Sector Differences in Glass Ceiling in Sweden

-Is It Tied to Occupational Segregation? *

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Abstract

This paper explores sector differences in how the gender wage gap varies across the wage distribution and the role of occupational segregation in explaining this variation for Sweden. Results indicate that the phenomenon known as the glass ceiling, i.e. larger gender wage differentials at the high end of the wage distribution is stronger in the public sector than the private. This difference is found to be due to occupational segregation and , to a large extent, pre-market educational choices. Most of the top/bottom differences within the public sector stem from the county level and is due to gender segregation between few occupations. These results indicate that the mechanisms behind the glass ceiling, and observed sector differences are attributable to occupational segregation by gender.

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1 Introduction

Previous research indicates that the magnitude of the gender wage gap varies along the wage distribution in many European countries as well as in Australia but is almost constant in the US.[1] In a number of countries, including Sweden, an accelerating gender wage gap toward the top of the wage distribution has been observed, indicating a larger gender wage gap for high- wage workers than low- wage workers. This pattern has been denoted as "glass ceiling" whereas a diminishing gender wage gap across the wage distribution has been designated as sticky floor.[2]

In a recent paper Arulampalam et al. (2007) report that the magnitude of the gender wage gap varies substantially along the wage distribution not only across eleven European countries but also across the public and private sector.[3] For example, in Australia a strong glass ceiling is detected only on the private sector (Kee, 2006; Baron and Cobb-Clark, 2008).[4] Baron and Cobb-Clark (2008) points out the significance of occupational segregation in exploring sector differences in the glass ceiling pattern and find that (unexplained) gender wage gap within occupations is higher (rather than lower) except for those in high paid private sector jobs in Australia.

Sweden (and other Scandinavian countries) characterized by high occupational segregation in Europe due to a high degree of female employment in occupations such as education, health care and social services. The majority of care work -child care, elderly care and so on- is performed as paid labor mainly by women, and are within the public

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[1] Baxter and Wright (2000); Albrecht et al. (2003); Gupta et al. (2006); Kee (2006); Arulampalam et al. (2007); de la Rica et al. (2007); Smith et al. (2010)

[2] The initial definition of glass ceiling, given by Booth et al. (2003) is that promotion possibilities are less for women than men, the broader definition, also used byAlbrecht et al. (2003) is that the gender wage gap is wider at the top of the wage distribution.

[3] Countries studied: Austria, Belgium, Britain, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Spain.

[4] Chzhen and Mumford (2009) find evidence of a glass ceiling in both the public and private sector in Britain. Wahlberg (Forthcoming), finds that the glass ceiling is more pronounced for the public sector in Sweden.

sector whereas industry and construction jobs are mostly performed by men in the private sector. Hence the structure of occupational segregation in Sweden differs between the private and public sector (Nermo, 1999; Löfström, 2004). Therefore a study of sector differences in how the gender wage gap varies along the wage distribution and the role of occupational segregation therein is particularly interesting for Sweden.

The research to date has merely explored differences between the public and private sector even though occupational segregation might differ at more disaggregated levels of the public sectors. For instance in Sweden, county councils are heavily established within health care, municipalities within education, governmental level within public administration. It might hence follow that the occupational segregation and how the gender wage gap varies along the wage distribution might differ at disaggregated public sector levels.

The purpose of this paper is to study the gender wage gap along the wage distribution by sector and the role of occupational segregation in explaining these differences in Sweden. This is done not only for the private and public sector but also for disaggregated levels of the public sector (governmental, municipality, county) with the aim of tracing the source of observed differences across the private and public sector.

Results in this study indicate that the public sector is characterized by a sharper acceleration in the gender wage gap along the wage distribution than the private sector. Differences between the public and private sector are due to occupational segregation which in turn, to a large extent, are attributable to pre-market educational choices. A large part of the top/bottom difference in the public sector is driven by county council employers and are due to segregation into only three occupations: nurses, doctors, care givers. In addition, older age groups are found to face larger top/bottom differences in the gender wage gap, in both the public and private sector, than younger age groups. Age differences

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are attributable to occupational segregation. These results indicate that the mechanisms behind the glass ceiling, and the sector differences therein, is tied to mechanisms leading to occupational segregation in the Swedish labor market. Moreover the results show the importance of examining disaggregated sector establishments when explaining the differences in the glass ceiling pattern in Sweden.

The remainder of the paper is as follows: Section 2 discuss briefly the possible mechanisms behind gender wage differentials between sectors. Section 3 presents the data used in estimation and the empirical strategy for the analysis. Results are presented in Section 4 and concluding remarks in Section 5.

2 Mechanisms Behind the Sector Differences in Glass Ceiling Patterns

Different mechanisms might contribute to sector differences in glass ceiling patterns, either by leading to gender wage differentials within occupational groups or between them. It is important to trace whether a glass ceiling is due to first or later type of gender wage differentials since they require different policy implications. Within occupational gender wage differentials would, for example, refer to regulations of wage setting policies while between occupational wage differentials would, for example, require attempts to decrease educational segregation. Three main mechanisms can be identified as possible sources to sector differentials in the glass ceiling pattern:

First, discrimination might lead to gender wage differentials within the same occupational groups if women are assumed to have lower unobserved productivity and therefore receive lower wages for the same occupation. Discrimination might also lead to segregation of women to low-wage occupations if women do not have access to high salaried

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occupational groups to the same extent as men.[5] The propensity to discriminate might differ between the private and public sector. The fact that the public sector is isolated from the rigors of the market economy might give it higher propensity to discriminate (Gregory and Borland, 1999; Arulampalam et al., 2007; Baron and Cobb-Clark, 2008). [6] The public sector, on the other hand, might have a lower degree of discrimination as the enforcement of anti-discriminatory laws is expected to be higher in this sector (Gregory and Borland, 1999; Baron and Cobb-Clark, 2008).[7]

Second, the behavior of men and women might differ. There is evidence in the behavioral economics literature showing that women are less competitive and more risk averse than men (Gneezy et al., 2003; Datta Gupta et al., 2005; Niederle and Vesterlund, 2007; Croson and Gneezy, 2009). This behavior might give an explanation for the lack of women in more competitive high-wage occupations.[8] This might also lead to lower wages for women than men within the same occupations due to poor wage bargaining among women. Säve-Söderbergh (2007), using individual wage bargaining data, finds that women submit lower wage bids and are offered lower wages than men. Pfeifer (2008) argues that the public sector may attract more risk-averse workers. A negative selection of women to the public sector in terms of competitive behavior and risk aversion would suggest higher gender wage differentials between occupational groups in this sector because of self-selection of women to low-wage occupational groups. It would also suggest gender wage differentials within the same occupational groups due to poor wage bargaining of women compared to men.

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[5]For studies on the effect of occupational segregation on the average gender wage gap in Sweden see Arai and Thoursie (1997); Le Grand (1997); Hansen and Wahlberg (2000); Arai et al. (2004); Löfström (2004).

[6]The economic argument for this is that taste based discrimination is not sustainable in a economic model with many profit maximizing companies.

[7]Public sector decision makers who seek to maximize social welfare may have both efficiency and equality goal and intend to resolve labor market inequalities existing elsewhere in economy. For example if discrimination against some groups (women) in the private sector cause inefficiency, public sector decision makers could attempt to implement an equal pay and employment policy for their employers (Gregory and Borland, 1999).

[8]Some studies show that gender differences in risk preferences among the general population do not extend to managers (See Croson and Gneezy (2009) for an overview). Women who choose competitive environments are as much competitive as men (Nekby et al., 2008) and perform as well as men in those settings (Datta Gupta et al., 2005; Croson and Gneezy, 2009).

The third mechanism that might constitute a source for sector differences actually works through the former two mechanisms i.e. wage setting policies and employee behavior. It has been argued in the literature that family friendly schemes such as parental leave, care days for sick children etc., give women a strong intensive to participate in the labor force, but may also have unintended side effects, so called boomerang effects, on the labor market position of women as they imply more frequent absence from work as women tend to participate in these schemes to a much larger extent than men (Albrecht et al., 2003; Gupta et al., 2006; Arulampalam et al., 2007; Smith et al., 2010).[9] Sweden is characterized by its extended welfare provision such as long parental leave, subsidized day care etc. both for private and public sector employees. There are no large differences in the governmental provision of family- friendly schemes between sectors.[10] However a high proportion of part-time employees in Sweden are women and located mostly in health care professions that are established within public sector. [11] If employees retain traditional gender roles, then women (who traditionally have the main responsibility for home and children) might choose occupations allowing a weaker connection (such as part-time employment) to the labor market with lower wages but non pecuniary compensations. As the demand among the female labor force for these "female occupations" increases, the public sector employers (that usually have larger establishments) might adjust the wages for these occupations either by lowering womens' wages within these occupations or by adjusting the overall wage level for these occupations even for male employers. Such an adjustment of wages would suggest higher gender wage differentials (within these occupations, or between these and other occupations) in the public sector

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[9]Arulampalam et al. (2007) shows that the increasing gender wage gap across the wage distribution is present across the majority of European countries with varying family-friendly policies, argues that this may weaken the boomerang effect argument as a primary explanation. Furthermore, Kee (2006) reports the presence of a glass ceiling pattern only in the private sector in Australia, which also makes the boomerang effect argument weaker since family friendly policies are not less supported in the Australian public sector.

[10]The municipalities are compelled to provide pre-school classes to inhabitants regardless of the employment status. The number of parental leave days in Sweden is 480, where 450 days can be divided among the parents in a flexible way, and 60 days are reserved to each parent. 83 percent of maternal leave days have been used by mothers while only 17 percent have been used by fathers during 2003 (Statistics Sweden).

[11]77 percent of part-time employees were women in 2002. The presence of part-time employment was highest within health care and lowest within industry (Löfström, 2004).

in comparison to the private.

The above mechanisms might lead to gender wage differentials within the same occupational groups or segregation of men and women into different occupational groups and thus different wages. However the gender wage gap in the public sector might to a larger extent be due to between occupational wage differentials rather than within for two reasons. First, the public sector usually has more formalized wage setting policies. For example; Le Grand (2004) find that the the most important determinant of wages in the Swedish public sector is the degree of difficulty of the job rather than individual characteristics, indicating a formalized wage setting policy.[12] Second, public sector jobs tend to be concentrated in more specialized occupations with higher educational levels leaving less room for wage differentiation (Gregory and Borland, 1999). These would indicate that the public sector has less scope for gender wage differentiation within occupational groups in comparison to the private sector.

Occupational segregation by gender might occur on a horizontal or vertical basis. Horizontal segregation can lead to a gender wage gap if women systematically choose or have access to occupations that have a flatter wage growth path than occupations that men choose. Vertical segregation, on the other hand, reflects that women may systematically not reach as high of hierarchical levels as men in their careers and hence receive lower wages. Therefore whether an analysis captures vertical or horizontal segregation depends on if the occupational categories includes elements of hierarchy or not.

Part of occupational segregation, especially horizontal segregation, can be attributed to pre-market educational choices. Although differences between men and women have evened out in Sweden in terms of level of education, significant differences in term of

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[12]Solidarity wage policies have been implemented in Sweden from 1951 to the middle of 1980, thereafter a decentralization in the wage setting process has increased both in the private and public sector (Edin and Richardson, 1999). However the decentralization has been implemented for a longer time in the private sector than the public (Granqvist and Regnér, 2004).

field of education remains (Jonsson, 2004).[13] Empirical research indicates that both occupational and educational segregation have changed during the last decades in Sweden (Löfström, 2004).[14] Hence different cohorts might have different degrees of occupational segregation and thereby experience different gender wage gap patterns. [15]

3   Data and Empirical Setup

The data used in estimation stem from the Longitudinal Individual Data (LINDA), from Statistics Sweden. This is register data on a representative sample drawn of approximately three hundred thousand individuals.[16] The sample is drawn from the Swedish Tax Authority register in 1994 and followed over time by adding newly born individuals and newly arrived immigrants. In this paper a cross-section of LINDA from 2004, is used in estimation. [17]

LINDA contains detailed information on demographic and individual characteristics. In addition, it has been matched with Statistic Sweden wage registers that include information on full-time equivalent monthly wages, occupation and full-time status. The wage register is based on information for individuals between the ages of 18 and 64, who, during a measurement week in November and December 2004, earned an income over SEK 10, 000 (roughly EUR 1,000) annually. The salaried sample consists of 129,068 individuals.

In this study further age restrictions have been imposed; individuals younger than 26

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[13]Notice that educational choice as well as occupational choice might be caused by discrimination as expected discrimination and gender norms might affect educational and occupational choices.

[14]The number of sex-balanced occupations has increased from 15 to 20 percent between 1997 and 2002. The ratio of male dominated occupations has decreased from 61 to 55 percent (Löfström, 2004). Jonsson (2004) finds that educational segregation has decreased for those with university educations.

[15]Milgrom and Petersen (2006) explore the effect of gender on the job rank reached in the US and Sweden, using a case study of a firm from the private sector for the period 1970-1990. They find significant cohort differences in the rank reached by the women where the younger cohort experiences lower gender rank gaps than the older.

[16]For further description of LINDA see Edin and Fredriksson (2000)

[17]As a robustness check, for cross-section effects, all the estimations have also been run on the LINDA 2000. Results are similar to those found for 2004.

and older than 60 are excluded in the estimations due to a higher probability of part- time work and early retirement within these age groups.[18] Furthermore individuals working within agriculture and fishing are excluded from estimations. The final sample consists of 96,614 individuals.

Empirical Set-up and Descriptive Statistics

The purpose of this study is to explore differences between sectors, and the role of occupational segregation therein, in explaining how gender the wage gap varies along the wage distribution. The Quantile regression framework has been used to estimate wage regressions at different levels (quantiles) of the log (wage) distribution separately by sector with a particular focus on gender differences. The main model used in estimation is:

$$Q\tau(log(w_i)) = a_\tau + \lambda_\tau Male_i + X_i B_\tau + \epsilon_{\tau i} \tag{1}$$

Where $Q\tau(log(w_i))$ is the value of log wage for individual i conditioned on individual characteristics X_i determining the wage of the τth quantile while $\epsilon_{\tau i}$ denotes the error term. X_i includes education, marital status, residence, children, sector and full-time status. For each sector, this model has been estimated at different quantiles of the wage distribution.

In order to explore the significance of top/bottom differences in the gender wage gap and the effect of explanatory variables on it, estimates for inter quantile-regression models based on differences between the 90th and 10th quantiles are also conducted by sector. Inter-quantile regression is essentially a presentation of two subtracted quantile regressions at different quantiles of the wage distribution. For example; subtracting the wage regression for the 90th quantile from the wage regression at the 10th quantile will provide

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[18]Those in early retirement are likely to have worked in physically demanding jobs and are presumably mostly blue collar workers. Therefore the oldest part of the sample those between the ages of 60 and 64 who are still in the labor force, are probably a selected sample of mostly white-collar workers. Limiting the sample to younger than 60 diminishes this potential selection effect.

the inter-quantile (wage) regression:

$$Q_{90}(log(w_i)) - Q_{10}(log(w_i)) = (a_{90} - a_{10}) + (\lambda_{90} - \lambda_{10}) * Male_i + (B_{90} - B_{10}) * X_i + \epsilon_{90i} - \epsilon_{10i}$$

(2)

Where, for instance, a significant $(\lambda_{90} - \lambda_{10})$ indicates that the gender wage gap significantly differ at the top (90th percentile) of wage distribution in comparison to the bottom (10th percentile).

All the analysis include basic controls for education, age, living in a major urban area, marital status (married or supposed), sector (private, governmental, municipalities, county), immigration status (born abroad) and full-time status.[19] Educational background is controlled for by including dichotomous variables indicating six different educational levels; compulsory school (< 9 years), compulsory school (>9 years), secondary school, post-secondary school (<2 years), post-secondary school (>2 years). [20] Although LINDA contains a large amount of registered information it lacks information about the actual work experience of individuals, age has therefore been used as an approximation for experience.[21]

Industry controls as well as occupation controls are introduced into the models to estimate the gender wage gap within industry and occupation. It is interesting to explore how much of the gender wage gap across the wage distribution is due to occupational segregation in different sectors. If occupations with higher wages are dominated by men,

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[19]See Table A-1 for complete description of variables used in estimations.

[20]It is also worth mentioning that although full-time status is included in estimations, the actual working hours between men and women might vary within this broad category. Full-time equivalent monthly salaries do not include overtime payments (but include bonuses and compensation for shift hours), nevertheless if men work overtime to a larger degree than women this might influence wage-setting over time in a manner not easily controlled for.

[21]Estimations have also been run on survey data containing the actual experience of individuals, Swedish Level of Living Survey (LNU 2000), however quantile regression estimations are extremely sensitive with this data due to small sample sizes (roughly 2,500 individuals). Therefore LINDA is preferred despite the lack of information concerning experience levels.

this will cause higher gender wage gaps at the top of the wage distribution in comparison to the bottom if differences in occupational segregation are not accounted for. Therefore, following Albrecht et al. (2003) and Arulampalam et al. (2007), estimations have been run with and without controls for occupation and industry. Dummy variables for 13 industries and 27 occupations (two- digit) are included in different estimations. Two- digit occupational codes capture mainly horizontal segregation by gender although they include some elements of hierarchy. [22]

Descriptive statistics by gender and sector, shown in Table 1, indicate that a large share (70 percent) of women work in the public sector. Men are full time workers to a larger degree than women, both in the public and private sector, and have higher monthly wages than women. Those who are employed in the private sector, both men and women, have lower average ages than those employed in the public sector.

-Table 1 about here -

Women have, as expected, to a larger degree children living at home than men. Women employed in both the public and private sectors have to a larger degree post secondary education (at least 2 years) than men. Public sector employees have a greater proportion of individuals with university degrees than private sector employees.

Figure 1 shows the raw gender wage gap across the wage distribution separately by sector. The gender wage gap accelerates along the wage distribution in both sectors.[23] However, the public sector shows a sharper acceleration in the raw gender wage gap along the wage distribution as the gender wage gap is lower at the bottom and higher at the top in comparison to the public sector. [24]

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[22]See Table A-2 for a description of two-digit occupational groups and the distribution of employees within occupations across sectors. In some estimations 3-digit occupational codes are used, allowing more than 120 possible categories. This finer occupational code captures vertical segregation by gender to a larger degree.

[23]These results are similar to those found in Wahlberg (Forthcoming) for 2006 cross-section.

[24]Figure A-1, shows the raw gender wage gap along the wage distribution aggregated for the public and private sector, and indicates that the gender wage gap accelerates, especially beyond the 80'th percentile of the wage distribution. The pattern is similar to that found by Albrecht et al. (2003) for 1998.

-Figure 1 about here-

The forementioned study by Arulampalam et al. (2007) shows that raw top/bottom differences are almost the same in the private and public sector in Finland while it is higher in the private sector in Denmark. The same pattern as in Denmark is found by Kee (2006) and Baron and Cobb-Clark (2008) for Australia. Therefore the different pattern observed in Sweden is worth exploring further. Only Baron and Cobb-Clark (2008) explores the role of occupational segregation on two-digit occupational level and find that occupational gender segregation in employment across occupations advantage (rather than disadvantage) all women except those in high-paid, private-sector jobs.

Occupational segregation

Occupational segregation might differ between sectors and along the wage distribution. I begin to explore this issue by calculating the dissimilarity index, using the two- digit occupational categories, at different levels of the wage distribution by sector.[25] The dissimilarity index can be expressed as follows;

$$DI_i = \frac{1}{2} \sum |M_{ij} - F_{ij}| \tag{3}$$

where i denotes six different levels of the wage distribution; bottom 10th percentile, 10th-25th percentile, 25th-50th percentile, 50th-75th percentile , 75th-90th percentile and the top 10th percentile, j stands for occupation and $M_{ij}(F_{ij})$ stands for the proportion of men (women) working in occupation j within the wage quantile i.[26] This index can be interpreted as the proportion of women or men who would have to change jobs in order to make the occupational distribution of men and women the same, within a certain wage quantile.[27]A value of 0 percent indicates that the occupational distribution of men and

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[25]Table A-2 present the two-digit occupational categories.

[26]This is similar to Baron and Cobb-Clark (2008).

[27]Occupations containing few individuals at a certain wage quantile are aggregated to similar occupational groups.

women are the same, a value of 100 percent indicates that men and women work in completely different occupations.

Figure 2 shows the dissimilarity index by sector for six different levels of wage distribution. Occupational segregation varies across the wage distribution both for the public and private sector; The variation is, however, larger for the private sector as it increases substantially in the middle of the wage distribution. In addition, between 10th and 90th percentiles, the dissimilarity index is higher in the private sector than the public.[28] Occupational segregation decreases, in both sectors, at the top of the wage distribution implying that highly paid individuals work in more similar occupations. [29]

-Figure 2 about here-

Whether the structure of occupational segregation implies higher or lower acceleration in the gender wage gap in the private or public sector is not clear a priori. The impact of occupational segregation on the gender wage gap might differ between sectors as the gender wage differentiation within and between occupations might differ across sectors due to varying wage setting policies. A higher degree of between occupational gender wage differentiation (rather than within) would imply a higher effect of occupational segregation on the gender wage gap. In order to explore to what degree sector differences in the gender wage gap across the wage distribution are due to the productivity related characteristics and occupational segregation, estimations including controls for individual characteristics as well as occupational categories are estimated. Results are presented in the next section.

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[28]The aggregated dissimilarity index is 0.46 for private sector and 0.37 for public sector. Meaning that; in the private sector 46 percent of employees would need to re-allocate in order to make distributions the same whereas the corresponding ratio of employees who would need to change their occupation in the public sector is 36 percent.

[29]Baron and Cobb-Clark (2008) find that within the Australian public sector less segregation at the middle and top of the wage distribution in comparison to the bottom.

4 Empirical Results

This section briefly explores how the gender wage gap varies along the log (wage) distribution both aggregated and by sector. Results, shown in Table 2 (panel A), indicate a widening pattern of the gender wage gap across the wage distribution despite controls for educational level, experience (age), full-time status, sector and demographic variables. Male-female wage differentials are roughly 5.2 percent at the 10th percentile of the wage distribution, rise to 10 percent at the 50th percentile and reach 18.2 percent at 90th percentile. Results therefore confirm the glass ceiling found by Albrecht et al. (2003) based on data from 1998 in Sweden. [30]

-Table 2 about here-

Other results (not sown) indicate that working in the private sector is associated with higher wage levels across all percentiles, with one exception.[31] Being a full- time worker is also associated with higher wages as well as living in a major urban area. Being foreign born is associated with lower wage levels in comparison to being born in Sweden at all estimated levels of the wage distribution. Furthermore being married and having children is associated with higher wage levels. [32]

Estimations by sector, shown in Table 2 (B) and (C), indicate that the public sector gender wage gap is roughly 2 percent at the bottom of the wage distribution (10th percentile) and accelerate to the 22 percent at the top of the wage distribution (90t'th percentile), with the same set of controls. The private sector shows a flatter acceleration pattern along the wage distribution, due to a relatively larger gender wage gap at the bottom of the wage distribution (7.5 percent) and low gender wage gap at the top of the wage distribution

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[30]Note that the sample in this paper has different age restrictions than those used in Albrecht et al. (2003).

[31]At the 10th percentile working in the county councils is associated with higher wage levels than working in the private sector.

[32]Separate estimations by gender show that the positive correlation between income and marriage/cohabitation is higher for men than women. Furthermore having a child is positively correlated with income for men but not for women, indicating that the aggregate results found for these variables are driven mainly by men.

(16 percent) in comparison to the public sector.[33]

These findings are in line with arguments suggesting that the public sector would show a sharper glass ceiling as it can more easily follow "tastes for discrimination", or a stronger selection of more risk averse females.[34] Both discrimination and risk aversion might entail a higher relative acceleration of the gender wage gap through the segregation of female employees into low paid occupations. [35]

Occupational Segregation

In order to explore to what degree the sector differentials in the top/bottom gender wage differences are due to occupational segregation, the inter-quantile regressions with and without controls for two-digit occupational controls are estimated. Table 3 shows results from the inter-quantile wage regressions, based on differences between 90th and 10th quantiles, by sector. The coefficient for the gender dummy can be interpreted as the difference in gender wage gap between the 90th quantile and 10th quantile of the wage distribution for men relative to women. Column 1 and column 4 shows inter quantile regressions with the same specification as in table 3 and indicates that top/bottom differences in the gender wage gap are significant for both the public (20.4 percent) and private sector (8.6 percent).

-Table 3 about here-

Including the industry controls (13 industry categories), in column 2 and 5, and adding two-digit occupational dummies (27 occupational categories), in column 3 and 6, alters the pattern remarkably. Top/bottom differences decrease to 7.4 percent in the public

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[33]The gender wage gap at the 10th and 90th percentiles significantly differs between sectors.

[34]Both males and females might be, in terms of risk aversion, selected to the public sector. However as the share of females is much higher in the public sector the selection of females might have a larger impact on the wages.

[35]Some earlier studies show that males working in typically female occupations have substantially better promotion chances equally qualified women whereas the opposite is true for women working in male dominated occupations (Hultin, 2003)

sector and to 8.3 percent in the private sector (column 3).[36] These results indicate that industry and occupational controls eliminate the top/bottom differences in the gender wage gap between sectors.[37] This in turn suggests a higher gender wage differentiation across occupations in the public sector in comparison to the private sector. If the degree of gender wage differentiation across occupational groups differs between sectors, then the same degree of occupational segregation may have different effects on the gender wage gap in various sectors.[38]

The Swedish public sector consist of three levels; the central, municipal and county level. In order to further explore the role of occupational segregation in explaining top/bottom differences in the gender wage gap in the public sector, estimations for the public sector have been re-run including interaction variables for gender and disaggregated levels of the public sector. Results, shown in Table 4 indicate that the top/bottom difference in the gender wage gap is roughly 12 percent (column 1) for the central government and 14.6 for the municipalities. However, the striking result is that the top/bottom differences reaches 46.8 percent in the county level despite the basic controls. This indicates that a large part of top/bottom differences in the gender wage gap within the public sector is driven by the accelerating gender wage gap at the county level.

-Table 4 about here-

The county council in Sweden is heavily concentrated in the health care sector and consists of only three different occupational categories, nurses, doctors and caregivers.[39] Since the two digit occupational controls do not capture these specific occupations, the

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[36]Estimations with three digit occupational controls have also been conducted; top/bottom differences decreases to 5.4 percent in the public sector and to 7.2 percent in the private sector. Three digit occupational categories contain information about managerial positions within some occupations and hence captures the effect of vertical segregation to a larger extent than two-digit codes. The inclusion of three-digit codes reduces the top/bottom differences in the gender wage gap slightly in both sectors, but does not alter the main pattern noted above.

[37]The top/bottom difference in the gender wage gap does not significantly differ between column (3) and (6).

[38]Baron and Cobb-Clark (2008) find that the inclusion of occupational controls increases rather than decreases the gender wage gap except for within high paid private sector jobs.

[39]According to the data; 24 percent of the individuals are nurses, 12 percent doctors, 24 percent are caregivers.

dichotomous variables indicating if the individual is a nurse or not, doctor or not and caregiver or not have been defined based on the three digit occupational codes. Results, in column 3, show that the inclusion of only three specific occupational dummies explains the differences between county councils and other levels in the public sector.

To explore how much of the sector differences in the top/bottom differences in the gender wage gap is driven by these three occupations, I exclude all doctors, nurses and care givers from the sample and re-run the estimations in Table 3. The results, shown in Table 5 indicate that the top/bottom differences in the public sector decreases from 20.4 percent (in table 3) to 13.6 percent. Including industrial (in column 2) and occupational controls (in column 3) decreases the top/bottom differences to 6.7 percent in the public sector. As expected, the top/bottom differences are almost unaffected in the private sector.

-Table 5 about here-

These results give provide a more nuanced picture of gender wage gaps across the wage distribution in Sweden. Segregation to only three different occupations explains a large part of the top/bottom differences in the gender wage gap within the public sector and hence reduces differences between sectors remarkably. These results indicate the importance of exploring in detail the impact of occupational segregation on sectoral differences in how gender wage gap varies across the wage distribution.

The Field of Education

As occupational segregation has a large impact on the top/bottom differences in the gender wage gap between sectors, it is interesting to explore how much of this is correlated to the pre-market entry decisions such as field of education. Differential choices by gender in terms of field of education may lead to occupational segregation. It is of interest to examine separately how these two mechanisms influence the top/bottom differences in the gender wage gap as they imply different policy measures.

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Interquantile regressions including basic controls, industry controls and control for educational field at the three digit level are estimated. Results, presented in Table 6, indicate that controlling for educational segregation yields a higher top/bottom difference in the private sector than the public sector.

-Table 6 about here-

Comparing the results of Table 6 with the results of Table 3 indicates that a large part of the effect from occupational segregation to the top/bottom differences in the gender wage gap is due to pre-market educational choices, especially within the public sector. Given field of education, private sector shows larger top/bottom differences than the public sector. This result makes sense as sample statistics, shown in Table 1, suggest that the public sector contains a higher proportion of employees with university degrees for whom educational field is more deterministic for the occupational choices than individuals with a lower levels of education. These results reinforce the need to adjust for occupational groups in the public sector.

Age Groups

Occupational segregation by gender has decreased lately in Sweden, indicating that different age groups might face different segregation patterns within respective sector. The dissimilarity index, described in section 3.2, has been calculated for four different age groups (26-35, 36-45, 46-55 and 56-60) by sector. Occupational segregation, shown in Figure 3, is highest for the oldest age group (56-60 years of age) in both sectors (0.43 and 0.52) and lowest for the youngest age group (26-35 year of age). The private sector has a higher dissimilarity index level than the public sector for all age groups.

To explore how and to what degree gender wage gap varies across the wage distribution for different age groups and the role of occupational segregation therein, regressions with interaction variables between gender and dichotomous variables indicating age group have been estimated. Column 1 and 4 in Table 7 shows the estimation results

with basic control variables for the public and private sector. Top/bottom differences are smaller for the all age groups ,with one exception, in comparison to the reference group (those between 56-60 years of age) in the both public and private sector. Interestingly, adding the industry and occupational controls, in column 3 and 6, leads to a remarkable decrease in the top/bottom differences across the age groups. This indicates that most of the differences between age groups are due to occupational segregation within the same sector.

-Table 7 about here-

Results showing that the younger age groups have lower top/bottom differences might indicate changes over time, i.e. cohort effects, or might simply be an indication of varying career patterns at different ages. In order to explore if reported results are due to differences between age groups or to changes over time, estimations in Table 7 have been re-estimated for the cross section 1999.[40] Although a longer time period than 5 year is desirable, it is interesting to explore the changes for the same age group over 5 years. Results (not shown) indicate a similar pattern to that found for 2004 where the younger age groups have lower top/bottom differences in the gender wage gap than older age groups in both the public and private sector. Similar to 2004, differences between age groups decrease remarkably with the inclusion of occupational controls. The similarity in results across the 5 year period yield no support for cohort effects in the data. These results differ from Milgrom and Petersen (2006) who find cohort effects in the private sector for 1970-1990 for Sweden.

In summary, different age groups face similar gender wage gap patterns in both sectors where the older age groups have larger top/bottom differences than the younger and most of those differences are due to the occupational segregation.

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[40]The monthly salaries are not available in LINDA earlier than 1999.

5 Conclusions

The purpose of this paper has been to explore the gender wage gap across the wage distribution for Sweden, analyzing sector differences and the role of occupational segregation in explaining these differences. This is done not only for private and public sector but also for disaggregated levels of the public sector i.e. the government, municipal and county levels.

Results in this study indicate that the phenomenon known as the glass ceiling i.e. larger gender wage differentials at the high end of the wage distribution are stronger within the public sector than the private sector. Differences between sectors are explained by within sector occupational segregation that in turn, to a large extent, is due to earlier choices concerning field of education. Disaggregating the public sector into three levels shows that differences within the county level drive the top/bottom differences in the public sector. Moreover segregation to only three different occupations (nurses, doctors, and care givers) can explain differences between the county and the other public sector levels and hence largely explain sector differences. Older age groups have larger top/bottom differences than younger and most of these differences are ,again, due to the occupational segregation.

These results indicate that the mechanisms behind the glass ceiling including sector differences are tied to mechanisms having to do with occupational segregation in the Swedish labor market. The effect of occupational segregation on the top/bottom gender wage gap is higher in the public sector compared to the private. This points out that the public sector has lower scope for gender wage differentiation within occupational groups but differentiate to a higher degree between occupations, leading to a sharper acceleration of gender wage gap along the wage distribution.

The high degree of gender wage differentiation across occupations in the public sector

may in part be due to a wage adjustment for female-dominated occupations in which a weaker attachment to the labor market is possible through for example part-time employment possibilities. This interpretation is reinforced by the result indicating that most of the top/bottom difference in the public sector is driven by the county level where the majority of the part-time employed female labor force is located.

The result that within occupational gender wage differentiation is not higher in the public sector than the private sector run counter to the argument that less competitive female employees in the public sector would lack bargaining skills for the same occupation than male employees. The explanation rather appears to lie in the selection of women and men among different occupational groups in the public sector. This result is in line with earlier research finding that women who has chosen competitive environments are as much competitive as men.[41] On the other hand, this selection might be due to womens differing preferences for risk and competition or preferences for higher responsibilities for the home (due to traditional gender roles), but might also reflect expected discrimination i male-dominated occupations.

Selection into different occupations in the public sector (where the glass ceiling is higher) is found to be, to a large extent, due to horizontal segregation and pre-market educational choices. Consequently one policy implication to diminish the top/bottom differences in the public sector would be to attempt to decrease gender segregation in education. Segregation across fields of education might partly be elicited by traditional gender roles that assign women higher responsibilities in the home. Therefore questioning traditional gender roles in the educational system as well as policies encouraging men to bear more responsibilities at home may decrease the glass ceiling effects.

In conclusion, I want to stress that the effect of occupational segregation on the gender wage gap should not be seen as full explanation but rather as one mechanism for exist-

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[41]See Croson and Gneezy (2009) for a literature overview and also see Nekby et al. (2008)

ing gender wage gap patterns. Although this paper sheds some light on the mechanisms driving sector differences in how gender wage gaps vary along the wage distribution, there are still top/bottom differences in the gender wage gap both in the private and the public sector that need to be explored further.

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Tables and Figures

<div align="center">Table 1: Descriptive statistics</div>

	Private Sector		Public Sector	
	Women	Men	Women	Men
Monthly Wage	22764.86	26882.32	21367.89	25370.57
Age	41.63	42.26	44.55	45.00
Married or co-habiting	0.62	0.62	0.65	0.61
Having children at home	0.50	0.44	0.48	0.40
Working full-time	0.67	0.94	0.58	0.87
Living in a major urban area	0.04	0.03	0.03	0.02
Born abroad	0.13	0.11	0.11	0.10
Educational Background:				
Primary school <9 year	0.04	0.05	0.02	0.03
Primary school 9 year	0.10	0.12	0.05	0.06
Secondary school	0.53	0.55	0.44	0.37
Post secondary school <2 year	0.06	0.09	0.03	0.07
Post secondary school>=2 year	0.26	0.19	0.45	0.43
Phd	0.00	0.01	0.01	0.04
No of obs.	20263	35997	28145	12219

Table 2: The gender wage gap along the wage distribution, 2004

Aggregated (A)

	(1) 10th percentile	(2) 25th percentile	(3) 50th percentile	(4) 75th percentile	(5) 90th percentile
Male	0.052***	0.075***	0.100***	0.140***	0.182***
	(0.002)	(0.001)	(0.002)	(0.003)	(0.004)
Observations	96614	96614	96614	96614	96614

Public Sector (B)

	(1) 10th percentile	(2) 25th percentile	(3) 50th percentile	(4) 75th percentile	(5) 90th percentile
Male	0.019***	0.051***	0.093***	0.156***	0.223***
	(0.003)	(0.002)	(0.003)	(0.004)	(0.007)
Observations	40356	40356	40356	40356	40356

Private Sector (C)

	(1) 10th percentile	(2) 25th percentile	(3) 50th percentile	(4) 75th percentile	(5) 90th percentile
Male	0.075***	0.088***	0.107***	0.128***	0.161***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.006)
Observations	56258	56258	56258	56258	56258

Included (basic) controls: Educational levels; compulsory school < 9 year, compulsory school >9 year, secondary school, post-secondary school <2 year, post-secondary school >2 year. Sector; private, governmental, municipality, county. Demographic characteristics; marital status, living in a major urban area, immigration status, children. Full-time status
Note: Quantile regression models. Bootstrapped standard errors with 100 replications in parentheses
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 3: Top/bottom differences by sector. Industry and occupation controls, 2004.

	Public Sector			Private Sector		
	(1) Q90-Q10	(2) Q90-Q10	(3) Q90-Q10	(4) Q90-Q10	(5) Q90-Q10	(6) Q90-Q10
Male	0.204***	0.166***	0.074***	0.086***	0.107***	0.083***
	(0.007)	(0.007)	(0.005)	(0.006)	(0.007)	(0.005)
Basic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	No	Yes	Yes
Occupation	No	No	Yes	No	No	Yes
Observations	40356	40356	40356	56258	56258	56258

Included (basic) controls: Educational levels, sectoral levels (governmental, municipality, county), marital status, living in a major urban area, immigration status, children and full-time status.
Note: Quantile regression models. Bootstrapped standard errors with 100 replications in parentheses
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 4: Top/bottom differences in the public sector.

	(1) Q90-Q10	(2) Q90-Q10	(3) Q90-Q10
Male	0.120***	0.112***	0.105***
	(0.012)	(0.013)	(0.014)
Male*Municipality	0.026*	0.018	0.028*
	(0.015)	(0.015)	(0.016)
Male*County	0.322***	0.338***	0.035
	(0.021)	(0.021)	(0.022)
Municipality	-0.132***	-0.109***	-0.127***
	(0.009)	(0.011)	(0.012)
County	-0.071***	-0.047***	-0.116***
	(0.012)	(0.013)	(0.013)
Basic Controls	Yes	Yes	Yes
Industry	No	Yes	Yes
Occupation	No	No	Yes
Observations	40356	40356	40356

Included (basic) controls: Educational levels, marital status, living in a major urban area, immigration status, children and full-time status.
Note: Quantile regression models. Bootstrapped standard errors with 100 replications in parentheses
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 5: Top/bottom differences by sector. Doctors, nurses and care givers excluded.

	Public Sector			Private Sector		
	(1)	(2)	(3)	(4)	(5)	(6)
	Q90-Q10	Q90-Q10	Q90-Q10	Q90-Q10	Q90-Q10	Q90-Q10
Male	0.136***	0.122***	0.067***	0.078***	0.101***	0.083***
	(0.008)	(0.008)	(0.005)	(0.006)	(0.007)	(0.005)
Basic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	No	Yes	Yes
Occupation	No	No	Yes	No	No	Yes
Observations	26221	26221	26221	54163	54163	54163

Included (basic) controls: Educational levels, sectoral levels (governmental, municipality, county), marital status, living in a major urban area, immigration status, children and full-time status.
Note: Quantile regression models. Bootstrapped standard errors with 100 replications in parentheses
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 6: Top/bottom differences by sector, controlling for field of education, 2004.

	Public Sector	Private Sector
	(1)	(2)
	Q90-Q10	Q90-Q10
Male	0.102***	0.132***
	(0.006)	(0.006)
Basic Controls	Yes	Yes
Industry	Yes	Yes
Field of Education	Yes	Yes
Observations	40356	56258

Note: Field of education controls are on three-digit level and indicates the highest level of education.
Included (basic) controls: Educational levels, sectoral levels (governmental, municipality, county), marital status, living in a major urban area, immigration status, children and full-time status.
Note: Quantile regression models. Bootstrapped standard errors with 100 replications in parentheses
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 7: Top/bottom differences in the gender wage gap by sector, interaction variables with age groups. 2004

	Public Sector			Private Sector		
	(1)	(2)	(3)	(4)	(5)	(6)
	Q90-Q10	Q90-Q10	Q90-Q10	Q90-Q10	Q90-Q10	Q90-Q10
Male(agegroup 56-60)	0.192***	0.214***	0.095***	0.253***	0.237***	0.094***
	(0.013)	(0.016)	(0.011)	(0.017)	(0.016)	(0.010)
Male*Agegroup 26-35	-0.166***	-0.163***	-0.022	-0.170***	-0.160***	-0.040***
	(0.016)	(0.020)	(0.015)	(0.019)	(0.019)	(0.013)
Male*Agegroup 36-45	-0.102***	-0.100***	-0.014	-0.096***	-0.106***	-0.025**
	(0.016)	(0.019)	(0.013)	(0.020)	(0.020)	(0.012)
Male*Agegroup 46-55	-0.066***	-0.069***	-0.005	-0.017	-0.018	-0.012
	(0.013)	(0.018)	(0.010)	(0.018)	(0.018)	(0.010)
Basic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	No	Yes	Yes
Occupation	No	No	Yes	No	No	Yes
Observations	56258	56258	56258	40356	40356	40356

Included (basic) controls: Educational levels, sectoral levels (governmental, municipality, county), marital status, living in a major urban area, immigration status, children and full-time status.
Note: Quantile regression models. Bootstrapped standard errors with 100 replications in parentheses
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

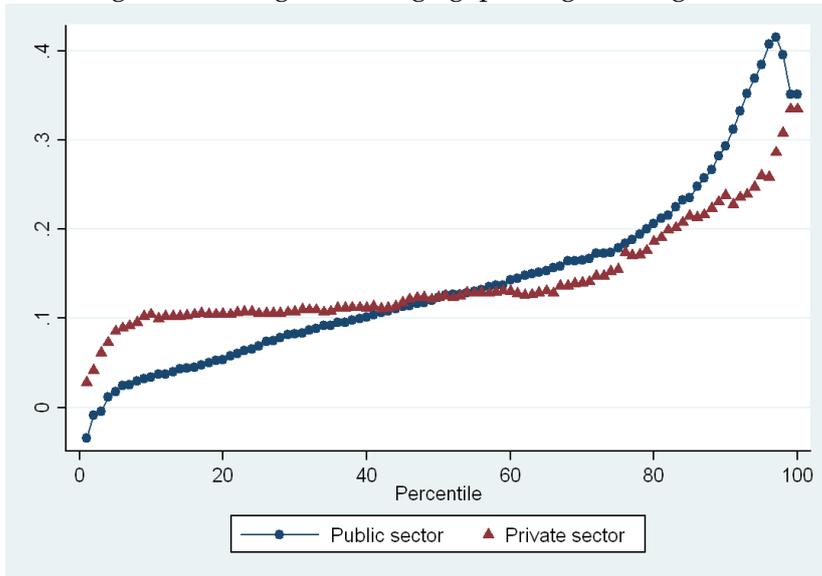Figure 1: Raw gender wage gap along the wage distribution by sector , 2004

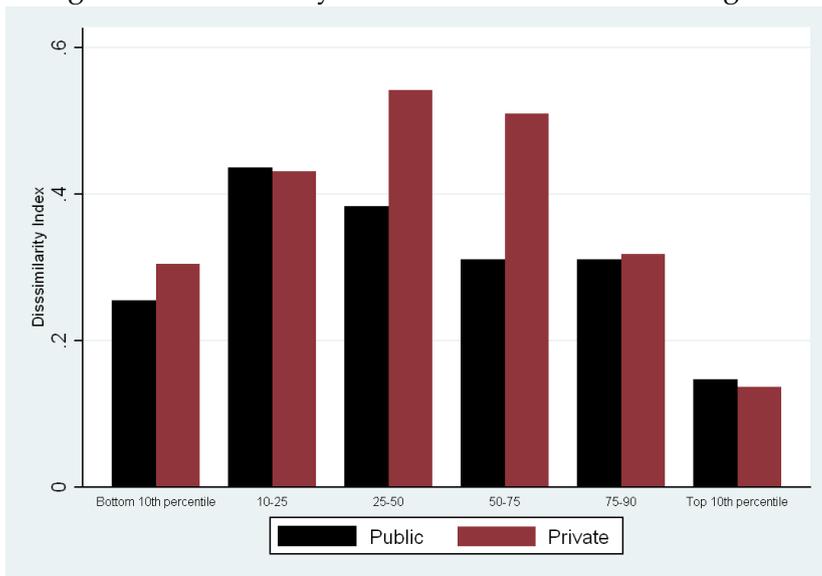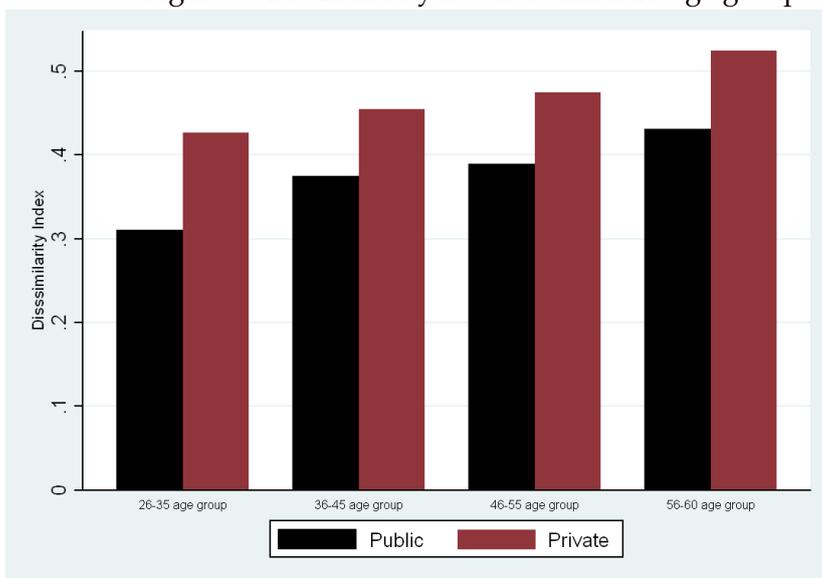Figure 2: Dissimilarity index at different levels of wage distribution by sector, 2004

Figure 3: Dissimilarity index at different age groups by sector, 2004

Appendix

Table A-1: Definition of variables	
Age:	The age of the individual
Born abroad:	Takes the value 1 if the individual is born abroad, 0 otherwise
Full time worker:	Takes the value 1 if the individual is working full time i.e. more than 90 percent, 0 otherwise.
Married/Co-habiting:	Takes the value 1 if the individual is married or co-habiting, 0 otherwise.
Sector:	Category variable indicating four sectoral levels; private, governmental, municipality, county council.
Number of children:	Number of children < 18 years of age in the household.
Level of education:	Six category variables; Comprehensive school < 9 year, Comprehensive 9 year, Secondary school, Post-secondary school <2 year Post-secondary school >=2 year, Doctoral degree.
Occupation:	Two-digit Swedish Standard Classification of Occupation (SSYK). (See Table A2).

Table A-2: Two digit occupational categories and the distribution of employees between sectors

Code	Occupation	Private Sector	Public Sector
01	Armed Forces	0	1
11	Legislators and senior officials	.60	.40
12	Corporate managers	.73	.27
13	Managers of small enterprises	.84	.16
21	Physical, mathematical and engineering science professionals	.84	.16
22	Life science and health professionals	.14	.86
23	Teaching professionals	.10	.90
24	Other professionals	.48	.52
31	Physical and engineering science associate professionals	.79	.21
32	Life science and health associate professionals	.15	.85
33	Teaching associate professionals	.15	.85
34	Other associate professionals	.71	.29
41	Office clerks	.64	.36
42	Customer services clerks	.80	.20
51	Personal and protective services workers	.19	.81
52	Models, salespersons and demonstrators	.97	.03
61	Skilled agricultural and fishery workers	.70	.30
71	Extraction and building trades workers	.84	.16
72	Metal, machinery and related trades workers	.91	.09
73	Precision, handcraft, craft printing and related trades workers	.88	.12
74	Other craft and related trades workers	.97	.03
81	Stationary-plant and related operators	.91	.09
82	Machine operators and assemblers	.98	.02
83	Drivers and mobile-plant operators	.86	.14
91	Sales and services elementary occupations	.55	.45
92	Agricultural, fishery and related laborers	.09	.91
93	Laborers in mining, construction, manufacturing and transport	.68	.32

Figure A-1: Raw gender wage gap along the wage distribution aggregated, 2004