Gender in trade – the effects of globalisation on gender wage disparities

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Abstract

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Title: Gender in trade – the effects of globalisation on gender wage disparities	
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Abstract: Economic integration and cooperation have grown more important during the last century and especially during the last decades. The benefits of economic globalisation are many, but even in the most equal societies these benefits are not distributed evenly among the population. Especially in developed economies, globalisation extends possibilities for highly educated individuals to gain employment and financial benefits, while individuals with lower education find it more difficult to benefit from, and take part in, more integrated global markets. Similar differences are observed between fields of education, industries and, as indicated by results in this thesis, genders. The purpose of this thesis is to analyse the relationship between globalisation and the gender wage gap in the Finnish private sector labour market. The analysis is based on a new panel data set created by combining enterprise-level data for Finnish enterprises and personal-level employee data from the FLEED database for years 2008-2016. The utilised registers are maintained by and accessed through Statistics Finland. Results show that enterprises participating in trade as exporters pay higher salaries to all of their employees, regardless of gender. Gender segregation into exporting and non-exporting enterprises causes an increase in wage disparities as male employees take part in, and benefit from, trade more often than female employees. An equalising effect arises as female employees who take part in trade, i.e. work in exporting enterprises or enterprises that start exporting, gain more from trade than their male colleagues. Nominal wage differences exist in both non-exporting and exporting enterprises, and they favour men in both enterprise groups, but the relative difference between genders seems to be smaller in enterprises engaging in trade.	
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1. Introduction

Economic globalisation[1] has been one of the most persistent topics of discussions in policymaking during the past decades. The role of international trade and economic cooperation has steadily grown more important and is influencing the development of countries all around the world. Countries and companies rely on distant trade partners for products and supplies ranging from raw materials to food and consumer electronics, and global trade networks allow for the fast transfer of goods across national borders. Every day, billions of euros worth of goods are shipped around the globe to fulfil the needs of private consumers, companies and nations.

Global markets and economic integration have many positive implications for people around the world; we gain access to higher quality products at lower prices, we share competences and develop new skills based on foreign knowledge, and we increasingly communicate to innovate and create new products that make our lives easier. Globalisation connects people in ways previously unheard of and it is a central source for economic growth and wellbeing.

While the macrolevel benefits of economic globalisation are undeniable, we do not have a clear view of how these benefits are distributed in society. The opportunities to capture positive effects of globalisation are not equal to all, and it is likely that there are both winners and losers as countries and markets become more intertwined. The relocation of factories from high-cost European countries to e.g. China is a good example of this; large enterprises and their owners have significantly benefitted from the lower production costs, while European factory workers have been forced to look for new ways to make their living.

In this thesis, I study the distribution of globalisation advantages from the perspective of gender equality. By utilising a new microdata set based on firm-level information from Finland, I aim to contribute to the discussion on globalisation in a new way and provide insight into the effects of globalisation on wage construction and wage disparities in developed economies.

[1] Used to describe an increasing internationalisation of markets for goods and services, the means of production, financial systems, competition, corporations, technology and industries (OECD, 2013a). The term is discussed further in chapter 1.3 Key concepts.

1.1 Background

Finland ranks among the most gender-equal countries in international comparisons. The World Economic Forum and the United Nations ranked Finland among the five most gender-equal countries in the world in 2017, and Finland is likely to stay at the top during coming years (United Nations Development Programme, 2017; World Economic Forum, 2017). Despite this fact, many discussions in Finnish policymaking and media revolve around the issues of gender wage gap, glass ceilings[2] and persistent gender differences in the choice of field of education[3]. These discussions indicate that international rankings do not fully describe the situation on the grass root level of society.

Finland has greatly benefitted from globalisation and international trade both as a provider and receiver of products, innovations, services and societal development. In a country perspective, it is clear that the current level of welfare could not have been achieved without international markets and cooperation. In the context of equality and on a more detailed level of society it is, however, worth questioning whether the benefits of globalisation have been evenly distributed among e.g. gender, levels of education and professions, despite Finland's high ranking in international comparisons. People take part in society in different ways and are therefore also differently affected by events and changes in it.

Income disparities exist and develop in different parts of society. Discriminatory wage differences are widely researched and discussed in media and policymaking, but reports show that, while not directly indicated, income disparities can arise for numerous other reasons. In conjunction with our increasingly interconnected world, the ability of groups to capture benefits of globalisation is a good example of how income inequality can increase without direct discriminatory actions. For example, Finnish economic globalisation, and economic globalisation in general, has largely been driven by high-tech firms employing engineering professions dominated by male professionals. As the dominant workforce in globalised industries, highly educated male employees have likely benefitted more than low-educated male employees or female employees from the advantages of economic globalisation.

[2] Invisible but real barrier through which the next level of advancement can be seen but cannot be reached by a section of qualified and deserving employees. Such barriers exist due to implicit prejudice based on e.g. age, ethnicity, political or religious affiliation or sex (BusinessDictionary, 2019).
[3] Gender pay gap (YLE, 2017), glass ceilings for female employees (YLE, 2015), fields of education (YLE, 2019)

The unequal participation in the globalisation process can also be seen among entrepreneurs. According to Statistics Finland's report *Yrittäjät Suomessa 2017* and the *Labour Force Survey 2017*, the share of female entrepreneurs is still considerably lower than the share of male entrepreneurs in the majority of sectors (Tilastokeskus, 2018, 2019). The reports further show that female entrepreneurs are mainly concentrated to low-paid, country-level sectors such as health- and social services. While the results do not directly indicate growing income disparities, they indicate that male entrepreneurs more often than female entrepreneurs take part in globalisation and are on the forefront of capturing the positive effects of international trade.

In this thesis, I show that enterprises engaging in international trade employ, on average, more male than female employees. The result is particularly interesting for exporting enterprises that are likely to benefit most from broader markets and less dependency on domestic demand. I also show that trading enterprises are more productive[4] than non-trading enterprises, anticipating that wages in trading enterprises are higher than in their non-trading counterparts[5]. A combination of the above results indicates a negative effect on the gender wage gap as the male-dominated workforce in trading enterprises captures more of the benefits of international markets. Similar second-hand effects are likely to appear between other groups in society, e.g. levels of education and professions, depending on their participation in foreign trade. Through my analyses I determine whether enterprise participation in international trade can explain a part of the existing wage differences between female and male employees. I try to find a statistically significant relationship between firm trade participation and the gender wage gap by checking for various firm heterogeneities and employee characteristics.

In the following subchapter I discuss the objectives, research questions and hypotheses of this thesis, and present the research methods.

1.2 Objective, research questions and hypotheses

The objective of this thesis is to analyse the relationship between globalisation and wage distribution. Through the analysis, I aim to provide a basis for better understanding how

[4] Productivity measured by value added per employee.
[5] According to marginal productivity theory (Encyclopedia Britannica, 2019).

globalisation affects wage disparities in Finland and, in a broader perspective, in other developed economies. Focus is set on gender wage disparities by examining the gender wage gap on enterprise level based on enterprise- and employee characteristics. The analyses include further dimensions that capture parts of and broaden the understanding of the effects of globalisation on wage distribution. Based on the objective the main research question is:

- What are the effects of globalisation on the gender wage gap?

I answer the research question by reviewing current research and statistics on the subject and by applying economic theories on income distribution to the problem. I also perform an econometric analysis to estimate the relationship between globalisation and wage disparities. In the analysis, I look at wage construction in enterprises that engage in international trade as exporters compared to those that do not export. The econometric analysis is based on a new panel data set comprised of enterprise-level data for Finnish enterprises and personal-level employee data from the FLEED database[6], both maintained by Statistics Finland. The econometric model and the microdata set are presented in more detail in chapter 4.

The hypothesis is that globalisation negatively affects income equality, i.e. increases inequality, between women and men. The basis for the hypothesis is the fact presented in the previous chapter – the primary drivers of economic globalisation have historically been enterprises in high-tech industries dominated by male employees. This indicates that male employees have traditionally been better suited to capture the economic benefits of globalisation, e.g. through higher wages. The thesis builds on the hypothesis that enterprises engaging in international trade are more productive than non-trading enterprises and, furthermore, that these enterprises still employ a male-dominated workforce.

The positive correlation between economic globalisation and skill-based income disparities has been proven by researchers before, but the gender aspect is a new addition to the existing literature (Brambilla et al., 2012; Helpman, 2017; Verhoogen, 2008). The newly comprised data set also allows for further breakdowns based on employee- and enterprise characteristics. Additional breakdowns are included to the extent that they give a better understanding of the researched causes and relations.

[6] Finnish Longitudinal Employer-Employee Data (Statistics Finland, 2019c). FLEED will be discontinued after statistical year 2016 and replaced by FOLK-modules.

In addition to the primary research question I aim to answer the following questions:

- What is the effect of international trade on wage differences on a national level?
- Do exporting enterprises employ a male-dominant workforce?
- Are exporting enterprises more productive than non-exporting enterprises?
- Do exporting enterprises employ a more highly educated workforce than non-exporting enterprises?
- Are wage differences larger in enterprises engaging in international trade, and why?

The objective of the sub-questions is to confirm or disconfirm the hypotheses mentioned earlier. By answering the sub-questions, I aim to better describe researched cause-effect relations between globalisation and wage disparities and, at the same time, improve prospects for finding additional results that describe the development of wage differences in Finland.

The thesis is structured as follows: I start by presenting previous research on the gender wage gap in Finland and internationally. I discuss gender wage disparities on a more general level, as it is a relevant field of research that can provide more and better background material for my research. I also present previous research and statistics on differences in trade participation between male and female employees. Lastly, I present a Norwegian study published in 2017 that analyses the relationship between globalisation and gender wage disparities in a similar way as I do in this thesis.

After presenting relevant research I discuss economic theories regarding wage distribution and income disparities. The theoretical framework is tied to my econometric analysis which is the main part of the thesis. The econometric analysis is based on a newly constructed panel data set covering Finnish enterprises and the Finnish workforce between years 2008 and 2016. The results indicate that globalisation increases gender wage disparities, and wage disparities more generally, on national level, but that it decreases gender wage disparities between individuals who actively take part in it by working in global enterprises. The thesis data set is presented in more detail in chapter 4.

There are numerous elements related to income distribution and -disparities that can be discussed based on the data used in this thesis. To keep a manageable structure and extent of research, I focus on the above-mentioned research questions and hypotheses. In accordance with the main research question, I analyse the globalisation-to-wage gap-relationship as a one-way cause-effect relation. Some researchers have looked at the effects

of gender equality on trade- and globalisation success, i.e. as a reversed cause-effect relation, but the question is outside the scope of research for this thesis. I also do not answer questions regarding e.g. long-term wealth distribution or economic justice.

The utilised data also demarcates the analyses and result interpretation to some extent. The data does not for example account for unpaid work such as household- or voluntary work as labour input and is therefore strictly an analysis of the Finnish labour market and its relationship with globalisation and international trade. Furthermore, salary is the primary dependent variable in the econometric analyses while other indicators of gender equality are excluded. Data-caused demarcations and restrictions are considered in all result interpretations and are discussed further in conjunction with the analyses.

In the following subchapter, I introduce key concepts that help specify the subject of the analysis. The subchapter concludes the introductory part of the thesis.

1.3 Key concepts

Globalisation

Globalisation is a frequently occurring topic in policy- and public discussion. The meaning of the concept is, however, somewhat difficult to pinpoint. In principle, globalisation indicates the process where the world is becoming increasingly interconnected as a result of cultural exchange, international cooperation, trade and knowledge sharing, to name a few. In an unspecified form globalisation can indicate all events that somehow connect people from different countries and parts of the world. Globalisation is not a new phenomenon, but the pace at which it takes place in our world today is remarkable compared to previous decades and it affects our lives in ways previously unthinkable. (Council of Europe, 2017)

There is no standardised definition for globalisation, but a consensus exists regarding what the concept means and which phenomena it includes. International organisations have their own definitions of globalisation on a general level, but none of them specify which indicators to be used for measuring it. UNESCO[7] lists a collection of characteristics that describe globalisation as a multi-dimensional process that increases e.g. economic-, policy- and technological cooperation across national borders. UNESCO also mentions the reduction of

[7] United Nations Educational, Scientific and Cultural Organization

the welfare state, privatisation of social services and the re-emergence of nationalism as non-economic effects of globalisation (UNESCO, 2017). The World Bank defines globalisation as "*the growing integration of economies and societies around the world"* (The World Bank, 2009) and the OECD[8] states that globalisation describes *"an increasing internationalisation of markets for goods and services, the means of production, financial systems, competition, corporations, technology and industries"* (OECD, 2013).

The common denominator in the definitions above is the economic aspect of globalisation. Although globalisation includes e.g. cultural and religious aspects, it is above all the related economic events that are discussed in policymaking and media. This is also the approach in this thesis. I define enterprise participation in globalisation through their participation in international markets, i.e. by measuring how much of their purchases they import and how much of their production they export to foreign countries. All cultural and unmeasurable enterprise characteristics are excluded from the assessment of globalisation participation. It is likely that this definition does not cover all aspects of enterprise participation in globalisation or how they are affected by it, but it is a clear way of separating enterprises that actively take part in globalisation from those that passively gather benefits or suffer drawbacks from it. With the clear separation of firms into non-partakers and partakers of globalisation, I can estimate the effects of globalisation on wage and wage distribution.

Gender wage gap

The gender wage gap shows how salaries for male and female employees differ in the workforce. Wage gaps between genders, and between other groups in society, have been closely examined during the past decades, as the attention of both policymakers and the general public has turned more towards equal possibilities for all.

An important thing to keep in mind is that my analyses focus on the *gender wage gap*[9] and not the *gender income gap. Wage,* or *salary,* is payed as a compensation for completing work over a given time, e.g. an hour or a month, while *income* is a broader concept that includes wages, capital incomes, rents, social benefits etc. (OECD, 2018). The analysed data set includes personal- and enterprise-level salary information but does not show incomes from

[8] Organisation for Economic Co-operation and Development
[9] Also referred to as the *gender pay gap.*

other sources, concentrating the analyses to labour market equality instead of societal equality as a whole. This means that indicators such as the internationally recognised Gini coefficient[10] are not directly comparable to my results.

The OECD defines the gender wage gap[11] as *"the difference between median earnings of men and women relative to median earnings of men"* (OECD, 2018a). The indicator is reported as a percentage value, where a higher value indicates a less equal labour market. The European Commission uses a similar definition as the OECD reading *"the gender pay gap is defined as the relative difference in the average gross earnings of women and men within the economy as a whole"* (European Commission, 2018). The indicator published by the European Commission is likewise reported as a percentage value where a higher value means less equality. A third common way of calculating the gender wage gap is by dividing the median income of female employees with the median income of male employees, producing a similar percentage-indicator as the other two methods (McManus, 2019).

The European Commission makes two important remarks related to the pay gap indicator that also apply to my research: 1) *"Since it concerns salaried people, the gender pay gap is not an indicator of the overall inequality between women and men"* and 2) *"The gender pay gap must be looked at along with other indicators linked to the labour market, in particular those that reflect the different working patterns of women"* (European Commission, 2018). These remarks highlight the importance of multi-dimensional analyses in understanding how and why gender wage disparities arise. My goal is to add international market-participation as a new dimension to existing research and thereby deepen the understanding of said disparities in developed economies.

In my analysis I estimate the effect of globalisation on female and male average wages, respectively. Instead of directly using one of the above definitions, I aim to estimate the relationship between globalisation and the presented indicators of gender wage equality.

[10] The Gini coefficient is based on the comparison of cumulative proportions of the population against cumulative proportion of income they receive. The coefficient ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality (OECD, 2018).
[11] Reported as gender pay ratio.

2. Previous research and current situation

In this chapter, I introduce previous research on the gender wage gap and relevant income disparities. I look at the gender wage gap in different countries during the last decades and discuss possible explanations for existing gender wage disparities. For research on gender wage disparities, I focus on research from Finland and the Nordic countries in order to obtain as reliable a comparison as possible. In subchapter 2.3 on gender trade participation, I take a more global approach. In subchapter 2.3, I present a Norwegian study on firm trade participation and gender wage disparities where the hypotheses and methodology are similar to the ones in this thesis.

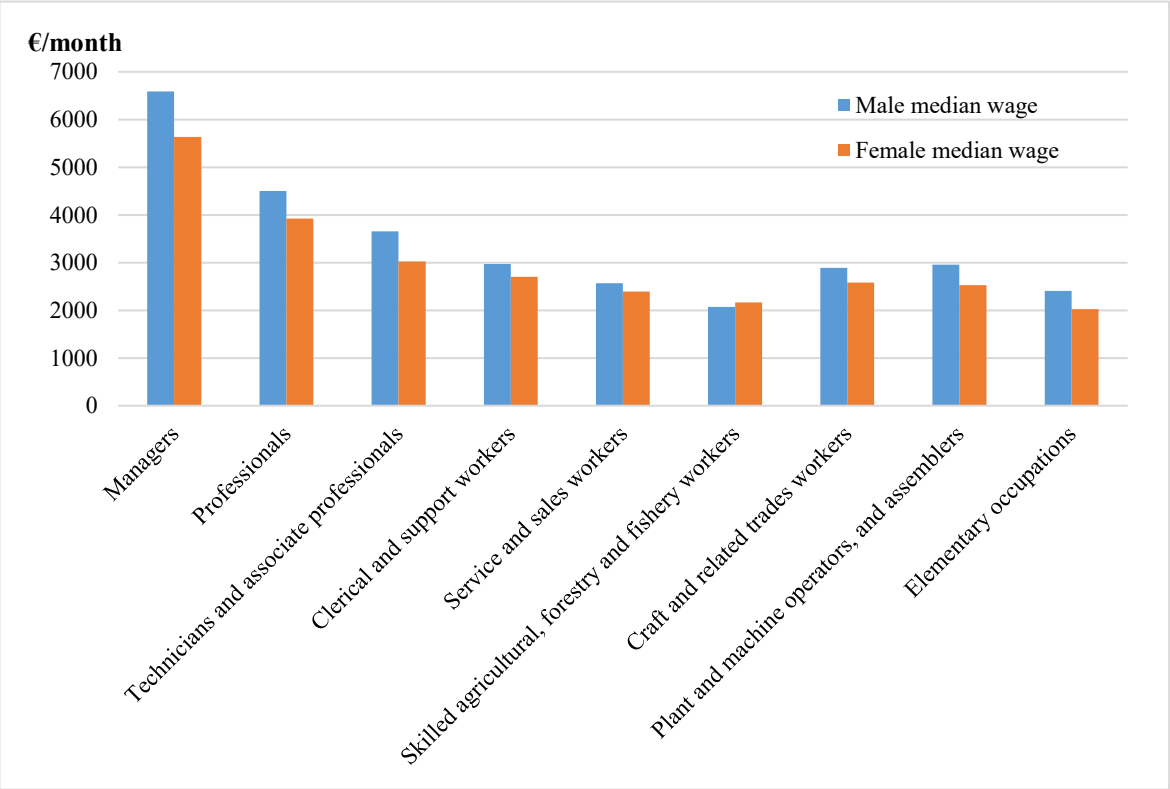
The gender wage gap in developed economies is usually between 15 and 25 per cent in favour of male employees. Estimates for the Finnish workforce have long fallen within this range. The latest indicators and research results show that the gender wage gap has diminished, but that there still exists an inexplicable wage difference between male and female employees. Researchers have found that differences in e.g. education and work experience explain significant portions of the wage gap, but not all of it. The inexplicable gender wage gap usually ranges from 2 to 7 per cent, indicating that some form of gender wage discrimination does take place even in the most gender-equal countries in the world (OECD, 2018a).

2.1 Wage disparities

A publication by Statistics Finland shows that male employees had a higher median wage than female employees in all but one of nine main occupational groups[12] in the Finnish private sector in 2018 (Tilastokeskus, 2019a)[13]. In the whole private sector, the median gender wage gap is about 22 per cent, meaning that female employees earning median wage earn 78 cents for every euro earned by male employees at their respective median wage. The difference for the whole economy has remained unchanged since 2017 (Tilastokeskus, 2018a).

[12] Classification of Occupations 2010 (Statistics Finland, 2019a).
[13] Female employees in group “skilled agricultural, forestry and fishery workers” have a higher median wage than male employees.

Looking at occupational groups separately, the median wage gap is largest among technicians and associate professionals, about 17 per cent. In occupational groups dominated by female employees, e.g. clerical support workers, the wage gap is significantly lower, about 9 per cent. The internal differences for professional groups have changed somewhat from 2017 when the largest difference, 22 per cent, was observed between male and female managers. Respective median wages for male and female employees are shown in Graph 1 below.



Graph 1 Median wages by main occupational groups in the Finnish private sector, 2018.

In 2018, male employees had higher median wages in all occupational groups except one. The percentage difference was largest among technicians and associate professionals and smallest among clerical support workers. Source: (Tilastokeskus, 2019a)*, own illustration.*

The lower wage gaps within occupational groups indicate that there are denominators in addition to gender that affect income disparities in the Finnish private sector. According to Statistics Finland, part of the gender wage gap can be explained by differences in fields of education between male and female employees. For example, male employees dominate industries employing high-wage educations such as ICT and engineering, while female employees dominate sectors employing lower-wage educations such as health and

wellbeing[14]. However, a breakdown of median wages by gender and field of education shows that male employees have a higher median wage in all 13 listed educational fields, even though 7 of them have a higher share of female examinations. The results indicate that further cross-denominal breakdowns are needed to understand how male and female employees differ, and how wage disparities arise in the Finnish workforce (Tilastokeskus, 2019a).

A gender pay gap-factsheet published by the European Commission shows that Finland had a one percentage point higher gender wage gap than the EU-average in 2014[15]. In addition to pay discrimination, the factsheet lists four factors that contribute to the gender pay gap: 1) "*management and supervisory positions are overwhelmingly held by men"*, 2) "w*omen take charge of important unpaid tasks, such as household work and caring for children or relatives on a far larger scale than men do",* 3) "*women tend to spend periods off the labour market more often than men"* and 4) *"segregation in education and in the labour market; this means that in some sectors and occupations women tend to be overrepresented, while in others men are overrepresented"*. Factor four is expanded with the notion that women tend to work in occupations where wages are lower even though requirements for education and experience are equal, e.g. teaching where a higher-degree level tertiary education is required (European Commission, 2017).

The factors listed above are common conclusions in research papers on gender wage disparities. Researchers have found that the gender wage gap is reduced significantly when accounting for differences in levels- and fields of education, hierarchical positioning within firms, parental leave as a disruption in work experience etc. Most publications find that inter-individual differences reduce the gender wage gap to around 5 per cent, some even lower[16]. While a positive result for the aspect of gender equality, the results show that there exists an inexplicable wage gap even after accounting for obvious differences between individuals.

In an article published in 2006, Ossi Korkeamäki and Tomi Kyyrä examine the gender wage gap in Finland using a similar data set as the one I use in this thesis (Korkeamäki & Kyyrä, 2006). The authors analyse the wage gap between white-collar male and female employees in the Finnish manufacturing sector in year 2000 using a matched employer-employee data set. Korkeamäki and Kyyrä observe industry-, firm- and employee characteristics in their analyses, and find an inexplicable wage gap of about 6 per cent between male and female

[14] Share of female examinations in; ICT (19%), engineering (17%), health and wellbeing (85%).
[15] Finland 17.3 per cent, EU-average 16.3 per cent.
[16] For example, sources presented below.

employees working similar jobs with equal education, work experience and tenure. The initial difference of 22 per cent is primarily explained by within-firm occupational segregation, as male workers occupy a larger share of managerial positions and positions requiring higher skill-levels. Firm gender segregation also affects the gender wage gap as female employees tend to work in firms that pay below-average wages. According to the authors, industry segregation is not a significant factor affecting the gender wage gap, i.e. female employees do not, on a significant level, work in industries paying below-average wages.

In another study, using an identical data set and the same methodology, Korkeamäki and Kyyrä analyse the gender wage gap for blue-collar employees in the Finnish manufacturing sector in 2000 (Korkeamäki & Kyyrä, 2003). Initial results show a gender wage gap of 16 per cent, considerably lower than for white-collar employees in the same sectors. After accounting for industry-, firm- and employee characteristics, the authors find the inexplicable gender wage gap for blue-collar workers to be 3.5 per cent. Firm gender segregation is the most significant denominator affecting wage differences among blue-collar workers, followed by occupational segregation of female employees to jobs requiring lower skill-levels. Korkeamäki and Kyyrä do not find an explanation for firms employing a female-dominated workforce paying on average lower wages, leaving a significant inexplicable gender wage gap possibly caused by gender discrimination.

Korkeamäki's and Kyyrä's results are comparable to contemporary results from other Nordic countries. During the years around 2000, the inexplicable wage gap for white-collar employees was roughly identical in Sweden and Norway, but significantly larger in Denmark (14 per cent). The main attributes affecting the gender wage gap differed somewhat in the Nordic countries. In Sweden and Norway, results match those of Finland with occupational segregation causing most of the wage gap. In Denmark, the wage gap is largely inexplicable, as no form of segregation is found to cause a significant share of the gender wage gap (Datta Gupta & Rothstein, 2001; Korkeamäki & Kyyrä, 2003; Meyersson-Milgrom et al., 2001; Petersen et al., 1997).

Among blue-collar workers, the initial wage gap was somewhat lower in both Sweden and Norway[17]. In Sweden, similarly to Finland, the gender wage gap was mainly explained by firm segregation. Results for Norway split the causes of gender wage disparities more

[17] Korkeamäki and Kyyrä do not present comparable results for Denmark.

equally, as no single form of segregation was found especially important. The inexplicable gender wage gap in Norway was very close to the 3.5 per cent gap found in Finland, and somewhat lower in Sweden (Korkeamäki & Kyyrä, 2003; Meyersson-Milgrom et al., 2001; Petersen et al., 1997).

Korkeamäki's and Kyyrä's results are corroborated by other Finnish researchers analysing the same time period. In a study on gender wage disparities in the Finnish service sector in 2001, Antti Luukkonen finds an inexplicable gender wage gap of 3.7 per cent. Luukkonen studies the total service sector working population without separating white- and blue-collar employees. He finds occupational segregation to be the most important factor causing gender wage disparities, explaining about half of the gender wage gap, followed by firm segregation explaining a third of the gap. As an additional result, Luukkonen finds that age-related work experience tends to raise wages more for male employees than for female employees, negatively affecting gender wage equality (Luukkonen, 2003).

A publication by the Swedish National Mediation Office shows that the gender wage gap was 11.3 per cent measured for the whole economy in 2017 (Medlingsinstitutet, 2018). In accordance with previously presented studies, the report shows that differences in professions, working sectors, educations, ages and working hours explain the majority of wage differences between female and male employees. The report finds the inexplicable wage gap to be 4.3 per cent within the whole economy, varying from 6.5 per cent for employees in the private sector to 0.3 per cent for municipal officials. The significant sectorial differences highlight the importance of breaking down the workforce into smaller groups when studying wage disparities.

The above results show that there exists a significant gender wage gap in all Nordic countries. The primary causes for the gap vary over country borders, industries and employee groups, but the share of the wage gaps that can be explained by observable forms of segregation and employee characteristics are of similar magnitude, as are subsequently the inexplicable shares. Recent publications by national institutions show that the gender wage gap structures have not significantly changed over time, indicating that results produced in earlier studies still hold for the Nordic labour markets.

2.2 Trade participation by gender

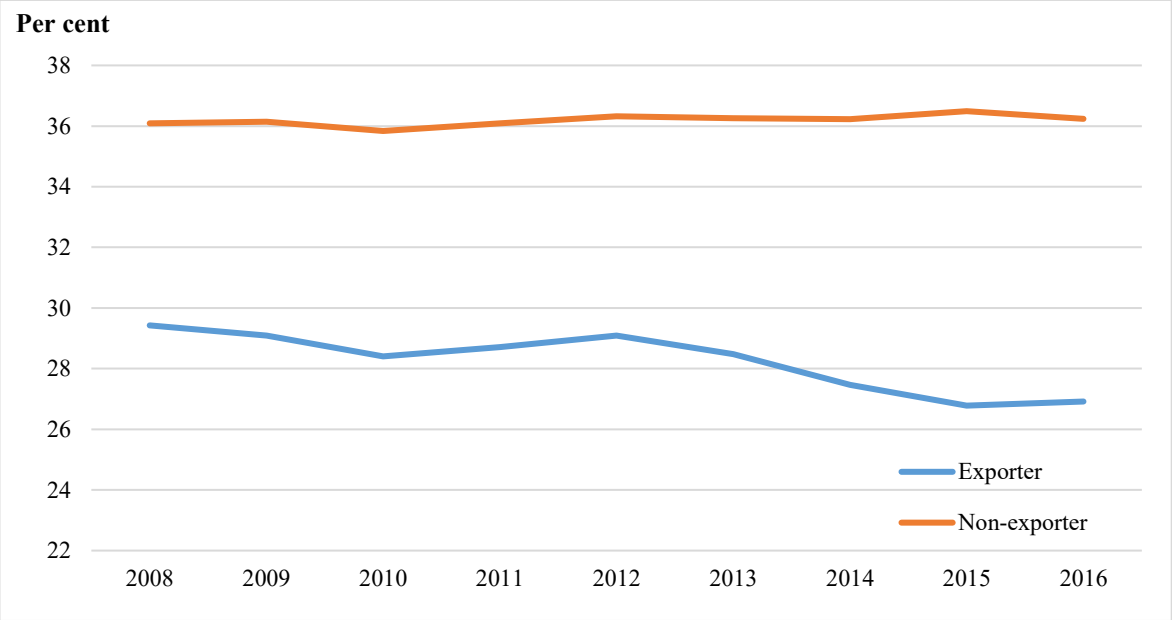
An OECD report on gender participation in global value chains shows that the share of male employees at exporting firms is relatively high, while female employees are more often found in enterprises supplying exporting firms (OECD, 2015). For all OECD countries combined, on average 37 per cent of male jobs are directly or indirectly dependent on exports. The corresponding share for female jobs is 27 per cent. Finland is mentioned as a country where differences in export-dependency are especially large and male employees take part in trade significantly more often - around 33 per cent of male jobs and 18 per cent of female jobs are directly or indirectly supported by exports. Female employment is also shown to be concentrated to service sectors with an above-OECD-average share.

Reports by the United Nations Conference on Trade and Development [18] and the International Trade Centre[19] show similar results for both female employees and female entrepreneurs (International Trade Centre, 2015; UNCTAD, 2017). Compared to their male counterparts, women more often take part in trade through delivery of supportive services and manufacturing to exporting enterprises. Furthermore, female employees and company owners who participate in trade are more often found in low-tech sectors such as textiles and clothing, indicating lower wages and yields for female trade participators (International Trade Centre, 2015).

The situation in Finland echoes that of above presented international results; firms that directly take part in international trade employ a male-dominant workforce, while the workforce is more gender-balanced in non-trading enterprises. Graph 2 on the following page illustrates the share of female employees in exporting and non-exporting enterprises - the share of female employees is below 50 per cent in the whole private sector, but male employees control a particularly large share of workplaces in exporting enterprises. As illustrated, the share of female employees in exporting enterprises has even decreased during recent years from just under 30 per cent in 2008 to 27 per cent in 2016, while the share of male employees has remained virtually identical during the time. Female employees in Finland are also concentrated to service sectors, which implies that they more often take part in trade by supplying supportive functions to trading enterprises. The subject of firm ownership by gender has not been thoroughly researched, but a recent publication by

[18] UNCTAD
[19] A joint agency of the World Trade Organization and the United Nations.

Statistics Finland shows that also female company owners are less likely to take part in international trade, compared to their male counterparts (Luomaranta, 2019).



Graph 2 Share of female employees by enterprise heterogeneity in Finland, 2008-2016.

The share of female employees in exporting enterprises is significantly lower than in non-exporting enterprises during the whole period between 2008 and 2016. The share of female employees in non-exporting enterprises has risen marginally, while the share in exporting enterprises has fallen by 2.5 percentage points. Source: (Luomaranta, 2019)*, own illustration.*

There are significant differences in how women and men participate in international trade. International reports show that enterprises taking part in trade predominantly employ male employees, and the situation is identical in Finland. If the thesis hypotheses of higher productivity and wages in exporting enterprises hold, the negative effect of globalisation on gender wage equality will likely be significant.

2.3 Globalisation and the gender wage gap

There is a limited amount of literature available on the relationship between globalisation and the gender wage gap. The data requirements are high, and few countries meet the register-standards for compiling comprehensive research data. Although researchers have access to matched employer-employee data, the additional dimension of enterprise characteristics is unavailable in most cases.

A study of the gender wage gap in the Norwegian manufacturing sector utilises an employer-employee panel data set combined with enterprise characteristics similar to the one I use in this thesis (Bøler et al., 2017). Bøler et al. define globalisation in the same way as I do; through enterprise participation in international trade and, more precisely, by separating exporting enterprises from non-exporters.

The researchers argue that "there is a systematic difference in the gender wage gap […] between exporting firms and non-exporters". Bøler et al. present the hypothesis that exporting enterprises require greater commitment, e.g. working particular hours or travelling on short notice, from their employees, and that they therefore disproportionally reward employee flexibility. The flexibility requirements arise as exporters are exposed to greater competition and do business with partners located in faraway countries. The authors state that if female employees are, or are perceived to be, less flexible than their male counterparts, exporters will exhibit a larger gender wage gap than non-exporters.

Bøler et al. focus on wage disparities between male and female college graduates. The supposition is that gender wage differences arise between highly-educated employees as the requirement for flexibility is primarily set on white-collar employees.

The authors find that exporting firms exhibit a 3-percentage point higher gender wage gap than non-exporters. Bøler et al. check results for different levels of education, and confirm their hypothesis that the wage gap is only present among college graduates. Results also show that female employees with a college degree earn higher wages at exporting firms than at non-exporting firms, but that they are in both cases underpaid compared to their male colleagues. Furthermore, they find that a higher export intensity[20], a greater number of export destinations and a greater number of exported products is positively correlated with the gender wage gap. This indicates that a higher level of international integration results in a larger within-firm gender wage gap.

Bøler et al. perform various robustness-tests to confirm their results. They find significant support for the effects of globalisation when checking for overlapping working hours with foreign trade partners. Results show a statistically significant rise in the gender wage gap when the number of overlapping business hours is reduced. The result strengthens the argument that less flexibility among female employees has an effect on the gender wage gap.

[20] Measured by the share of output that is exported.

The literature presented in this chapter shows the structure of gender wage gaps in the Nordic countries and how female and male employees take part in international markets. There exists a significant inexplicable gender wage gap in Finland, a part of which can possibly be explained by differing participation in international markets. The study presented in subchapter 2.3 funtions as inspiration for the analysis conducted in this thesis, albeit conducted on a population of employees rather than a population of enterprises.

In the following chapter, I tie my research to economic theories on trade and on wage construction.

3. Theory

In this chapter, I present economic theory related to my research. I begin by presenting the *Heckscher-Ohlin model*, a possible theoretical motivation for varying trade participation between enterprises and employee groups, and the related *Stolper-Samuelson theorem* that relates foreign market participation and returns to different groups of individuals in society. After that, I present two theories of wage construction: the theory of *compensating wage differentials* which suggests that wages vary among employees due to *differences in jobs* and the theory of *human capital* which suggests that wages vary due to *differences between employees*.

The Heckscher-Ohlin model proposes that countries export what they can most efficiently produce, i.e. products of which factors of production they are abundant in. For example, if Finland is relatively abundant in high-skill workers, Finland will produce and export products that require these workers. The Stolper-Samuelson theorem further states that increasing prices of output with the introduction of foreign trade will lead to increasing returns to the required factors of production. Related to the thesis hypothesis, these two models provide possible explanations as to why male employees are better represented in trading enterprises, and further, how relative gains from globalisation are distributed between women and men.

The theories of compensating wage differentials and the theory of human capital suggest that wage differences are caused by observable differences in jobs and individuals. Concurrently, both theories suggest that when there are no observable differences between jobs or employees, the wages payed to individuals are identical. As shown in the previous chapter, inexplicable differences between identical employees working identical jobs exist, suggesting that the mentioned theories do not historically hold for the Finnish labour market, or, that previous analyses are missing variables that affect wages in a significant way.

From the theory of human capital, I focus on the Mincer earnings function and argue that an adapted version of the equation can describe wage formation in the Finnish labour market. The adapted earnings function later forms the basis for my econometric analysis.

3.1 The Heckscher-Ohlin model and the Stolper-Samuelson theorem

According to the Heckscher-Ohlin theorem (H-O theorem), countries export products that they can relatively cheaply produce and import products that are relatively costly for them to produce. The relative cost of production is determined by a countries relative access to production factors, i.e. inputs required for producing a good. The theorem is based on the Heckscher-Ohlin model (H-O model) introduced by Swedish economists Eli Heckscher and his student Bertil Ohlin in the 1920s. The Heckscher-Ohlin model in turn builds on David Ricardo's theory of comparative advantages (Heckscher & Ohlin, 1991; Suranovic, 2010).

The H-O model compares two countries propensity to produce two different goods given two different factors of production. As introduced by Heckscher and Ohlin, the model compares two countries relative abundance of capital and labour and states that, when trade is possible, the country with better access to labour will produce labour-intensive goods and the country with better access to capital will produce capital-intensive goods. In the model, capital refers to physical machines and equipment that are used in production, e.g. tools, computers, office supplies and trucks, and labour is the labour input of individual workers. Different from the Ricardian model, the H-O model assumes that technologies in both countries are identical, and therefore that the only differences between countries are the variations in the relative abundance of production factors[21] (Suranovic, 2010).

Capital, like labour, has to be owned by someone and it has to produce income for the owner. The H-O model assumes private ownership of capital and income from owning capital is called rent. This means that individuals earn wages and capital owners earn rents for their respective efforts in production (Suranovic, 2010).

The H-O model defines the ratio of capital to labour used in a production process as the capital-labour ratio. Within a country, different industries producing different goods are assumed to have different capital-labour ratios. If a country for example produces steel and clothing, and the production of steel requires more capital per unit of labour than the production of clothing, the H-O model states that steel production is capital intensive relative to clothing production. In tandem, clothing production is then labour intensive relative to steel production (Suranovic, 2010).

[21] For an extended list of assumptions related to the H-O model see for example (Suranovic, 2010a). For the Ricardian theory of comparative advantages see for example (Suranovic, 2010b).

The H-O model extends to international markets by assuming that countries have access to different quantities of capital and labour. Some countries, for example the United States of America, have extensive capital assets relative to their labour force. Other countries, for example India, have less physical capital but are well endowed with large labour forces. The ratio of aggregate endowment of capital to the aggregate endowment of labour is used to define relative factor abundancy between countries. In the above situation, the United States would be seen as capital abundant compared to India and India seen as labour abundant compared to the United States (Suranovic, 2010).

The H-O model has led to four main theorems, one of which is the Heckscher-Ohlin theorem. The H-O theorem predicts the pattern of trade between countries based on the characteristics of countries, i.e. the relative abundance of production resources between countries. Like the H-O model, the theorem considers a two-country situation like the US-India relation above (Suranovic, 2010).

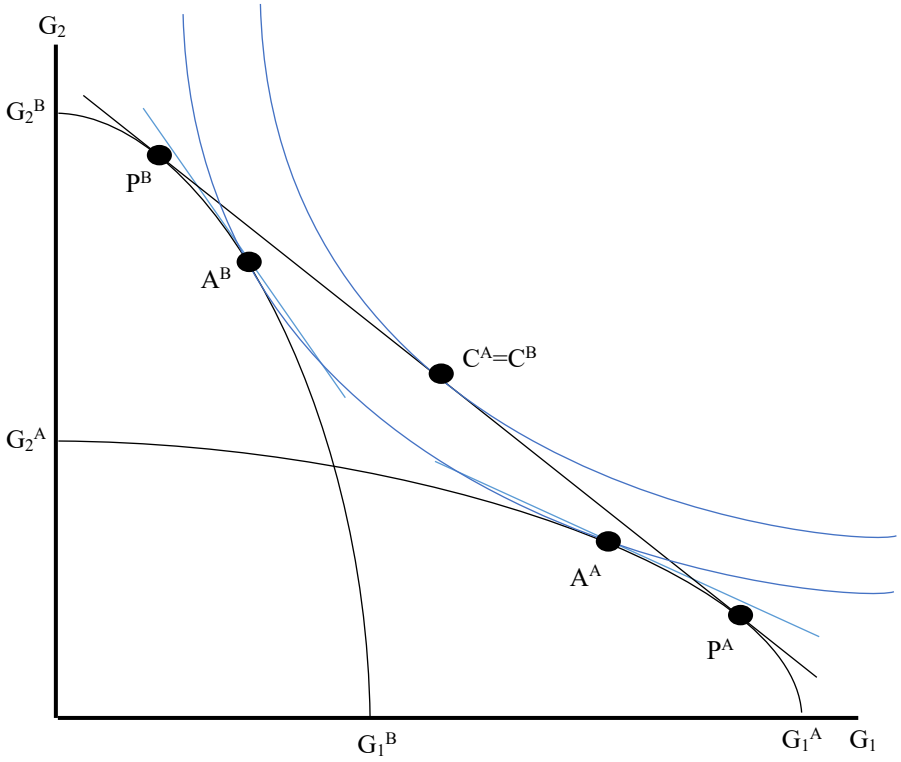
The H-O theorem states that, in a two-country situation, each country will export the good in which production factor it is relatively abundant and import the good that is relatively expensive for it to produce. The theorem can be looked at in two steps.

First, before trade, when both countries are in autarky, the capital-intensive good will be relatively cheaper in the capital-abundant country compared to the same good in the labour-abundant country. The relatively lower price is caused by the extra supply of the "cheap" good as there is more available capacity for production. The reverse price-supply relation will be true for the labour-abundant country (Suranovic, 2010).

Second, when trade is initiated, profit-seeking firms will move their products to the foreign markets where prices for their goods are higher than in the home country. This means that the capital-abundant country will export the capital-abundant good to the labour-intensive country, and the labour-intensive country will do the reverse. Trade will increase until the prices of both goods are equalised in both markets. In equilibrium, both countries will focus production to the product that they are relatively good at producing, resulting in an increase of total production and lower prices on imported products (Suranovic, 2010). Graph 3 on the following page illustrates the above situation.

Both the H-O model and the H-O theorem are primarily described using the capital and labour endowment used here. It is, however, also possible to describe why trade occurs using the same methodology but other factors of production. In relation to this thesis, the H-O

theorem can possibly motivate the differing participation in international markets between different enterprises and, furthermore, between male and female employees and other groups of employees.



Graph 3 The Heckscher-Ohlin model, situation before and after trade is initiated.

Countries A and B are identical but have different access to production factors. In autarky equilibrium (A^A, A^B) there is no trade and the countries' production equal their own consumption. The relative price of product G_1 is higher in country B than in country A, and the price of product G_2 is higher in country A than in country B. After trade is initiated, country A moves production to point P^A and country B moves production to point P^B, specialising in their respective "cheap" good. Both countries can then consume at the new equilibrium point $C^A=C^B$, outside the scope of their respective production-possibility frontiers and at higher indifference curves. Source: (EconomicPort, 2019)*, own illustration.*

As mentioned, Finnish globalisation has historically depended on enterprises in high-tech industries. According to the H-O model, this means that Finland has had a relative abundance of production factors required by these enterprises, whatever these factors may be. One likely important factor is the highly skilled workforce that has been available in Finland. If, as is rational to believe, high-tech production requires highly skilled employees, then according to the H-O theorem Finnish integration into foreign markets has increased the demand for highly skilled employees. The high demand for skilled workers further relates to the thesis research question if men have historically held a majority share of high-skill jobs, which will later be shown that they have.

The distinction between high- and low-skill employees is not the only one to be made as not all jobs in trading enterprises have required highly skilled or well-educated workers. Theoretically, it is expected that all employees in globalised enterprises are better off than employees in domestic firms performing similar tasks, at least in the short run. If men dominate the workforce in globalised enterprises, they will also gain most from Finnish integration into international markets.

The distribution of gains from trade was theorised by Wolfgang Stolper and Paul Samuelson in 1941 with the so called Stolper-Samuelson theorem (S-S theorem) – an extension of the H-O model. The American economists argued that, given a number of specific assumptions[22], a rise in the relative price of a good will lead to a rise in the real return to the factor which is used most intensively in the production of that good, and furthermore, to a fall in the real return to other factors of production. In context of the production factors used in the H-O model, an increase in the price of the labour intensive good will, per the S-S theorem, lead to an increase in wages, while an increase in the price of the capital intensive good will lead to an increase in capital rents payed to owners of capital assets (Suranovic, 2010).

According to the S-S theorem, when a country opens up for international trade, all of its abundant production factors leading to trade will gain – also the ones that do not take part in trade. This means that when a capital-abundant country starts exporting, all capital owners will gain – regardless of whether their capital is used by the exporting industry or not. Simultaneously, all workers will lose as the relative price of labour declines – regardless of whether they are employed in exporting enterprises or not. This effect is sparked by the changing inter-country demand of production factors and the changing relative factor prices in favour of the abundant factor (Suranovic, 2010).

The long-term effect suggested by the S-S theorem offers a possible explanation for the male-favouring "gains from trade"-relation among workers in Finland. Given the facts that Finnish exporting enterprises have historically employed more male than female workers and that men have represented a majority share of the workforce demanded in exporting enterprises[23], the S-S theorem states that men in both exporting and non-exporting enterprises have gained more from globalisation than their female counterparts.

[22] For example, constant returns to scale, perfect competition, equality of the number of factors to the number of products.
[23] Given the assumptions mentioned before with e.g. high-skill employees in high-tech industries.

3.2 Compensating wage differentials

The theory of compensating wage differentials argues that wages vary because of differences in jobs. Some jobs expose workers to dangerous or uncomfortable working conditions, some provide comfortable seating in optimised office spaces, some are located in city centres while others require living in the secluded countryside. According to the theory, employees who are willing to accept unfavourable working conditions are compensated with higher wages (Borjas, 2016).

The idea that job characteristics influence wages was first proposed by Adam Smith in *The Wealth of Nations* in 1776[24]. He argued that a free labour market with rational employees, when left without interference, balances advantages and disadvantages between jobs. Smith stated that a comparison of wages is not sufficient in a competitive labour market, but that instead it is the total advantages and disadvantages of jobs that need to be evaluated. A firm offering pleasant working conditions should, according to Smith, get away with paying lower wages as "the whole package" for an employee is better than that offered by others (Smith, 1976).

The theory of compensating wage differentials breaks the traditional labour market equilibrium where wage is the only variable affecting employer-employee matching. The theory instead measures an individual's utility-gain from a job, a value dependent on wage and personal assessment of job quality. Compensating wage differentials replace the randomness of employment allocation and introduce employee preferences as a property that affects employment choices. The theory simultaneously provides a basis for analysing an important question in the labour market: why are workers payed differently? (Björklund et al., 2014)

In connection to my research, the theory motivates the inclusion of job and employer characteristics such as international market participation as variables in an econometric model. The theory deals primarily with the quality of jobs given individuals personal preferences, but it provides a framework for analysing how different job characteristics affect wages even when these characteristics do not depend on individual assessment. An econometric analysis of wage construction does not show employees' personal evaluations of job quality, but it estimates a market evaluation of job characteristics and how they are

[24] Republished by University of Chicago Press in 1976.

compensated. The primary goal of my analysis is to estimate how the characteristic of international market participation affects wage construction, and how the effect differs between sexes.

3.2.1 The quality of jobs

Compensating wage differentials is an analysis of an individuals' choice between good and bad characteristics of jobs. Good characteristics increase an individual's valuation of the quality of a job while bad characteristics decrease the valuation. Good characteristics can be e.g. a safe working environment, a long-term contract or nice colleagues. These characteristics allow employers to pay lower wages as they form part of the total compensation of the job. Bad characteristics, like being exposed to toxic substances or working in a cold environment, need to be compensated with higher wages as they worsen an individual's situation. The theory of compensating wage differentials assumes that individuals have perfect knowledge of the "goods" and "bads" related to each job, i.e. that their assessment of job quality is perfect. This assumption allows for the formation of an individual's utility function given the wage payed for a job and the characteristics associated with it (Borjas, 2016).

$$\text{Utility} = f(w, \text{ job quality}) \tag{1}$$

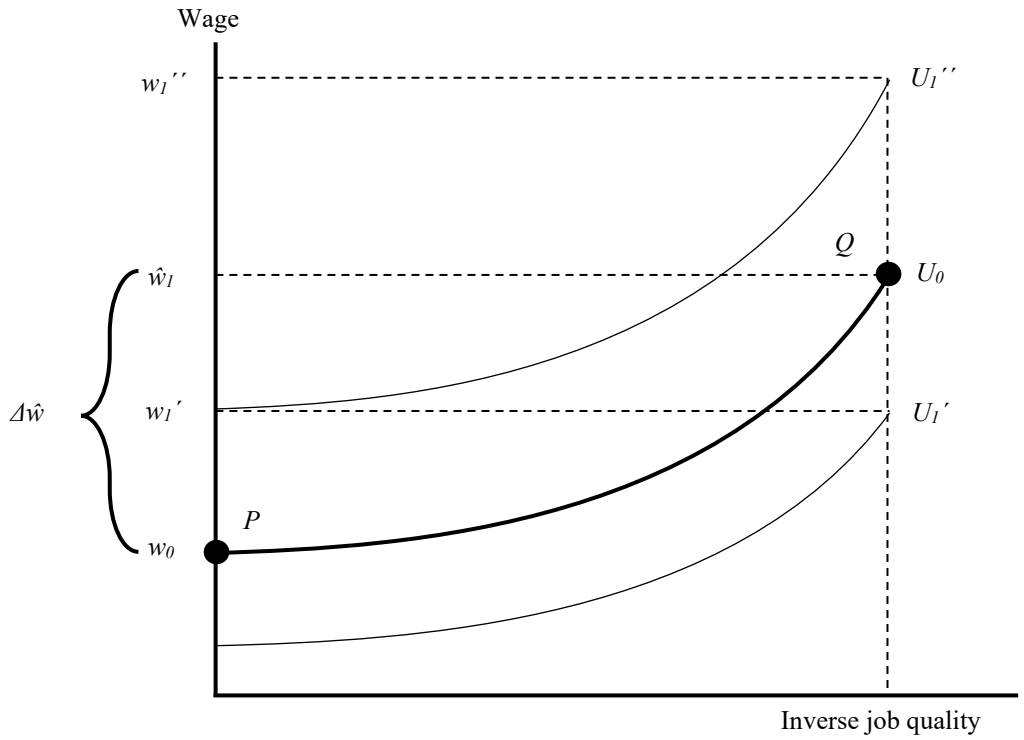
The marginal utility of income gives the change in utility resulting from a one unit increase in an individual's income when job quality is held constant. By assumption, individuals prefer higher wages and the marginal utility of income is therefore positive. The marginal utility of quality gives the decrease in utility from a one unit decrease in the quality of a job when the wage is held constant. Bad characteristics are undesirable, and the marginal utility is therefore negative, given that a higher value indicates lower quality[25] (Borjas, 2016).

The utility function shows an individual's weigh off between the wage and the quality of a job. This relationship can be illustrated with an indifference curve, as in Graph 4 on the following page. Note that job quality decreases when the value of x increases, and that the

[25] Excluding individuals that desire bad characteristics.

value of x is here dependent on total job quality instead of the single-characteristic valuation used by e.g. Borjas[26].

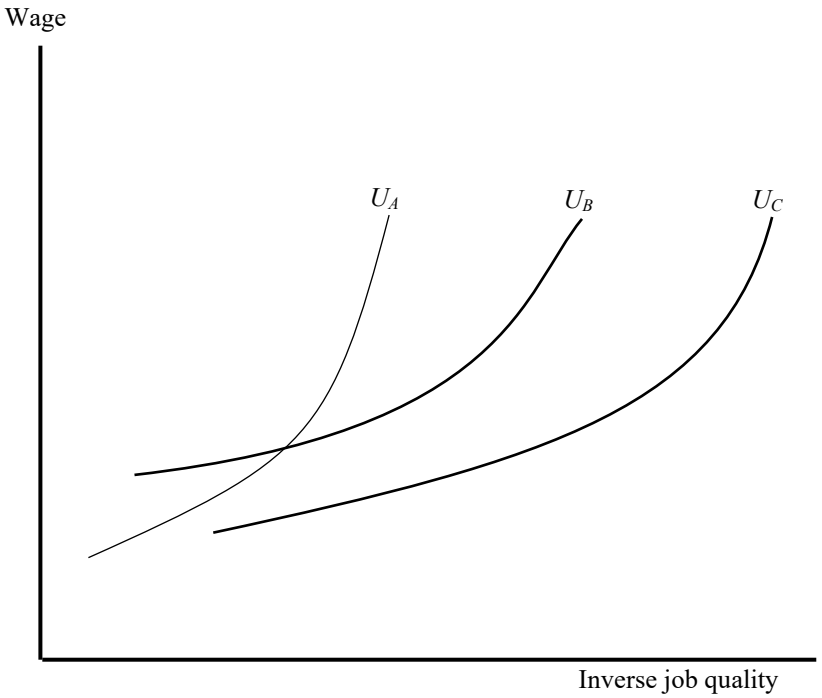
At point P in Graph 4, the individual receives wage w_0 for a job of good quality. In order to persuade the individual to accept a job of lower quality, the wage has to increase. This is illustrated by the upward slope of the indifference curve U_0. If the employee accepts a job of bad quality, he or she has to receive wage $\hat{w}_1$ to reach the same level of utility, point Q on the indifference curve, as he or she did at point P. The slope of the indifference curve, and consequently the reservation price $\Delta\hat{w}$ showing how much wage has to increase for the individual to accept a job of worse quality, depends on the individual's attitude towards job quality. An individual who is more accepting of bad jobs will have a flatter indifference curve and a smaller reservation price than individuals who dislike jobs of worse quality. Graph 5 on the following page illustrates indifference curves for three individuals with different attitudes towards jobs of worse quality (Borjas, 2016).



Graph 4 Indifference curves relate wage and job quality for employees.

An individual who chooses a job of good quality paying wage w_0 *gets utility* U_0. *If the job payed wage* w_1' *the individual would prefer the good job. If the job payed wage* w_1'' *the individual would prefer the bad job. At wage* $\hat{w}_1$ *the individual is indifferent between the good job and the bad job.* $\Delta\hat{w}$ *shows the individual's reservation prices, i.e. the wage compensation required for the individual to accept a job of bad quality. A higher value of x indicates lower job quality. Source:* (Borjas, 2016)*, own illustration.*

[26] Wage versus probability of injury in (Borjas, 2016).

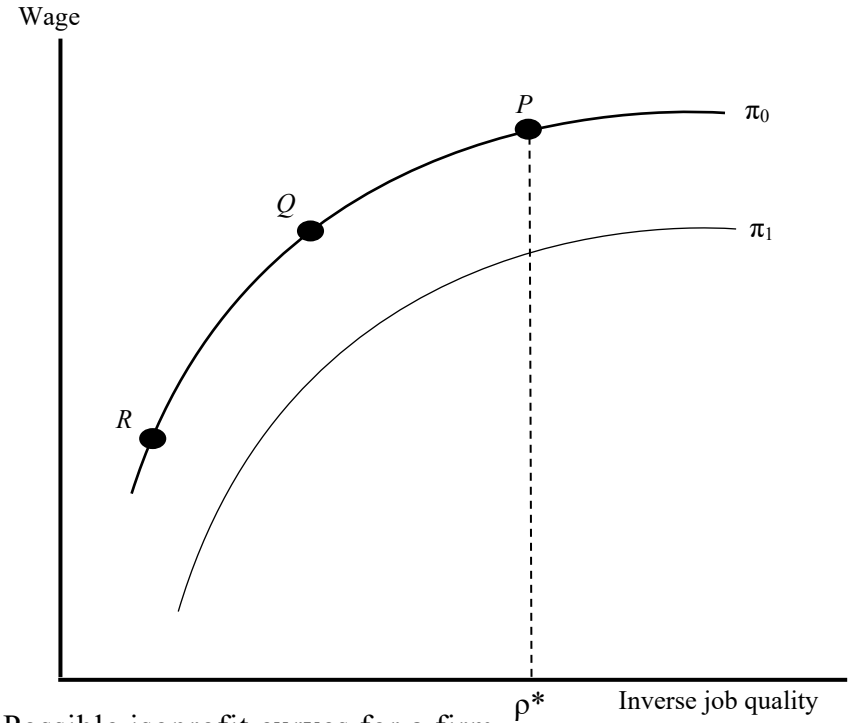


Graph 5 Indifference curves for individuals with different attitudes towards job quality.

Individuals have different attitudes towards jobs of different quality. Worker A *dislikes jobs of worse quality, worker* B *is somewhat more accepting and worker* C *is most accepting towards jobs of worse quality. Individual* C *demands least compensation for working a job of lower quality, i.e. has the lowest reservation price. Source:* (Borjas, 2016)*, own illustration.*

3.2.2 Firm wage setting

Indifference curves show the employee side of the wage construction. For an individual to receive a specific wage at a specific job quality, there also needs to be a firm that offers the desired combination. A firm's weigh off between wage and quality of offered jobs can be illustrated with the *isoprofit curve*. Isoprofit curves illustrate employers' profits given combinations of payed wages and quality of offered jobs. All points along an isoprofit curve yield the same profit, and an employer is thereby indifferent between combinations of wages and job quality along a single curve. Graph 6 illustrates two isoprofit curves for a firm (Borjas, 2016).



Graph 6 Possible isoprofit curves for a firm.

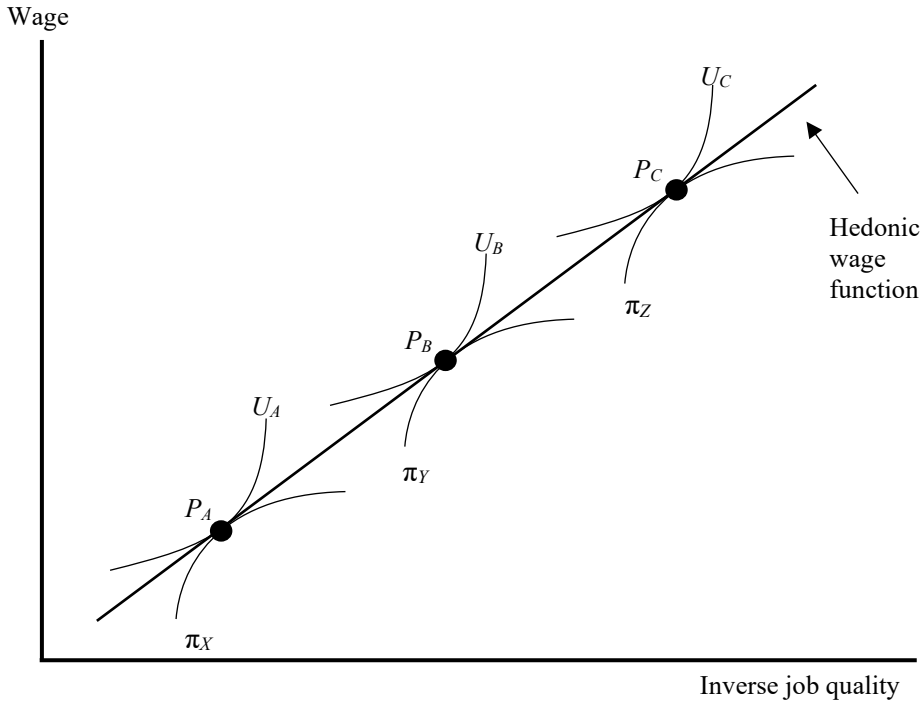
All points along a single isoprofit curve yield the same profits for the firm. Providing jobs of higher quality requires financial resources that reduce profits. Firms have to pay lower wages at higher job quality to keep profits constant. Source: (Borjas, 2016)*, own illustration.*

Isoprofit curves are upward sloping because it costs money to offer jobs of higher quality. If a firm is located at point *P* on the isoprofit curve in Graph 6 and wants to increase job quality without losing profits, it needs to lower wages for its employees, i.e. move to point *Q* or *R* on the curve. Isoprofit curves are concave because the law of diminishing returns applies to the production of better-quality jobs. This means that firms need to invest an increasing amount of resources to further increase the quality of offered jobs. Firms that want to increase profits without decreasing quality of offered jobs need to move to a lower isoprofit curve where the quality of jobs is constant, but wages are lower (isoprofit π_0 versus π_1) (Björklund et al., 2014; Borjas, 2016).

Like with individual indifference curves, all firms have their own isoprofit curves. The shape of a firm's isoprofit curve is determined by how easy it is for the firm to offer jobs of higher quality. In equilibrium, all firms operate at their respective zero-profit isoprofit curves (Borjas, 2016).

3.2.3 Hedonic labour market equilibrium

In labour market equilibrium, employees are matched with firms given their respective job quality-to-wage preferences. The indifference-isoprofit matchings form the Hedonic wage function which describes how wages and job quality are related in the labour market. The function can be illustrated as in Graph 7 below.



Graph 7 Indifference-isoprofit matching and the Hedonic wage function.

In labour market equilibrium, workers and firms are matched by their wage-job quality supply and demand. The relationship forms the hedonic wage function describing the weigh off for the whole labour market. Source: (Borjas, 2016), own illustration.

As mentioned, the theory of compensating wage differentials removes the randomness from traditional labour market theory. Employees and employers are matched by their wage-job quality preferences, and in equilibrium everyone finds their best match. Firms that can easily increase job quality can pay lower wages and increase their profit (firm A at P_A in Graph 7), while firms offering lower-quality jobs need to compensate their employees with higher wages (firm C at P_C in Graph 7) and suffer profit-losses (Borjas, 2016).

Borjas points out that the theory of compensating wage differentials is dependent on one very important assumption; *all* individuals in the population have to agree on how job characteristics affect job quality. He points out that although the theory is central to

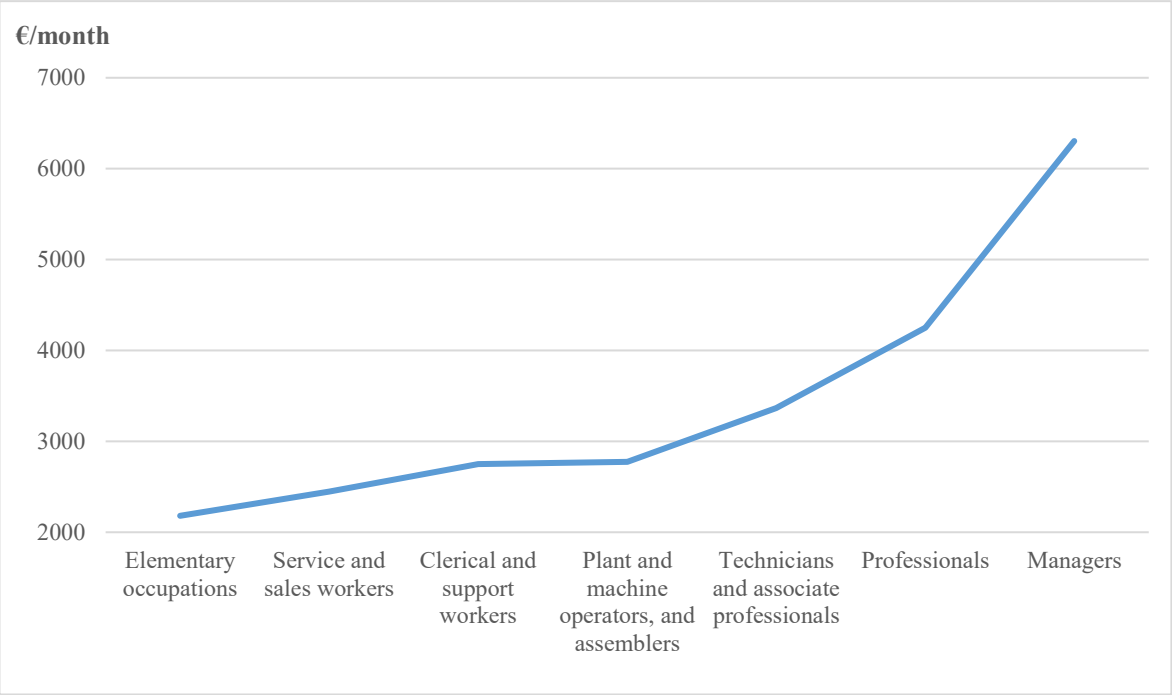
understanding labour market equilibrium, empirical studies do *"not provide a ringing endorsement of the theory"* (Borjas, 2016)[27]. The only job characteristic that researchers have found to conclusively affect wages according to the theory is the risk of death[28].

3.2.4 The Hedonic wage function in action

Compensating wage differentials are in theory applicable to all job characteristics that affect individuals' assessments of job quality. Employees who are required to take risks, be responsible for subordinates or work uncomfortable hours should be compensated to make it worth their extra effort. The theory is significantly restricted by the fact that all individuals need to agree on how characteristics affect job quality, and as mentioned, researchers have not found consistent results to support the theory except when controlling for the risk of fatal accidents at work[25]. For the Finnish labour market, e.g. Böckerman & Ilmakunnas (2006) find that adverse working conditions, measured with the Quality of Work Life Survey, play only a minor role in determining individuals' wages.

Despite the lack of empirical support for the theory, there are indications that the hedonic wage function can describe wage construction when looking at wage statistics separately. For example, when plotting median wages against assumed level of responsibility for subordinates[29], there are signs that higher responsibility increases wage according to the theory of compensating wage differentials, given that increasing responsibility is seen as a bad characteristic. The relationship illustrated in Graph 8 is relatable to the Hedonic wage function illustrated in Graph 7 on page 28.

[27] Page 214.
[28] For example (Eberts & Stone, 1985), (Bellavance et al., 2009) and (Abdelaziz et al., 2013).
[29] By hierarchical level for occupational groups.

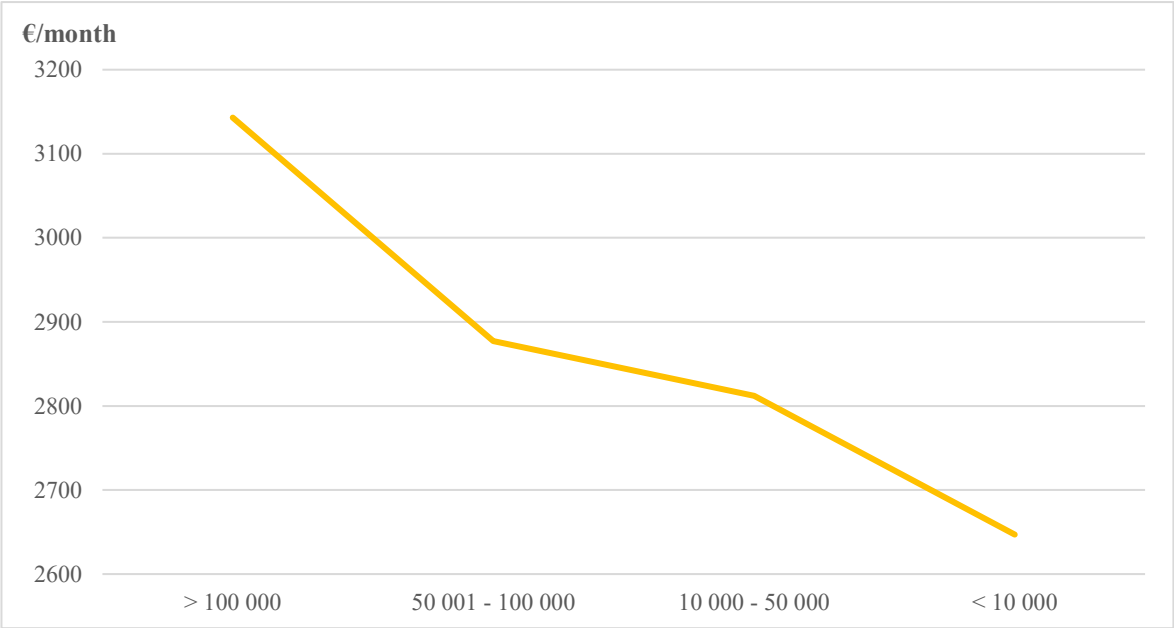


Graph 8 Median wages by occupational groups, Finland, 2018.

Median wages increase when the expected level of responsibility for subordinates increases. The relationship is similar to that estimated by the theory of compensating wage differentials. Source: (Tilastokeskus, 2019a)*, own illustration.*

There are also relationships that show the complete opposite to the estimates of the Hedonic wage function. For example, assuming that individuals prefer living and working in urban areas with better access to services, there is an opposite relationship showing that employers in smaller municipalities pay lower wages. Given that employees who accept living in remote locations should, according to theory, be compensated by higher wages, the actual relationship is reversed. The situation for year 2014 in Finland is illustrated in Graph 9 on the following page.

The lack of empirical support for compensating wage differentials means that there must be other factors that significantly affect wage construction. It might be that individuals have largely dissimilar opinions about good and bad job characteristics, or that job characteristics actually only play a marginal role in wage determination. Either way, in the following chapter I present an alternative way of determining wages that focuses on employee characteristics instead of job characteristics – the theory of human capital.



Graph 9 Median wages by workplace municipality population, 2014.

Contrary to the theory of compensating wage differentials, wages decrease when workplace municipality size decreases, i.e. living in a remote location is not compensated with higher wage. The assumption is that job quality decreases with workplace municipality population. Source: (Statistics Finland, 2016)*, own illustration.*

3.3 Human capital and wage

The theory of human capital argues that wages vary because employees differ from each other. According to the theory, each individual brings into the labour market a unique set of skills that forms his or her personal human capital. Different sets of skills are compensated differently, creating wage disparities between employees (Borjas, 2016).

The theory of human capital is based on two central assumptions. The first assumption is that wages match productivity – if an employee is more productive than others, or more productive than he or she was before, then his or her level of compensation will be higher. The second assumption is that an employee's productivity is based on his or her skills, and that skills are primarily acquired through education. Skills that increase productivity can be e.g. level of education, field of education, working experience or physical properties. The latter two cannot be acquired through formal education but are additional traits, or skills, that form part of an individual's capital (Björklund et al., 2014).

Knowledge acquired through formal education has grown especially important during the past decades, as an increasing share of the population chooses to finish higher degrees. In 1970, 74.6 per cent of the Finnish population aged 15 or over did not have any formal

education beyond primary school, and only 4.3 per cent had a university degree. In 2017, the corresponding shares were 27.9 and 21.5 per cent (Statistics Finland, 2018). Today, companies also invest significant resources into specialised training for their employees with the expectance that it increases their personal capital and consequently their future productivity.

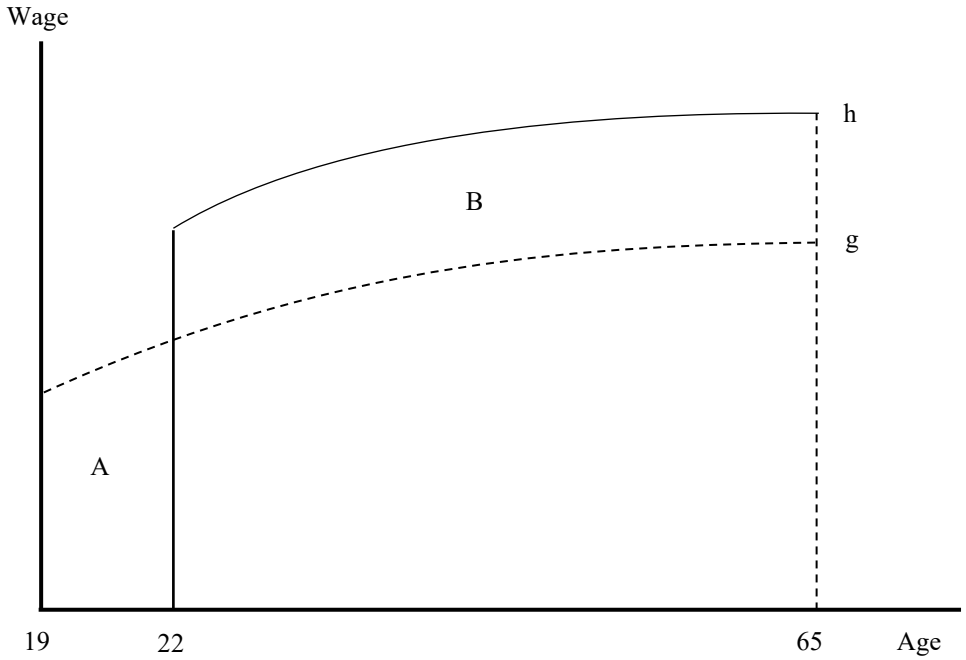
In the following subchapter, I focus on the role of education in individuals' human capital. The way education is considered to affect human capital, and thereby wage, is conceptually applicable to other personal characteristics. When an individual's human capital increases, his or her wage should also increase to compensate for the additional productivity. This generalised view of the human capital theory ties employee characteristics to econometric analysis and shows why, and how, personal characteristics affect wages and possible wage disparities.

3.3.1 Human capital acquisition

In line with the increasing importance of formal education, a central part of the human capital theory revolves around an individual's choice of education. Assuming that individuals are rational, and that wage is the only form of compensation for a job, the choice between education and no education is determined by which decision maximises the present value of lifetime earnings[30]. An individual who invests time into education loses income in the form of lost wages and possibly has to pay for the schooling, and these losses need to be compensated at later stages for the investment to be profitable. This means that firms that want to hire more productive employees, i.e. employees with more human capital, need to pay higher wages. In short, the education decision is based on whether or not lifetime earnings increase with education or not (Borjas, 2016).

The education decision can be illustrated as in Graph 10 on the following page. For the education decision to be profitable, area *B* (income as compensation for education) has to be larger than area *A* (costs of getting an education). The age at which an individual receives an education is important as the time for receiving compensation is longer when graduating early, and consequently the likelihood of $B > A$ is higher (Björklund et al., 2014).

[30] Lifetime earnings discounted to present value by an individual's discount rate.



Graph 10 The education decision.

Line g illustrates an individual's income if he or she chooses to not acquire further education. Line h illustrates an individual's income if he or she chooses to acquire further education. Area A represents the income value of immediately starting work, while area B represents the income value of further education. Area B has to be larger than area A for a rational individual to acquire further education. Source: (Björklund et al., 2014)*, translated.*

The profitability of the education decision depends on two value-comparisons[31]: 1) *the income that an individual expects to receive without further education compared to the income with further education* and 2) *the individual's discount rate of future income*. When the expected income with education increases, or the expected income without education decreases, the likelihood of $B > A$ increases. Reversely, when an individual's discount rate increases, the likelihood of $B > A$ decreases. The discount rate indicates how an individual values income today versus future income, a higher rate meaning that the individual values today's income more than future ones (Borjas, 2016).

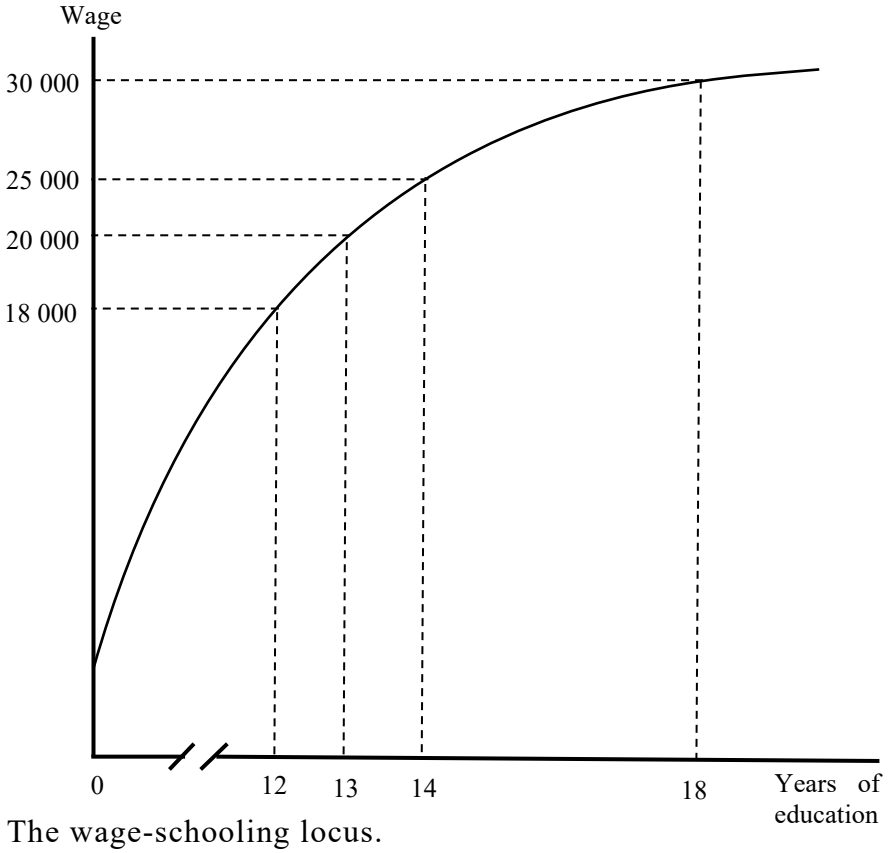
A more intuitive way of looking at the education decision, and the acquisition of human capital in general, is by illustrating an individual's wage-schooling locus. The locus shows the wage gain from an additional year of education and it has three important properties: 1) *it is upward sloping* as individuals with higher education must be compensated with higher wages, 2) *the slope shows how much an individual's wage increases with an additional year*

[31] In addition to age of graduation as mentioned earlier.

of education and 3) *the locus is concave* as the law of diminishing returns applies to human capital acquisition (Borjas, 2016).

The wage-schooling locus can be used to generalise the education decision to an individual's process of human capital acquisition. Human capital is in real life constructed from many other characteristics in addition to education and, as shown in chapter 2, these additional characteristics need to be included to understand wage construction. The theoretical approach of the education decision is a good way of showing how employee decisions and characteristics tie to wages and, in a broader perspective, how human capital ties to wages. Employees with better skill sets and more human capital should be better compensated than their counterparts, just like individuals with more education are in theory assumed to be.

Graph 11 below illustrates an individual's wage-schooling locus. In a generalised form, years of education on the x-axis are replaced by an individual's total human capital, indicating that more capital is compensated with higher wage. Like with education, the marginal rate of return to human capital is diminishing as an individual cannot infinitely increase wage by acquiring more human capital.



Graph 11 The wage-schooling locus.

An individual's wage increases by each year of additional education. An individual with 12 years of education receives EUR 18 000 per year, an individual with 13 years of education receives EUR 20 000 per year and so on. The locus can be generalised to show how other forms of additional human capital affects wage. Source: (Borjas, 2016), reworked.

The theory of human capital recognises that the education decision is in reality affected by several other denominators than the ones stated in the theory. An individual's decision can e.g. be affected by financial restrictions, restrictions in the supply of education or geographical restrictions (Borjas, 2016). The same restrictions also apply to the acquisition of other forms of human capital. Despite these limitations, the model provides a possible explanation as to why some individuals choose further education, actively read newspapers or gather human capital in other ways. Furthermore, it provides a theoretical framework for analysing wage construction and wage disparities caused by differences in employee characters and skills.

In the following subchapter, I present the Mincer earnings function which mathematically ties human capital to wage. The model focuses on level of education and working experience and provides a baseline model for my upcoming econometric analysis.

3.3.2 The Mincer earnings function

The Mincer earnings function explains an individual's wage as a function of education and working experience (Mincer, 1974). The argument is that education and labour market experience, seen as a combination of experience and workplace training, increases an employee's productivity and thereby his or her wage. The equation is widely used in empirical economics and has, despite its simple form, proven to well estimate individuals' wages in different labour markets (Borjas, 2016).

The Mincer earnings function looks as follows:

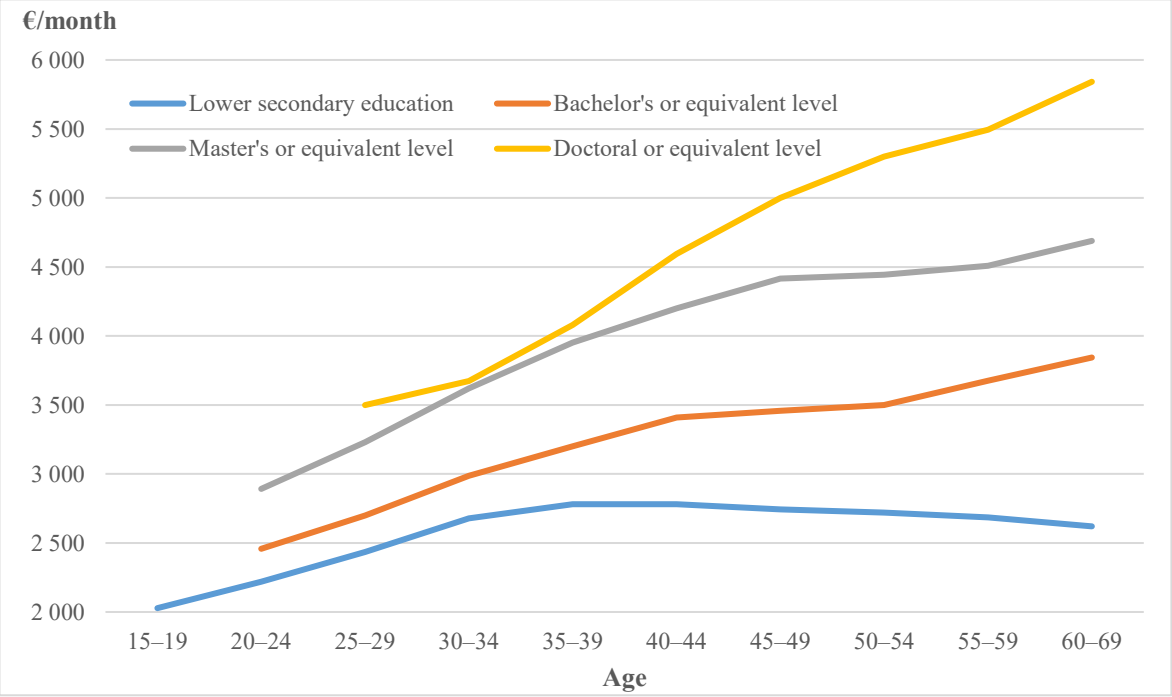
$$\log w = \beta_0 + \beta_1 \, education + \beta_2 \, experience - \beta_3 \, experience^2 + \varepsilon \qquad (2)$$

where w is the natural logarithm of an employee's wage, e*ducation* the number of years of education, *experience* the number of years of labour market experience, and $experience^2$ a quadratic on labour market experience that captures the concavity of the earnings function[32]. The parameter β_0 is the function intercept and estimates an individual's wage with zero years of education and zero years of labour market experience. Parameters β_1, β_2 and β_3 are interpreted as the respective percentage returns from increased years of education and labour

[32] Caused by a decreasing return on human capital as age increases.

market experience. The error term ε captures the effect of all variables not included in the function.

The empirical efficiency of the Mincer earnings function is primarily thanks to the ability of education to estimate an individual's wage. As mentioned before, education plays an important role in both the theory of human capital and in real-life wage construction. An example of the strong relationship between level of education and wage is illustrated in Graph 12. The graph shows median wages for different age groups by levels of education in the Finnish labour market in 2017. Higher levels of education are strongly related to higher wage – to the extent that median wages for recent Master level graduates are higher than median wages for lower secondary education graduates with 40 years of work experience. The illustration further shows that education is important when estimating wage disparities, as wages for individuals with higher levels of education increase at higher rates. Graph 12 also signals the importance of labour market experience as median wages for all levels of education keep rising with age, with the exception of lower secondary education.



Graph 12 Median monthly wage by level of education and age, Finland, 2017.

Source: (Statistics Finland, 2019), own illustration.

The significance of formal education in wage construction has also been proven through empirical studies in various countries. For example, Autor et al. (2008) show that the return

to education has significantly increased in the U.S. between 1980 and 2005, which in turn has raised the wage gap between employees with different levels of education. Autor (2014) in turn states that about two thirds of the increase in wage differences in the U.S. since the 1980s can be explained by increasing returns to education. For Finland, e.g. Asplund & Pereira (1999) and Asplund (2000) find that the returns to education are considerable, although significantly lower than in the U.S.[33].

Despite the explanatory power of the Mincer earnings function, it does no perfectly depict wage composition. To form a better understanding of wages, the Mincer earnings function can be combined with the theory of compensating wage differentials. In such cases, the earnings function is augmented to include variables that influence an individual's earnings – i.e. variables that are included in the error term of the basic function.

In an augmented wage function, variables can be e.g. based on job characteristics (hierarchical level, title) or employer characteristics (industry, enterprise size, *trading status*), but also on additional employee characteristics (field of education, number of children, *gender*). The vector **X** in equation 3 below represents these additional variables:

$$\log w = \beta_0 + \beta_1 \, education + \beta_2 \, experience - \beta_3 \, experience^2 + \mathbf{X}\boldsymbol{\gamma} + \varepsilon \qquad (3)$$

Identical to the original Mincer earnings function, the effect of each independent variable on logarithmic wage is estimated with a respective β-value[34]. The effects previously captured by the error term are split among included independent variables to form a better understanding of wage composition.

In my econometric analysis, I utilise an enterprise level data set. This means that I do not estimate an employee level Mincer function, but rather an enterprise level function accounting for the most important employee- and enterprise characteristics. Rationally, the characteristics that affect wages on personal level should also affect wages on market level. If the supposition holds, average wages should increase on enterprise level when for example the share of highly educated or the share of experienced employees at the enterprise increases.

The following chapter introduces the data, research method and econometric model in detail.

[33] The returns to education have historically been higher in the U.S. compared to other developed countries.
[34] The estimated effect of variables in vector **X** are included in $\boldsymbol{\gamma}$.

4. Method and data

To describe wages and analyse wage disparities in the Finnish labour market, I perform an econometric analysis with variables that affect wage construction. Focus lies on the effect of enterprise participation in international trade on wage differences between genders. The included variables are motivated by the theoretical background presented in chapter 3. The hypothesis is that trade participation increases gender wage disparities, and that it thereby explains part of the existing gender wage gap. The analysis is based on a new panel data set created by combining enterprise-level data for Finnish enterprises and personal-level employee data from the FLEED database for years 2008-2016.

The following subchapters present the sources for the microdata, the analysis variables and descriptive statistics for the microdata. Data limitations and demarcations are discussed throughout the chapter. Descriptive statistics in subchapter 4.2 enable introductory analyses and checks of the thesis hypotheses. Subchapter 4.3 presents the analysis method and the econometric model.

4.1 Data

In this chapter I present the data sources, describe the data set and introduce the analysis variables.

The data set is constructed by combining two data sources maintained by Statistics Finland – enterprise information from the Business Register and employee information from the FLEED database (*Finnish Longitudinal Employer-Employee Data)*. Personal-level variables are aggregated and averaged to enterprise level. To maintain a sensible quantity of columns, employees are grouped according to characteristics such as age and level of education. The grouping of employees means that all personal level characteristics available in the FLEED database cannot be included in the econometric model, and consequently that the analysis focuses on enterprise characteristics. Employee groupings are selected based on their assessed contribution to the analysis and their assumed role in wage construction.

For the sake of stability, the data only includes individuals with 12 months of work per reference year. As will be explained, this does not automatically mean that included

individuals work full time at the affiliated enterprise, and not even that they work full time, but it increases stability and reliability of the analysed wage variables and specifies the analysis. The data is also restricted to only include employees aged 16-65.

The data is further restricted to only include enterprises that employ at least one full time equivalent employee (FTE) during the reference year. Enterprises that fill this requirement but that do not register salaries through the FLEED database during the year are also excluded. Further treatment of the data set is explained in subchapter 6.1. Data sources and linkages are illustrated in Appendix I.

4.1.1 Data sources

The Business Register

Enterprise information and characteristics are retrieved from Statistics Finland's Business Register. The Business Register "*covers all enterprises, private practitioners of trade, general government and non-profit institutions serving households with a Business ID derived from the Tax Administration*". The reported values in the Business Register are based on several administrative records and Statistics Finland's direct inquiries to enterprises (Statistics Finland, 2019b).

The analysed data set includes private enterprises in the non-financial business sector according to Eurostat Structural business statistics (SBS) framework. This means that e.g. non-profit organisations, general government organisations and banks are excluded from the analysis. Non-profit- and general government organisations are excluded in order to focus the analysis to the Finnish business sector. Financial institutions are excluded as their activities significantly differ from other enterprises, causing a distorting valuation of their financial statements. The excluded sectors are NACE Rev.2[35]-section *A – Agriculture, forestry and fishing*, *K - Financial and insurance activities*, *O – Public administration and defence; compulsory social security*, *P – Education*, *Q – Human health and social work activities*, *R – Arts, entertainment and recreation*, *S – Other service activities* excl. NACE 95, *T – Activities of households as employers; undifferentiated goods- and services-*

[35] Nomenclature générale des Activités économiques dans le Communautés européennes. Svenska: Näringsgrensindelningen 2008.

producing activities of households for own use, *U – Activities of extraterritorial organisations and bodies* and *X – Industry unknown* [36] (Statistics Finland, 2019h).

FLEED database

Information on employees is retrieved from the FLEED database. The database contains personal-level information for all 15-70-year-old individuals living in Finland. Individuals are followed over time which means that the database contains information for all years when the individual is alive, fulfils the age restriction and lives in Finland (Tilastokeskus, 2014).

The database contains personal-level basic information and information on family relations, residency, job relations, unemployment, income and education. The database also includes the Business ID of an individual's employer at the end of each year. The Business ID enables linking of enterprise information from the Business Register with employee information from the FLEED database.

4.1.2 Variables

The data set contains variables for enterprise characteristics and aggregated wage and employment information on enterprise level for various employee groups. In the econometric analysis, as well as in the descriptive statistics, the dependent variables are average yearly wages for female and male employees on enterprise level. The independent analysis variables are shares of female and male employees, respectively, by the employee groups presented below. Additional employee variables and -groupings are explained when used in the analysis.

Enterprise characteristics include variables taken straight from the Business Register, e.g. turnover and value of exports, as well as analysis variables computed based on these variables, e.g. trade participation, employment growth and value added[37]. In order to observe

[36] Excluded 2-digt NACE-codes: 01, 02, 03, 64, 65, 66, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 96, 97, 98, 99 and 00.
[37] Value added = EBITDA + total personnel costs
EBITDA = turnover – other profits – profits from sales of fixed assets – merger profits – use of materials and supplies – external services – personnel costs – salary corrections – other operating expenses + merger losses + losses from sales of fixed assets

important employee characteristics, employees are grouped as presented below and their respective shares of the workforce in a given enterprise are used as independent variables in the analysis.

Wage, euro[38]

The data set includes two wage variables on enterprise level – one for average gross yearly wage and one for average gross monthly wage. The importance of monthly wages is reduced as only employees working 12 months are included in the analysis. As mentioned, the Business ID connected to an employee in the FLEED database is the ID of the employer at the end of the year. The wage variable on personal level shows aggregated wages for the whole year, meaning that employees who work multiple jobs or switch jobs during a year will marginally affect the aggregated wages for related enterprises.

Yearly wage is the total amount of wages received by an employee during the reference year. The value does not account for how many hours, days or months an individual works, and it does not include other sources of income. Personal-level wages are aggregated to enterprise level to show the total amount of salaries payed by an enterprise during the reference year. The total wages payed are then averaged on enterprise level by dividing total wages with the number of employees at the end of the year. In descriptive statistics, wages are aggregated by enterprise groupings (all/exporters/non-exporters) and averaged to employee level by dividing total salaries with the total number of employees in the enterprise grouping, i.e. the averages are weighted.

Trading status, category

Trading status is an enterprise characteristic computed from the Business Register and the databases on foreign trade in goods and services by enterprise. Enterprises are divided into five groups depending on their market participation: exporters, importers, two-way traders, occasional traders and non-traders. The groupings are based on the combined value of imported and exported goods and services, and their value related to purchases (imports) and turnover (exports). Trading status-groupings are defined as follows:

[38] Appendix II presents a full list of income sources counting towards aggregate personal wage (in Finnish).

- *Exporters* have a total export value of more than EUR 5 000 (goods and services combined) and export more than 5 per cent of their turnover.
- *Importers* have a total import value of more than EUR 5 000 (goods and services combined) and import more than 5 per cent of their purchases.
- *Two-way traders* are enterprises that fill the criteria for both *Exporter* and *Importer*.
- *Non-traders* do not fill the criteria for *Export* or *Importer*.
- *Occasional traders* are enterprises that do import or export goods and/or services, but that do not fill the criteria for the *Exporter*- or *Importer* categories.

The primary trading status-split used in the analysis is between exporting and non-exporting enterprises. Enterprises that fill the above criteria for Exporter or Two-way trader are considered *Exporter*-enterprises. All other enterprises are considered *Non-exporters*.

Level of education, %

Employees are divided into three groups by level of education: *low-skill*, *medium-skill* and *high-skill* employees. The groupings are based on the *International Standard Classification of Education* [39] maintained by the UNESCO [40] Institute for Statistics. The education classifications are explained in detail in (UNESCO Institute for Statistics, 2012).

- Employees with education levels *early childhood education* (code 0), *primary education* (code 1), *lower secondary education* (code 2) or *unknown level of education* (code 9 or no code) are considered low-skill employees.
- Employees with education levels *upper secondary education* (code 3) or *post-secondary non-tertiary education* (code 4) are considered medium-skill employees.
- Employees with education levels *short-cycle tertiary education* (code 5), *bachelor's or equivalent level* (code 6), *master's or equivalent level* (code 7) or *doctoral or equivalent level* (code 8) are considered high-skill employees.

The skill-groupings are used to estimate the effect of education on wage. Each group is a separate variable and the variables take values between 0 and 100, with a total of 100. The skill-groupings serve as a replacement for years of education in the Mincer earnings function. Identical to the age-groups, shares of low-, medium- and high-skill female and

[39] ISCED 2011
[40] United Nations Educational, Scientific, and Cultural Organization

male employees are calculated separately for both genders.

Employee age, %

Employees are divided into three age-groups according to the following split:

- group 1: employees aged 16-24 years
- group 2: employees aged 25-39 years
- group 3: employees aged 40-65 years

The FLEED database includes information on employees aged under 16 and above 65, but these are excluded from the analysis. The number of employees in these age groups are significantly lower than for included groups, and therefore give no further dimension to the analysis.

The econometric models are estimated separately for female and male employees and the shares of employees by age are therefore calculated separately for genders. The share of for example female employees in age-group 1 is thereby calculated as the share of total number of female employees at an enterprise, not as a share of total number of employees.

The age-groupings are used to estimate the effect of labour market experience on wage, i.e. it is expected to function as *experience* in the Mincer earnings function. Each group is a separate variable and the variables take values between 0 and 100, with a total of 100.

Enterprise size, category

Enterprises are divided into four groups according to number of full-time equivalent employees (FTEs):

- *Micro* enterprises have less than 10 FTEs.
- *Small* enterprises have between 10 and 49 FTEs.
- *Medium* enterprises have between 50 and 249 FTEs.
- *Large* enterprises have 250 or more FTEs.

The number of FTEs is retrieved from the Business Register where the number of employees is converted to FTEs according to (Statistics Finland, 2019f). The size groupings are identical to the size classifications used by Statistics Finland (Statistics Finland, 2019e).

Enterprise age, category

Enterprises are divided into three age-groups according to their age and demographic status. The demographic codes distinguish enterprises that start operating (code 1) from enterprises that continue operating (code 2) and stop operating (codes 3 and 4) during a reference year:

- *Young* enterprises are aged five years or less AND:
    - start operating in the reference year OR
    - continue operating in the reference year OR
    - restart operating with an existing Business ID in the reference period.
- *Old* enterprises are aged six years or more AND continue operating in the reference year.
- Enterprises that seize operations in the reference year are considered *Dead*.
    - *Dead* enterprises can continue to exist in the dataset after seizing operations.

Enterprise age is used as a dummy variable named "Old" which takes value 1 if the enterprise belongs to age category *Old* and value 0 if it belongs to age category *Young* or *Dead.*

4.2 Descriptive statistics

In this subchapter I present descriptive statistics for my data set. The descriptive statistics allow for introductory analyses on wage construction and provide answers to some of the hypotheses mentioned in chapter 1.2. Table 1 presents descriptive statistics for analysis-variables according to the enterprise trading status-heterogeneity in year 2016. Table 2 shows statistics for Exporter-enterprises compared to all enterprises in the data set over time and Table 3 presents more detailed information on employees in the two enterprise groupings.

In Table 1, the first thing worth noting is the difference in average yearly salaries between Exporters and Non-exporters – the difference is almost 13 000 euros or 29.2 per cent. This supports the hypothesis that exporting enterprises pay higher wages than their non-exporting counterparts. It also shows that international market participation can affect wage differences between employee groups.

The second thing worth noting is the share of female employees in exporting and non-exporting enterprises. The share of female employees is 7.8 percentage points lower in

Exporter-enterprises. This supports the hypothesis that enterprises participating in international markets employ a male-dominated workforce, and furthermore that they employ a higher share of male employees than other enterprises. In combination with the wage-hypothesis confirmed above, this raises questions regarding effects on the gender wage gap, and also regarding the cause-effect relation of female employment and foreign market participation.

The employee skill- and age-groupings indicate two possible explanations for the higher average wages in Exporter-enterprises. Exporters employ a more experienced workforce than Non-exporters, which in theory means a more productive workforce. Exporters also employ a more highly educated workforce, especially seen to the share of high-skill employees, which is another important indicator of theoretical productivity-gain, and consequently higher wages.

Table 1 Descriptive statistics for employee- and enterprise characteristics, 2016.

	All	**Exporters**	**Non-exporters**
Average yearly wage, €	41 202	50 058	37 289
Employee characteristics			
Female employees, %	34.6	29.2	37.0
Low-skill employees, %	13.1	10.5	14.3
Medium-skill employees, %	51.3	44.5	54.3
High-skill employees, %	35.6	45.0	31.4
Employees aged 16-24, %	7.8	3.6	9.7
Employees aged 25-39, %	38.1	36.6	38.7
Employees aged 40-65, %	54.1	59.8	51.6
Enterprise characteristics			
Micro enterprises, %	78.9	56.1	81.3
Small enterprises, %	17.2	28.9	16.0
Medium enterprises, %	3.2	11.9	2.3
Large enterprises, %	0.7	3.1	0.4
Employees per enterprise	13.5	43.5	10.3
Young enterprises, %	24.5	20.7	24.9
Value added per employee	87 531	110 013	77 595
Number of enterprises	74 262	7 044	67 218
Number of employees	999 586	306 382	693 204

The enterprise characteristics show that Exporter-enterprises are significantly larger and significantly more productive than Non-exporters. The average size of an exporting enterprise, measured by number of employees, is more than four times that of an average non-exporter. The difference in productivity, measured by value added per employee, supports the hypothesis that exporting enterprises are more productive than non-exporters. The difference raises the cause-effect question of whether exporters are in fact more productive, or whether more productive enterprises are exporters?

The last two rows in Table 1 show that the majority of Finnish enterprises are Non-exporters and that the majority of the workforce works in these enterprises. The situation is identical internationally, and also mirrors the fact that many Finnish entrepreneurs seek self-employment rather than growth when starting their enterprises.

Table 2 shows descriptive statistics over time separately for all enterprises and Exporter-enterprises. There are three changes that need to be highlighted.

The first change concerns the data itself and is a result of a change in the Business Register; in 2013, the register was extended to include more enterprises. This extension especially increased the number of micro sized enterprises. The total number of enterprises increased by almost 80 000, from 272 519 in 2012 to 350 864 in 2013, and more than 77 000 of the additional enterprises were micro sized. Many of these micro-enterprises drop out of the analysis due to the requirement of one FTE, but some stay and affect the number of enterprises and the average size of enterprises. This should not affect results but instead give further dimension and robustness to the analysis.

The second change concerns the structure of Exporter-enterprises; the share of exporting micro enterprises has increased by 8.2 percentage points from 2008 to 2016. Consequently, the average size of Exporter-enterprises has decreased significantly during the period. This change is also reflected in the number of Exporter enterprises and number of employees in these enterprises – the number of enterprises has increased by more than 2 800 and number of employees by merely 25 000. The simultaneous increase in productivity is interesting and indicates high productivity among small enterprises entering international markets.

Table 2 Descriptive statistics by enterprise heterogeneity, 2008, 2012 and 2016.

	All enterprises			Exporters		
	2008	**2012**	**2016**	**2008**	**2012**	**2016**
Average yearly wage, €	35 133	38 182	41 202	41 318	46 806	50 058
Employee characteristics						
Female employees, %	35.6	35.9	34.6	28.6	29.1	29.2
Low-skill employees, %	18.3	15.6	13.1	16.1	11.9	10.5
Medium-skill employees, %	49.2	50.6	51.3	46.7	44.1	44.5
High-skill employees, %	32.5	33.8	35.6	37.2	44.0	45.0
Employees aged 16-24, %	8.7	8.7	7.8	4.8	3.7	3.6
Employees aged 25-39, %	37.4	37.7	38.1	38.2	38.2	36.6
Employees aged 40-65, %	53.9	53.6	54.1	57.0	58.1	59.8
Enterprise characteristics						
Micro enterprises, %	79.6	79.7	78.9	47.9	56.1	56.1
Small enterprises, %	16.6	16.5	17.2	32.6	28.8	28.9
Medium enterprises, %	3.0	3.0	3.2	14.5	11.7	11.9
Large enterprises, %	0.8	0.8	0.7	5.0	3.4	3.1
Employees per enterprise	15.0	14.4	13.5	65.3	46.1	43.5
Young enterprises, %	24.3	26.4	24.5	15.6	21.5	20.7
Value added per employee	76 211	75 248	87 531	98 332	90 070	110 013
Number of enterprises	72 087	72 632	74 262	4 201	6 250	7 044
Number of employees	1 080 912	1 047 965	999 586	274 345	288 082	306 382

The third change, which is of high interest in my analysis, and which is more significant in direction than magnitude, is the share of female employees in Exporter-enterprises. While average wages and productivity have significantly increased in Exporter-enterprises, the share of female employees has remained almost identical. It raises questions regarding which enterprises have managed to establish themselves internationally, and whether female employees have been underrepresented in these enterprises already before they entered international markets.

Table 3 shows descriptive statistics for female and male employees in exporting and non-exporting enterprises in years 2008 and 2016. The yearly averages for genders are also the

primary dependent variables in the upcoming econometric analysis. Some of the points raised in combination with Table 1 can also be pointed out here, but there are some interesting and counter-theoretical observations that need to be highlighted.

The first point to be made is of course that of average wages; Exporters pay significantly higher wages than Non-exporters and female employees receive lower average wages in both enterprise groups at both points in time. The wage differences are considerable both between male and female employees and between employees in Non-exporters and Exporters, but the gender wage gap measured here is well in line with previously published figures for Finland (European Commission, 2017; Statistics Finland, 2019g). Interestingly, and contrary to the thesis hypothesis, female employees seem to benefit relatively more from working in exporting enterprises than their male counterparts[41].

Table 3 shows that male employees represent a larger share of employees in both enterprise groupings, but that Exporters employ a more male-dominant workforce than Non-exporters. This fact is observable in the form of total employees by gender, gender share of the workforce in the enterprise groups and by average number of employees per enterprise by gender.

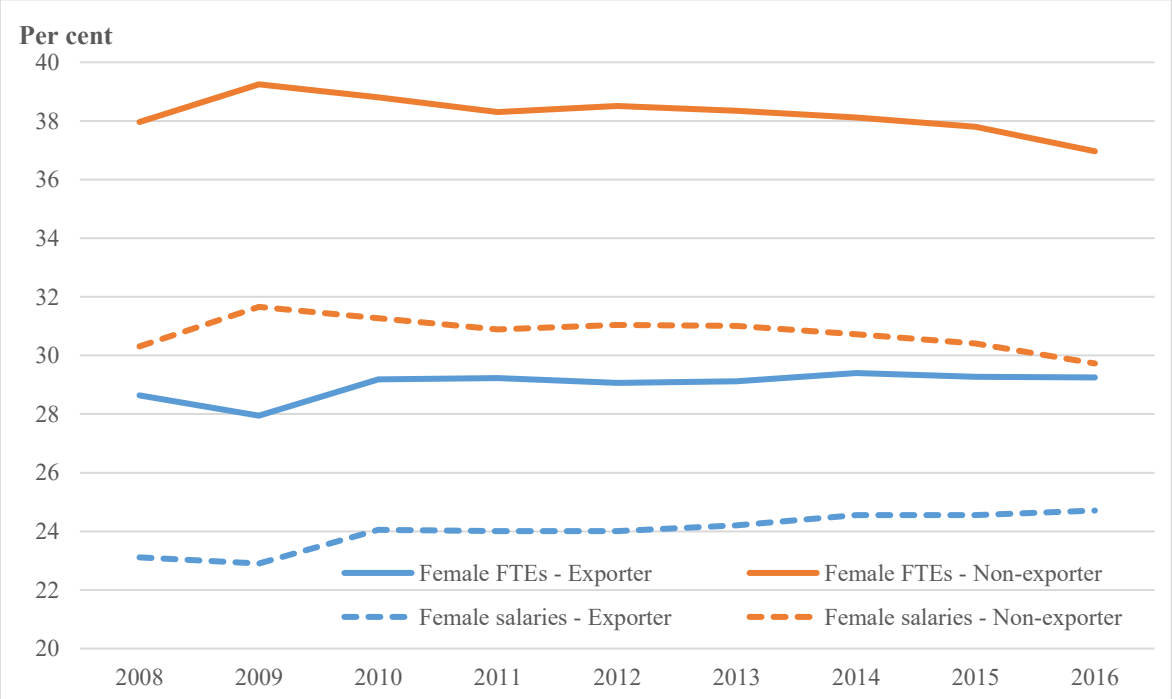
Table 3 Descriptive statistics by gender and enterprise heterogeneity, 2008 and 2016.

	Non-exporters				**Exporters**			
	2008		**2016**		**2008**		**2016**	
	Female	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
Average yearly wage, €	26 370	37 104	30 132	41 571	33 344	44 517	42 291	53 268
Total employees, 1000	306.2	500.3	256.2	436.9	78.6	195.8	89.6	216.8
Share of workforce, %	38.0	62.0	37.0	63.0	28.6	71.4	29.3	70.7
Employees per firm	4.5	7.4	3.8	6.5	18.7	46.6	12.7	30.8
Low-skill employees, %	17.3	20.1	11.7	15.9	18.6	15.0	9.6	10.9
Medium-skill employees, %	46.9	52.0	50.6	56.4	38.6	50.0	35.8	48.0
High-skill employees, %	35.8	27.9	37.7	27.7	42.8	35.0	54.6	41.1
Employees aged 16-24, %	12.9	8.5	12.9	8.1	4.7	4.9	4.3	3.3
Employees aged 25-39, %	35.9	37.9	36.9	39.6	36.7	38.9	35.6	37.0
Employees aged 40-65, %	51.2	53.6	50.2	52.3	58.6	56.2	60.1	59.7

[41] The subject is further analysed in Graph 12 and in the econometric analysis.

The most interesting takeaway from Table 3 concerns average ages and levels of education related to average wages. These two statistics do not show any motivation for the wage difference favouring men. Women are, at all points of observation, on average more highly educated than their male counterparts. The actual situation does therefore not follow the theoretical framework of e.g. the Mincer earnings function. Average ages do not either motivate the higher wages observed for male employees, since men are only marginally less frequently represented in the youngest age group and the shares of employees in the oldest age groups are near identical or higher for women.

Graph 2 in chapter 2.2 showed the respective shares of female employees in exporting and non-exporting enterprises in the Finnish private sector as presented by Luomaranta, (2019). Graph 13 below shows comparable shares for female employees in my data and is extended with the share of wages payed to female employees in both enterprise groups. The graph illustrates some of the points mentioned above, e.g. that the share of female employees is significantly lower in exporter enterprises compared to non-exporters.



Graph 13 Female FTEs and share of wages payed to female employees, 2008-2016.

The share of female employees is significantly lower in exporting enterprises compared to non-exporters. The gap between share of employees and share of wages is larger in non-exporters.

Most interestingly, Graph 13 illustrates the total sample gender wage gap in exporter- and non-exporter enterprises. In the absence of a wage gap, the share of female employees and the share of wages payed to female employees would be identical. Contrary to the thesis hypothesis, the difference between share of female employees and share of wages payed to female employees seems to be larger in non-exporter enterprises. The graph shows a female employment-to-wage gap of 5.0 per cent in exporter enterprises, while the corresponding value for non-exporters is 7.7 per cent in 2016. The counter-hypothetical wage gaps are an interesting benchmark going into the econometric part of the analysis.

The presented descriptive statistics show that the data set is well established and suited for my analysis. Superficial checks of the data support several of the thesis hypotheses and raise interesting points regarding trade participation and its effects on the Finnish labour market, the gender wage gap and income disparities on national level.

The following chapter 4.3 presents the research method in more detail.

4.3 Research method

In this chapter I motivate my research method, discuss advantages and disadvantages with the chosen method, and discuss requirements for conducting reliable econometric analyses.

I analyse the panel data using Multiple Regression Analysis with enterprise- and year-fix effects according to the Ordinary Least Squares (OLS) method. The dependent variable is logarithmic average yearly wage on enterprise level, analysed separately for female and male employees. My primary regression model looks as follows[42]:

$$\log w_{et} = \beta_0 + \beta_1 Exporter_{et} + \mathbf{X}_{etc}\boldsymbol{\gamma} + a_i + \varepsilon_{et} \quad (4)$$

The independent variable in focus is the categorical variable of international trade participation, i.e. Exporter or Non-exporter. The variable captures the wage-effect of selling on international markets and shows whether trade participation on a statistically significant level affects wages, and further wage differences between genders. Given the presented

[42] where β_0 represents the function intercept, e represents an enterprise, t stands for a year, c is a denominator for various independent variables, β represents estimates for independent variables, $\mathbf{X}$ is a vector that represents independent variables, $\boldsymbol{\gamma}$ represents the estimates for variables in vector $\mathbf{X}$, a represents enterprise fixed effects that do not vary over time and ε represents the error term. The dependent variable log w shows the logarithmic average wage payed by an enterprise in a given year.

economic theories and the thesis hypotheses, I expect that trade participation leads to larger wage disparities between male and female employees. Extending on the descriptive statistics presented in the previous chapter, I also expect trade participation to increase wage disparities more generally, i.e. between employees who do and do not take part in international trade, regardless of gender.

4.3.1 Fixed effects regression

Simple regression analysis using the OLS-method means estimating a linear relationship between two variables to see how the dependent variable (in my case logarithmic average wage) is affected by changes in the independent variable (in my case trade participation). The goal is to find a statistically significant relationship and to see whether the dependent variable is positively or negatively affected by changes in the independent variable (Wooldridge, 2012).

The OLS-method estimates the best fitting model by minimising squared residuals for the independent variable (Wooldridge, 2012). Simple regression analysis is best suited for estimating clear linear relationships between two variables. To estimate more complicated relationships, the OLS-method can be extended to include two or more independent variables. Models with more than one independent variable are called multiple regression models. In a multiple regression model, part of the effect captured by the error term in the simple regression model is split among further independent variables to get a more detailed view of the construction of the dependent variable (Wooldridge, 2012). As wage is dependent on several other variables than trade participation, I estimate a multiple regression model.

A way of isolating further unobservable effects in a panel data multiple regression model is to use fixed effects regression. In a fixed effects model, the error term is split into two parts: one for constant effects and one for variable effects. The advantage of fixed effects regression is that it is easier to distinguish relationships between variables by isolating constant unobservable effects such as geographical, political, cultural etc. properties (Wooldridge, 2012). As an example, it is likely that wages are affected by the geographical positioning of enterprises in my data. By using enterprise fixed effects, I can isolate differences caused by such properties. By using year fixed effects, I can isolate effects caused

by differences between years, e.g. due to economic cycles. A disadvantage of using fixed effects is that it is no longer possible to estimate how these affect the dependent variable, but these effects are not the primary focus of my analysis (Wooldridge, 2012).

The use of an enterprise fixed effects model allows me to better interpret the change in wage and wage disparities when an enterprise moves from being a Non-exporter to an Exporter or vice versa. In other words, regression results indicate how enterprises internal wage disparities are affected as their market relations change. Average wages are unlikely to change significantly directly as an enterprise begins to export or stops selling to foreign markets, and possible results should thereby indicate more long term and robust effects.

Regression analysis with fixed effects sets some requirements on the used data. In order to achieve reliable regression results, the data needs to fulfil two important properties; 1) *the error term has to be homoscedastic* and 2) *the fixed effects cannot be correlated with the independent variables.* Error term homoscedasticity means that the error term variance is constant, i.e. that the error term is of similar magnitude for each observation in the data. If the requirement does not hold, the standard errors can be misleading and consequently the significance of the model estimates can be incorrectly interpreted. Since it is difficult to define the error term, the residuals are used to check for homoscedasticity (Wooldridge, 2012).

If the second property, requiring lack of correlation between fixed effects and independent variables, is not fulfilled, the magnitude of estimated effects can be misleading. If for example an exogenous event occurs that affects the dependent variable, but also affects an independent variable and the fixed error term, it is difficult to interpret what actually causes the change in the outcome. In cases where both an independent variable and the error term are affected, it is impossible to interpret the magnitude of change caused by the independent variable (Wooldridge, 2012). Additional requirements that need to be fulfilled to reliably use the OLS-method with fixed effects are: a linear relationship between the dependent variable and the independent variables, the data represents a random sample from the cross section, no perfect collinearity, no autocorrelation between residuals, the expected average of the residuals is zero and the residuals are normally distributed (Wooldridge, 2012, p. 509).

The following chapter 5 presents the central analysis results. Chapter 5.3 with subchapters presents regression diagnostics and model robustness- and heterogeneity tests that motivate the chosen regression method and model.

5. Results, analysis and discussion

In this chapter I present results from the empirical analysis. I discuss the results and their indication for gender wage disparities and tie them to previous research and the general framework of the thesis. The central result of the analysis is that globalisation increases wage disparities between employees in exporting enterprises and non-exporting enterprises. The result is not restricted to gender wage disparities as both male and female employees gain from globalisation. Interestingly, the results indicate that gender wage disparities for employees in exporting enterprises in fact decrease as women on average gain more than men from participating in trade.

5.1 Results

In this subchapter I present the regression models used in the analysis and discuss the analysis results. Results are presented in Table 4 and 5 on page 57 and 58, respectively.

The primary regression model takes average wages payed to female and male employees on enterprise level as its dependent variable. The included independent variables are trade participation, enterprise size, enterprise age, shares of employees by various levels of education and shares of employees in various age-groups. The analysis includes yearly observations for years 2008-2016 and the model uses enterprise- and year-fixed effects.

The enterprise fixed effects included in models 3-8 change the interpretation of results somewhat compared to models 1 and 2. Instead of estimating the effect of foreign market participation on aggregate level, models 3-8 estimate the effect on enterprises' internal average wages and wage disparities when their respective trading statuses change. Models 1 and 2 thereby describe the aggregate situation in a similar manner as the descriptive statistics in chapter 4.2, while models 3-8 focus on heterogeneity changes on enterprise level.

There are two ways of evaluating the significance of regression estimates; the statistical significance and the practical (or economic) significance. The statistical significance of an independent variable is dependent on standard errors and indicates whether changes in the variable are significantly aligned with changes in the dependent variable. The statistical significance of a model, measured with R^2-value, indicates whether estimated effects are

actually caused by included independent variables. The practical significance depends on the size of estimates; even if a variable is statistically significant it is not guaranteed to have an effect in reality (Wooldridge, 2012). The latter valuation needs to be done separately for each estimate.

Table 4 on page 57 presents eight regression models; four separate models for female and male employees respectively. Models 1 and 2 show simple regression models for the effect of globalisation on female and male average wages. In models 3 and 4, employee characteristics control variables for age and level of education are added, along with enterprise-fixed effects. Models 5 and 6 include all control variables and enterprise-fixed effects. Models 7 and 8 include all control variables and enterprise- and year fixed effects.

Models 1 and 2 show that the relationship between trade participation and higher wages is large and statistically significant for both genders. The estimated increase in average wage from employment in an exporting enterprise is 34.0 and 37.4 per cent for female and male employees respectively. The explanatory strengths of the models are, however, very low, which indicates that there are several other factors that affect wages for both genders. This result is expected and in line with the descriptive statistics in Table 3.

Models 3 and 4 show that the practical significance of enterprise trade participation is greatly reduced when two workforce characteristics are included in the model. The estimated difference in average wage between exporting and non-exporting enterprises drops to around a tenth of the estimates in models 1 and 2, to 4.1 per cent for female employees and 2.7 per cent for male employees. The estimates are statistically highly significant and, even though much smaller than before, still practically significant. The estimates for employee age- and skill groupings go the expected ways; when the shares of low-skill and young employees increase, the average wages decrease and when the shares of high-skill and old employees increase, average wages increase. The omitted groups are medium-skill employees and employees aged 25-39 years.

Models 5 and 6 show that the estimated effect of enterprise trade participation is further reduced when independent variables for enterprise characteristics are included in the model. The gender-relation is intact as female employees are estimated to benefit relatively more from enterprise trade participation. The estimates for enterprise size groups show that average wages increase most for employees in medium enterprises compared to the omitted group of micro enterprises, but that the differences between enterprise size-groups are

marginal. Identical to models 3 and 4, employee age is estimated to have the strongest effect on average wages for both female and male employees. This compares well to the background theory as age is here included as a replacement for work life experience.

Models 7 and 8 include all variables and year- and enterprise-fixed effects. Interestingly, the estimates for trade participation are significantly smaller than before for both genders and statistically insignificant for male employees. For female employees, the estimated increase in average wages is 1.1 per cent. For male employees, the estimated effect is negative at -0.3 per cent. The effects of other independent variables are also smaller than in previous models, but still statistically significant, with the exception of the year-fixed effect for female employees in year 2009. Age-group, skill-group and enterprise-size estimates all go in the same direction as before, i.e. no previous positive effects are now negative.

A positive result for the analysis is the steadily increasing adjusted R-squared values when additional independent variables are included. The values for models 7 and 8 are still low, but the positive trend indicates that additional included variables are of relevance to the analysis. The low values are expected as several relevant variables are excluded, and several analysis improvements could be made according to previous discussion.

With the introduction of year-fixed effects, the majority of changes in average wages are estimated to depend on the observed year. In models 7 and 8, all year-estimates are statistically- and economically significant as they fall in the range of -1.0 per cent for male average wages in 2009 to 16.6 per cent for male average wages in 2016. This indicates that average wages for female employees have increased steadily since 2008 and similarly for male employees excluding a dip in 2009.

There are two likely causes for the significant year estimates: inflation and the financial crisis of 2008-2009. Inflation should, per definition, lead to higher wages over time. The estimates are likely also affected by the economic decline during the financial crisis which affected wages, employment and the economy altogether. This possible connection will be discussed further in the following subchapter, but it does provoke an interesting question regarding economic shocks and wage disparities.

The interesting and partially counter-hypothetical results in Table 4 inspire a more direct analysis of wage disparities in exporting and non-exporting enterprises. Furthermore, the statistically and practically significant year estimates, combined with the negative estimate for male wages in 2009, raise questions regarding gender differences in susceptibility

towards changes in the labour market. These two topics are superficially analysed, and the results are presented in Table 5 on page 58.

Table 5 presents OLS estimates for the effect of an economic crisis on average wages for female employees (model 1), male employees (model 2) and the relative level of average wages (model 3). The dependent variables in models 1 and 2 are the same as in models presented in Table 4, i.e. average logarithmic wage by gender. In model 3, the dependent variable is an interactive term between these two, i.e. average logarithmic wage for female employees divided by the average logarithmic wage for male employees. The variable "Crisis" is a dummy variable that takes value 1 in year 2009 and value 0 in other years. The variable "Exporter#Crisis" is an interactive variable between Exporter and Crisis which takes value 1 when the enterprise is an exporter and the year is 2009, and value 0 in all other cases. Model 3 only includes enterprises that employ both female and male employees. Like in previous regressions, all variables are enterprise specific.

The combined conclusion from the three models in Table 5 is the same as from models in Table 4: women gain more from working in exporting enterprises than men do. Model 1 estimates a 3.6 per cent increase in average wages for women in exporting enterprises while the corresponding estimate for men in model 2 is 2.1 per cent. Model 3 also estimates that the relative difference between female and male wages is 0.15 per cent smaller in Exporter-enterprises, and thereby still favours male employees.

The hypothesis regarding higher susceptibility towards economic crisis among male employees in exporting enterprises does not seem to hold. The negative estimate for crisis is marginally higher for male employees at -7.7 per cent versus -7.0 for female employees, but when checking separately for exporting enterprises during crisis the estimated negative effect is higher for female employees at -3.4 per cent versus -1.4 per cent for men. Model 3 estimates that the relative level of income increases in favour of male employees when an economic crisis strikes. The estimate is statistically significant but practically insignificant as the estimate falls within the range of constant rounding[43].

[43] Separate analyses for enterprises in manufacturing industries and services industries show similar counterintuitive results: men are estimated to suffer less in manufacturing industries and women are estimated to suffer less in services industries during an economic crisis. Results indicate that analysing e.g. rates of unemployment could give a better understanding of the negative effects caused by economic shocks.

Table 4 OLS-estimates for the effect on average wages by gender in Finland 2008-2016, enterprise trade participation as independent variable.

	(1) Female	(2) Male	(3) Female	(4) Male	(5) Female	(6) Male	(7) Female	(8) Male
Exporter	0.293***	0.318***	0.0399***	0.0264***	0.0360***	0.0213***	0.0108**	-0.00274
	(0.003)	(0.002)	(0.005)	(0.003)	(0.005)	(0.003)	(0.005)	(0.003)
Low-skill female employees, %			-0.000315***		-0.000122		0.000192*	
			(0.0001)		(0.0001)		(0.0001)	
High-skill female employees, %			0.0015***		0.00149***		0.00126***	
			(0.0001)		(0.0001)		(0.0001)	
Female employees aged 16-24, %			-0.00265***		-0.0026***		-0.00247***	
			(0.0001)		(0.0001)		(0.0001)	
Female employees aged 40-65, %			0.00147***		0.00144***		0.00131***	
			(8.46e-05)		(8.46e-05)		(8.45e-05)	
Low-skill male employees, %				-0.000916***		-0.000711***		-0.000333***
				(6.79e-05)		(6.73e-05)		(6.67e-05)
High-skill male employees, %				0.00105***		0.00106***		0.00112***
				(0.0001)		(0.0001)		(0.0001)
Male employees aged 16-24, %				-0.00242***		-0.00237***		-0.00213***
				(6.61e-05)		(6.57e-05)		(6.51e-05)
Male employees aged 40-65, %				0.000707***		0.000626***		0.000358***
				(5.04e-05)		(5.00e-05)		(4.91e-05)
Small enterprise					0.0638***	0.0697***	0.0587***	0.0598***
					(0.005)	(0.003)	(0.005)	(0.003)
Medium enterprise					0.0886***	0.0817***	0.0734***	0.0598***
					(0.007)	(0.005)	(0.007)	(0.005)
Large enterprise					0.0708***	0.0501***	0.0600***	0.0334***
					(0.010)	(0.010)	(0.009)	(0.010)
Old enterprise					0.0764***	0.0874***	0.0106***	0.0180***
					(0.004)	(0.003)	(0.004)	(0.003)
Year fixed effects								
Year 2009							0.00192	-0.0106***
Year 2010							0.0231***	0.0144***
Year 2011							0.0538***	0.0517***
Year 2012							0.0843***	0.0850***
Year 2013							0.102***	0.0919***
Year 2014							0.117***	0.111***
Year 2015							0.129***	0.128***
Year 2016							0.151***	0.154***
Constant	10.07***	10.29***	9.959***	10.28***	9.860***	10.18***	9.847***	10.17***
Enterprise fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No	No	Yes	Yes
Number of observations	379,408	584,967	128,032	273,456	128,032	273,456	128,032	273,456
Adjusted R-squared	0.028	0.029	0.046	0.029	0.056	0.044	0.099	0.097

*The dependent variable is average logarithmic wage by enterprise for female and male employees, respectively. ***, ** and * imply statistical significance on the 1-, 5- and 10-per cent level. Models 1 and 2 are simple regression models. Models 3 and 4 include employee characteristics and enterprise fixed effects. Models 5 and 6 further include enterprise characteristics. Models 7 and 8 include all independent variables and enterprise- and year fixed effects. All models are OLS-regressions.*

Table 5 OLS estimates for the effect of globalisation on relative average wage by gender and the effect of an economic crisis on relative wage.

	(1) Female	(2) Male	(3) Relative average wage
Exporter	0.036***	0.021***	0.0015***
	(0.0037)	(0.0025)	(0.0004)
Crisis	-0.073***	-0.08***	-0.0006***
	(0.0016)	(0.0012)	(0.0002)
Exporter#Crisis	-0.035***	-0.014***	-0.0013**
	(0.005)	(0.0038)	(0.0006)
Constant	10.11***	10.32***	0.98***
	(0.0004)	(0.0003)	(5.70e-05)
Enterprise fixed effects	Yes	Yes	Yes
Number of observations	379,407	584,965	300,966
Adjusted R-squared	0.009	0.011	0.000

5.2 Analysis and discussion

In this chapter I discuss the regression results and their relation to previous research and background economic theories.

The central point of analysis is how gender wage disparities are affected by international trade. The models in Table 4 estimate, with the exception of the year- and enterprise-fixed effects model for male employees, that exporting enterprises pay on average higher wages than non-exporters. The estimated wage increases are 3.7 per cent for female employees and 2.1 per cent for male employees in models 5 and 6, respectively. These results imply two interesting conclusions.

First, from the perspective of the whole economy, globalisation increases wage disparities. The majority of the workforce works in non-exporting enterprises, i.e. does not directly take part in globalisation, and thereby receives on average lower wages. The minority share of employees who work in exporting enterprises receive significantly higher wages, indicating a steady concentration of wage income to this group. These estimates follow the conclusions drawn from the descriptive statistics in chapter 4.2.

Analysing the effect on gender wage disparities requires an additional step of interpretation. Building on the conclusion in the previous paragraph and by adding the fact that male employees dominate the workforce in exporting enterprises, globalisation does increase gender wage disparities. Since male employees are better represented in exporting enterprises and exporting enterprises pay higher wages, male employees receive a relatively large share of total wages. This effect is marginally reduced by the fact that male employees also represent a larger share of employees in non-exporting enterprises, but it is still considerable.

Bøler et al. (2017) find that international trade participation increases gender wage disparities by around 3 percentage points in the Norwegian labour market. The authors relate this increase to demand of more flexibility among employees in exporting enterprises, especially among colleage graduates. The assumption relates to the theory of compensating wage differentials as travelling and flexibility requirements can rationally be seen as negative job characteristics. The results in Table 4 do not quantify the effect on the gender wage gap, but they show that the direction is identical and that the wage gap increases with globalisation. It is possible that the cause for the increase is similar to that noted by Bøler et al., (2017).

The second interesting conclusion regards the effect on gender wage dispartites between employees participating in international trade. While the conclusion for the whole economy is that wage disparities increase, the effect within exporting enterprises seems to be the opposite. Average wages increase for both female and male employees, but the percentage increase is higher for women. The result holds for all but the simple regression models and is especially visible in models 7 and 8 where the estimate for the effect of globalisation on male wages is negative.

Bøler et al., (2017) conclude that female employees in exporting enterprises earn higher wages than women working in non-exporting enterprises, but that they are underpaid given their unobservable characteristics. The lower constant for female average wages indicates a similar result here: female employees in exporting enterprises are underpaid compared to their male counterparts, but their situation is, in two ways, relatively better compared to women working in non-exporting enterprises. Women in exporting enterprises earn on average more than other women, and they are relatively less underpaid compared to their male colleagues. The practical interpretation of Bøler et al., (2017) is more robust as the

authors check for several employee- and enterprise characteristics, but the presented conclusion holds for all models in this thesis.

The negative and insignificant[44] estimate for trade participation in model 8 raises some interesting questions. For example, is it possible that the analysed time period affects regression estimates? The analysis is timed to the aftermath of the financial crisis of 2008-2009, a crisis that affected jobs and the labour market in many ways. It is possible that, as male employees are dominant in exporting enterprises, male employees were hit harder by the financial crisis than female employees. This assumption is rational and supported by the steady increase in year fixed-estimates for models 7 and 8, with the exception of year 2009 for male employees. This is the year when the Finnish economy dipped lowest following the financial crisis, an effect that should rationally be visible in labour market research (The World Bank, 2019). The two irregular years at the beginning of the analysis may also explain the statistically insignificant estimate for trade participation in model 8[45].

Model 3 in Table 5 disputes the above hypothesis and in fact estimates a reverse effect, although marginal. The estimate for the effect of an economic crisis on relative wage levels in exporting enterprises is negative, which indicates that male employees are less affected by the negative consequences of an economic crisis. The counterintuitive effects also occur when checking separately for manufacturing and service industries: men are estimated to be less affected than women in manufacturing industries and women less affected than men in service industries. These results are likely affected by the aggregated level of analysis and their factual significance should therefore be regarded with caution.

Estimates for employee skill- and age groups follow the theoretical framework throughout the model development. Estimates for low-skill and young employees are negative, indicating lower average wages when the enterprise workforce is less experienced and/or less educated. The estimated difference between low-skill and medium-skill employees is, however, very small and practically insignificant. The estimates for age groups, i.e. experience, are greater than for skill-groups and indicate a practically significant effect on average wages. Estimates for skill and age are both in line with the theory of human capital where productivity, and consequently wage, is stated to increase with age and education.

[44] Statistically and practically.
[45] Esimtating a model without years 2008 and 2009 turns the estimate for trade participation back to positive, but does not increase the estimates´ statistical significance.

The estimates for enterprise size are quite large, which follows the intuition that micro enterprises are less productive and have less production assets than larger enterprises. The differences between other enterprise sizes are small, indicating that additional size and assets do not continuously increase wages. Medium-size enterprises are estimated to pay the best average wages to both female and male employees. The significantly lower estimate for male employees in large enterprises compared to female employees is possibly a consequence of male employees occupying most low-skill occupations in e.g. large manufacturing enterprises.

As expected, the estimate for old enterprises is positive. This shows that enterprises that have established a stable base are able to pay higher wages than young enterprises going through stages of growth.

Even though there are several limiting factors related to the estimated models, the estimates are in line with previous research and the theoretical framework of the thesis. The models answer the central research question regarding the effect of globalisation on wage construction and gender wage disparities. The models show that trade participation increases gender wage disparities on national level but decreases gender disparities between employees participating in trade. The results are indicated by estimates in both Table 4 and 5.

Research of the Finnish labour market by e.g. Korkeamäki & Kyyrä (2003, 2006), showed that there exists an inexplicable gender wage gap after checking for several employee and enterprise characteristics. The results presented here indicate that trade participation is a valid variable to consider when analysing the formation of gender wage disparities in Finland, especially when analysing interenterprise disparities, and that it can likely explain part of the currently inexplicable gender wage gap.

6. Data treatment, model specification and robustness

The primary econometric model is equation (4) as presented in chapter 4.3. The equation is an enterprise-level wage function based on the theory of compensating wage differentials and the theory of human capital. The regression model includes enterprise- and year fixed effects as presented earlier.

Subchapters 6.1 to 6.3 motivate the choice of model, highlight a step of data treatment and present results for statistical tests of the econometric model. Subchapter 6.4 highlights some data- and model weaknesses and subchapter 6.5 includes a number of robustness- and heterogeneity checks.

6.1 Outliers

The underlying data sources are of good quality and require little manual treatment after restrictions in the combination process. However, the FLEED database contains some illogical wage information that can affect results and need to be treated. The method used for treating illogical wages also excludes inflating wage effects caused by single "superstar" individuals. Some enterprises are excluded based on area of activity. Both treatments are done to stabilise data.

The exclusion of enterprises is a straight forward process of eliminating outliers and concerns the NACE sections listed in chapter 4.1.1, especially enterprises in section *K - Financial and insurance activities.* Enterprises in this section significantly differ from other enterprises in form of activity and construction of financial statements. These differences can affect analysis results and it is therefore reasonable to exclude all enterprises in the sector.

Illogical wages on personal- and enterprise level can be caused by e.g. incomplete reporting or incomplete transfer of individuals wage information. Some individuals have registered 12 months of work in a year but have an unrealistically low wage sum for the same year. There are also some employees who have extremely high wages and who stand out in a graphical representation of the data. This is likely not a result of wrongful reporting, but these individuals distort average wages on all levels from personal- to enterprise grouping-level.

To avoid this distortion and reduce bias, enterprise-level average wages are treated with a method called winsorizing.

Winsorizing is a data trimming method used to avoid bias without removing observations from a data set. Instead of removing outlier observations, winsorizing replaces outliers with the nearest value in the data[46]. Like other trimming methods, winsorizing treats both ends of a data set simultaneously. In practice this means that the same number of values at the bottom and the top of the data set are replaced with the nearest value (Field, 2016).

Common practice when winsorizing is to treat a chosen percentile of the data set. For example, a 90 per cent winsorization means that the top and bottom 5 per cent of values are replaced with the first value outside the respective percentiles, i.e. the top 5 per cent of values are replaced by the first value outside the top fifth percentile, and likewise the lowest 5 per cent of values are replaced by the first value outside the lowest fifth percentile (Field, 2016).

Average yearly wages on enterprise level for all employees are here treated with a 94 per cent winsorization for the whole data set, i.e. all observations for average yearly wage are winsorized simultaneously instead of treating each year separately. A 94 per cent winsorization means that wage values for 39 804 observations are changed, an average of 4 422 observations per year. The lowest average wage after winsorizing is EUR 9 081 and the highest EUR 69 927.

Average yearly wages for female and male employees are winsorized separately from the average wage for all employees and from each other. Due to the lower number of observations, male and female average wages are treated with a 96 per cent winsorization. Enterprises with no female or male employees respectively are excluded from the winsorization, i.e. no average wages are imputed for these enterprises. In total, 15 176 average female wages and 23 398 average male wages are winsorized. After winsorizing, the lowest average wages for female employees are EUR 4 642 and the highest EUR 65 252. The respective values for male employees are EUR 6 445 and EUR 88 101. The percentual differences between winsorized female and male wages are well in line with published figures and with values before winsorizing the research data.

[46] Or by assigning outliers a lower weight than other values.

6.2 Model specification

In order to find the best model and variables for my analysis, I conduct statistical tests on my data set. In this and the following subchapter 6.3 I follow the method recommended in (Chen et al., 2003) chapters 1 and 2 on OLS-regression and regression diagnostics in Stata. All regression- and data diagnostics are not applicable to fixed effects models and the method I use is therefore not exactly identical to that in the source literature.

The primary econometric model uses enterprise- and year fixed effects and takes average wages payed to female and male employees on enterprise level as its dependent variable. The included independent variables are trade participation, enterprise size, shares of employees by various levels of education and shares of employees in various age-groups. Many available variables are excluded, and the reasons are described below.

Within-model correlation between dependent variables, called *multicollinearity,* can be a problem in multiple regression models. When adding independent variables to a model, one runs risk of adding predictors that are dependent on one or more variables already included in the model. Perfect correlation between two or more independent variables is called *perfect multicollinearity* (Wooldridge, 2012).

Correlation between independent variables does not necessarily reduce the predictive power of a model, but it does affect results of individual predictors and makes interpretation of regression results more difficult. Even though sometimes problematic, multicollinearity does not automatically mean that a variable has to be excluded from the model. Given strong theoretical or empirical support, a variable can be included in a model even if it increases multicollinearity (Goldberger, 1991). Multicollinearity can be reduced for example by increasing the number of observations, by excluding variables or by chaining the research question. *Perfect multicollinearity* is a more difficult problem and hinders use of the OLS-method (Wooldridge, 2012). The used data set contains a large number of observations and it is therefore unlikely that a multicollinearity problem will occur, but it is always worth running data diagnostics.

One way of measuring multicollinearity is by performing a *variance inflation factor*-test (*VIF*-test). The *VIF*-test quantifies within-model multicollinearity by comparing the variance in a model with several terms to that of a model with only one term (Wooldridge, 2012). The thesis data set contains several variables that are likely correlated with each other and it is

therefore relevant to perform a correlation test and a *VIF*-test for the variables included in the regression model.

The correlation matrix shows no problematic correlations between variables in the models[47]. As expected, the employee groupings by age and skill are internally strongly negatively correlated, i.e. age groups 1, 2 and 3 are negatively correlated with each other and skill groups low-skill, medium-skill and high-skill with each other. The negative correlations are expected and correct as the share of employees in one group per definition has to decrease when the share in another group increases. The dummy variables for enterprise size are also negatively correlated with each other. This follows the definition as an enterprise can only belong to a single size group.

The *VIF*-test is not applicable to fixed effects models in Stata, but the test results for the regression model without fixed effects show that none of the chosen variables need to be excluded. So far, the model looks good and seems to estimate enterprise-level wages in a reliable way. There is still, however, merit in testing for the possible inclusion of additional variables in the model.

There are numerous criteria that can be accounted for when determining the best model for econometric analysis. The value R^2 (r-squared) is automatically generated by analysis programs and indicates the explanatory strength of the estimated model, i.e. how much of the variation in the dependent variable is explained by the included independent variables. The R^2-value gives an introductory view of how good the estimated model is (Wooldridge, 2012). There is, however, a significant problem with using R^2 when estimating models with several independent variables; the value of R^2 automatically increases when more variables are included, even when these variables are irrelevant. It is therefore advisable to take note of the adjusted R^2, a value that is also automatically generated by most analysis programs, as it accounts for the number of independent variables included in the model (Wooldridge, 2012).

In addition to the R^2-values, there are several other ways of determining the adequacy of a regression model. Most measures of adequacy compare the complexity of a model to its' explanatory strength in a similar way as the adjusted R^2. Two such measures are used here: the *Akaike information criterion* (AIC) (Akaike, 1974) and the *Bayesian information criterion* (BIC) (Stone, 1979). AIC and BIC do not determine the actual fit of a model, but

[47] The statement holds for all three models, i.e. for all employees, for female employees and for male employees.

rather the relative fit of a model compared to others. For a more extensive explanation of AIC and BIC, see for example (Williams, 2018).

In order to find the best possible model for analysis, I compare different models by in turn including and excluding a variety of different independent variables. I keep an eye on the significance-levels of independent variables, the adjusted R^2, the AIC and the BIC when comparing each model.

The final regression model takes the logarithmic average yearly wage on enterprise level as the dependent variable. The independent variables are share of respective employee skill groups, share of respective employee age groups, dummy variables for enterprise size and a dummy variable for enterprise age. This model scores best in the various tests mentioned above and the included variables show good levels of significance. The model also follows the theory behind the conducted analysis.

The included independent variables are simply defined as dummy variables or shares of the workforce and thereby easy to interpret. The dependent wage variable is, on the other hand, converted to logarithmic form for two reasons: it decreases the distance between the smallest and the largest observations and it makes percentual interpretation easier. The decrease in distance is not so important here as the data set is winsorized. However, the easier percentual interpretation is beneficial when analysing effects on wage disparities, especially since it is here done by estimating separate models for genders. It is for example possible that female employees benefit relatively more from participating in international trade than male employees do, and such an effect is easier to detect by observing percentual changes.

The regression model is now specified, but it is possible that the model is missing relevant variables that affect wage construction. Missing variables inflate the estimates for included independent variables as the weight of relevant variables has to be assigned elsewhere. It is also possible that the model includes irrelevant variables, in which case the estimates of relevant variables are underestimated (Wooldridge, 2012). To test the relevance of the chosen model, I run a *regression specification error test* (RESET-test) and a *model specification link test for single-equation models* (link-test). The RESET-test checks for possible missing variables and whether included variables need to be transformed, i.e. if power-variables need to be included. The link-test checks for problems with model specification (Chen et al., 2003).

Both the RESET-test and the link-test indicate that the chosen regression model is mis specified. As most variables are dummy-variables, this is probably caused by missing independent variables. The results are identical both when excluding variables and when including more independent variables, which leads to the conclusion that the data is likely missing variables that affect wage construction. This conclusion is at least partially confirmed by the relatively low R^2-value for the model[48].

The various tests conducted when specifying the model indicate that the data is well constructed, but that the chosen regression model is inadequate. In the following subchapter I conduct model tests based on the requirements for conducting reliable analyses with the OLS-method.

6.3 Regression diagnostics

In this subchapter I conduct further tests on the chosen regression model with dependent variable logarithmic average wage on enterprise level. I include all independent variables.

The chosen model uses fixed effects for enterprises and years, but another common practice is to use *random effects.* Random effect models assume that the fixed effects error term lacks correlation with the independent variables. It is rational to think that fixed effects regression is appropriate for the thesis analysis and there are ways of testing validity of the assumption. The usefulness of a fixed effects model can be tested with the *Hausman*-test (Wooldridge, 2012). As expected, the Hausman-test supports the use of a fixed effects model in the analysis.

A basic assumption for using the OLS-method is that the model residuals are normally distributed (Wooldridge, 2012). There exists a variety of tests that confirm or deny this, one of which is the *kernel density estimate* which can be thought of as a histogram with narrow bins and moving averages (Chen et al., 2003). A graphical check of the kernel density estimate shows that the residuals are skewed from normal distribution. To further check the normality of residual distribution, one can perform for example a *Shapiro-Wilk* test that checks the possibility of rejecting the null-hypothesis that the model residuals are normally distributed (Shapiro & Wilk, 1965). The test confirms that the model residuals are not

[48] Further discussion on model limitations and possible reasons can be found in chapter 6.3.

perfectly normally distributed, which could indicate a weakness in the model. It is, however, likely that the non-normality is caused by the large number of observations in the data. When dealing with large data sets, the assumption of normality is almost always violated without it causing any problems (Ghasemi & Zahediasl, 2012).

Another important assumption for the OLS-method is that residuals are homoscedastic. Heteroscedastic residuals can cause problems with the explanatory degree of a model and variables in the model, as for example the level of significance is affected. Three tests that can be used to check for residual homoscedasticity are; a graphical valuation of residuals, the *Breusch-Pagan*-test and the *Whites*-test. The graphical valuation is used to identify clear patterns in the model residuals and the statistical tests check for the possibility of rejecting the null-hypothesis that the residuals are homoscedastic (Wooldridge, 2012). The power of graphical evaluation is here limited as the number of observations is very large, but a pattern is recognisable which suggests there might be a problem with heteroscedastic residuals. The problem om heteroscedasticity is confirmed by both the Breusch-Pagan-test and the Whites-test. To deal with the problem of heteroscedasticity, I use clustered errors on enterprise ID in the analysis (Project Guru, 2018).

Before the analysis, I perform a final check of the assumed linear relationship between each independent variable and the dependent variable. As with the graphical check mentioned earlier, this is also problematic due to the large number of observations. With a large number of observations, it is more likely that a linear relationship can be found for each independent variable. This is also the case here; all variables show a linear relationship both when plotted against residuals and when plotted in an *augmented component-plus-residual plot* used for finding nonlinearity between variables, but it is very difficult to distinguish single observations from the plots (Chen et al., 2003).

The diagnostics carried through in this chapter show several shortages with the chosen model. In the following subchapter I discuss possible solutions for these problems.

6.4 Data- and model criticism

The first, and most important, problem to discuss is the level of analysis. The validity of analysing effects of globalisation on wages and wage disparities on enterprise level is questionable. The optimal would be to follow the method used by (Bøler et al., 2017) and

analyse effects on employee level. Aggregating and averaging wages to a less granular level decreases the likelihood of finding reliable results and decreases validity of the analysis. The theoretical background suggests that personal level characteristics such as level of education and quality of job[49] are most important in wage construction, but these characteristics are hard to pinpoint on enterprise level. Previous research has also shown that out-of-job characteristics such as number of children are important in wage analysis, but all such properties have to be excluded when aggregating wages. This analysis will, hopefully, inspire further research on personal level.

Touching on the theoretical relevance of the analysis, there is little to no theoretical or empirical support for the assumptions made based on the background theories in this thesis. The theory of compensating wage differentials has lacking support on personal level, and likely even less when generalised to enterprise level as in this thesis. The theory of human capital is likely also weakened when generalised to enterprise wage construction, leaving only a vague connection between the theoretical framework and empirical results in this thesis.

Analysing wages separately for female and male employees is also worth discussing as the primary goal is to understand wage disparities. Separate models estimate the respective wage effects of participating in international trade, which can in turn be used to estimate the effect on the gender wage gap. A more direct way of analysing the gender wage gap would be to use female employees' wages divided by male employees' wages, i.e. an interactive term. This would provide a more relevant dependent variable, but the data limitations would still be the same – and further extended as only enterprises with both female and male employees could be included[50]. The exclusion/restriction of enterprises is in itself an interesting discussion. When producing different estimates for female and male employees, enterprises with only one gender in their workforce are included in the analysis. This might lead to skewed estimates as different enterprises are included in each regression, and thereby different enterprise characteristics are included. Using enterprise fixed effects at least partially takes care of this problem, but the pool of enterprises is still different for the two regressions.

[49] The "quality" of a specific employee's job.
[50] Table 5 presents results for a version of this analysis.

As presented in subchapter 6.1, the data is winsorized before the analysis. Winsorizing means that no observations need to be excluded from the data, but it is worth questioning whether this is better than excluding outliers or cutting data altogether. Estimates should not significantly be affected since both ends of the data are treated simultaneously, but there might be merit in manually choosing different cut-offs for the top- and bottom ends of the data. This would increase variation in average wages, but if executed correctly it would produce results that better depict the real-world situation. The winsorization, or possible cut-off, might also be better if done on personal level wages instead of average wages on enterprise level.

The statistical tests performed in the previous two chapters indicate some problems with the analysed data and the chosen model. Some of the problems are fixed by tweaking the regression method, some can be explained by the large number of observations, but there are questions that remain open regarding the suitability of the analysis. Many of the problems are likely caused by the aggregated analysis and can thereby be solved through future investments in more granular research.

As shown in the analysis chapter, the explanatory strength of the chosen model is limited. This strengthens the argument that wage analysis is better conducted on personal level, as previous results using simple functions, e.g. the Mincer earnings function, have produced good estimates in various labour markets. The model used in this thesis is conceptually an extended version of the Mincer function on enterprise level, but its' explanatory strength is very limited. In summary, the analysis results have to be regarded with caution.

6.5 Robustness and heterogeneity

The extensive data set used in this thesis offers countless possibilities for defining variables and analysing Finnish enterprises and their employees. The definitions used in the above analysis are primarily based on previous work conducted at Statistics Finland, but there is merit to testing other definitions as well. The above analysis also considers the entire enterprise population that meets the analysis criteria, but it is possible, and even likely, that analysing different subpopulations will show different results. Against this background, I perform some robustness and heterogeneity tests. The additional regression results are presented in Appendix 3 and 4.

Variable robustness

Table 6 in Appendix 3 shows regression results with a new definition for the primary analysis variable, Exporter. The initial definition requires an enterprise to have a total export value of 5 000 euros or more in the reference period while the annual requirement used in Table 6 is 20 000 euros. Regressions 1 and 2 in Table 6 are identical to regressions 1 and 2 in Table 4, and regressions 3 and 4 are identical to regressions 7 and 8.

Regressions 1 and 2 show very similar results with both definitions – the only notable change is the higher estimate for Exporter on female average wages in Table 6. Estimates in the full regressions are also almost perfectly identical – the only change occurs in the estimate for Exporter which slightly decreases in both statistical and practical significance for female average wages and conversely increases in both statistical and practical significance for male average wages. The results indicate that the Exporter-definition is well motivated and that it is sufficiently robust for the conducted analysis. The requirement that the value of exports should be no less than 5 per cent of an enterprise´s turnover likely increases the robustness of the variable[51].

Table 7 in Appendix 3 shows regression results when the definition of Exporter is changed in the other direction as above , i.e. when the required value of exports is reduced and the required ratio of exports to turnover is removed. The required value of annual exports is here only 1 euro. With this definition, neither the estimated effects on female- nor male wages are statistically significant. Lowering the requirements defines more, and especially more small, enterprises as exporters which likely increases the variation in effects. The results in Table 7 support the use of more significant values, and especially the required export-turnover ratio seems to be important for increasing analysis robustness.

The importance of services exports for Finnish enterprises has increased significantly during the past decades but registering services trade poses significant problems to national officials (Roine, 2019). The reliability of service trade statistics is lower compared to that of goods trade, which motivates a robustness check which only accounts for trade in goods.

Table 8 in Appendix 3 shows regression results when the Exporter-definition disregards enterprises' trade in services. Interestingly, the statistical and practical significance of the Exporter-variable on female average wages is lower in Table 8 than in Table 4 while other

[51] When the 5 per cent requirement is removed, both the statistical and practical significance of regression estimates decrease.

estimates are almost identical. A possible explanation for this is that some large Finnish enterprises, which are surveyed on an annual basis and thereby provide reliable information also on trade in services, export a significant amount of services and do not fill the new exporter-definition which leads to a less robust analysis[52]. Once again, the stability of other regressions variables is distinct which indicates that the original analysis as a whole is robust.

Heterogeneity

As mentioned, conducting the analysis for different subpopulations of enterprises will likely show different results from the original regressions. To check for possible heterogeneity-effects, I run some further regression with different subpopulations. The results are presented in Appendix 4.

Table 9 presents results for two different time periods, 2008-2012 and 2013-2016. The estimates for the control variables are of the same magnitude as in the original analysis and there are no significant differences between the two periods. The results for Exporter are more interesting as only one of four estimates is statistically significant. The estimated effect on male average wages also switches from negative in years 2008-2012 to positive in 2013-2016, which partially explains the insignificant estimate in the main analysis. The overall impression is that results may vary depending on which time period is analysed, at least if the analysis is timed directly after a significant shock to the overall economy.

Table 10 presents results for two groups of enterprises by size. All enterprises with less than 250 FTEs are defined as SMEs and enterprises with 250 FTEs or more are defined as large. Once again, only one of four estimates for Exporter is statistically significant – the one for female average wages in SMEs. The estimate for female average wages is negative in large enterprises, an estimate that has not occurred in any other model so far. Both estimates for male average wages are negative and, as before, statistically insignificant. Estimates for control variables are in line with those in previous models.

The insignificant estimates for large enterprises are not surprising – when the number of employees at a firm increases, so does the variation between these employees. Like other

[52] As they no longer fill the export-turnover requirement.

analysis-specifying measures, grouping enterprises by size would likely increase analysis robustness and better pinpoint cause-effect relations.

Table 11 presents results based on a grouping of enterprises that has not been used in this thesis before – domestically- and foreign-owned enterprises. None of the four Exporter-estimates are statistically significant and most control variable-estimates also lose statistical significance in both groups and for both genders. As presented in Table 11, the number of enterprises for which country of ownership can be specified is quite limited which likely affects the significance of estimates, especially in combination with the fact that foreign-owned enterprises are mostly large corporations employing a wide variety of employees. The grouping of enterprises by ownership is an interesting point to explore in the future but does not seem to provide additional legitimacy when used on an aggregate level.

7. Conclusion

In this chapter I summarise the thesis results, discuss possible policy implications and suggest further analysis based on analysis criticism and results.

7.1 Summary of results

The thesis results both support and refute the hypothesis that globalisation increases gender wage disparities. Gender segregation into exporting and non-exporting enterprises causes an increase in wage disparities as male employees take part in, and benefit from, trade more often than female employees. An equalising effect arises as female employees who take part in trade, i.e. work in exporting enterprises or enterprises that start exporting, gain more from trade than their male colleagues. Nominal wage differences exist in both non-exporting and exporting enterprises, and they favour men in both enterprise groups, but the relative difference between genders seems to be smaller in enterprises engaging in trade.

The distorting effect caused by gender segregation is primarily shown by the descriptive statistics presented in chapter 4.2. The statistics provide a good insight into the advantages of participating in trade and which employees benefit from these advantages. The average wage gain from working in an exporting enterprise is significant and men take hold of this opportunity more often than women.

The equalising effect between employees in exporting enterprises is shown in the econometric analysis in chapter 5. Both men and women gain from working in exporting enterprises, but women gain relatively more. This result holds both when analysing the construction of average wages separately for women and men and when analysing wage disparities directly as an interactive term.

Although not quantified, it is rational to think that the increase in wage disparities caused by gender segregation is greater than the decrease caused by higher gain for women participating in trade. The share of employees in exporting enterprises is significantly lower than the share in non-exporting enterprises, which means that the negative effect is merely attenuated by the relatively higher gain for women in exporting enterprises. The effect is

further attenuated by the fact that men occupy an even greater share of positions in exporting enterprises.

In summary, results indicate that globalisation increases gender wage disparities on national level in Finland. Globalisation makes a small group of female employees relatively better off but increases aggregate inequality. The effect seems to be small compared to effects caused by for example educational-and industrial segregation or explained by level of education and age, but results indicate that there is a valid argument for including trade participation in analyses of gender wage disparities in Finland.

7.2 Policy implications

As mentioned at the beginning of this thesis, gender wage disparities are frequently discussed in Finnish media and policymaking. There is widespread interest in decreasing gender wage disparities, and wage disparities altogether, in the Finnish labour market, but the required steps are still unclear.

Analysis results show that gender wage disparities are lower in exporting enterprises – is it therefore valid to recommend that Finnish policymakers increase support for these enterprises and for enterprises striving to enter international markets? Just by looking at the numbers the answer is yes, but practically no.

Firstly, based on the analysis it is impossible to say whether the lower gender wage gap is a cause or an effect of international market participation. There exists correlation between the two variables, but the direction cannot be reliably stated based on these results. Reliably stating cause-effect relations requires further delving into the workforce structures of different enterprises and analysing the causes behind the different wage gaps instead of merely stating the existing difference.

Secondly, it is a practically impossible situation that all enterprises in Finland take part in international markets. While more frequent participation in foreign markets would benefit a portion of the workforce, it would make a greater share of employees relatively worse off. This means that gender wage disparities would decrease marginally at the expense of greater wage disparities between other individuals in society.

Unrelated to the gender wage gap, however, Finnish policymakers should push enterprises to take part in global markets as they bring significant benefits to the economy. As shown, enterprises engaging in international trade are bigger, more productive and pay higher salaries than purely domestic enterprises – properties that are attractive to both the national economy and the private economies within the country.

The rising importance of services exports for the Finnish economy presents a possible, however only partial, non-policy solution for better aggregate gender wage equality in the future. As industries and enterprises where women are better represented gain ground and expand internationally, women will also take better advantage of benefits provided by international relations. This possible improvement of course requires that the expanding sectors employ relatively more women than traditional export sectors and that the enterprises fill the same properties as traditional exporters, for example that they pay higher wages than other employers.

7.3 Future work

The utilised data set and, especially, the sources used for creating the data set enable countless further analyses on both enterprise- and individual level. The aggregate level analysis conducted in this thesis merely scratches the surface and gives indicative results for how globalisation affects different individuals in the Finnish labour market.

A first step towards better describing the effects that globalisation has had on Finnish workers would be to conduct identical analyses on a more detailed level, for example by sector, industry or even geographical positioning. There are significant differences between both enterprises and employees in different enterprise groupings, and these differences are impossible to account for on aggregate level.

The analysis in this thesis has solely focused on wage differences between genders, but globalisation has likely also affected differences between other groups of employees. A future approach could therefore be to analyse effects on other groups of employees, for example by different levels of education or same levels of education in different enterprise heterogeneities.

Like the FLEED database, the FLOWN database could give an additional interesting approach to analysing the distribution of monetary gains from trade among individuals in society. The FLOWN database registers owners of private enterprises in Finland and enables analyses of for example participation of women as enterprise owners in international trade. Adding the owner approach would also allow for analysing gender wage disparities in enterprises with different owner-structures, for example female- and male owned.

The most important future approach is to analyse the effect of globalisation on individual level as done by Bøler et al. This analysis is possible by using the same data sources as in this thesis, merely a technical change in the data creation process is required. An analysis on individual level will provide better knowledge of the role of globalisation on gender wage disparities, but also on how factors such as education and age affect wages in Finland.

Summary in Swedish – Svensk sammanfattning

Utlandshandel och jämställdhet – globaliseringens effekt på löneskillnader mellan kvinnor och män

Den ökade internationella ekonomiska integrationen som växt fram under de senaste decennierna har format samhällen på alla håll i världen. Betydelsen av internationell handel och ekonomiskt samarbete har stadigt vuxit och idag litar såväl nationer som företag och individer på långväga handelspartners för stadig tillgång till råvaror och konsumtionsprodukter.

Den ekonomiska globaliseringen innebär betydande nyttor för individer runtom i världen; vi får tillgång till produkter av högre kvalitet till lägre pris, vi delar kompetenser och utvecklar nya kunskaper på basis av utländskt kunnande och vi kommunicerar allt mer för att skapa nya produkter och tjänster som förenklar våra liv. Globaliseringen kopplar samman människor på tidigare otänkbara sätt och har en central roll i skapandet av ekonomisk tillväxt och välfärd.

De makroekonomiska nyttorna av globaliseringen är många, men vi har inte en klar bild av hur dessa nyttor fördelas i samhället. Möjligheterna att dra nytta av globaliseringens positiva effekter är inte lika för alla, och det är sannolikt att det finns både vinnare och förlorare även i Finland. Flykten av stora industriföretag till asiatiska lågkostnadsländer under början av 2000-talet är ett praktiskt exempel på detta; företagen och deras ägare drog nytta av de lägre produktionskostnaderna medan europeiska fabriksarbetare tvingades söka nya inkomstkällor.

Frågeställning

I denna avhandling undersöks globaliseringens effekt på löneskillnader mellan kvinnor och män på den finska arbetsmarknaden. Globaliseringen definieras genom företagens, det vill säga arbetsgivarnas, deltagande i utlandshandel som exportörer och frågeställningen riktas till om de internationella handelsrelationerna har en signifikant effekt på medellönerna för kvinnor och män. Avhandlingens primära forskningsfråga är:

- Hur påverkar globaliseringen löneskillnader mellan kvinnor och män?

Som stöd för den primära forskningsfrågan och för att kontrollera avhandlingens hypoteser undersöks även följande stödfrågor:

- Hur påverkar globaliseringen löneskillnaderna på nationell nivå?
- Anställer exportföretag fler män än kvinnor?
- Är exportföretag mer produktiva än icke-exportföretag?
- Anställer exportföretag en större andel högutbildade arbetstagare än icke-exportföretagen?
- Är löneskillnader mellan kön större i exportföretag än i icke-exportföretag, och varför?

Avhandlingen utgår från hypotesen att utlandshandeln ökar löneskillnaderna mellan kvinnor och män. Hypotesen baseras på de faktum att den finska globaliseringen historiskt sett drivits av högteknologiska företag där majoriteten av arbetstagarna varit män och att finska exportföretag betalat, och betalar, i genomsnitt högre löner än andra företag.

Datamaterial och variabler

Datamaterialet som används i denna avhandling är en kombination av företags- och personregister som tillhandahålls av Statistikcentralen. Företagsinformationen hämtas från Företagsregistret och arbetstagarinformationen från FLEED databasen (*Finnish Longitudinal Employer-Employee Data*). Arbetstagarinformationen aggregeras till företagsnivå där arbetstagare grupperas enligt kön, ålder och utbildningsnivå. (Statistics Finland, 2019b; Tilastokeskus, 2014)

De kombinerade datakällorna innehåller information om alla företag i Finland och alla personer som är anställda av dessa företag. För ökad stabilitet och analysfokus inkluderas endast arbetstagare i åldern 16-65 år i analysen. Datamaterialet är även avgränsat till att endast inkludera de arbetatagare som registrerat 12 månader av arbete under året. Företagen avgränsas enligt näringsgren så att endast de branscher som ingår i finska *Structural Business Statistcs* ingår i analysen[53]. Vidare avgränsas företagen så att endast de som anställer minst ett årsverke under året är inkluderade. Analysen genomförs för åren 2008-2016.

[53] Exkluderade näringsgrenar på 2-siffernivå: 01, 02, 03, 64, 65, 66, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 96, 97, 98, 99 and 00.

Den huvudsakliga utfallsvariabeln är medellön för kvinnor och män och båda räknas skilt för varje företag som ingår i analysen. Lönevariabeln är bruttolön i euro och lönen knyts till individens arbetsgivare vid slutet av året.

Arbetstagarna delas in i tre grupper enligt utbildningsnivå – lågutbildade, medelutbildade och högutbildade. Arbetstagare som inte har utbildning efter grundnivå klassas som lågutbildade. Arbetstagare med gymnasie- eller yrkesskoleexamen klassas som medelutbildade. Arbetstagare med yrkeshögskole- eller universitetsexamen klassas som högutbildade. Arbetstagarna delas vidare in i tre grupper enligt ålder. Grupp 1 består av arbetstagare i åldern 16-24 år, grupp 2 av arbetstagare i åldern 25-39 år och grupp 3 av arbetstagare i åldern 40-65 år.

Företagen delas in i fyra grupper enligt antal heltidsanställda. Microföretagen har färre än 10 heltidsanställda, små företag har 10-49 heltidsanställda, medelstora företag har 50-249 heltidsanställda och företag med över 250 heltidsanställda klassas som stora. Vidare delas företagen in i två grupper enligt ålder; unga företag är under 5 år gamla och gamla företag har verkat i 5 år eller fler.

Den huvudsakliga analysvariabeln *Exporter* är en dummyvariabel som antar värdet 1 för företag som deltar i utlandshandeln som exportörer och värdet 0 för övriga företag. Exportföretagen uppfyller följande krav:

- Det totala värdet av exporterade varor och tjänster överstiger 5000 euro och företaget exporterar minst 5 procent av sin omsättning under året.

Analys

Avhandlingens analys genomförs i två steg. Den deskriptiva analysen i kapitel 4.2 besvarar flera av avhandlingens stödfrågor och lägger grunden för den ekonometriska analysen vars resultat presenteras i kapitel 5.

Den deskriptiva analysen visar att exportföretag, i enlighet med avhandlingens hypotes, betalar i genomsnitt högre löner än icke-exportföretag. Den nominella löneskillnaden år 2016 är nästan 13000 euro, vilket innebär en skillnad på 29,2 procent. Exportföretagen anställer också en större andel män än kvinnor, även jämfört med övriga företag. De två inledande faktumen pekar på att män gynnas relativt mer av företagens deltagande i utlandshandel eftersom de oftare arbetar i exportföretag och därmed oftare drar nytta av de

i genomsnitt högre lönerna. Sammanfattningsvis visar den deskriptiva analysen på en arbetskraftssegregation av män till exportföretag som ökar löneskillnaderna mellan kön på samhällsnivå, och vidare på ökade löneskillnader till fördel för arbetstagare i exportföretag gentemot arbetstagare i icke-exportföretag. Table 1, 2 och 3 på sidorna 45, 47 och 48 presenterar deskriptiv statistik.

Graph 13 på sidan 49 illustrerar en form av lönegap i export- och icke-exportföretag. Illustrationen går emot avhandlingens hypotes eftersom den indikerar mindre löneskillnader i exportföretag än i icke-exportföretag. Grafen motiverar vidare analys av företagsgruppernas medellöner och den vidare analysen presenteras i kapitel 5.

Den ekonometriska analysen utgår från ekvation (4) på sidan 50 och beaktar företags- och arbetstagaregenskaper för att estimera deras respektive effekter på medellöner för kvinnor och män. Den slutgiltliga regressionsmodellen, vars resultat presenteras i Table 4 på sidan 57, beaktar företags- och årsfixa effekter.

Regressionsresultaten pekar på samma resultat som den deskriptiva analysen: lönerna i exportföretag är betydligt högre än i icke-exportföretag och kvinnor gynnas relativt mer än män av att arbeta i exportföretag. De fullständiga regressionmodellerna (model 7 och 8 i Table 4) visar på en statistiskt signifikant ökning i medellönen för kvinnor på 1,1 procent och en statistikt icke-signifikant minskning i medellönen för män på -0,3 procent av att arbeta i ett exportföretag. Regressionsmodellerna pekar därmed på samma effekter av deltagande i utlandshandel som tidigare nämndes – den första, och största, effekten ökar löneskillnaderna mellan kön på samhällsnivå genom arbetskraftssegregering, medan den andra effekten minskar den negativa effekten genom att kvinnor i exportföretag kompenseras relativt bättre än män i exportföretag. De nominella skillnaderna i medellönerna gynnar män både i export- och icke-exportföretag, men skillnaderna är relativt mindre i exportföretag.

Regressionsmodellernas förklaringsgrader är låga, men resultaten pekar ändå på att exportdeltagande är en egenskap som har en effekt på lönekonstruktionen på den finska arbetsmarknaden. Den aggregerade analysnivån påverkar förklaringsgraden betydligt men även på denna nivå syns ett statistiskt signifikanta samband mellan medellönen för kvinnor och den huvudsakliga analysvariabeln.

Slutsatser

Analysresultaten både bekräftar och häver avhandlingens hypotes om att globaliseringen ökar löneskillnader mellan kvinnor och män. Könssegregationen mellan export- och icke-exportföretag leder till ökade löneskillnader då män oftare tar del av utlandshandeln och därmed gynnas av de högre löner som erbjuds i exportföretag. En mildrande effekt uppstår då kvinnor som deltar i utlandshandeln drar relativt större nytta av den än sina manliga kollegor.

De sammanlagda analysresultaten pekar på att globaliseringen ökar löneskillnaderna i Finland. Globaliseringen gynnar en minoritetsgrupp av kvinnor och ökar jämställdheten för dem medan den aggregerade jämställdheten minskar. Effekten av företagens deltagande i utlandshandel på medellöner för både kvinnor och män är marginell jämfört med exempelvis utbildningsnivå eller ålder, men analysen ger grund för att inkludera variabeln i fortsatta studier angående löneskillnader.

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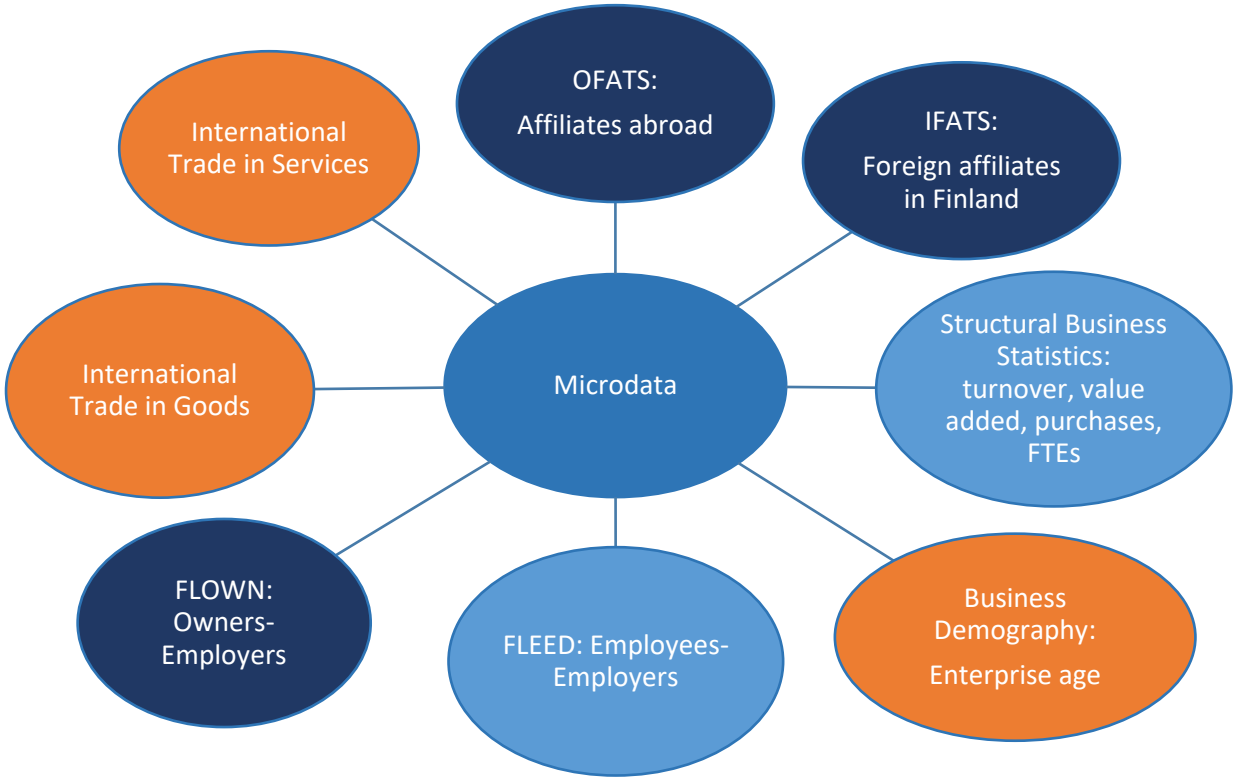
Appendix 1: Data sources and linkages



Information from light blue sources is brought directly into the microdata. Information from orange sources is used to calculate important analysis variables. Information from dark blue sources is available in the microdata but is not used in the analysis.

Appendix 2: Wage

Palkkatulo:

TRPL = palkkatulo päätoimesta
TMPT = muut palkkatulot
TEPALK = ennakonkannon alaiset palkkatulot
TMERI = merityötulo
TKUST = työnantajan maksamat kustannusten korvaukset
TPALV = lunastukset, palvelurahat yms. ennakonkannon alaiset tulot
TPJATA = hankintatyön arvo metsätaloudessa hankintatyön arvo yhtymästä
TYHTHAV = hankintatyön arvo yhtymästä
TPTURVA=palkkaturva
TELPS = työkorvaus
TELPS3 = urheilijan palkka
TELPS7 = kunnallisen perhepäivähoitajan palkka
TLUE2 = luontaisedut merityötulosta
TLUE3 = luontaisedut merityötulosta
TUTMP2 = ulkomaisen työnantajan maksama palkka (ei Suomessa vakuutettu)
TUTMP3= ulkomaisen työnantajan maksama palkka (Suomessa vakuutettu)
TOSINKTK= työpanokseen perustuva osinko (työkorvaustA) 2010

Appendix 3: Variable robustness

Table 6 OLS estimates for the effect of trade participation on average wages by gender – Exporter requirement 20 000 euros.

	(1) Female Exporter, 20k	(2) Male Exporter, 20k	(3) Female Exporter, 20k	(4) Male Exporter, 20k
Exporter, 20k	0.304***	0.318***	0.0084*	-0.0054*
	(0.004)	(0.003)	(0.005)	(0.003)
Low-skill female employees, %			0.00019*	
			(0.000)	
High-skill female employees, %			0.00126***	
			(0.000)	
Female employees aged 16-24, %			-0.00247***	
			(0.000)	
Female employees aged 40-65, %			0.00131***	
			(8.45e-05)	
Low-skill male employees, %				-0.00033***
				(6.67e-05)
High-skill male employees, %				0.00112***
				(0.000)
Male employees aged 16-24, %				-0.00213***
				(6.51e-05)
Male employees aged 40-65, %				0.000358***
				(4.91e-05)
Small enterprise			0.0587***	0.0598***
			(0.005)	(0.003)
Medium enterprise			0.0734***	0.0599***
			(0.007)	(0.005)
Large enterprise			0.060***	0.0336***
			(0.009)	(0.010)
Old enterprise			0.0106**	0.0180***
			(0.004)	(0.003)
Year fixed effects				
Year 2009			0.002	-0.011***
Year 2010			0.023***	0.014***
Year 2011			0.054***	0.052***
Year 2012			0.085***	0.085***
Year 2013			0.102***	0.092***
Year 2014			0.117***	0.111***
Year 2015			0.130***	0.128***
Year 2016			0.152***	0.153***
Constant	10.09***	10.30***	9.847***	10.17***
Enterprise fixed effects	No	No	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Number of observations	379,408	584,967	128,032	273,456
Adjusted R-squared	0.018	0.016	0.099	0.097

Table 7 OLS estimates for the effect of trade participation on average wages by gender - Exporter requirement 1 euro.

	(1) Female Exporter, 1€	(2) Male Exporter, 1€	(3) Female Exporter, 1€	(4) Male Exporter, 1€
Exporter, 1€	0.309***	0.325***	0.0054	0.0032
	(0.003)	(0.002)	(0.003)	(0.002)
Low-skill female employees, %			0.00019*	
			(0.000)	
High-skill female employees, %			0.00126***	
			(0.000)	
Female employees aged 16-24, %			-0.00247***	
			(0.000)	
Female employees aged 40-65, %			0.00131***	
			(8.45e-05)	
Low-skill male employees, %				-0.000333***
				(6.67e-05)
High-skill male employees, %				0.00112***
				(0.000101)
Male employees aged 16-24, %				-0.00213***
				(6.51e-05)
Male employees aged 40-65, %				0.000358***
				(4.91e-05)
Small enterprise			0.0586***	0.0597***
			(0.005)	(0.003)
Medium enterprise			0.0733***	0.0594***
			(0.007)	(0.005)
Large enterprise			0.0598***	0.0328***
			(0.010)	(0.010)
Old enterprise			0.0105**	0.0179***
			(0.004)	(0.003)
Year fixed effects				
Year 2009			0.00185	-0.0106***
Year 2010			0.0233***	0.0143***
Year 2011			0.0541***	0.0516***
Year 2012			0.0845***	0.0849***
Year 2013			0.102***	0.0917***
Year 2014			0.117***	0.111***
Year 2015			0.130***	0.128***
Year 2016			0.152***	0.153***
Constant	10.06***	10.28***	9.847***	10.17***
Enterprise fixed effects	No	No	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Number of observations	379,408	584,967	128,032	273,456
Adjusted R-squared	0.038	0.036	0.099	0.097

Table 8 OLS estimates for the effect of trade participation on average wages by gender - Exporter requirement 5 000 euros of goods.

	(1) Female Exporter, 5k goods	(2) Male Exporter, 5k goods	(3) Female Exporter, 5k goods	(4) Male Exporter, 5k goods
Exporter, 5k goods	0.262***	0.269***	0.0068	-0.0041
	(0.004)	(0.003)	(0.006)	(0.004)
Low-skill female employees, %			0.00019*	
			(0.000)	
High-skill female employees, %			0.00126***	
			(0.000)	
Female employees aged 16-24, %			-0.00247***	
			(0.000)	
Female employees aged 40-65, %			0.00131***	
			(8.45e-05)	
Low-skill male employees, %				-0.00033***
				(6.67e-05)
High-skill male employees, %				0.00112***
				(0.000)
Male employees aged 16-24, %				-0.00213***
				(6.51e-05)
Male employees aged 40-65, %				0.000358***
				(4.91e-05)
Small enterprise			0.0587***	0.0598***
			(0.005)	(0.003)
Medium enterprise			0.0734***	0.0598***
			(0.007)	(0.005)
Large enterprise			0.0600***	0.0335***
			(0.009)	(0.010)
Old enterprise			0.0105**	0.0180***
			(0.004)	(0.003)
Year fixed effects				
Year 2009			0.002	-0.011***
Year 2010			0.023***	0.014***
Year 2011			0.054***	0.052***
Year 2012			0.085***	0.085***
Year 2013			0.103***	0.092***
Year 2014			0.117***	0.111***
Year 2015			0.130***	0.128***
Year 2016			0.152***	0.153***
Constant	10.09***	10.30***	9.847***	10.17***
Enterprise fixed effects	No	No	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Number of observations	379,408	584,967	128,032	273,456
Adjusted R-squared	0.012	0.010	0.099	0.097

Table 9 OLS estimates for the effect of trade participation on average wages by gender, 2008-2012 and 2013-2016.

	(1) Female 2008-2012	(2) Female 2013-2016	(3) Male 2008-2012	(4) Male 2013-2016	(5) Female 2008-2012	(6) Female 2013-2016	(7) Male 2008-2012	(8) Male 2013-2016
Exporter	0.276***	0.296***	0.299***	0.323***	0.00239	0.0211***	-0.00350	0.00354
	(0.004)	(0.004)	(0.003)	(0.003)	(0.006)	(0.008)	(0.004)	(0.004)
Low-skill female employees, %					0.000293**	0.000507***		
					(0.000)	(0.000)		
High-skill female employees, %					0.00115***	0.00142***		
					(0.000)	(0.000)		
Female employees aged 16-24, %					-0.00238***	-0.00280***		
					(0.000)	(0.000)		
Female employees aged 40-65, %					0.00125***	0.00117***		
					(0.000)	(0.000)		
Low-skill male employees, %							-0.000291***	-0.000155
							(9.17e-05)	(0.000)
High-skill male employees, %							0.00124***	0.00109***
							(0.000137)	(0.000)
Male employees aged 16-24, %							-0.00202***	-0.00217***
							(8.72e-05)	(0.000)
Male employees aged 40-65, %							0.000190***	0.000441***
							(6.89e-05)	(7.99e-05)
Small enterprise					0.0505***	0.0533***	0.0480***	0.0466***
					(0.006)	(0.00811)	(0.00346)	(0.004)
Medium enterprise					0.0643***	0.0667***	0.0488***	0.0549***
					(0.008)	(0.0106)	(0.00586)	(0.007)
Large enterprise					0.0625***	0.0518***	0.0395***	0.0346***
					(0.012)	(0.0144)	(0.0142)	(0.011)
Old enterprise					0.0110*	0.00475	0.00828**	0.0176***
					(0.006)	(0.00726)	(0.00382)	(0.004)
Year fixed effects								
Year 2009					0.00241		-0.00960***	
Year 2010					0.0237***		0.0165***	
Year 2011					0.0556***		0.0553***	
Year 2012					0.0878***		0.0921***	
Year 2014						0.0123***		0.0153***
Year 2015						0.0215***		0.0304***
Year 2016						0.0425***		0.0542***
Constant	10.03***	10.13***	10.24***	10.34***	9.844***	9.962***	10.18***	10.26***
Enterprise fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Number of observations	211,672	167,736	321,294	263,673	76,797	51,235	156,869	116,587
Adjusted R-squared	0.023	0.031	0.023	0.034	0.073	0.060	0.068	0.043

Table 10 OLS estimates for the effect of trade participation on average wages by gender, SMEs and large enterprises.

	(1) Female SME	(2) Female Large	(3) Male SME	(4) Male Large	(5) Female SME	(6) Female Large	(7) Male SME	(8) Male Large
Exporter	0.286***	0.208***	0.312***	0.192***	0.0117**	-0.00841	-0.00176	-0.0100
	(0.003)	(0.008)	(0.002)	(0.008)	(0.005)	(0.006)	(0.003)	(0.006)
Low-skill female employees, %					0.000110	-0.00316**		
					(0.000)	(0.002)		
High-skill female employees, %					0.00116***	0.00471***		
					(0.000)	(0.001)		
Female employees aged 16-24, %					-0.00246***	-0.00284***		
					(0.000)	(0.001)		
Female employees aged 40-65, %					0.00129***	0.00267***		
					(8.50e-05)	(0.000)		
Low-skill male employees, %							-0.000411***	0.000789
							(6.68e-05)	(0.002)
High-skill male employees, %							0.00104***	0.00615***
							(0.000)	(0.001)
Male employees aged 16-24, %							-0.00212***	-0.00541***
							(6.53e-05)	(0.001)
Male employees aged 40-65, %							0.000342***	-0.000237
							(4.93e-05)	(0.001)
Old enterprise					0.0137***	-8.92e-05	0.0207***	0.00341
					(0.005)	(0.008)	(0.003)	(0.006)
Year fixed effects								
Year 2009					0.00201	-0.00945**	-0.0109***	-0.0135***
Year 2010					0.0225***	0.0154***	0.0138***	0.0177***
Year 2011					0.0533***	0.0533***	0.0519***	0.0590***
Year 2012					0.0832***	0.0817***	0.0853***	0.0818***
Year 2013					0.101***	0.0971***	0.0926***	0.0939***
Year 2014					0.116***	0.107***	0.112***	0.100***
Year 2015					0.129***	0.120***	0.130***	0.113***
Year 2016					0.151***	0.130***	0.156***	0.127***
Constant	10.07***	10.34***	10.28***	10.60***	9.867***	10.06***	10.19***	10.43***
Enterprise fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Number of observations	374,541	4,867	580,102	4,865	123,324	4,708	268,701	4,755
Adjusted R-squared	0.025	0.125	0.027	0.102	0.092	0.659	0.092	0.581

Table 11 OLS estimates for the effect of trade participation on average wages by gender, domestically and internationally owned enterprises.

	(1) Female Domestic	(2) Female International	(3) Male Domestic	(4) Male International	(5) Female Domestic	(6) Female International	(7) Male Domestic	(8) Male International
Exporter	0.107***	0.0555***	0.0980***	0.0139**	0.00340	-0.00840	-0.00251	-0.00423
	(0.004)	(0.006)	(0.004)	(0.006)	(0.009)	(0.006)	(0.004)	(0.005)
Low-skill female employees, %					-0.000410	-1.97e-05		
					(0.000)	(0.001)		
High-skill female employees, %					0.00280***	0.00234***		
					(0.000)	(0.001)		
Female employees aged 16-24, %					-0.00209***	-0.00313***		
					(0.000)	(0.001)		
Female employees aged 40-65, %					0.00213***	0.00221***		
					(0.000)	(0.000)		
Low-skill male employees, %							-0.000363	0.000594
							(0.000)	(0.001)
High-skill male employees, %							0.00329***	0.00273***
							(0.000)	(0.000)
Male employees aged 16-24, %							-0.00338***	-0.00415***
							(0.000)	(0.000)
Male employees aged 40-65, %							0.00125***	0.00110***
							(0.000)	(0.000)
Small enterprise					0.0257*	0.00807	0.0211**	0.0112
					(0.015)	(0.030)	(0.010)	(0.018)
Medium enterprise					0.0244	-0.00570	0.0168	-0.00743
					(0.017)	(0.031)	(0.012)	(0.021)
Large enterprise					0.00753	-0.00772	-0.0170	-0.0209
					(0.018)	(0.032)	(0.015)	(0.029)
Old enterprise					0.00327	-0.0104	0.00897*	0.00966
					(0.007)	(0.013)	(0.005)	(0.009)
Year fixed effects								
Year 2009					-0.00742**	-0.00187	-0.0109***	-0.00385
Year 2010					0.0245***	0.0276***	0.0130***	0.0235***
Year 2011					0.0649***	0.0669***	0.0555***	0.0526***
Year 2012					0.0901***	0.0923***	0.0806***	0.0801***
Year 2013					0.112***	0.116***	0.0860***	0.0899***
Year 2014					0.124***	0.138***	0.0980***	0.101***
Year 2015					0.130***	0.150***	0.105***	0.116***
Year 2016					0.148***	0.171***	0.124***	0.125***
Constant	10.35***	10.56***	10.61***	10.92***	10.02***	10.19***	10.36***	10.58***
Enterprise fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Number of observations	42,393	17,474	48,127	19,738	19,399	7,839	28,554	11,082
Adjusted R-squared	0.014	0.005	0.010	0.000	0.258	0.347	0.253	0.285

Appendix 5: Relative average wage

Table 12 OLS estimates for the effect of globalisation on relative average wage by gender and the effect of an economic crisis on relative wage, Exporter, 20k.

	(1) Female	(2) Male	(3) Relative average wage
Exporter, 20k	0.0360***	0.0174***	0.00165***
	(0.00426)	(0.00332)	(0.000472)
Crisis	-0.0738***	-0.0809***	-0.000604***
	(0.00157)	(0.00117)	(0.000220)
Exporter, 20k#Crisis	-0.0462***	-0.0137***	-0.00222***
	(0.00500)	(0.00397)	(0.000566)
Constant	10.11***	10.32***	0.980***
Enterprise fixed effects	Yes	Yes	Yes
Number of observations	379,407	584,965	300,966
Adjusted R-squared	0.009	0.011	0.000

Table 13 OLS estimates for the effect of globalisation on relative average wage by gender and the effect of an economic crisis on relative wage, Exporter, 1€.

	(1) Female	(2) Male	(3) Relative average wage
Exporter, 1€	0.0345***	0.0223***	0.00105***
	(0.00292)	(0.00215)	(0.000324)
Crisis	-0.0719***	-0.0803***	-0.000538**
	(0.00166)	(0.00123)	(0.000236)
Exporter, 1€#Crisis	-0.0330***	-0.0105***	-0.00137***
	(0.00373)	(0.00296)	(0.000456)
Constant	10.11***	10.32***	0.980***
Enterprise fixed effects	Yes	Yes	Yes
Number of observations	379,407	584,965	300,966
Adjusted R-squared	0.009	0.011	0.000

Table 14 OLS estimates for the effect of globalisation on relative average wage by gender and the effect of an economic crisis on relative wage, Exporter, 5k goods.

	(1) Female	(2) Male	(3) Relative average wage
Exporter, 5k goods	0.00898*	-0.00188	0.000777
	(0.00525)	(0.00400)	(0.000591)
Crisis	-0.0743***	-0.0812***	-0.000628***
	(0.00157)	(0.00117)	(0.000220)
Exporter, 5k goods#Crisis	-0.0420***	-0.0102**	-0.00204***
	(0.00503)	(0.00402)	(0.000567)
Constant	10.11***	10.32***	0.980***
Enterprise fixed effects	Yes	Yes	Yes
Number of observations	379,407	584,965	300,966
Adjusted R-squared	0.009	0.011	0.000

Appendix 6: Continuous Exporter-variable[54]

Table 15 OLS estimates for the effect of trade participation on average wages by gender, continuous Exporter-variable (0-100).

	(1) Female	(2) Male	(3) Female	(4) Male	(5) Female	(6) Male	(7) Female	(8) Male
Export intensity	0.0128***	0.0133***	0.00101***	0.0006***	0.0008**	0.00036	2.91e-05	-0.00034
	(0.0003)	(0.0002)	(0.0004)	(0.0002)	(0.0004)	(0.0002)	(0.0003)	(0.0002)
Export intensity squared	-9.72e-05***	-0.0001***	-1.65e-06	-1.38e-06	-2.17e-07	-7.84e-08	2.92e-06	3.14e-06
	(3.06e-06)	(2.76e-06)	(3.81e-06)	(2.48e-06)	(3.80e-06)	(2.45e-06)	(3.42e-06)	(2.29e-06)
Low-skill female employees, %			-0.0003***		-0.0001		0.0002*	
			(0.0001)		(0.0001)		(0.0001)	
High-skill female employees, %			0.0015***		0.0015***		0.0013***	
			(0.0001)		(0.0001)		(0.0001)	
Female employees aged 16-24, %			-0.0027***		-0.0026***		-0.0025***	
			(0.0001)		(0.0001)		(0.0001)	
Female employees aged 40-65, %			0.0015***		0.0014***		0.0013***	
			(8.46e-05)		(8.46e-05)		(8.45e-05)	
Low-skill male employees, %				-0.0009***		-0.0007***		-0.0003***
				(6.79e-05)		(6.73e-05)		(6.67e-05)
High-skill male employees, %				0.0011***		0.0011***		0.0011***
				(0.0001)		(0.0001)		(0.0001)
Male employees aged 16-24, %				-0.0024***		-0.0024***		-0.0021***
				(6.62e-05)		(6.57e-05)		(6.51e-05)
Male employees aged 40-65, %				0.00071***		0.00063***		0.00036***
				(5.04e-05)		(5.00e-05)		(4.91e-05)
Small enterprise					0.064***	0.070***	0.059***	0.060***
					(0.005)	(0.003)	(0.005)	(0.003)
Medium enterprise					0.089***	0.082***	0.074***	0.060***
					(0.007)	(0.005)	(0.007)	(0.005)
Large enterprise					0.071***	0.050***	0.060***	0.034***
					(0.0105)	(0.010)	(0.009)	(0.010)
Old enterprise					0.077***	0.088***	0.011**	0.018***
					(0.004)	(0.003)	(0.004)	(0.003)
Year fixed effects								
Year 2009							0.002	-0.011***
Year 2010							0.023***	0.014***
Year 2011							0.054***	0.052***
Year 2012							0.085***	0.085***
Year 2013							0.102***	0.092***
Year 2014							0.117***	0.111***
Year 2015							0.130***	0.128***
Year 2016							0.152***	0.153***
Constant	10.09***	10.30***	9.96***	10.28***	9.86***	10.18***	9.85***	10.17***
Enterprise fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No	No	Yes	Yes
Number of observations	379,408	584,967	128,032	273,456	128,032	273,456	128,032	273,456
Adjusted R-squared	0.017	0.015	0.046	0.029	0.056	0.044	0.099	0.097

[54] The variable *Export intensity* is calculated as (turnover/value of exports)*100 and indicates the share of production that an enterprise exports as goods and services. The lowest possible value is 0 and the highest possible value is 100. *Export intensity squared* is the squared value of the *Export intensity*-variable.