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Is there a Gap within the Gap?

A Municipal Analysis of the Gender Earnings Gap in Sweden

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Abstract: In the past century, Sweden has seen vast developments in narrowing the gender earnings gap between men and women. Nevertheless the gap still remains, and has revealed patterns of stagnation in the recent decade. In the presence of a gender earnings gap there is an unequal distribution of economic power between men and women, which may lead to an inefficient resource allocation. Today there is a lack of within-country studies tackling the gender earnings gap. Policies in Sweden today target the gender earnings gap on a national level although there are notable within-country differences to be found. An urban-rural comparison suggests that the gender earnings gap is generally larger in urban municipalities to rural municipalities; hence generating the question *is there a gap within the gender earnings gap in Sweden?*

The thesis examines variables significantly relating to the gender earnings gap, taking into consideration that the gap is not uniform across Sweden. By examining the differing mechanisms of average earnings, human capital, gender-segregation and labour market absence between urban and rural municipalities in Sweden, the aim is to further contribute to the field of gender economics. Exploring the determinants on an urban-rural level is necessary to enable a more efficient policy-making process and confront the current stagnation. With macro-level data gathered from *Statistics Sweden* and the *Swedish Social Insurance Agency* for the years of 2003 to 2013, a series of Pooled Ordinary Least Squared regressions and Fixed Effects regressions are performed. Interaction variables are included in order to examine the difference in explanatory power of the gender earnings gap mechanisms in urban compared to rural municipalities. Results confirm a gender earnings gap in all 290 municipalities. Women's to men's earnings vary between 56 percent in urban municipalities to 87 percent in rural municipalities. The variables with the strongest impact on the gap are gender-segregation, labour market time and average earnings. Gender-segregation affects the gap more in rural municipalities and average earnings and human capital affect the gap most in urban municipalities, implying it is of relevance to go beyond country-borders in creating policies to narrow the gender earnings gap in Sweden.

Key words: gender earnings gap, regional economics, gender economics, Swedish labour market, and urban and rural differences.

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1. Introduction

*“In general men and women are not and never
have been paid the same wage.”*
(Stanfors et al., 2013; 48)

1.1 Problem formulation

When studying labour economics today, one of the most pronounced facts is that women earn less than men (Hirsch et al., 2009). Although the past decades have seen vast developments in the attempts to narrow the gender earnings gap existing between men and women, the gap still remains, although to a limited extent. Referring to a recent by the European Commission (2014), the earnings differential between men and women for the EU-27 countries in the year of 2013 was 16.2 percent¹. Although Sweden does score more favourably compared to the average, with an earnings differential of approximately 15.4 percent, the disparities are not very different in a social and economic context (European Commission, 2014; Plantenga & Remery, 2006). According to a report by the United Nations (2014), Sweden is among the highest ranked country in the world when it comes to gender equality. This however refers to health, labour market participation, and empowerment measures. When instead looking to the gender earnings gap compared to the other members of the European Union, Sweden does not score much under the average gender earnings gap percentage, indicating continued discrimination in the labour market (European Commission, 2014).

For almost a century, Sweden has succeeded in closing the gap to a remarkable extent, seeing steady convergence of the overall earnings between men and women. Scandinavian countries were among the first countries to gain equal pay by law, although not in practise (Datta Gupta et al., 2006). While many countries in the European Union still profoundly expect women to take care of the household, Sweden has largely moved to a two-earner model (Gärtner, 2014). Furthermore, according to the most recent report from the OECD (2016) on education patterns, one of the most remarkable developments is the reversal of education in the OECD countries over the

¹”The gender pay gap is the difference between men’s and women’s pay, based on the average difference in gross hourly earnings of all employees.” (European Commission, 2014; 2).

past decades. Looking to higher education, women in Sweden held 69 percent of the bachelor's degrees in 2013. Although the convergence both in the labour market participation and in education for women, the pattern of convergence of the gender earnings gap that has been progressing for a century, has evolved to a period of stagnation. According to Datta Gupta et al. (2006), both Swedish and Danish women have undergone a stagnation process in the gender earnings gap, which most likely is due to their absence from the labour market due to generous child care schemes and family policies. Allowing paid leave from the labour market leads to an indirect interference of the human capital attainment for women. Other reasons for this stagnation is the existence of a glass ceiling, where women tend to converge with men to a greater extent at the low and middle levels of the earnings distribution, but where the gender earnings gap is stagnating or even increasing at the top of the earnings distribution. Another reason may be the stagnation of improvement in the gender-segregated labour markets (Albrecht et al., 2001).

This thesis examines mechanisms relating to the gender earnings gap, taking into consideration that the gap is not uniform across Sweden. By examining the differing mechanisms of average earnings, human capital, gender-segregation and labour market absence between urban and rural municipalities in Sweden, the aim is to further contribute to the field of gender economics. Exploring the determinants on an urban-rural level is necessary to enable a more efficient policy-making process and confront the current stagnation. With macro-level data gathered from *Statistics Sweden* and the *Swedish Social Insurance Agency* for the years of 2003 to 2013, a series of Pooled Ordinary Least Squared regressions and Fixed Effects regressions are performed. Interaction variables are included in order to examine difference in explanatory power of the gender earnings gap mechanisms in urban compared to rural municipalities. An urban-rural comparison suggests that the gender earnings gap is generally larger in urban municipalities to rural municipalities; hence generating the question *is there a gap within the gender earnings gap in Sweden?*

Reducing the gender earnings gap is an important topic both on the European political agenda as well as on the Swedish political agenda (Plantenga & Remery, 2006; European Commission, 2014; Calmfors & Richardsson, 2004). Finding solutions to the gender earnings gap is mainly in the hands of national governments, but is also of

great interest for the European Union (EU), where the equality between the genders is a fundamental right in the EU (European Commission, 2014). In an effort to eliminate the gender earnings gap in the European Union, the European Commission has launched the *Strategy for Equality between Women and Men (2010-2015)* where subjects on discrimination against women and structural inequalities including segregation in occupations, sectors, work pattern, education and training is treated and is used as a reference to policy settings. Furthermore, the strategy sets out five areas of action including the economy and labour market, equal pay, equality in senior positions, tackling gender violence and promoting equality beyond the EU (European Commission, 2006; European Commission, 2014). Similarly Sweden works after the model of the *Discrimination Act*, which regulates two types of earnings differentials between men and women, the first being the difference in pay between men and women doing the same work, and the second regulating workers of different gender performing equal work (Calmfors & Richardsson, 2006). Furthermore, the *Discrimination Act* promotes equal pay growth opportunities both for women and men (European Commission, 2014). The results of these policies are somewhat unclear, as studies continue to report consistent gender earnings gaps worldwide and even stagnating gender earnings gaps as in the case of Sweden. Nevertheless, this extensive attention underlines the centrality of the subject both internationally and nationally.

The fact that women earn less than men and the existence of a gender earnings gap is a consistent and widely observed phenomenon, and there is an extensive range of academic studies aiming to explain this occurrence on a worldwide level. The urge to explain the gender earnings gap has attracted much attention not just because the subject is interesting by definition, but also because these types of “discriminatory earnings practises could lead to an inefficient resource allocation” (Polachek & Xiang, 2014; 2). Less skilled workers should earn lower salaries and correspondingly higher skilled workers should earn higher salaries responding to a natural job selection process. However, with the existence of a gender earnings gap the natural job selection process risks being interrupted and may artificially place workers in positions for which they are ill prepared, or workers in positions in which they are overqualified for. Although the gender earnings gap has been a subject of interest for several decades, using numerous datasets, various methods of estimation and

countries of reference, scholars fail to find consistent underlying causes of the gender earnings gap, hence motivating its continued relevance of study (Polachek & Xiang, 2014). A substantial part of the gender earnings gap can be explained when controlling for determinants such as occupation, education and experience, but a share of the gap found in the EU-27 countries remains unexplained (Hirsch et al., 2009; European Commission, 2006; European Commission, 2014). The determinants connected to human capital and occupational segregation that are not controlled for may suggest discrimination against women, which is also subject to much study in the school of gender earnings gaps today, and is an issue to many political agendas in the field (Hirsch et al., 2009).

Although a share of the gender earnings gap remains unexplained, key determinants influencing the gap have been identified through various studies, including individual characteristics connected to the earnings level, working time, human capital levels and gender-segregation (Hirsch et al., 2009). One key explanation for the gap in Sweden is linked to the amount of working time that women allocate in the labour market. It has been identified that women in Sweden tend to spend fewer hours per week and fewer weeks per year in the labour market compared to men (Blau & Kahn, 2000). According to *Statistics Sweden* (2014), women work part-time to a greater extent than men, and the majority of the parental leave is utilized by women. Another explanation for the difference in working time between men and women include women's larger share of sick leave compared to men, affecting earnings and job opportunities negatively (Hansen, 2000). Referring to Budig & England (2001), an explanation to the higher share of sick leave and part-time work is their greater responsibilities and effort with children at home.

Another aspect of the gender earnings gap is looking to the human capital theory. Women in Sweden tend to have higher education than men, however this is not reflected in the earnings distribution between men and women (OECD, 2016). Hence the statistics contradict the human capital theory, theorizing that higher investment in education and training should result in higher earnings. This further motivates the importance of the subject, and two main observations can be made connected to this. The first observation is found when looking to the size of the gender earnings gap in Sweden, which fluctuates with the level of education. The earnings gap tends to

increase with higher educational levels, hence implying that higher educated women are more exposed to the gender earnings gap than are lower-educated women (Albrecht et al., 1999). Furthermore, as both sexes enter the workforce, the earnings levels are fairly similar. It is over time, experience and increasing earnings that women tend to fall behind. This phenomenon can also be referred to as the glass ceiling, highly present in Sweden according to Albrecht et al. (2001).

The second observation connected to the contradicting observations of the human capital theory is the gender-segregated labour markets, highly present in Sweden. The earnings differences between men and women can to some extent be explained by the gender-segregated labour markets, which is the division of men and women between both occupations and between sectors. The trend in Sweden is that female-dominated sectors and occupations pay lower earnings (Blau & Kahn, 2000). An important observation here is also that Sweden tends to see one of the most gender-segregated labour markets in the European Union (European Commission, 2014). Another major problem with gender-segregation is that individuals may not gain the job where they would perform the best, and hence an inefficient allocation of labour is created. In Sweden, the most gender-segregated labour markets can be found in construction for men and in social care for women, which can be seen in **Table 1**.

Table 1. The labour market sectors with the most gender-segregation for men and women. Source: Statistics Sweden

Gender segregated industries	Male share	Female share	Labour market share
Transportation and warehouse	0.80	0.20	0.04
Manufacturing of metals	0.84	0.16	0.02
Retail and repair of motor vehicles	0.87	0.13	0.02
Construction	0.92	0.08	0.07
Education	0.25	0.75	0.1
Health care	0.20	0.80	0.07
Social work	0.18	0.82	0.04
Social care	0.14	0.86	0.05

While the literature on the gender earnings gap is extensive, there is one aspect that has not yet been greatly explored. When discussing the gender earnings gap, most literature in the field focuses on performing overall national reports. Furthermore, much empirical literature today focuses on the variation of the gender earnings gap between countries. These studies are important in the assessment of the gender earnings gap as it lays the groundwork for what determinants are of most importance in empirical modelling. In a report by the European Commission (2010) it is accentuated that there is a lack of efficient national and within-country studies throughout Europe to explore the efficiency and potential links between the gender earnings gap and national policies to tackle this. According to the OECD (2009), the difference between regions within countries is often greater than the difference across countries. However, policymakers tend to focus more on developing overall international and national policies than regional policymaking. In the same way that cross-country reports on the gender earnings gap can assist to develop efficient policies to tackle this issue, within-country reports should be equally considered.

Hence, what is somewhat neglected is the importance of studying the gender earnings gap on a regional level, and the analysis of the gender earnings gap *within* a country (Hirsch et al., 2009). Although the European Commission (2014) reports a gender earnings gap in Sweden of approximately 15.4 percent, this gives a rather limited picture of the true story. Observing municipal data on the gender earnings gap in Sweden, women's earnings as a percentage of men's earnings ranges from 56 percent in urban municipalities to 87 percent in rural municipalities (*Statistics Sweden*). In the same way that there exist gender earnings differences between countries, data suggests that the gender earnings gap differs between regions and as in the case of this study, between urban and rural municipalities. A question to be considered is *whether one needs to go beyond country borders in order to deal with the gender earnings gap?* As the past decade has revealed stagnation of the gender earnings gap in Sweden, studying the determinants of municipal differences in the gender earnings gap could help to develop policies for continuing the reduction in the overall gap.

1.2 Purpose & aim

The aim of this thesis is to study the mechanisms that relate to the difference in size of the gender earnings gap between urban and rural municipalities in Sweden, taking into consideration that the gap is not uniform across Sweden. Despite a period of convergence in the gender earnings gap, and convergence in education and labour market participation for women, the gender earnings gap today is basically stagnant. Policies in Sweden target the gender earnings gap on a national level although there are notable within-country differences to be found, hence implying that it is necessary to go beyond country borders in order to understand the mechanisms of the gap. Urban-rural comparisons suggest that the gender earnings gap is generally larger in urban municipalities to rural municipalities; generating the question *is there a gap within the gender earnings gap in Sweden?*

By examining the differing mechanisms of average earnings, human capital, gender-segregation and labour market absence between urban and rural municipalities in Sweden, the purpose is to further contribute to the field of gender economics. Exploring the determinants on an urban-rural level is necessary to enable a more efficient policy-making process and confront the current stagnation. With macro-level data gathered from *Statistics Sweden* and the *Swedish Social Insurance Agency* for the years of 2003 to 2013, a series of Pooled Ordinary Least Squared regressions and Fixed Effects regressions are performed. Interaction variables are included in order to examine the difference in explanatory power of the gender earnings gap mechanisms in urban compared to rural municipalities, in other words whether there are differences on the impact of variables for urban and rural municipalities.

Sub-questions of consideration throughout the thesis are the following:

- *What mechanisms are most decisive for the gender earnings gap?*
- *Do the mechanisms show different explanatory power across urban and rural municipalities?*
- *Do we need to go beyond country borders in order to develop policies for continuing reduction in the overall gender earnings gap in Sweden?*

1.3 Disposition

The remainder of the paper is organized as follows. *Chapter 2* presents the theory, which has an investigative character related to analytical frameworks and theory on the gender earnings gap. The chapter further presents the previous studies and summarizes the recent literature on the subject, in order to illustrate what has been done and to highlight issues in previous work that can be improved. Here the hypotheses treated are also formed. *Chapter 3* provides the descriptive statistics of the chosen variables as well as motivating the classification of the urban-rural division. Further, in this chapter the method used for the empirical analysis is presented, including the empirical equations. *Chapter 4* contains the results and discussion of the thesis, where the major observations of the study can be found, responding to the hypotheses formed. *Chapter 5* concludes the paper, providing with the key findings, comparing them with previous research. *Chapter 6* holds the suggestions for further research.

2. Analytical framework

The purpose of the analytical framework is to describe the main ideas of the gender earnings gap, and to provide the reader with both the theory and the knowledge of previous studies made in this field. In this section, the most relevant gender earnings gap theories are presented, with a special focus on theories connected to determinants of the gender earnings gap and regional disparities within this subject. The previous studies summarize the recent literature on the subject, in order to illustrate what has been done and to highlight issues in previous work that can be improved. A section presenting the hypotheses is also included.

2.1 Theoretical framework

The gender earnings gap has more explanations and sources than can be dealt with, and they are expanding at an exponential rate, much due to the increased focus on narrowing the gap since the 1970's both internationally and nationally. Becker and Mincer primarily provide groundwork on the gender earnings gap in connection with the *human capital theory* (Mincer, 1958; Becker, 1985; Mincer & Polachek, 1974; Bielby & Bielby, 1988; Polachek, 2004). However, the theories have expanded, and today central theories to be acknowledged also concern *gender-segregated labour markets* (Doeringer & Piore, 1971; Anker, 1997; Cotter et al., 1996; Bygren & Kumlin, 2005; De la Rica et al., 2008) *labour market time* (Albrecht et al., 1999; Budig & England, 2001; Selmi, 2000; Mandel & Semynov, 2005; Datta Gupta et al. 2006; Doeringer & Piore, 1971) and theories on the *location and the gender earnings gap* (Andersson et al., 2014; Albrecht et al., 2001; Berry & Glaeser, 2005; De la Rica et al., 2008; Cotter et al., 1996; Mellander & Florida, 2014). Much theory on the gender earnings gap are based upon international data, however, the bulk of the theories are also applicable on a municipal level.

2.1.1 Human capital theory

When assessing the determinants of the gender earnings gap, the most pronounced and influential theory is the *human capital theory*. Referring to Polachek (2004), it is now certain that the human capital model is important in explaining the trends in the gender earnings gap. According to the human capital theory the amount of incentive to invest in training and education should be directly proportional to the amount of time one is expected to spend in the labour market over one's lifetime. Hence, as

women are successively spending increased time in the labour market, the human capital investment of women should also intensify. Also, rising human capital for women to men should theoretically lead to a narrowing of the gender earnings gap (Polachek, 2004). Looking to the original theory of human capital, Mincer (1958) and Becker (1985) are the frontrunners and the first to pronounce that productivity is determined by the human capital of the worker and where earnings are equivalent to a worker's return on human capital.

2.1.1.1 The Mincer earnings function

Mincer (1958) discusses the nature and causes of equality in personal incomes. From the study, the initial *Mincer earnings function* is developed, which is one of the earlier and simpler model equations in the literature on earnings differences. The model assumes that all individuals have identical abilities and equal opportunities to enter any occupation, and as occupations differ, the amount of training also differs. The model further recognises that training takes time, and each year postpones the earnings for another year, reducing the span of earning life (Mincer, 1958). Hence, individuals with different amounts of training need to be compensated for the costs of training. The model hence theorizes that the difference in overall earnings between individuals depends upon the difference in schooling and the difference in experience between individuals, and where all individuals have the same opportunity to and abilities to enter any occupation. The initial Mincer model can be seen in equation 1 where y is earnings, y_0 is the earnings of an individual with no education or experience, S is the schooling of the individual and X is the number of years of potential labour market experience (Mincer, 1958).

$$\ln y = \ln y_0 + rS + B_1X + B_2X^2 \quad (1)$$

However, the early theory does not differentiate between men and women on the labour market. Mincer & Polachek's (1974) develops the theory taking into consideration both men and women, where it is found that it is during the early years of the career that most earnings growth occurs, which is unfavourable for women due to labour market absence. The Mincerian earnings function is seen in equation 2, where experience is specified in equation 2. The main finding in the study pronounces that women tend to spend less time in the labour market compared to men after

marriage, hence affecting the human capital level negatively compared to men, and intrinsically also earnings. Thus, this function lays the groundwork for understanding human capital as a contributing mechanism to the gender earnings gap. Marriage is in this theory equated by the acquirement of children and greater responsibilities in the household and childcare. As women tend to take on these responsibilities, discontinuity of work is created, generating a human capital gap between men and women (Mincer & Polachek, 1974).

$$\ln w = b_0 + b_1SCH + b_2EXP + b_3EXP^3 + \varepsilon \quad (2)$$

$$EXP = age - schooling - 6 \quad (3)$$

2.1.1.2 Becker's work effort hypothesis

In a study by Becker (1985) expands the theories proposed by Mincer (1958) and Mincer & Polachek (1974) in the formation of the *work effort hypothesis*. It pronounces the specialization of activities that occur between men and women, and scholars find this a key theory to understanding the gender earnings gap. It is argued that returns from specialization of human capital are the mainspring for creating a division between the genders, as it explains the division of the allocation of time and investment in human capital (Becker, 1985). The key mechanism of the work effort hypothesis pronounces that the incentive to invest in a specific activity is positively related to the time spent at that activity and that investment in specialized human capital create increasing returns. Assuming a household of two identical individuals, investing their time in different activities and specializing in these should maximize their utility, creating incentives for the division of labour (Becker, 1985). The work effort hypothesis can explain why women are more absent from the labour market and hence tend to loose human capital attainment compared to men. Historically, this specialization of trade created gains for households, as childcare was more efficiently produced and consumed within household. It also provides explanation as to why women are expected to do so today, namely due to the gains of specialization.

The specialization mechanism for women in the household creates consequences for women in the labour market. The main implications are connected to earnings and occupational differences between the genders (Becker, 1985; Bielby & Bielby, 1988). The *work effort hypothesis* focuses on the supply-side and acknowledges that the

reason for the sex disparities between the genders is identified in the amount of *effort* that women devote to the home compared to men, where effort is referred to as mental and physical energy put into work (Becker, 1985). Hence, women devote less effort into market work and acquire less human capital per hour of work experience. Due to a generally lower level of earnings for women, they supply less hours of market work, reducing the human capital and earnings level further. Another consequence of this specialization is that women tend to sort into occupations with less hours and effort, which are usually found in the secondary sector, with lower earnings levels (Becker, 1985; Doeringer & Piore, 1971). The small disadvantages that women are faced with connected to specialization, result in earnings disparities between men and women (Bielby & Bielby, 1988).

2.1.1.3 The glass ceiling

Referring to human capital, experience in the labour market is a major component. However, education is also an investment in human capital to be considered. Women with higher education will tend to participate in the labour market to a greater extent than lower educated women, due to higher investment in human capital (De la Rica et al., 2008). Reasoning with the *Mincer earnings equation*, higher educated women should gain higher earnings. However, looking to theory by De la Rica et al. (2008) the gender earnings gap increases with higher levels of education and thus with higher earnings. In Sweden, one can observe higher levels of the gender earnings gap at the top of the earnings distribution compared to the lower levels of the earnings distribution (Albrecht et al., 2001). Although the gender earnings gap level has decreased since the 1970's, looking to the gender earnings gap at the top of the earnings distribution, this has increased, which is referred to as a glass ceiling. When looking at the beginning of the career, the earnings gap is fairly small. However, as experience and earnings increase, the women fall behind and the gender earnings gap grows larger. According to Albrecht et al. (2001) an explanation to the existence of a glass ceiling for women at the top of the earnings distribution in Sweden is most likely the career interruptions connected to motherhood as proposed in the *work effort hypothesis*. With well-employed family-policies mostly utilized by women, this leads to a loss of experience for women and lower earnings. Another explanation is that women tend to select into more family-friendly and less demanding jobs, where the outcome would be that women do relatively well to men at the bottom and middle of

the earnings distribution, but not as well at the top of the distribution (Albrecht et al., 2001).

2.1.2 Gender-segregated labour market theory

As theorized in the *work effort hypothesis* by Becker (1985), women tend to select into occupations with less hours and effort, responding to the specialization in the household. Gender-segregated labour markets are pointed out as one of the major causes of the gender earnings gap. The theoretical basis of gender-segregated labour markets can be found when looking to works by Anker (1997), Doeringer & Piore (1971), Cotter et al. (1996), De la Rica et al. (2008), and Bygren & Kumlin (2005).

2.1.2.1 Dual labour market theory

Referring to a study by Doeringer & Piore (1971), the theory of the *dual labour market theory* is formed. Women and men are represented in different sectors and industries, where the labour market is divided into the primary and the secondary sector (Doeringer & Piore, 1971). The two sectors are perceived as independently functioning of each other, with no crossover possibilities. The primary sector has market power, which largely isolates them from competition, whilst the competition in the secondary sector is large (Anker, 1997). The secondary sector represents the female-dominated sector, where occupations are low skilled and require little work experience. This sector is characterised as being unattractive, giving little pay and as having high turnover rates. The primary sector is mainly dominated by males, and represent occupations that are high skilled, require more work experience, giving higher pay (Doeringer & Piore, 1971).

Generally women are overcrowded into a small number of occupations, whilst men benefit from reduced competition and a greater range of occupations, generally leading to higher earnings. A primary reason for the overrepresentation of men in the primary work sector is their continuous labour market experience to women. Due to the primary sector being able to generate higher earnings, they can choose from individuals with the greatest human capital, which in most cases are perceived to being men (Anker, 1997). A higher gender-segregation within industries and sectors where women are over-represented in female-dominated sectors and men are over-represented in male-dominated labour markets will result in an increased gender earnings gap. Furthermore, in an occupational structure in a country where a large

share of the working population is working in sectors that are more gender-segregated will result in an increased gender earnings gap (Cotter et al., 1996).

There are several explanations for why the labour markets are highly segregated. On the labour-supply side the human capital theory stress that women tend to bring lower levels of human capital to the labour market, referring to less education and less relevant fields of study. According to Bygren & Kumlin (2005), the educational choices between men and women are different, where women tend to choose less education, and educational forms which do not lead to primary-sector occupations. Referring to De la Rica et al. (2008), women tend to choose occupations where the cost of career interruptions is lower. Furthermore, the reasoning follows that women bring less labour market experience than do men, due to marriage and childcare responsibilities (Anker, 1997). On the labour demand side, it is rather the preference from the employee to hire a man against a woman, which creates a gender-segregated labour market (Anker, 1997). In occupations requiring high levels of education and labour market experience, men are more likely to being offered these positions to women due to an expectation of career interruptions for women. Another explanation given by Bygren & Kumlin (2005) is that sectors dominated by one of the genders tend to continue to hire individuals of the same gender to a greater extent.

In Sweden, women sort into secondary sectors to a greater extent than the primary sectors, referring principally to the public sector. Public sector jobs tend to be lower paid in Sweden, and hence the earnings of women tend to be lower (Bygren & Kumlin, 2005). The major issue when looking to the gender-segregated labour market in Sweden is that one can see a convergence into the male-dominated sectors but not into the female-dominated sectors. Whilst women have started to sort into the primary and male-dominated sector, the trend is not reversed. There is little to no convergence of men into the female-dominated occupations and sectors (Bygren & Kumlin, 2005).

2.1.3 Working time theory

Revisiting the *Mincer earnings function* and Becker's *work effort hypothesis*, it is not until the accumulation of time and experience (or lack of experience) that human capital (and earnings) disparities between the genders tend to arise (Mincer, 1958; Becker, 1985; Mincer & Polachek, 1974). According to Blau & Kahn (2000), women

tend to work fewer hours per week and fewer weeks per year than men. Hence, the amount of human capital is affected largely by working time. Two aspects, namely parental leave and sick leave, can practically explain this. Absences from the labour market reduce women's earnings both directly and indirectly by reducing women work experience and employment stability (Mandel & Semynov, 2005).

Disparities in *parental leave* between men and women are common and seen to be a major contribution to the gender earnings gap (Budig & England, 2001). Women tend to take more time off from work than men due to specialization in the household (Becker 1985). In Sweden, women take the most parental leave, although it has been balanced more between the men and women during the past decade. In 2013, women took 75 percent of the compensation rate for being on parental leave, whilst men take the remaining 25 percent (*Statistics Sweden*). The consequence of parental leave is that women spend less time doing market work and thus lose human capital through loss of work experience. The loss of job experience hence leads to an earnings disadvantage. Furthermore, parental leave leads to statistical discrimination for women in the labour market as there exists an employer expectation that women will be absent. This applies both to women with and without children which, obstructing the competition for higher status jobs and earnings (Budig & England, 2001). In countries where family policies are structured to facilitate women's employment, the gender earnings gap tends to be somewhat smaller (Mandel & Semynov, 2005).

Another aspect affecting the working time of women is the higher presence of *sick leave* for women to men. According to Albrecht et al. (1999) women are on average more absent from work than men, and one of the reasons is due to the higher share of sick leave for women compared to men. Being absent from the labour market due to illness does not only affect the income during the period while being ill, but also causes interruptions in the career and working experience, hence affecting the earnings for women in the long run (Albrecht et al., 1999). According to *Statistics Sweden*, women hold two thirds of the accounted sick leave hours in Sweden. Hence, reduced working hours affects the working time of women, which would affect the earnings of women negatively, further affecting the gender earnings gap negatively.

2.1.4 Location theory

Although not as pronounced in the literature on the gender earnings gap, the location is of importance when evaluating the earnings differences between the genders. The gender earnings gap varies greatly between urban and rural municipalities across Sweden. By taking into consideration the location, this allows a “parameter estimate for each aggregation level, making it possible to assess the importance of each component” on both an urban and a rural spatial sphere (Andersson et al., 2014; 730). Important observations to take into account when evaluating the gender earnings gap on an urban-rural level are the different levels of earnings, human capital and the varying presence gender-segregated labour markets that can be found. Regions develop their own profiles with unique properties and economies of scale, which is applicable when comparing urban and rural municipalities (Cheshire & Shepard, 1995).

According to research, individuals in urban areas gain higher earnings than the counterpart in rural areas, which is the case for both men and women (Andersson et al., 2014). There is a so-called urban earnings premium (UWP) for individuals located in urban areas. Referring to a study by Mellander & Florida (2014), the reason for the existence of the UWP and a location size earnings gap is the higher shares of human capital that the urban areas attract. Higher earnings-social analytical skills are succumbed to urban areas due to these regions having distinct advantages, whilst lower earnings-social analytical skills are succumbed to rural regions. Expanding on this reasoning, Berry & Glaeser (2005) pronounce that human capital levels have become more concentrated over the last century, where urban regions with initial high levels of human capital increases their human capital levels more over time than other locations in an initial lower position (Berry & Glaeser, 2005; Mellander & Florida, 2014). Hence, firms in urban municipalities have a higher concentration of high-skilled people and are more productive. Since productivity is closely connected to earnings, and due to the higher level of productivity and concentration of high-skilled people in urban regions, earnings are higher in these areas (Andersson et al., 2014). Earnings vary with human capital, and thus one would expect to see a lower earnings level in rural to urban regions as urban municipalities attract higher human capital levels.

Gender segregation between urban and rural municipalities also differs, where labour markets are generally more gender-segregated in rural regions than in urban regions. For both the non-educated and educated population, there is a more extreme gender composition in the sectors in less populated areas (Smith & Glauber, 2013; Cotter et al., 1996). The occupational structure between urban and rural regions also differ on an urban-rural sphere, where a higher share of the rural population are working in industries that are generally more gender segregated, such as manufacturing, transportation and health care (see **Table 1**). The labour markets in urban areas are generally more integrated compared to rural regions (Smith & Glauber, 2013).

2.2 Previous literature

The main focus of this study is to clarify which mechanisms that affect the gender earnings gap on an aggregate level, taking into consideration the urban-rural municipal disparities in the earnings distribution between men and women in Sweden. The literature analysing the mechanisms of the gender earnings gap is vast and highly disciplinary in nature, and can be found on both national and international levels. Furthermore, the literature covering the difference in average earnings between regions is extensive. However, the range of studies combining a regional approach with analysing the mechanisms driving the gender earnings gap is limited, although there are pronounced differences to be found.

Studies related to the gender earnings gap tend to focus on the mechanisms as to why the gender earnings gap exists in a country as a whole, assuming that the earnings gap is uniform across a country. These studies hence neglect the possibility of regional differences in the gender earnings gap, but nevertheless provide motivation for some of the mechanisms driving the gender earnings gap as pronounced in the theory. Such a study is conducted by Albrecht et al. (2001) using micro-data from 1998 in Sweden estimating pooled quantile regressions with gender dummies and separate quantile regressions by gender. The focus of the paper is to examine the earnings distribution in Sweden, and where the gender earnings gap is most pronounced. The paper succeeds in identifying several of the mechanisms that theory has marked, and also highlights the existence of a glass ceiling at the top of the earnings distribution for women.

The findings of the study advocate that there is a gender-specific mechanism in the Swedish labour market. The study shows that when gender differences in basic covariates, such as age and education are controlled for, giving women the same labour market characteristic as men, none of the gender earnings gap at the top of the earnings distribution can be explained. In fact, the gender gap increases throughout the distribution. However, when adjusting for the field of education and the industry of labour, this explains a small proportion of the gender earnings gap. Furthermore, when adding the type of education, both the gender earnings gap at the bottom of the earnings distribution and the top of the earnings distribution can be explained. Although the study does not explore a regional approach, the existence of a glass ceiling at the top of the earnings distribution due to education type, level and industry sector and occupation suggests that the earnings gap should be more pronounced in regions where this is commonly occurring.

Furthermore, there is a broad range of literature on the gender earnings gap across countries and internationally. These studies do identify a difference in explanatory power of the mechanisms driving the gender earnings gap between countries, but still assume that the gap is uniform within the countries studied. Arulampalam et al. (2006) is an expansion of the study by Albrecht et al. (2001) but rather than studying Sweden specifically, it explores the gender pay gap across the earnings distribution in for eleven countries in Europe. Arulampalam et al. (2006) uses harmonized micro-data from the European Union Household Panel and analyses the gap by sector across the earnings distribution using quantile regression techniques. The findings correspond to the study by Albrecht et al. (2001), in the way that in all countries, the gender earnings gap is seemingly higher at the top of the earnings distribution, suggesting a glass ceiling for women. What is more interesting is that the gender earnings gap differs significantly across sectors between countries. In some countries, the gender-segregation across sectors explain a substantial part of the gender earnings gap, whilst in some countries, this has little impact on the gap. This thus suggests that when comparing different countries, or spatial spheres, mechanisms have different explanatory power on the gender earnings gap.

Another cross-country comparison is conducted by Blau & Kahn (1992), which examines the impact of the changes in overall earnings levels on the gender earnings

gap between countries, with the U.S. as a reference country. The study uses micro-data across a sample of eight industrialized countries, amongst them Sweden. The study estimates the gender-specific factors against the earnings structure in each of the countries to explain the differences in the gender earnings gap. The major finding of the study is that the higher earnings inequality in the U.S. as a whole increases the gender earnings gap in the U.S. compared to the other countries examined. This would thus explain the paradoxical position of women in the U.S. compared to women in the other countries studied. When comparing women per se across the countries, in measures of skills relative to men, the U.S. scores favourably in equal earnings and equal employment opportunities. However, the U.S. nevertheless ranks unfavourably when compared to the Scandinavian countries such as Sweden. Hence, through the study, it is to a larger extent pronounced that there are inter-country differences that need to be taken into consideration in order to be able to fully understand the mechanisms of the gender earnings gap.

Although less common, there is a field of studies focusing on the gender earnings gap and regional differences. Such a study is carried out by Cotter et al. (1996), with the intention to explain the inequality of earnings between men and women comparing nonmetropolitan and metropolitan areas. The study analyses the impact of mechanisms such as occupational gender segregation, earnings ratio and female labour participation to explain the difference in the gender earnings gap between metropolitan and non-metropolitan areas in the U.S by using micro data from the CPS, PUMS and the GSS. The main findings show that occupational sex segregation is higher in non-metropolitan areas but that the labour market participation is higher in metropolitan areas. Also earnings are higher in metropolitan areas. Although all these stratifications have been declining over the last two decades, the gender earnings gap is seemingly higher in the metropolitan areas. An explanation to this is found in the higher labour market participation and the higher earnings in metropolitan areas. Although a difference can be found in the gender earnings gap level comparing metropolitan and non-metropolitan areas, Cotter et al. (1996) claim that variations in the gender stratification have been greater across time than across place in the U.S. Nevertheless, this study awakens interest in further exploring whether there is a difference in the gender earnings gap over a spatial sphere.

A recent study in the area of women's earnings is conducted by Smith & Glauber (2013) exploring whether there is a spatial earnings penalty for women. They draw micro-data from the Current Population Survey to analyze the spatial earnings gap between women in non-metropolitan and metropolitan regions in the U.S. The study does not specifically treat the gender earnings gap, but motivates a spatial focus connected to earnings by exploring mechanisms such as education, occupation and industry. Findings show that earnings of metropolitan women are higher than for non-metropolitan women, and that women in metropolitan regions have higher education. Women in metropolitan regions are overrepresented in higher-paying occupation and industries, whilst higher-educated women in non-metropolitan regions are overrepresented in lower-paying occupations. Nevertheless, most of the earnings differentials can be found for women in the higher end of the education level and the higher end of the earnings distribution. The bulk of these studies motivate the selection of explanatory mechanisms within this thesis and suggest that a spatial analytical perspective can be useful in understanding earnings differentials for women across regions. However, a combined analysis of the gender earnings gap and regional differences in the mechanisms influencing the gender earnings gap is missing from literature.

2.3 Expectations of study

From the bulk of the theoretical framework and the previous studies, one can determine that when studying the gender earnings gap, the human capital theory, the gender-segregated labour markets, work effort and location are of importance in the understanding of the difference in pay between men and women in Sweden. Furthermore, one can expect differences in the gender earnings gap between urban and rural municipalities. The expectations of the study formulate hypotheses for the empirical analysis of the study. These hypotheses are based upon the theory and previous studies.

Hypothesis 1: *The gender earnings gap is expected to be higher in urban to rural municipalities. Assuming that there are higher earnings in urban municipalities, the gender earnings gap should be larger as the gender earnings gap at higher income distributions is larger (Albrecht et al., 2001).*

Hypothesis 2: *The gender earnings gap is expected to be larger in municipalities where average earnings are higher.* The gender earnings gap is not as pronounced in the secondary sector where pay is lower and the gender earnings gap is not as pronounced in the early stages of the career when earnings are lower (Doeringer & Piore, 1971; Bielby & Bielby, 1988; Becker, 1985; Mincer & Polackek, 1974).

Hypothesis 3: *The gender earnings gap is expected to be larger in municipalities where human capital levels are higher.* The gender earnings gap increases with higher levels of education. Hence, in municipalities where a large share of the population has higher education (three years or more), the gender earnings gap should be higher (De la Rica et al., 2008; Cotter et al., 1996).

Hypothesis 4: *The gender earnings gap is expected to be higher in municipalities where there is more gender-segregation on the labour market.* Women tend to be positioned in lower-paying jobs with higher turnover rates and lower pay, hence dividing the labour market into different sectors for men and women. Men generally attain a greater proportion of the occupations that are well paid (Anker, 1997; Doeringer & Piore, 1971; Bygren & Kumlin, 2005).

Hypothesis 5: *The gender earnings gap is expected to be higher in municipalities where the women compared to men are more absent from the labour market.* Women tend to work fewer hours per week and fewer weeks per year than men. Absences from the labour market due to sick leave, parental leave and larger share of part time work reduce women's earnings both directly and indirectly by reducing women work experience and employment stability (Blau & Kahn (1992; 2000), Mandel & Semynov, 2005; Selmi, 2000).

Hypothesis 6: *Mechanisms relating to the gender earnings gap are expected to have different explanatory power in urban compared to rural municipalities.* Due to different levels of average earnings, human capital, gender-segregation and labour market time in urban compared to rural municipalities, the mechanisms should be different between urban and rural municipalities in the way each explanatory variable affect the gender earnings gap (Andersson et al., 2014; Berry & Glaeser, 2005; Smith & Glauber, 2013).

3. Method

The aim of the methodology is to provide the necessary tools to answer the hypotheses and the research questions formed with basis of the knowledge from the analytical framework and previous studies. The methodology will initiate with a section describing and motivating the variables used in the empirical analysis. This will follow with a section including detailed information of the calculations of the variables and their sources, following a description of the division of municipalities into urban and rural entities. The section will end with the descriptive statistics and limitations of the study.

3.1 Data & descriptive statistics

The data used in the study is mainly gathered from *Statistics Sweden* and the *Swedish Social Insurance Agency*, considered reliable sources of data. The data is in aggregate macro-economic form and is collected on a municipal basis over the years 2003 to 2013, comprising of 290 observations for each variable and year. The municipalities are divided into urban and rural categories after the density of population and spatial distance to urban locations. The 11-year time period was chosen, as it is the most recent data available for the desired explanatory variables included in the analysis, making it highly contemporary. Furthermore, this period is relevant as it represents a development from convergence to stagnation in the narrowing of the gender earnings gap. The data is collected as repeated observations on the same cross-sectional units over time, thus constituting panel data. Each variable has been collected independently and calculated into desired form for the most intuitive interpretation in the analysis.

3.1.1 Dependent variable

The data for calculating the dependent variable of the *gender earnings gap* is collected from *Statistics Sweden*. The variable is expressed as women's earnings as a proportion of men's earnings in the municipality that they live, for the working age population (20-64). The data includes only the population that has an income above 0, and is translated as the income from taxable employment and business expressed in SEK thousands ("sammanräknad förvärvsinkomst"). The variable is calculated by dividing women's total average earnings over men's total average earnings for each consecutive Swedish municipality. The variable is expressed as a ratio, which must be

considered in the interpretation of the variable in the empirical analysis. A negative effect on the dependent variable (*gender earnings gap*) with a one-unit increase in the explanatory variable would mean that the women's earnings in relation to men's earnings decrease, meaning that the gender earnings gap between men and women increases.

3.1.2 Explanatory variables

The key issue in this study is the extent to which the observed gender earnings gap can be explained by determinants connected to human capital, gender-segregated labour markets and working time, in response to the classification of the municipality categorized as either urban or rural. The explanatory variables chosen and assessed are motivated with the help of the theories and previous studies.

3.1.2.1 *Average earnings*

The data for the average earnings is collected from *Statistics Sweden*. The average earnings are expressed as the average earnings for the working age population (20-64) for each municipality and year. The variable is expressed as SEK thousands of yearly earnings. The importance of including this variable in the model regressions is motivated by referring mainly to the theory by Albrecht et al. (2001) and the human capital theories developed by Becker (1985), Mincer (1958) and Mincer & Polackek (1974). Looking to the early years of an individual's career, or an individual that has a lower-paid job, the gender earnings gap is generally lower. With the accumulation of experience, education and earnings, women's earnings tend to fall behind, where the presence of a so-called glass ceiling further increases the gender earnings gap at the top of the earnings distribution (Albrecht et al., 2001). Hence, in municipalities where the average earnings are higher, the gender earnings gap should be higher. This variable is relevant in the testing of *Hypothesis 2*.

3.1.2.2 *Average age*

The average age is collected from *Statistics Sweden* and is expressed as the average age of the working age population (20-64) for each municipality and year. The variable is included as a control variable, as according to theory, with the accumulation human capital and experience over time, the earnings of women tend to fall behind (Becker 1985; Mincer, 1958; Mincer & Polachek, 1974; Bielby & Bielby). Hence, the average age variable is expected to have a negative coefficient, meaning

that with increasing age, the women's to men's earnings is expected to decrease, meaning that the gender earnings gap increases.

3.1.2.3 Human capital

In this study, education is used as a proxy for human capital. According to theory, the gender earnings gap increased with higher education (Albrecht et al., 2001; Blau & Kahn, 2000). The human capital is divided into two separate variables, the first being *human capital as a population share* and the second being *human capital as a gender ratio*. The data for these variables are collected from *Statistics Sweden*. The variable *human capital as a population share* is calculated by dividing the population with higher education (individuals with three years or more of university studies) by the working age population (20-64), for each consecutive municipality and year. Hence, a higher value of this variable in the municipality would mean that a larger proportion of the population has a higher education. This variable is expected to be negatively related to the gender earnings gap, as is with the accumulation of human capital that women experience greatest earnings gaps (Mincer & Polachek, 1974). The gender earnings gap increases with areas with high education levels; hence the gender earnings gap should be higher in areas where the education level is higher, which is suggested in *Hypothesis 3*.

Looking to the *human capital as a gender ratio*, this variable is calculated by dividing the women with higher education with the men with higher education. The higher the value of the human capital as a gender ratio, the more educated women are respective to men in that municipality. According to the theory by Becker (1985), Mincer (1958) and Mincer & Polackek (1974), a higher level of education should lead to higher earnings, which should be the case for the human capital as a population share. Hence, the variable is expected of being positively related to the gender earnings gap, meaning that as human capital as a gender ratio increases, and the gender earnings gap decreases.

3.1.2.4 Gender-segregation

A major reason for the gender earnings gap is gender-segregated labour markets. A persisting characteristic in studies of the gender earnings gap is that women tend to select into lower-paying jobs, creating a dual labour market (Doeringer & Piore, 1971; De la Rica et al., 2008). This proposes that the gender earnings gap should be

higher in municipalities where the labour market is more gender segregated, responding to *Hypothesis 4*. The gender-segregation variables are divided into two separate measures in order to capture the true effect on the gender earnings gap. The data for calculating the gender-segregation variables are collected from *Statistics Sweden* and represent gender-segregation within industries and gender-segregation as a share of the labour market. The data divides the Swedish labour market into 50 industries. In creating the gender-segregation variables, the four industries that are the most female-dominated and the four industries that are the most male-dominated are chosen. These are further industries that employ at least one percent of the total labour force in Sweden and are collected on a municipal level. The industries chosen represent the industries that employ about 45 percent of the Swedish population (see **Table 1**).

Referring to the variable *gender-segregation within industries*, this variable is calculated by taking the mean value of women in female-dominated industries divided by the mean value of men in male-dominated industries. A higher value of gender-segregation within industries means that industries are either more female- or male-dominated, and that there is a high degree of gender-segregation within that municipality. When looking to *gender-segregation as a share of the labour market*, this variable is calculated by dividing the share of the population within the eight most gender-segregated industries with the total workforce of the municipality. A higher value of this variable would indicate that a higher share of the population is subject to gender-segregation in the work force, as a higher share of the population is employed within the male- and female.

3.1.2.5 Parental leave

The variable of parental leave is calculated from data collected from the *Swedish Social Insurance Agency* and is a proxy for a labour market absence variable. The variable represents the share of the parental pay that is utilized by women for each consecutive municipality. A higher value of parental pay indicates that woman to men in that municipality utilizes a higher share of the parental leave. Differences in working time is theorised as a major reason for the persisting earnings gap, as absence from the labour market affects women's earnings both directly and indirectly. The absence from the labour market in the form of parental leave indirectly lowers the

women's work experience and employment stability (Budig & England, 2001; Mandel & Semynov, 2005). This is also closely connected to the specialization issue for women as discussed in Becker's (1985) *work effort hypothesis*. Women tend to choose occupations and work places where hours are less due to domestic responsibilities. The expectation for this mechanism is that in municipalities with a higher degree of parental leave, the gender earnings gap is larger.

3.1.2.6 Sick leave

The variable of sick leave acts as a proxy for a labour market absence variable. According to Blau & Kahn (2000), women tend to work fewer hours per week and fewer weeks per year than men. The sick leave data is collected from the *Swedish Social Insurance Agency* and is based on the measure of sickness and rehabilitation days for each municipality ("nya sjupenningtalet"). This indicator is separated into two types of variables, the first being *sick leave as a population share*, and the second being *sick leave as a gender ratio*.

The variable *sick leave as a population share* is calculated by dividing the population that is categorised as sick in the respective municipality by the municipal working age population (20-64). As women generally utilize the greater share of the sick leave days in Sweden, a higher value of this variable would indicate that women in this municipality suffer more from sickness. Hence, a higher value of sick leave as a population share should increase the gender earnings gap. The variable *sick leave as a gender ratio* is calculated by dividing the women's number of sick days by the men's number of sick leave, and thus captures the difference in sick leave between men and women, and not merely the overall population. This variable hence shows the degree that women are affected by short-term illness in comparison to men. Hence, a higher value of this variable indicates that women are more subject to short-term illness than men. In municipalities where this value is higher, the gender earnings gap should be higher, responding to *Hypothesis 5*.

3.1.2.7 Lowered work capacity

Lowered work capacity is a further proxy for labour market absence. Work capacity is divided into two variables, namely the *lowered work capacity as a population share* and the *lowered work capacity as a gender ratio*. The data is gathered from the *Swedish Social Insurance Agency* and is based on a measure compiling the population

that has permanent or temporary lowered capacity to work. The data can be translated to the population newly granted sickness and sickness replacement per 1000 of the population (“SA beståndet”). The *work capacity as a population share* is calculated by dividing the population that has a lowered capacity to work, with the working age population (20-64). A high value of this variable means that a larger proportion of the population has lowered capacity to work, and should hence negatively affect the gender earnings gap.

The *work capacity as a gender ratio* is calculated by dividing the women with lowered capacity to work, by the men with lower capacity to work for each consecutive municipality. A high value of this variable would indicate that women in that municipality has a lower work capacity than men, and should hence affect the gender earnings gap negatively, indicating that the gender earnings gap is larger between men and women. For municipalities with higher share of the population with lowered work capacity, the gender earnings gap is expected to be larger as there is a loss of working experience and employment stability, responding to *Hypothesis 5*.

3.1.2.8 Urban-rural classification /municipal dummy

In the decision to divide the municipalities in Sweden into either urban or rural municipalities, there is not one uniform classification that is provided by Swedish statistics or databases. Looking to urban and rural classifications, it is important to understand that every region develops its own profile, with unique properties of scale, and hence this motivates why a division of the municipalities is of interest (Cheshire & Shepard, 1995).

The classification of the municipalities in this study as either urban or rural is based upon the classifications provided by Swedish local authorities and government agencies, and can thus be trusted as reliable. Sweden is divided into 290 consecutive municipalities, after reforms completed in 1974, which finalised the transition to a decentralised welfare state and representative democracy (Erlingsson et al., 2011). The Swedish Association of Local Authorities and Regions (SALAR, Svenska Kommuner och Landsting, 2006; 2014) provides a categorisation of the municipalities into ten groups according to features such as economic structures and population density. Following this, the Swedish Board of Agriculture has ordered these groups

into four categories after population density and the distance to economic centres hence representing metropolitan regions, urban regions, countryside regions and sparse rural regions (Jordbruksverket (Swedish Board of Agriculture), 2013).

The metropolitan regions are the municipalities of Stockholm, Gothenburg and Malmö and signify municipalities where the population of at least 100 000 inhabitants lives within a radius of 60 km radius. The urban regions are characterised by municipalities where there is a population of at least 30 000 inhabitants in total, or 25 000 inhabitants within the population centre. Also, municipalities with 50 percent of its population within a 60 km radius to a metropolitan region is considered as being an urban region. Countryside regions are municipalities where there is at least a population density of five people per km². The sparse rural regions are the municipalities, which do not fit any of the previous descriptions and hence represents municipalities with lower than five inhabitants per km² (Jordbruksverket (Swedish Board of Agriculture), 2013).

For this particular study, the four categories divided into two categories, representing one urban municipal category and one rural municipal category. Hence, metropolitan regions and urban regions are represented by the urban municipal category, and countryside regions and sparse rural regions are represented by the rural municipal category. This thus divides the 290 municipalities in Sweden into 126 urban municipalities and 164 rural municipalities. The division into two categories is done in order to provide a simpler interpretation of the urban-rural differences of the gender earnings gap, and since there is not expected to be any major differences if leaving a four-category division. This variable is presented as a dummy, where urban regions take the value 1 and rural regions take the value of 0. Interaction variables are included using four of the explanatory variables (average earnings, human capital as a population share, gender-segregation within industries and work capacity as a population share). The interaction variables are included to explore whether there are differences on the impact of each variable for urban and rural municipalities. The expectation is that all variables will have a negative relation to the gender earnings gap.

3.1.3 Variable overview

The following table includes the explanatory variables used in the empirical analysis of the study. The table shows the definition of the variable and the expected sign of the explanatory variable when setting women's earnings to men's earnings.

Table 2. The variables, their definition, expected value and source. Source: Statistics Sweden, the Swedish Social Insurance Agency, SALAR, and Swedish Board of Agriculture.

Variable	Definition (per municipality)	Expectation	Source
Dependent variable:			
Gender wage gap	Women's total average wage (20-64)/men's total average wage (20-64)	(The expected effect on the dependent variable with one unit increase in the independent variable)	Statistics Sweden
Independent variables:			
Average wage	Average wage of the working age population (20-64) (SEK thousand)	-	Statistics Sweden
Average age	Average age of the working population (20-64) within the municipality	-	Statistics Sweden
Human capital, population share	Municipal population with higher education (20-64) / total municipal population (20-64)	-	Statistics Sweden
Human capital, gender ratio	Women with higher education/men with higher education	+	Statistics Sweden
Gender segregation, within industries	Mean value of women in female-dominated industries / mean value of men in male-dominated industries	-	Statistics Sweden
Gender segregation, share of labour market	Share population working in the 8 chosen industries / total workforce (20-64)	-	Statistics Sweden
Parental leave	Share of parental pay utilized by women	-	Swedish Social Insurance Agency
Sick leave, population share	Share of population sick /population	-	Swedish Social Insurance Agency
Sick leave, gender ratio	Women's value of the sick leave measure / men's value of the sick leave measure	-	Swedish Social Insurance Agency
Lowered work capacity, population share	Total amount of individuals with lowered work capacity / working age population (20-64)	-	Swedish Social Insurance Agency
Lowered work capacity, gender ratio	Share of women with lower capacity to work / share of men with lower capacity to work	-	Swedish Social Insurance Agency
Municipal dummy	Urban = 1 , Rural = 0	-	SALAR and Swedish Board of Agriculture

3.1.4 Descriptive statistics

The descriptive statistics in **Table 3** show all the variables included in the regression models, including their standard deviation, mean, minimum values and maximum values. The table of the descriptive statistics show the pooled dataset of all of the municipalities in the years 2003 to 2013 in Sweden and contains 3190 observations per variable. **Table 4** present the municipalities which have the highest and the lowest gender earnings gaps in Sweden, including the female average earnings, male average earnings and the women's share of men's earnings.

Table 3. The descriptive statistics for the full sample of 290 municipalities in Sweden, including the mean, standard deviation, and minimum and maximum values. The dummy for region is also included. Source: Statistics Sweden and the Swedish Social Insurance Agency.

Variable	Mean	Std.Dev	Min	Max
<i>Municipality (dummy) urban=1</i>	0.57	0.49	0	1
<i>Gender earnings gap (ratio)</i>	0.81	0.06	0.56	0.87
<i>Average earnings (thousands)</i>	273.54	37.11	193.65	499.61
<i>Average age</i>	41.64	0.09	37.21	48.73
<i>Human capital (population share)</i>	0.21	0.62	0.10	0.61
<i>Human capital (gender ratio)</i>	1.11	0.48	1.03	3.11
<i>Gender segregation (share labour market)</i>	0.48	0.32	0.41	0.53
<i>Gender segregation (within industries)</i>	0.80	0.05	0.69	0.94
<i>Parental leave (share of women)</i>	0.69	0.08	0.72	0.93
<i>Sick leave (population share)</i>	8.13	0.03	4.11	12.13
<i>Sick leave (gender ratio)</i>	1.73	0.07	1.66	2.84
<i>Lowered work capacity (population share)</i>	0.19	0.03	0.06	0.31
<i>Lowered work capacity (gender ratio)</i>	1.78	0.09	0.82	2.63

Looking to the descriptive statistics in **Table 3**, the most notable observation is the minimum and maximum value of the *gender earnings gap*, hence the women's share of the men's earnings. This variable ranges from women earning 56 percent of men's earnings to 87 percent of men's earnings, suggesting that the gender earnings gap is not evenly distributed across the 290 municipalities in Sweden. Hence, this confirms the expectations that the gender earnings gap is not unanimous across Sweden, but varies greatly across municipalities.

Furthermore, the *average earnings* across the municipalities vary greatly, from approximately 19 300 SEK to 49 900 SEK. According to theory, earnings have great influence on the size of the gender earnings gap, where the size of the gender earnings gap is higher where the average earnings are higher. The same can be said for the levels of *human capital as a population share*, which ranges from 0.10 to 0.61. This is

interpreted as a 10th of the population in some municipalities having higher education ranging to approximately 60 percent of the population having higher education. It is expected that in municipalities with higher education levels as a population share, the gender earnings gap is larger. *Gender segregation within industries* also shows a great range, where in some industries in municipalities, as much as 94 percent of the population within these industries are subject to gender-segregation. Due to the great variation in these mentioned variables, these are subject to the creation of interaction variables, as the variation between urban and rural municipalities in these variables suggests a difference in explanatory power.

Table 4. The average earnings and gender earnings gap in the five municipalities with the highest gender earnings gap and the five municipalities with the lowest gender earnings gap for the years 2003 to 2013. The gender earnings gap indicates the women's share of men's earnings. The average earnings indicate average monthly earnings. Source: Statistics Sweden.

Municipality	Women's average earnings	Men's average earnings	Gender earnings gap
<i>Danderyd (urban)</i>	29911	53298	0.56
<i>Lidingö (urban)</i>	25734	42176	0.61
<i>Vellinge (urban)</i>	20311	32871	0.61
<i>Lomma (urban)</i>	22799	35901	0.63
<i>Täby (urban)</i>	24734	38344	0.64
<hr/>			
<i>Average earnings of the five municipalities with highest wage gap:</i>	24698	40518	
<hr/>			
<i>Haparanda (rural)</i>	16401	18906	0.87
<i>Kalix (rural)</i>	16276	18831	0.86
<i>Gotland (rural)</i>	16813	19885	0.84
<i>Boden (rural)</i>	15867	18994	0.83
<i>Övertärneå (urban)</i>	16351	19678	0.83
<hr/>			
<i>Average earnings of the five municipalities with lowest wage gap:</i>	16342	19259	
<hr/>			

Looking to the statistics **Table 4**, the difference in the average earnings of men and women and the share of women's earnings to men's earnings is presented. The data shows the five municipalities with the highest gender earnings gap and the five municipalities with the lowest gender earnings gap. An indication of whether the

municipality is urban or rural is provided in brackets. The most notable trend to be found is that the municipalities with the largest gender earnings gap are categorized as urban municipalities, and the majority of the municipalities with the lowest gender earnings gap are primarily rural. Furthermore, when comparing the average earnings between the two distributions, one can see that the gender earnings gap seems to be higher in the municipalities where the average earnings are higher. For example, the average earnings for the five municipalities with the highest earnings gap are 40518 SEK (men's earnings), whilst the same indication for the municipalities with the lowest earnings gaps is 19259 SEK (men's earnings). This thus suggests that the theory that the gender earnings gap is larger where the income level is higher is correct. Hence, this indicates that both *Hypothesis 1* stating that the gender earnings gap is expected to be higher in urban compared to rural municipalities, and *Hypothesis 2* stating that the gender earnings gap is expected to be larger in municipalities where the average earnings is larger is should not be rejected.

3.1.5 Considered variables

In the process of choosing the variables relevant to include for the study, some additional variables were initially considered. The variables chosen are carefully weighed out from bulk of theory and previous studies that is relevant when studying the gender earnings gap. Since a higher share of the population with higher education is considered to increase the gender earnings gap a dummy for *University* was collected and tested (Albrecht et al., 2001; Blau & Kahn, 2000), Hence cities with a University would be expected to have a higher earnings gap due to higher levels of education. However, this variable was excluded as it had no level of significance and did not show any strong relationship to the *gender earnings gap* variable. An explanation for this is that the University cities include population that are students, and most likely have not yet entered the labour market. Another variable considered was the *proportion of male versus female residents*. With a higher proportion of male residents in a municipality, the gender earnings gap would be expected to be larger. However, this variable did not show any significance and was thus excluded. An explanation for this is that the distribution male and female residents of working age population (20-64) are fairly evenly distributed across all municipalities in Sweden (*Statistics Sweden*).

3.2 Empirical design

The aim of the empirical design is to create a comprehensive empirical model to fit the theoretical background and the data that has been chosen, in order to present the results in the most intuitive way and generate an interesting discussion on the subject of the gender earnings gap on a municipal level. The aim is furthermore to be able to assess the research questions posed and the hypotheses developed. The chosen data is collected as repeated observations on the same cross-sectional units over time from 2003 to 2013, hence constituting panel data. The data is complete and balanced, meaning that each entity have measurements in all of the chosen time period and across all the 290 municipalities (Greene, 2008).

Two models of design, the Pooled Ordinary Least Squared (POLS) model and the Fixed Effects (FE) model, generate the empirical design in order to assess the data fully. The POLS model is used as a baseline and comparison model and is the simplest form of estimation to treat this type of panel data. The FE model is used to estimate the data in a similar way as the POLS model, but is important to include as estimation as it accounts more specifically to the time-effect and heterogeneity (Greene, 2008; Wooldridge, 2012). Interaction variables are included in both of the models in order to be able to respond to the expectations of the study, in other words whether there are differences on the impact of variables for urban and rural municipalities.

3.2.1 Pooled Ordinary Least Squared model

The equation used for estimating the POLS model for the chosen data is the following.

$$Y_i = \alpha_i + \beta_1 X_i \dots + \beta_k X_{ki} + \mu_i$$

In this equation Y_i represents the dependent variable, i.e. the *gender earnings gap*, where $i = municipalities$. Furthermore, α_i ($i = 1 \dots n$) represents the unknown intercept for each of the studies municipalities, X_i signifies one of the independent variables, β_1 is the coefficient for the independent variable and μ_i represents the error term.

According to Wooldridge (2012), an advantage of using panel data rather than cross-sectional data is that panel data both looks to group effects and time-effects at the same time in order to deal with heterogeneity effects. By using a POLS model when estimating this data, the data is sampled randomly from the population included at different points in time. This means that a more precise estimate is generated than if simply using cross-sectional analysis. A limitation to using the POLS model is that it assumes that there are no period-effects and no cross-sectional heterogeneity (Wooldridge, 2012). Hence, this is the reason to as why the POLS model in this case is used as a baseline model, where the FE model is more reliable.

3.2.2 Fixed Effects model

Responding to the limitation of the POLS model, assuming that there are no period-effects and no cross-sectional heterogeneity, the reality is that both slopes and intercepts do vary across time and with individual observations. Hence, by using the FE model, this is accounted for and thus is a model regression which analyses the impacts of variables over time (Wooldridge, 2012). According to Gujarati & Porter (2009), the use of a FE model removes the time-invariant characteristics so the net effect of the predictors on the outcome variables can be assessed.

If referring to specifically to municipalities when using the FE model, it is assumed that something within the consecutive municipality may bias the predictor variable, which needs to be controlled for. Hence, in order to control for the individuality of each of the municipalities, by using the FE model, the intercept varies, but the slope remains constant across all years. This thus means that the relationship between the dependent and the independent variable *within* each entity (municipality), rather than randomly, is explored. Hence, by using the FE model, the within-groups variation is estimated rather than the across-group variation, which is estimated by the POLS model. The equation used for estimating the FE model for the chosen data is the following.

$$Y_{it} = \alpha_i + \beta_1 X_{it} \dots + \beta_k X_{kit} + \delta_i + \mu_{it}$$

In this equation Y_{it} is the dependent variable *gender earnings gap* where $i = municipalities$ and $t = time$ (2003-2013). Furthermore, $\alpha_i (i = 1 \dots n)$ represents

the unknown intercept for each consecutive municipality; X_{it} represents each of the dependent variables for each municipality and each time period, β_1 is coefficient for the independent variable, δ_i is the FE (fixed effect) and μ_{it} represents the error term for each time period and municipality.

When using the FE model, there are some advantages, which cannot be captured by merely using a cross-sectional analysis or a POLS model. The first advantage is that the FE model is robust to omitted variables due to that the model assumes that omitted variables in the general model are correlated with the regressors in the model (Greene, 2008). A second advantage is that the FE model assumes that differences in individuals (in this case municipalities) can be captured in the differences in the intercepts (Greene, 2008). A third advantage is that the FE model allows the unobserved effects to be correlated with the explanatory variables, thus meaning that it is a good model to use when the risks of correlation between the variables is high, which is the case in this study as seen in the descriptive statistics in section 3.1.5 (Wooldridge, 2012). Also, the model is of advantage to use if autocorrelation is present, as the results are unbiased (Gujarati & Porter, 2009).

3.3 Limitations

When setting up the method of the study, limitations were found which are of interest to discuss in order to provide further research with suggestions for improvement and caution. Looking to the data, it is collected on an aggregate rather than an individual level. The reason for this is because no micro-data could be found on a municipal level. Most papers studying the gender earnings gap uses individual data of the form of income surveys, thus providing large numbers of observations. The issue of using aggregate data has been prominent in all social sciences as it is identified as an indicator of lost information. There is thus an aggregation problem defined as the information loss occurring in the substitution of macro-level data for individual data (Clark & Avery, 1976). Furthermore, by using aggregate data to infer about individual behaviour and choices, one might make the mistake of ecological fallacy. This refers to a fallacy in the interpretation of the statistical data where inferences about the individual are deducted from the inference for the group where the individual belongs (Clark & Avery, 1976). However, by using individual data, one omits information

about aggregate levels and lose some explained variance, and may make statistical mistakes by ignoring dependencies of observations.

Furthermore, the study is of a spatial nature, hence aiming to analyse the difference in the earnings of men and women across urban and rural municipalities. However, what should be considered is that individuals may live in one municipality and work in another. This may skew the results to some extent. The use of FA-regions was considered to be used, which is referred to as a group of municipalities that are assumed as being self-sufficient in terms of jobs and labour (*Statistics Sweden*). However, although this type of division of the municipalities may capture some of the skewness of the earnings distribution, it may lose information in other determinants.

Looking to the empirical design of the study, there is a limitation with the use of the POLS model. When using the POLS model it is assumed that there are no period-effects and no cross-sectional heterogeneity (Wooldridge, 2012). This is why the POLS model merely is used as a baseline model, and the FE model is rather preferred in the evaluation of the data in this study. The FE model does account for the individuality of the municipalities across time and space. There are limitations when using the FE model for the empirical design, connected to statistical problems. The FE model does account for the common effect and the correlation that exist between the observations within a group (municipality). However, what the FE model does not account for is the heteroscedasticity of the data as it only centres the conditional mean (Greene, 2008).

4. Results & discussion

The objective of this paper is to investigate what impact the chosen variables have on the *gender earnings gap* when comparing urban and rural municipalities in Sweden to determine whether one needs to go beyond country borders in order to understand the gender earnings gap. This is in order to shed further light on the factors affecting the gender earnings gap and to suggest areas of improvement in policy-making in narrowing the gender earnings gap in Sweden. In this section the three main research questions are answered.

- *What mechanisms are most decisive for the gender earnings gap?*
- *Do the mechanisms show different explanatory power across urban and rural municipalities?*
- *Do we need to go beyond country borders in order to develop policies for continuing reduction in the overall gender earnings gap in Sweden?*

The analysis of results is divided into three sections, where the general impact of the explanatory variables on the gender earnings gap are investigated, first looking to the POLS model and second looking to the FE model, discussing its relation to previous theory and literature. The third section deals specifically with the urban-rural comparison of the variables, including interaction variables to analyse whether there are differences on the impact of variables for urban and rural municipalities.

4.1 Analysis of results

Looking to the estimations for both the POLS regression model (**Table 5**) and the FE regression model (**Table 6**), the results are similar when looking to the final model of estimation (**Model 1**). This suggests that the results that are found in the POLS regression are reliable and do not suffer from the biased estimate by omitted variables, which could be a limitation when using the POLS model (Greene, 2008). When looking to the values of the adjusted R^2 , one can see that the value varies between approximately 50 to 70 percent, meaning that the estimated variables included in the estimations can account for approximately 50 to 70 percent of the variation in the gender earnings gap, which is a satisfactory value when using aggregated data (Gujarati, 2008).

4.1.1 Pooled Ordinary Least Squared model

Table 5. *Dependent variable: Gender earnings gap. Cluster robust standard errors in the brackets. **,* significant at the 0.01 and 0.05 level.*

POOLED OLS MODEL (Dependent variable: gender earnings gap)		
	Model 1	Model 2
Municipality (urban=1)	-0.114** (0.017)	-0.121** (0.015)
Average earnings	-0.008** (0.001)	-0.011** (0.000)
Average age	-0.004** (0.008)	-0.003** (0.011)
Human capital (population share)	-0.152** (0.001)	0.143** (0.001)
Human capital (gender ratio)		-0.003* (0.002)
Gender segregation (share of labour market)		-0.127 (0.001)
Gender segregation (within industries)	-0.223** (0.000)	-0.284** (0.000)
Parental leave	-0.079* (0.000)	-0.083* (0.000)
Sick leave (population share)	-0.013* (0.006)	-0.011* (0.004)
Sick leave (gender ratio)		-0.009 (0.001)
Work capacity (population share)	-0.254** (0.000)	-0.264** (0.000)
Work capacity (gender ratio)		-0.064 (0.003)
Year dummies are not reported		
Adj. R square	0.611	0.712
F probability	0.000	0.000
Sample size	3190	3190

A stepwise regression analysis of the POLS regression is done, in order to find the model of best fit, where **Model 1** and **Model 2** are displayed in **Table 5**. Looking to **Model 2** in the POLS model including all explanatory variables, the control variables of *average earnings* and *average age* are significant to the 1 % level, and respond to the hypotheses set up. Looking to *average earnings*, the sign is negative, indicating that in municipalities with higher average earnings, the gender earnings gap is larger. The same is true for *average age*. What is not unexpected is that **Model 2** including all of the explanatory variables shows signs of multicollinearity in the variables.

When looking to the significance level and the sign of the coefficients, some variables do not respond to theory. The human capital variables show conflicting signs to expectations and the variables of *gender segregation as a share of the labour market*, *sick leave as a gender ratio* and the *work capacity as a gender ratio* are insignificant.

The *human capital as a gender ratio* is significant to the 5 % level, but shows a negative coefficient, contradicting to the expectations of the study. The *human capital as a gender ratio* should be positively related to the gender earnings gap, as when women have a higher level of education compared to men in a municipality, this should decrease the gender earnings gap (Becker, 1985; Mincer, 1958; Mincer & Polackek, 1974). Relating to this is the sign of the coefficient for the *human capital as a population share*; this coefficient is positively related to the gender earnings gap, again contradicting theory. In municipalities where the human capital levels are higher compared to other municipalities, the gender earnings gap is generally larger; hence the coefficient should have a negative sign (Mincer & Polachek, 1974; Albrecht et al., 2001).

Examining the proxies of working time (*sick leave as a gender ratio* and *work capacity as a gender ratio*) the variables are insignificant. According to theory, the gender earnings gap should be higher in municipalities where a larger share of the female population to the men's population is taking time off work, due to a loss in human capital levels such as experience (Mandel & Semynov, 2005). The variables of *sick leave as a population share* and *work capacity as a population share* are significant to the 1 % level. When looking to both of the gender-segregation variables, a similar relation can be found, where only one of the variables is significant. The *gender-segregation within industries* is significant to the 1 % level, whilst the *gender-segregation as a population share* is insignificant. The variable of *parental leave* is significant to the 5 % level. A possible explanation to the insignificance of some of the variables in **Model 2** is that when including both of the variations of the variables in the regression, one of them becomes insignificant, which is the case in all tested regressions. This may thus be a sign of multicollinearity in the variables.

Model 1 shows the regression model when omitting the variables that are possibly the reason for multicollinearity in **Model 2**. It is estimated in order to gain more

satisfactory results, where the gender ratio variables as well as the *gender-segregation as a share of the labour market* are excluded. In this model, the results tend to correspond well to the theory and the hypotheses set up, and are the basis for the rest of the analysis. The adjusted R^2 for **Model 2** is slightly lower than for **Model 1** with a value of 0.611, which is nevertheless satisfactory.

In studying **Model 1** in the POLS regression, the urban-rural comparison is of interest for discussion, referring to the dummy variable of *municipality* where the value of 1 represents an urban municipality. The POLS model is used as a baseline model, but contains more information concerning the urban and rural differences in the gender earnings gap than the FE model. The dummy variable is used to respond to *Hypothesis 1* stating that *the gender earnings gap is expected to be higher in urban to rural municipalities*. Urban municipalities generally contain a population which has higher earnings and higher human capital levels, which both are theorized as affecting the gender earnings gap negatively, meaning that the women's earnings compared to men's earnings are lower (Albrecht et al., 1999; 2001). From the POLS model one can determine that the variable is negative and is significant at the 1% level. Hence, in the case that the municipality is of urban nature rather than rural nature, the women's earnings to men's earnings would be lower; indicating that the *gender earnings gap* in urban municipalities is higher. More specifically, in the case of Sweden, the gender earnings gap of is approximately 11.4 percent higher in urban municipalities compared to rural municipalities, even after controlling for other explanatory variables.

4.1.2 Fixed Effects model

The results from the POLS model establishes that there is a higher gender earnings gap in urban to rural municipalities, hence corresponding to the expectations in *Hypothesis 1*. The POLS model is used as a reference when analysing the urban-rural comparison on a general level, and assumes that the estimated coefficients are the same for each cross-section over all years. The FE model is of more use when discussing the magnitude of the explanatory variables, as the time invariant characteristics are removed so that one can evaluate the net effect of the explanatory variables on the outcome variables (Gujarati, 2008; Wooldridge, 2012).

For this analysis, the results in **Model 1** displayed in **Table 6** are considered, hence excluding some of the original explanatory variables to avoid multicollinearity, for the model of best fit. Differences in earnings, age, human capital levels, gender-segregation and labour market absence have been established by theory to affect the gender earnings gap where increases in the variables cause the gender earnings gap to increase. When looking to **Model 1**, all variables are significant and follow the expected sign.

Table 6. *Dependent variable: Gender earnings gap. Cluster robust standard errors in the brackets. **, * significant at the 0.01 and 0.05 level.*

FIXED EFFECTS MODEL (Dependent variable: gender earnings gap)					
	Model 1	Model 2	Model 3	Model 4	Model 5
Average earnings	-0.016** (0.002)	-0.017** (0.011)	-0.011** (0.007)	-0.019** (0.005)	-0.020** (0.000)
Average age	-0.005** (0.002)	-0.011** (0.001)	-0.008** (0.000)	-0.009** (0.000)	-0.011** (0.001)
Human capital (population share)	-0.143** (0.003)	-0.139** (0.000)	-0.134* (0.001)	-0.141** (0.007)	-0.145** (0.000)
Human capital (gender ratio)					
Gender segregation (share of labour market)					
Gender segregation (within industries)	-0.257** (0.001)	-0.249** (0.000)	-0.243** (0.001)	-0.251** (0.002)	-0.224** (0.000)
Parental leave	-0.098* (0.011)	-0.099* (0.007)	-0.089* (0.003)	-0.101* (0.003)	-0.086** (0.000)
Sick leave (population share)	-0.022* (0.004)	-0.019* (0.004)	-0.024* (0.005)	-0.018* (0.001)	-0.012** (0.003)
Sick leave (gender ratio)					
Work capacity (population share)	-0.196** (0.000)	-0.183** (0.000)	-0.215** (0.000)	-0.199** (0.001)	-0.211** (0.004)
Work capacity (gender ratio)					
Municipality*average earnings		-0.013** (0.001)			
Municipality*human capital as a population share			-0.141* (0.014)		
Municipality*gender segregation within industries				0.112** (0.000)	
Municipality*sick leave as a population share					-0.019** (0.000)
Year dummies are not reported					
Adj. R square	0.543	0.578	0.603	0.582	0.574
F probability	0.000	0.000	0.000	0.000	0.000
Sample size	3190	3190	3190	3190	3190

4.1.2.1 Average earnings

For the analysis of **Model 1** in the FE regression model, the first explanatory variable is *average earnings*. This variable is included to respond to *Hypothesis 2* stating that *the gender earnings gap is expected to be larger in municipalities where the average earnings are higher*. According to the theoretical framework, it is in the higher earnings distributions that the greatest earnings gaps occur, much due to that women's

earnings tend to fall behind, also referred to as a glass ceiling (Bielby & Bielby, 1988; Albrecht et al., 2001). Looking to the coefficient of *average earnings*, it has a negative value of -0.016, indicating that if the average earnings increases by one unit, the gender earnings gap decreases by 0.016 units, meaning that the women's to men's earnings decrease. This result responds to the municipalities where incomes are higher compared to other municipalities. Thus, in municipalities where women earn more in relation to other women, men earn even more in relation to other men. Hence, in municipalities where the average earnings are higher, the gender earnings gap is larger, and thus *Hypothesis 2* cannot be rejected. Revisiting **Table 4**, the municipalities with the highest average earnings have the highest earnings gap, and are urban municipalities. As theorized by De la Rica et al. (2008), the regions with the highest average earnings and education levels tend to be in urban regions, which is indicated by the results, and thus sees the highest earnings gaps.

4.1.2.2 *Human capital*

Hypothesis 3 states that *the gender earnings gap is expected to be larger in municipalities where human capital levels are higher*. This refers to the theory put forward by Cotter et al. (1996) and De la Rica et al. (2008) suggesting that the gender earnings gap increases with higher levels of education. The variable referred to is the *human capital as a population share*, and the results are consistent with the theory. The coefficient is significant to the 1 % level and has a value of -0.143 indicating that in municipalities where a greater share of the population has a high level of education, the gender earnings gap is larger. The urban municipalities of Danderyd, Lidingö and Täby are municipalities with the highest gender earnings gaps, and incidentally also the municipalities with the highest levels of human capital as a population share.

4.1.2.3 *Gender-segregation*

Looking to the gender-segregation on the labour market, theory has shown strong evidence that this is a major cause of the sustaining gender earnings gap, especially in Sweden (Anker, 1997; Doeringer & Piore, 1971; Bygren & Kumlin, 2005). *Hypothesis 4* states that *the gender earnings gap is expected to be higher in municipalities where there is more gender-segregation on the labour market*. The theory suggests that there occurs more gender-segregation in rural municipalities to urban municipalities, and hence the gender earnings gap should be larger in rural municipalities (Cotter et al., 1996). In this case the gender-segregation *within*

industries is significant to the 1 % level and has a negative value, and thus the hypothesis cannot be rejected. This means that in municipalities where the industries are more female or more male-dominated, the gender earnings gap is larger. This corresponds to the statistics, where after the municipalities with the highest average earnings and the highest educational level, the municipalities that show most gender-segregation has the highest earnings gaps. For example, the rural municipalities of Gällivare and Hammarö have amongst the highest gender gaps, although they show lower values of average earnings and human capital compared to other municipalities.

4.1.2.4 *Labour market absence*

The variables connected to labour market absence are expected to affect the gender earnings gap negatively, as absences from the labour market reduce women's earnings both directly and indirectly by reducing women work experience and the overall pay due to less hours worked (Mandel & Semynov, 2005). *Hypothesis 5* states that *the gender earnings gap is expected to be higher in municipalities where the women compared to men are more absent from the labour market*. Looking to the regression in **Model 1** all explanatory variables connected to labour market absence is significant and negative (see *parental leave* (-0.098), *sick leave as a population share* (-0.022), and *work capacity as a population share* (-0.196)). Hence, it can be established that a higher value of labour market absence in a municipality increases the gender earnings gap. Women take 75 percent of the compensation rate for being on parental leave compared to men's 25 percent. Furthermore, 30 percent of women in Sweden do part-time work compared to men's 15 percent (*Statistics Sweden*). This may be the explanation to the negative relation of the observed variables on the gender earnings gap, as this would affect human capital attainment and earnings negatively, increasing the gender earnings gap.

In looking at the magnitude of the variables analyzed in the FE model, the variables with most explanatory power on the gender earnings gap is the *gender segregation within industries*, the *human capital as a population share* and the *work capacity as a population share*. The *average earnings* also show some explanatory power, and is significant to the 1 % level, hence motivating its importance in tackling the gender earnings gap. Hence, responding to the first research question posed, these four mechanisms are most decisive for the gender earnings gap in Sweden.

4.1.3 Interaction effects

As the regression results seen in the POLS model determine that there is a difference in the variable of the *gender earnings gap* when comparing urban and rural municipalities, and that many of the explanatory variables have a significant effect on the gender earnings gap, it is of interest to assess if there are differences between urban and rural municipalities in the way the explanatory variables affect the gender earnings gap. This discussion responds to *Hypothesis 6* claiming that *mechanisms relating to the gender earnings gap are expected to have different explanatory power in urban compared to rural municipalities*.

Table 7. The interaction effects of four chosen explanatory variables with most variation across an urban-rural sphere.

Interaction variables:	Coefficient	Urban
<i>Average earnings</i>	-0.017	-0.031
<i>Human capital, population share</i>	-0.134	-0.275
<i>Gender-segregation, within industries</i>	-0.251	-0.139
<i>Lowered work capacity, population share</i>	-0.199	-0.218

When discussing the effects of the explanatory variables in the previous sections, this implied looking at the overall trend across all urban and rural municipalities in Sweden. However, merely looking to the overall effect of the explanatory variables leaves little room for discussion for an urban-rural analysis. Hence, interaction variables are included in the FE regression, which can be seen in **Model 2** through **Model 5** in **Table 6**, using the FE model². The aim of including the interaction effects is to gain further understanding as to whether the *gender earnings gap* is more or less sensitive to the explanatory variables when comparing urban and rural municipalities. All interaction variables included in the models are statistically significant at the 1 % level, meaning that there are differences between urban and rural municipalities in the way each explanatory variable affects the gender earnings gap.

Looking to the variable *average earnings*, the coefficient is significant to the 1 % level and negative. Firms in urban municipalities have a higher concentration of high-skilled people and are more productive. Since productivity is closely connected to

² The interaction effect, here notified 'urban' in **Table 7**, is calculated by adding the coefficient variables value by the interaction variables value found in **Table 6**.

earnings, and due to the higher level of productivity and concentration of high-skilled people in urban regions, earnings are higher in these areas (Andersson et al., 2014). This implies that the gender earnings gap is higher in municipalities where the average earnings are higher. Since theory suggests that the average earnings are higher in urban municipalities, there is an expectation that the gender earnings gap is more sensitive to changes in the average earnings in urban to rural municipalities. Hence, looking to **Table 7**, the overall effect of higher average earnings in Swedish municipalities is -0.017 units meaning a higher gender earnings gap. However, looking to the explanatory effect of the average earnings in urban municipalities alone (the interaction effect), the impact on the average earnings gap is even larger, showing a value of -0.031. Hence, this does not only further confirm *Hypothesis 2* that the gender earnings gap is higher in municipalities with higher earnings, but also suggests that in urban municipalities, the gender earnings gap is more affected by high average earnings levels than in rural municipalities. Hence, on an urban municipal level, the average earnings gap is a stronger determinant than on a rural level, and should thus be of greater focus in policy-making.

A similar conclusion can be made when analysing the *human capital as a population share*. *Hypothesis 3* stating that *the gender earnings gap is expected to be larger in municipalities where human capital levels are higher* cannot be rejected. According to theory, human capital levels have become more concentrated over the last century, where urban regions with initial high levels of human capital increases their human capital levels more over time than other locations in an initial lower position (Berry & Glaeser, 2005; Mellander & Florida, 2014). This hence renders the expectation that the high human capital levels should affect the gender earnings gap more in urban municipalities to rural municipalities. The overall effect of human capital as a population share is -0.134, whilst in urban municipalities the effect is -0.275. This confirms the expectation that the gender earnings gap is more affected by high human capital levels in urban municipalities than in rural municipalities, and thus should be of more interest in policy-making in urban municipalities.

Looking to gender-segregation on the labour market, the expectation is that the gender earnings gap in rural municipalities should be more affected by high gender-segregation than in urban municipalities. Gender segregation between urban and rural

municipalities differs, where labour markets are generally more gender-segregated in rural regions than in urban regions (Smith & Glauber, 2013). The general impact of gender-segregated labour markets is negatively correlated with the gender earnings gap in Sweden with a value of -0.251, implying that the gender earnings gap is larger in municipalities where there is more gender-segregation on the labour market. The interaction effect of gender-segregation within industries in urban municipalities is however lower, with a value of -0.139 hence confirming that gender-segregation affects the gender earnings gap to a greater extent in rural municipalities to urban municipalities. Hence, in the narrowing of the gender earnings gap in rural municipalities, gender-segregation should be dealt with to a larger extent than in urban municipalities.

When assessing working time, a higher degree of the population taking time off work should affect the gender earnings gap negatively, hence showing a greater gender earnings gap across all municipalities of Sweden. This is confirmed in when assessing the variable of *lowered work capacity as a population share*, where the coefficient value shows -0.199, and meaning that in municipalities where a higher share of the population share has a lower capacity to work, the gender earnings gap is higher. Looking to the interaction variable it shows a value of -0.218, meaning that there is a slightly stronger effect in urban municipalities than in rural municipalities.

Hence, assessing the interaction variables, average earnings, human capital levels and less working time (lowered work capacity) are the variables influencing the gender earnings gap most in urban municipalities. This suggests that these areas should be of most interest to focus upon in the forming of policies on an urban level. The issue of gender-segregated labour markets should be dealt with to a greater extent in rural municipalities. This section thus implies that it may be of relevance to focus on creating policies on a municipal level when creating policies to narrow the gender earnings gap. Hence, revisiting the research questions, the chosen mechanisms do show different explanatory power across urban and rural municipalities and hence one should go beyond country borders in order to develop policies for continuing a reduction in the overall earnings gap in Sweden.

5. Concluding remarks

The main objective of the thesis was to study the mechanisms impacting the gender earnings gap in urban and rural municipalities in Sweden, determining whether one can observe a gap within the gender earnings gap in Sweden. The purpose of the thesis was to analyse whether one needs to go beyond country borders in order to explain the gender earnings gap and enable a more efficient policy-making process to confront the current stagnation of earnings between men and women in Sweden. With macro-level data gathered from *Statistics Sweden* and the *Swedish Social Insurance Agency* for the years of 2003 to 2013, a series of Pooled Ordinary Least Squared regressions and Fixed Effects regressions were performed. The thesis was approached taking into consideration that the gap is not uniform across Sweden, and the following research questions were formed.

- *What mechanisms are most decisive for the gender earnings gap?*
- *Do the mechanisms show different explanatory power across urban and rural municipalities?*
- *Do we need to go beyond country borders in order to develop policies for continuing reduction in the overall gender earnings gap in Sweden?*

A gender earnings gap is found in all 290 Swedish municipalities; however, the size of the gender earnings gap differs substantially on a municipal level compared to an overall national level. From the analysis of the regressions it can be confirmed that there is a difference in the level of the gender earnings gap when comparing urban and rural municipalities, where the gender earnings gap is generally larger in urban municipalities. This means that there is an uneven distribution of economic power between women and men in the Swedish population although two equally sized groups, and that an overall national policy objective to tackle the gender earnings gap is not enough.

The results can confirm expectations and hypotheses formed, suggesting that in municipalities where average earnings, human capital levels, gender-segregation and absence from the labour market is higher, the gender earnings gap is higher in Sweden. Hence, in policy-making, these areas of influence should be considered. The

most decisive explanatory variables in consecutive order are *gender segregation within industries*, the *human capital as a population share*, *work capacity as a population share*, and *average earnings*.

Most interesting is observing the difference in explanatory power of the observed mechanisms when comparing urban and rural municipalities. In doing so, the municipalities examine the stronger determinants at their local level to find suitable ways to decrease the gender earnings gap. Addressing the interaction effects, it is found that the explanatory variables of average earnings, human capital and work capacity (lowered work capacity) are more critical to address in urban to rural municipalities, as these have a stronger negative impact on the gender earnings gap in urban compared to rural municipalities. When looking to the rural municipalities, the greatest influence on the gender earnings gap is the existence of highly gender-segregated labour markets. This implies that it is of relevance to focus on creating policies on a municipal level or sub-national level when aiming to narrow the gender earnings gap in Sweden. Hence, going beyond country borders when developing policies could enable a continued reduction in the overall earnings gap in Sweden, instead of the currently observed stagnation.

6. Suggestions for further research

From the analysis, there is an observed higher earnings gap in urban to rural municipalities, where the explanatory variables of average earnings, human capital levels and a greater absence from the labour market in these municipalities are the major influencers. In rural municipalities, higher levels of gender-segregation are of most influence on the gender earnings gap. Since most of the gender earnings gap can be observed in urban municipalities, it would be of interest to further observe the most influential variables, specifically concentrating on urban municipalities to explain the gender earnings gap and confront the current stagnating gender earnings gap in Sweden. Additionally, a suggestion would be to confront the gender-segregation in rural municipalities, due to its substantially high impact on rural municipalities in Sweden. Furthermore, it would be of interest to repeat the research using individual level data if access to it would be granted.

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Appendix

A. Correlation matrix for all variables.

Variable	Gender wage gap	Average wage	Population density	Human capital (population share)	Human capital (gender ratio)	Gender segregation (share labour market)
Gender wage gap	1.000					
Average wage	-0.627	1.000				
Population density	-0.414	0.571	1.000			
Human capital (population share)	-0.314	0.771	0.448	1.000		
Human capital (gender ratio)	0.303	-0.619	-0.587	-0.778	1.000	
Gender segregation (share labour market)	0.355	-0.491	-0.578	-0.345	0.422	1.000
Gender segregation (within industries)	-0.104	-0.313	-0.216	-0.492	0.471	0.102
Parental leave	0.248	-0.470	-0.174	-0.507	0.370	0.181
Sick leave (population share)	0.271	-0.300	-0.300	-0.496	0.439	0.216
Sick leave (gender ratio)	-0.257	-0.360	0.124	0.386	-0.253	-0.262
Work capacity (population share)	0.433	-0.721	-0.565	-0.693	0.593	-0.262
Work capacity (gender ratio)	0.543	0.328	0.362	0.207	-0.335	0.514

Variable	Gender segregation (within industries)	Parental leave	Sick leave (population share)	Sick leave (gender ratio)	Work capacity (population share)	Work capacity (gender ratio)
Gender wage gap						
Average wage						
Population density						
Human capital (population share)						
Human capital (gender ratio)						
Gender segregation (share labour market)						
Gender segregation (within industries)	1.000					
Parental leave	0.211	1.000				
Sick leave (population share)	0.250	0.090	1.000			
Sick leave (gender ratio)	-0.130	-0.258	-0.174	1.000		
Work capacity (population share)	0.299	0.367	0.467	-0.320	1.000	
Work capacity (gender ratio)	0.063	-0.274	0.126	0.220	0.287	1.000