM related fields is the gender wage gap the highest and in which the lowest? What has been previously studied and what were the results? The results of the empirical analysis are discussed below.

Gender wage gap in STEM-related fields has diminished in all three Baltic countries, but it remains relatively high in Latvia, with the average gender wage gap in 2018 being around 13%, but in Estonia and Lithuania almost two times higher (24%). The gap remains the highest in the business and administration education field, where the percentage of women graduates is the second highest. Similar conclusions can also be made in the health and welfare field, where the gender wage gap is the second highest and the percentage of women graduates is the highest in Estonia, Latvia and Lithuania. The highest results came in, as expected, based on the Estonian data. In all five different fields of education related to STEM, the wage gap is more than 20% – women earn on average only 80% what men earn or less in STEM fields. The situation dates back to decades ago, when Webb (1891) reached to a similar result where the differences in wages between genders is significant.

These results are also supported by the regression and correlation analysis. Based on the ordinary least squares (OLS) method, which is used for estimation in linear models and is implemented for regression analysis, not providing any results for Lithuania, the following discussion is based on the results of Estonia and Latvia. According to the model based on the Estonian data, tertiary education majors such as health and welfare and information and communication technologies have an impact on the gender wage gap. If the percentage of graduates in health and welfare rises by one percentage point, average gender wage gap rises by 0.85%. In information and communication technologies, the result is 0.19%. Moreover, information and communication also plays a significant role in Latvia with 0.15%, just 0.04% lower than Estonia's result. Instead of health and welfare, the natural logarithm of business and administration field had a significant influence on the pay gap. The coefficient in the model was 0.12 indicating that if the percentage of graduates is rises by one percentage point, the average gender wage gap also rises by 0.12%.

In all three Baltic countries, the Pearson correlation coefficient shows positive correlation between two variables. According the empirical analysis part, in Estonia and Latvia the strongest correlation occurred in master's or equivalent level of studies – 37.4% and 58.7% accordingly. In Lithuania, the strongest correlation was in doctor's or equivalent level (51.2%). Given results are all of medium strength but support the results of regression analysis.

The findings are also supported by previous empirical and theoretical studies. In 2014, Graduate Careers Australia (2014) stated that already tertiary education choices determine the future job market. Additionally, based on the thesis' findings, the percentage of women graduates in STEM fields is dropping in almost every major in the Baltics – similar situation can be noted amongst the countries within the OECD (2013). Moreover, Pfeifer's and Osikominu's (2018) findings based on the German youths stated that women's expectations for wages are lower compared to men and rather choose non-STEM subjects – it can be directly linked to the thesis' OLS models and correlation analysis', where the gender wage gap and percentage of women graduates in STEM fields had a positive correlation. It can indicate to the fact that gender wage gap stays persistent due to women not willing to demand equal salary.

On the contrary, when analysing non-STEM related fields of studies and the gender pay gap in related fields, the results are quite the opposite – in Latvia and Lithuania, the correlation coefficient results show negative correlation. In Latvia, the coefficient in bachelor's or equivalent and master's or equivalent fields of study expresses a strong downhill linear relationship. In Lithuania, on the same levels, the coefficients indicate to medium negative strength. When analysing the results based on the Estonian data, everything is the other way around – in all three levels of education, the coefficient shows a positive linear connection. Overall, the gender wage gap is comparably lower in non-STEM related fields than in STEM-related fields on a country basis and has been diminishing over the period of 6 years (Figure 5).

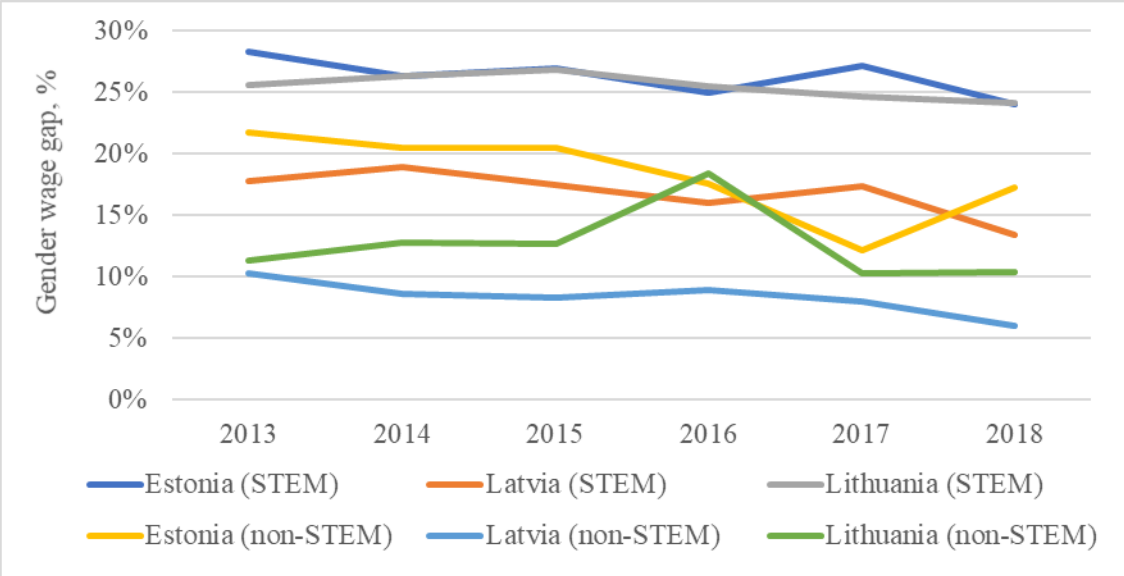

Figure 5. Average gender wage gaps in STEM and non-STEM related fields in the Baltics in 2013-2018, %
Source: Statistics of Estonia (2020), Central Statistical Bureau of Latvia (2020), Lithuanian Department of Statistics (2020), on the basis of the data provided by the author in Annex 4 and Annex 16

Current results should be, however, taken with caution as more complex models and methodology and better data may give more detailed insight to the issue. The thesis is composed to draw society's attention to the problem of women being underrepresented in STEM-related fields where the gender wage gap remains one of the highest compared to non-STEM fields. Further works should be completed with bigger sets of data where the analysis may give some ground-breaking results. The author strongly suggests researchers to go into depth with the described problem and use regressors not covered in this thesis. Overall results were as expected, but even more grim – women are being engaged in STEM-related subjects less and less while the gender wage gap in those related fields is remaining one of the highest in the Baltic economies.

CONCLUSION

The aim of this thesis is to examine whether the percentage of women who graduate in science, technology, engineering and mathematics (STEM) fields is affected by the gender wage gap in STEM-related jobs in the three Baltic states: Estonia, Latvia and Lithuania. This thesis provides a discussion about the gender wage gap from the perspective of the STEM-related fields-based pay gap. Emphasis is on bringing the attention to the issue of women being underrepresented in “masculine” economic fields, which might bring a fresh outlook to the reasons behind the overall gender wage gap.

To reach the objective of the thesis, the author had proposed the following research questions: What are the main reasons behind the underrepresentation of women in STEM fields and how have they changed during the years? In which STEM related fields is the gender wage gap the highest and in which the lowest?

Moreover, the following hypothesis were being tested in the empirical analysis chapter:

- The percentage of women graduates in STEM fields is dependent on the gender wage gap in STEM related jobs.
- Gender wage gap is the highest in STEM related jobs.
- The percentage of women graduates in STEM fields is similar in all three Baltic countries.
- The percentage of women graduates in non-STEM fields has a diminishing effect on the gender wage gap in non-STEM related jobs.

To assess the impact of the educational choices to the gender wage gap, the author employed regression, dispersion and correlation analysis separately for Estonia, Latvia and Lithuania. The empirical analysis was conducted by implementing the ordinary least squares (OLS) method that is one of the most common methods for estimation for linear models. Additionally, dispersion analysis was performed by using ANOVA (Analysis of Variance) method and correlation analysis by using the Pearson correlation coefficient. The thesis applied the methods on three levels of education: 1) bachelor’s or equivalent, 2) master’s or equivalent, 3) doctor’s or equivalent.

The general results revealed that the percentage of women graduates in three STEM fields is dependent on the gender wage gap in STEM related jobs in Estonia and Latvia: health and welfare and information and communication technologies in Estonia, business and administration and information and communication technologies in Latvia. For health and welfare, if the percentage of graduates rises by one percentage point, the average gender wage gap rises by 0.85%. For business and administration field, average gender wage gap is rising by 0.12%, and in information and communication technologies, a rise of 0.15% in Estonia and 0.19% in Latvia can be detected. For Lithuania, any statistically significant results were not received when implementing the OLS method.

When taking a look at the overall numbers of the gender pay gap in the Baltics, a recognisable difference between STEM-related jobs and non-STEM jobs is present – higher pay gap occurs in STEM-related jobs in all three Baltic countries, which is an alarming result. In non-STEM fields, the average pay gap in the Baltics is 13.6% and maximum value is 28.0%. On the other hand, in STEM-related fields, the average wage gap is 22.9% and maximum value is 41.8% – almost two times the difference. The percentage of women graduates in STEM fields is similar in all three Baltic countries ranging from 52.3% in Lithuania to 54.0% in Estonia and Latvia, but overall, the number of women graduates is in a downfall.

An additional analysis on non-STEM related fields was composed by using the Pearson correlation coefficient. The results were different than expected – negative correlation coefficient was present in Latvia and Lithuania, but positive correlation was detected based on the Estonian data. It can be concluded that if the percentage of women graduates in non-STEM fields is on the rise, it has a diminishing effect on the gender wage gap in non-STEM related jobs in Latvia and Lithuania.

The author suggests to further investigate the topic due to not having enough research composed based on the underrepresentation of women in STEM fields and its relation to the slowly diminishing, but still relatively high gender pay gap. As the issue is the most imminent in Estonia, other regressors or methods could be implemented in order to understand, what are the main issues that lie behind such situation. This could be done by applying Oaxaca-Blinder decomposition, which is used for linear regression models in order to show the unexplained part of the wage gap between genders.

KOKKUVÕTE

NAISED STEM ALADEL: KARJÄÄRIVALIK NING PALGALÕHE BALTI RIIKIDE NÄITEL

Sigrid Lii Treialt

Läbi aastakümnete on arenenud riikides laialdaselt arutletud naiste alaesindatusest teaduse, tehnoloogia, inseneriteaduste ja matemaatika (STEM) valdkondades, mida sageli nimetatakse kas „rasketeks” või „mehelikeks” aladeks. Varasemad uuringud (Bloom *et al*. 2006; Else-Quest *et al*. 2010) on täheldanud, et ülikoolidest või sarnastest kõrgemat haridust pakkuvatest õppeasutustest on mittelõpetanute osakaal naiste hulgas suurem kui meeste. Sellest tingituna võib järeldada, et naised on STEM valdkondadega seotud töökohtadel ja juhtivatel positsioonidel alaesindatud. Lisaks, naistele makstakse vähem palka isegi, kui neil on meestega võrreldes sama kvalifikatsioon, neid edutatakse vähem ja nad saavad vähem toetusi (Fox 2001). Euroopa Komisjoni 2018. aastal koostatud uuringu kohaselt teenivad Euroopa naised keskmiselt 16% vähem kui mehed kui kogu majandustegevus on kaasatud (Euroopa Komisjon… 2018). Ühendkuningriigis läbi viidud uuringu tulemusena selgus, et naised panustavad õpetamisele rohkem energiat ja aega ning kulutavad vähem tunde teadusuuringute läbiviimisele, mis võib neid omakorda edutamise ajal viia ebasoodsasse olukorda (OECD… 2008).

Käesoleva töö eesmärgiks on välja selgitada, kas sooline palgalõhe STEM-iga seotud aladel on mõjutatud ülikoolis naislõpetajate osakaalust STEM ainetel aastatel 2013 – 2018 kolmes Balti riigis: Eestis, Lätis ning Leedus. Antud lõputöös käsitletakse palgalõhe olemasolu teoreetilist kui ka empiirilist poolt keskendudes just STEM ainetele. Töö rõhk on asetatud probleemile, kus naisi on “maskuliinsetel” tööaladel märkimisväärselt vähem, mis võib ka avaldada uusi murekohti palgalõhe olemasolule.

Töö eesmärgi saavutamiseks on autor püstitanud järgnevad uurimisküsimused:

- Mis on peamised põhjused, miks on naised STEM valdkondades alaesindatud ning kuidas on see töös käsitletud aastate jooksul muutunud?
- Millistes STEM valdkondades on palgalõhe suurim ja millistes väikseim?

Toetudes empiirilise analüüsi osale, testitakse ka järgnevaid hüpoteese:

- STEM aladel ülikoolis lõpetanud naiste osakaal on sõltuvuses STEM valdkonna palgalõhega.
- Palgalõhe on suurim just STEM valdkonnaga seotud töökohtades.
- Ülikooli naislõpetanute osakaal STEM aladel on sarnane kõikides Balti riikides.
- STEM valdkondadega mitteseotud lõpetanud naiste osakaal mõjutab STEM valdkondadega mitteseotud töökohtade soolist palgalõhet vähendavalt.

Töö esimeses peatükis tutvustatakse soolise palgalõhe teoreetilist ülevaadet ning selle rolli lähiajaloos ja tänases ühiskonnas. Samuti antakse ülevaade olulisematest uuringutest, mida on läbi aastate avaldatud. Teine peatükk annab ülevaate naiste alaesindatusest STEM valdkondadega seotud aladel ja ülikoolis STEM suunaga õppealadel. Lisaks pannakse rõhku käimasolevale võitlusele saamaks võrdse töö eest võrdset palka – probleem, mille ajendiks on kallutatud ning tugevate eelarvamustega ühiskond.

Töö kolmandas peatükis esitatakse kasutatud metoodika ning andmed. Autor arutleb kasutatud empiirilise meetodi ning selle üle, kuidas valitud uurimismeetod läbi viiakse. Neljandas peatükis käsitletakse korrelatsiooni- ja regressioonanalüüside tulemusel saadud empiirilisi tulemusi kasutades harilikku vähimruutude (OLS) meetodit. Lõigus 4.5 käsitleb autor tulemusi ja edasisi analüüsivõimalusi.

Empiirilise analüüsi jaoks on autor otsustanud kasutada OLS meetodit, mis on lineaarsete mudelite puhul üks levinumaid hindamismeetodeid ning mida kasutatakse regressioonanalüüsiks. Lisaks viiakse läbi dispersioonanalüüs kasutades ANOVA meetodit ja korrelatsioonanalüüsi kasutades multikollineaarsuse hindamiseks dispersioonide inflatsioonifaktorit (VIF). Autor viib läbi vajalikud testid andmekogumite seaduspärasuse kontrollimiseks – kõik testid sooritatakse statistika vabavaraga Gretl.

Eelpool kirjeldatud metoodikat rakendatakse OECD, Eesti Statistikaameti, Läti Statistika Keskbüroo ja Leedu Statistikaosakonna pakutavatel andmekogumitel. Antud andmeid avaldatakse iga-aastaselt, mida kogutakse riiklikel ning individuaalsetel tasandil. Kõrgkoolides ja ülikoolides kraadi või kvalifikatsiooniga lõpetajate andmed kajastavad naiste osalemist STEM valdkonnaga seotud õppeainetes, mida uuritakse kõikides OECD riikides (37 riiki) ja kolmes OECD-välises majanduses (Brasiilia, Costa Rica ja Venemaa). Kategooriad on jagatud mitmetesse erinevatesse kategooriatesse, kuid töö eesmärgi saavutamiseks valib autor kolm eraldi rühma (Education … 2020): 1) bakalaureuseõpe või samaväärne tase, 2) magistriõpe või samaväärne tase, 3) doktoriõpe või samaväärne tase.

Analüüsi tulemusena selgus, et Eestis ja Lätis on kolmes STEM valdkonnas lõpetanud naiste osakaal sõltuvuses soolisest palgalõhest STEM valdkonnaga seotud töökohtades: nendeks olid tervishoid ja heaolu ning info- ja kommunikatsioonitehnoloogia Eestis, ettevõtlus ja haldus ning info- ja kommunikatsioonitehnoloogia Lätis. Tervise ja heaolu valdkonnas lõpetajate osakaalu ühe protsendipunktiline tõus tingib keskmise soolise palgalõhe tõusu 0.85%. Ettevõtluse ja halduse valdkonnas kasvab keskmine sooline palgalõhe 0.12% ning info- ja kommunikatsioonitehnoloogias on Eestis märgatav 0.15% ja Lätis 0.19% kasv. Leedu puhul OLS meetod statistiliselt olulisi tulemusi ei andnud.

Vaadates soolise palgalõhe näitajat Baltikumis, on äratuntav erinevus STEM valdkonnaga seotud ja mitteseotud töökohtade vahel – kõrgem palgalõhe esineb STEM aladega seotud töökohtades kõigis kolmes Balti riigis, mis on võrdlemisi murettekitav tulemus. STEM aladega mitteseotud töökohtades on keskmine palgalõhe Baltikumis 13.6% ja maksimaalne väärtus 28.0%. Seevastu STEM aladega seotud valdkondades on keskmine palgalõhe 22.9% ja maksimaalne väärtus 41.8% – peaaegu kahekordne erinevus. STEM valdkondade ülikooli või sarnase õppeasutuse lõpetanute osakaal naistest on kõigis kolmes Balti riigis sarnane, ulatudes 52.3% Leedus kuni 54.0% Eestis ja Lätis, kuid aastate lõikes on lõpetanute arv languses.

Autor soovitab teemat edasi uurida, kuna puudub piisavalt uuringud, mis põhinevad naiste alaesindatusel STEM valdkondades ja selle seos aeglaselt väheneva, kuid siiski suhteliselt kõrge soolise palgalõhega. Kuna küsimus on Baltimaade lõikes Eestis kõige problemaatilisem, võiks kasutusele võtta ka teisi regressoreid või meetodeid mõistmaks peamisi probleeme, mis on tinginud taolise olukorra. Võimalusena saaks rakendada Oaxaca-Blinderi dekompositsiooni mudelit, mida kasutatakse lineaarse regressiooni mudelite jaoks näitamaks sooliste palgalõhe seletamatut osa.

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APPENDICES

Appendix 1. The percentage of women graduates in tertiary education in STEM fields in Estonia

Field	2013	2014	2015	2016	2017	2018
Business and administration*	70%	77%	74%	70%	67%	67%
Engineering, manufacturing and construction*	27%	34%	31%	30%	29%	31%
Health and welfare*	93%	93%	93%	92%	93%	91%
Information and communication technologies*	23%	25%	27%	27%	28%	27%
Natural sciences, mathematics and statistics*	64%	63%	66%	62%	67%	66%
Business and administration**	72%	76%	75%	75%	70%	67%
Engineering, manufacturing and construction**	34%	41%	34%	35%	35%	39%
Health and welfare**	81%	77%	78%	77%	79%	72%
Information and Communication Technologies**	39%	37%	37%	29%	31%	35%
Natural sciences, mathematics and statistics**	68%	68%	65%	61%	62%	57%
Business and administration***	55%	50%	83%	80%	71%	43%
Engineering, manufacturing and construction***	51%	42%	37%	36%	43%	45%
Health and welfare***	88%	80%	69%	64%	57%	50%
Information and Communication Technologies***	8%	0%	31%	13%	32%	14%
Natural sciences, mathematics and statistics***	57%	45%	47%	54%	60%	50%

Source: OECD (2020), author's calculations

Notes:

1. * Bachelor's or equivalent level
2. ** Master's or equivalent level
3. *** Doctor's or equivalent level

Appendix 2. The percentage of women graduates in tertiary education in STEM fields in Latvia

Field	2013	2014	2015	2016	2017	2018
Business and administration*	69%	66%	69%	68%	64%	62%
Engineering, manufacturing and construction*	29%	32%	28%	26%	28%	30%
Health and welfare*	91%	93%	89%	92%	88%	90%
Information and Communication Technologies*	23%	24%	20%	21%	20%	22%
Natural sciences, mathematics and statistics*	61%	62%	60%	65%	63%	62%
Business and administration**	73%	74%	71%	70%	68%	69%
Engineering, manufacturing and construction**	39%	39%	34%	36%	30%	32%
Health and welfare**	83%	77%	78%	77%	75%	74%
Information and Communication Technologies**	25%	24%	28%	33%	38%	31%
Natural sciences, mathematics and statistics**	65%	65%	63%	67%	64%	72%
Business and administration***	80%	80%	53%	58%	35%	50%
Engineering, manufacturing and construction***	32%	51%	41%	38%	50%	35%
Health and welfare***	80%	73%	64%	83%	73%	56%
Information and Communication Technologies***	35%	42%	33%	25%	43%	25%
Natural sciences, mathematics and statistics***	61%	44%	48%	53%	68%	58%

Source: OECD (2020), author’s calculations

Notes:

1. * Bachelor’s or equivalent level
2. ** Master’s or equivalent level
3. *** Doctor’s or equivalent level

Appendix 3. The percentage of women graduates in tertiary education in STEM fields in Lithuania

Field	2013	2014	2015	2016	2017	2018
Business and administration*	71%	70%	69%	70%	69%	69%
Engineering, manufacturing and construction*	22%	24%	25%	23%	24%	26%
Health and welfare*	88%	87%	89%	87%	88%	88%
Information and Communication Technologies*	16%	12%	10%	10%	13%	15%
Natural sciences, mathematics and statistics*	57%	62%	58%	60%	58%	62%
Business and administration**	72%	74%	73%	72%	71%	71%
Engineering, manufacturing and construction**	33%	34%	30%	31%	32%	33%
Health and welfare**	78%	75%	75%	77%	75%	74%
Information and Communication Technologies**	15%	27%	24%	20%	27%	26%
Natural sciences, mathematics and statistics**	62%	61%	57%	61%	59%	60%
Business and administration***	76%	84%	70%	69%	63%	95%
Engineering, manufacturing and construction***	39%	32%	38%	33%	39%	25%
Health and welfare***	81%	73%	55%	75%	78%	61%
Information and Communication Technologies***	8%	45%	63%	0%	63%	17%
Natural sciences, mathematics and statistics***	58%	58%	51%	52%	49%	59%

Source: OECD (2020), author's calculations

Notes:

1. * Bachelor's or equivalent level
2. ** Master's or equivalent level
3. *** Doctor's or equivalent level

Appendix 4. Gender wage gap in STEM-related fields in the Baltics

Field	2013	2014	2015	2016	2017	2018
Business and administration*	42%	40%	34%	33%	38%	33%
Engineering, manufacturing and construction*	26%	22%	26%	22%	22%	19%
Health and welfare*	22%	30%	28%	26%	28%	29%
Information and communication technologies*	30%	25%	23%	25%	25%	23%
Natural sciences, mathematics and statistics*	21%	15%	25%	19%	23%	16%
Business, administration**	31%	35%	29%	26%	30%	28%
Engineering, manufacturing and construction**	11%	11%	11%	12%	9%	8%
Health and welfare**	21%	23%	22%	19%	17%	18%
Information and communication technologies**	14%	10%	11%	15%	16%	11%
Natural sciences, mathematics and statistics**	13%	16%	14%	8%	15%	3%
Business and administration***	40%	40%	39%	38%	38%	37%
Engineering, manufacturing and construction***	13%	14%	15%	14%	12%	11%
Health and welfare***	28%	32%	34%	30%	28%	27%
Information and Communication Technologies***	28%	29%	30%	30%	28%	28%
Natural sciences, mathematics and statistics***	20%	17%	17%	16%	17%	18%

Source: Statistics of Estonia (2020), Central Statistical Bureau of Latvia (2020), Lithuanian Department of Statistics (2020), author’s calculations

Notes:

1. * Estonia
2. ** Latvia
3. *** Lithuania

Appendix 5. OLS model based on Estonian data

Mean dependent var	−1.337	S.D. dependent var	0.061
Sum squared resid	0.002	S.E. of regression	0.027
R-squared	0.883	Adjusted R-squared	0.805
F(2, 3)	11.322	P-value(F)	0.040
Log-likelihood	15.267	Akaike criterion	−24.534
Schwarz criterion	−25.159	Hannan-Quinn	−27.034
rho	−0.032	Durbin-Watson	1.994

Appendix 6. ANOVA test based on Estonian data

Analysis of Variance:

	Sum of squares	df	Mean square
Regression	0.016	2	0.008
Residual	0.002	3	0.001
Total	0.019	5	0.004

$R^2 = 0.0163 / 0.019 = 0.883$
$F (2, 3) = 0.008 / 0.001 = 11.322$ [p-value 0.040]

Appendix 7. VIF test based on Estonian data

Variance Inflation Factors
Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

l_Healthandwelfare	1.144
l_Informationandcommunication	1.144

$VIF_j = 1/(1 - R_j^2)$, where R_j is the multiple correlation coefficient between variable j and the other independent variables.

Appendix 8. White's test based on Estonian data

Dependent variable: $uhat^2$

	coefficient	std. error	t-ratio	p-value
const	−0.004	0.020	−0.226	0.859
l_Healthandwelfa~	−0.017	0.019	−0.935	0.521
l_Informationand~	−0.007	0.028	−0.244	0.848
sq_l_Healthandwe~	−0.039	0.040	−0.988	0.509
sq_l_Information~	−0.003	0.010	−0.318	0.804

Unadjusted R-squared = 0.905

Test statistic: TR^2 = 5.433,
with p-value = P(Chi-square(4) > 5.433) = 0.246

Appendix 9. OLS model based on Latvian data

Mean dependent var	0.168	S.D. dependent var	0.019
Sum squared resid	0.001	S.E. of regression	0.012
R-squared	0.783	Adjusted R-squared	0.638
F(2, 3)	5.413	P-value(F)	0.101
Log-likelihood	20.351	Akaike criterion	−34.701
Schwarz criterion	−35.326	Hannan-Quinn	−37.202
rho	0.048	Durbin-Watson	1.569

Appendix 10. ANOVA test based on Latvian data

Analysis of Variance:

	Sum of squares	df	Mean square
Regression	0.001	2	0.001
Residual	0.001	3	0.001
Total	0.002	5	0.001

$R^2 = 0.001 / 0.002 = 0.783$

F (2, 3) = 0.001 / 0.001 = 5.413 [p-value 0.101]

Appendix 11. VIF test based on Latvian data

Variance Inflation Factors
Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

l_Businessandadministration 1.070
l_Informationandcommunication 1.070

$VIF_j = 1/(1 - R_j^2)$, where R_j is the multiple correlation coefficient between variable j and the other independent variab

Appendix 12. White's test based on Latvian data

Dependent variable: $uhat^2$

	coefficient	std. error	t-ratio	p-value	
const	−0.074	0.002	−33.66	0.019	**
l_Businessandadm~	0.002	0.001	3.633	0.171	
l_Informationand~	−0.118	0.004	−33.15	0.019	**
sq_l_Businessand~	0.006	0.001	9.489	0.067	*
sq_l_Information~	−0.047	0.001	−33.13	0.019	**

Unadjusted R-squared = 0.999

Test statistic: TR^2 = 5.997,
with p-value = P(Chi-square(4) > 5.997) = 0.199

Appendix 13. The percentage of women graduates in tertiary education in non-STEM fields in Estonia

Field	2013	2014	2015	2016	2017	2018
Agriculture, forestry, fisheries and veterinary*	38%	41%	42%	36%	39%	41%
Education*	95%	93%	93%	95%	95%	98%
Arts and humanities*	77%	75%	72%	74%	72%	74%
Services*	44%	38%	48%	45%	43%	47%
Agriculture, forestry, fisheries and veterinary**	65%	73%	68%	66%	68%	65%
Education**	95%	92%	90%	91%	91%	89%
Arts and humanities**	74%	73%	71%	69%	68%	63%
Services**	38%	53%	54%	44%	39%	55%
Agriculture, forestry, fisheries and veterinary***	75%	67%	43%	55%	62%	57%
Education***	90%	100%	70%	82%	75%	78%
Arts and humanities***	62%	66%	52%	79%	63%	58%
Services***	100%	50%	0%	0%	100%	0%

Source: OECD (2020), author's calculations

Notes:

1. * Bachelor's or equivalent level
2. ** Master's or equivalent level
3. *** Doctor's or equivalent level

Appendix 14. The percentage of women graduates in tertiary education in non-STEM fields in Latvia

Field	2013	2014	2015	2016	2017	2018
Agriculture, forestry, fisheries and veterinary*	47%	28%	37%	33%	32%	25%
Education*	91%	89%	93%	91%	90%	92%
Arts and humanities*	80%	78%	75%	74%	75%	77%
Services*	68%	58%	60%	61%	58%	59%
Agriculture, forestry, fisheries and veterinary**	74%	59%	82%	71%	63%	78%
Education**	92%	93%	91%	91%	92%	94%
Arts and humanities**	81%	81%	80%	78%	77%	78%
Services**	68%	64%	64%	69%	62%	61%
Agriculture, forestry, fisheries and veterinary***	30%	67%	100%	33%	75%	57%
Education***	88%	65%	72%	63%	80%	88%
Arts and humanities***	59%	70%	68%	87%	100%	67%
Services***	50%	67%	80%	100%	100%	0%

Source: OECD (2020), author's calculations

Notes:

1. * Bachelor's or equivalent level
2. ** Master's or equivalent level
3. *** Doctor's or equivalent level

Appendix 15. The percentage of women graduates in tertiary education in non-STEM fields in Lithuania

Field	2013	2014	2015	2016	2017	2018
Agriculture, forestry, fisheries and veterinary*	44%	41%	41%	41%	48%	50%
Education*	81%	80%	82%	80%	79%	79%
Arts and humanities*	77%	73%	75%	73%	75%	76%
Services*	39%	39%	48%	47%	47%	48%
Agriculture, forestry, fisheries and veterinary**	67%	65%	59%	54%	62%	63%
Education**	84%	82%	83%	83%	83%	85%
Arts and humanities**	75%	73%	75%	71%	72%	75%
Services**	28%	24%	30%	22%	22%	30%
Agriculture, forestry, fisheries and veterinary***	62%	78%	81%	72%	81%	76%
Education***	79%	81%	77%	75%	64%	85%
Arts and humanities***	67%	61%	76%	62%	65%	59%
Services***	0%	0%	0%	0%	0%	0%

Source: OECD (2020), author's calculations

Notes:

1. * Bachelor's or equivalent level
2. ** Master's or equivalent level
3. *** Doctor's or equivalent level

Appendix 16. Gender wage gap in non-STEM related fields in the Baltics

Field	2013	2014	2015	2016	2017	2018
Agriculture, forestry, fisheries and veterinary*	13%	15%	20%	19%	13%	19%
Education*	26%	25%	21%	19%	16%	17%
Arts and humanities*	20%	21%	27%	25%	18%	21%
Services*	27%	21%	14%	8%	1%	13%
Agriculture, forestry, fisheries and veterinary**	19%	15%	16%	19%	22%	18%
Education**	3%	2%	1%	-4%	-12%	-5%
Arts and humanities**	9%	8%	18%	12%	14%	5%
Services**	0%	0%	-2%	0%	0%	0%
Agriculture, forestry, fisheries and veterinary***	15%	16%	16%	15%	15%	12%
Education***	0%	3%	3%	28%	1%	2%
Arts and humanities***	12%	12%	13%	12%	10%	12%
Services***	18%	20%	20%	19%	15%	16%

Source: Statistics of Estonia (2020), Central Statistical Bureau of Latvia (2020), Lithuanian Department of Statistics (2020), author’s calculations

Notes:

1. * Estonia
2. ** Latvia
3. *** Lithuania

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