Public sector wage compression and wage inequality: Gender and geographic heterogeneity*

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Abstract

Studies of wage inequality concentrate on private wages. Public sector wages are typically assumed to contribute to overall wage equality. We challenge this understanding in an analysis of the relative skill premium in public versus private sectors. The analysis of heterogeneity across gender and geography is based on rich register data for Norway. The raw data confirm the relative wage compression in the public sector. However, this is a male phenomenon and only prevalent in large cities when unobserved worker and firm characteristics are taken into account. With identification based on shifters between private and public sectors and movers between city-size groups, wage setting for female workers in the public sector increases wage inequality in all regions, particularly in the periphery. The result is consistent with policies promoting recruitment of high-educated female workers and expansion of public services in the periphery counterbalancing the desired equality effect of public wages.

Keywords: Wage inequality, skill premium, geography, private-public wages

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1. Introduction

The rising skill premium over time has been an important source of growing wage inequality. Influential articles by Acemoglu and Autor (2011) and Autor (2014) show how skill demand with technological progress is a driving force. The studies concentrate on market adjustments for male private sector workers. We extend the understanding of wage inequality by including public sector wages to investigate the relative wage compression between public and private sectors.

The broad literature comparing public and private wages concludes that the wages in the public sector are more compressed. The stylized fact is shown in the overview by Lausev (2014) – public sector pay compression results from governments 'overpaying' unskilled workers and 'underpaying' skilled workers. It follows that the public sector contributes to wage equality. We challenge this result by addressing the heterogeneity of public sector wages. While overall public sector wage policies typically are oriented towards wage equality, conflicting goals related to recruitment of high-educated workers and promotion of public services in the periphery are observed. In the analysis, heterogeneity of relative wage compression is investigated with respect to gender and geography. Identification is based on shifters between sectors and movers between regions taking into account individual observable and unobservable characteristics of worker and firms. The main result is that relative public sector wage compression is a male phenomenon and prevalent only in large cities. Wage setting for female workers in the public sector increases wage inequality in all regions, particularly in the periphery.

We apply the standard framework of wage inequality analysis, Mincer equations, to analyze the relative college premium between public and private sectors. All comparisons of public and private workers struggle with selection issues. The regression models here include observed individual worker characteristics and capture unobservables using fixed effects for regions, workers and firms. The identification consequently is based on shifters between the sectors and movers between city-size groups. Compared to existing studies we also account for unobserved firm quality, motivated by recent studies of matching in the labor market (Leknes et al., 2022). A related study by Hausmann et al. (2020) estimates wage equations for private and public sectors separately, distinguishing workers by education levels. They find that high educated in the public sector gain less compared to middle educated. An analysis of unionization by Card et al. (2020) throws light on the roles of gender, skill and public sector employment for wage inequality in the US and Canada. They observe that 'there is substantial wage compression in all periods for both men and women' in the public sector (p. 162).

Alternative methodological approaches have been used to handle selection. The influential study of Postel-Vinay and Turon (2007) estimate a structural model to compare the wages of the two sectors. Based on the model, Dickson et al. (2014) offer evidence of public sector wage compression covering several European countries. Another literature investigates the private-public wage gap along the wage distribution, typically using quantile regression. Bargain and Melly (2008) study the sources of public sector wage compression with this method. The distributional analyses have been extended to handle panel fixed effects. Recent contributions include Campos and Centeno (2012) and Hospido and Moral-Benito (2016). Broadly they find that positive selection into the public sector in the lower part of the distribution reduces the wage compression. Campos and Centena (2012) covering ten European countries conclude that the wage compression in several of the countries largely is driven by selection. Bargain et al. (2018) are concerned about the potential incidental parameter bias in fixed effects quantile regression. They restore the compression result when a correction to this bias is introduced.

There is a geographic aspect of wage inequality since city labor markets are different from labor markets in the periphery. The combined geographic and private-public dimensions affect overall wage inequality. Regional within-country variation in wage inequality is expected since industrial structure and education level differ across regions and geographic mobility is constrained. Lindley and Machin (2014) show higher increases in relative demand for skill in more technologically advanced US states. A city-size wage inequality premium is shown by Baum-Snow and Pavan (2013), Glaeser et al. (2009), and Moretti (2013), and the sources of the geographic inequality are further studied by Baum-Snow et al. (2018). They relate higher return to skills in cities to agglomeration economies driven by technological change. Analyses of agglomeration effects, recently Carlsen et al. (2016), find higher urban wage premium for high-educated compared to low-educated workers. Leknes et al. (2022) show that a significant part of the urban wage premium, and in particular a significant part of the difference in urban wage premium between low- and high-educated workers, can be explained by assortative matching between workers and firms.

Public sector wage setting is different from private markets. In the literature comparing private and public firms, private firms are associated with profit maximization and competition contributing to efficiency. Public firms have broader objectives, and the influential model of De Fraja (1993) assumes that both consumer surplus and union utility are taken into account. The different objectives may explain that private ownership can lead to higher effort and thereby higher wages (Bastos et al., 2014). In the wage setting, public ownership allows a role for political guidelines typically motivating wage

equality. Finan et al. (2017) emphasize institutional aspects, notably limitations on the formulation of contracts in the public sector and typical rigid civil service rules affecting hiring criteria, promotion patterns and wage levels. The equality goals are built into the institutional system and at the same time the politicians are held at arm-length distance to the implementation.

To estimate the relative skill wage premium, we use register data for Norway during 2001–2014. The skill premium is measured by the college-educated to high-school-educated wage gap for private and public sectors separately. The raw data confirm the pattern of relatively lower skill premium in the public sector. However, in the aggregate, more compressed wages in the public compared to the private sector is fully explained by differences in observed and unobserved worker characteristics in the two sectors. Addressing gender and geographic heterogeneity reveals interesting structural variation. To capture the geographic dimension of wage inequality we separate between the larger Oslo area, other city regions with more than 65,000 inhabitants, and the rest of the country. Public sector wage compression is only found for male workers in large cities, while for female workers, the public sector increases wage inequality in all regions, particularly in the periphery. In terms of selection on unobserved ability into the private sector, we find opposite effects for male and female workers. While high-ability college-educated men are more likely to self-select into the private sector (relative to high-ability high school educated men), high-ability college-educated women are relatively more likely to self-select into the public sector. Without controlling for worker fixed effects, the degree of relative wage compression in the public sector is overestimated for male workers and underestimated for female workers. Failing to account for unobserved firm quality overestimates the degree of public sector wage compression for both genders. Our main finding is that the public sector reduces urban wage inequality for men, while it adds to wage inequality in the periphery. This brings new evidence to the policy debate about wage inequality and regional differentiation of public sector wages.

Section 2 presents the data and the econometric approach. The analysis of public sector wage compression is presented in section 3. Section 4 investigates geographic heterogeneity in wage inequality and estimates the city size effect on the sectoral wage premia. Section 5 offers short concluding remarks.

2. Data and econometric approach

To estimate the skill wage premium, we use register data on hourly wages and worker characteristics from 2001 to 2014. The dataset is computed from three administrative registers: employment, tax,

and education. The employment register links workers and firms and gives information on work contracts for all employees. It includes the duration of the contract, the type of contract[1], and the exact number of hours worked per week. We calculate the number of hours worked per year, which is combined with data on annual wage income from the tax register to give a measure of hourly wages for all employees. The education register covers the entire adult population and gives detailed information about workers' level of education. We also have information on the age, gender, immigrant status, industry affiliation, firm affiliation, and home region of all individuals.

We concentrate on native, full-time workers aged 25–55, holding at least a high school degree.[2] The dataset includes 6,668,634 observations and 1,001,104 different workers. The workers are allocated to 56 industries, 89 labor market regions, and approximately 190,000 firms. In the main analysis, we separate between two levels of education; high school degree and any college education with degree, and the analysis estimates the wage premium of college-educated workers relative to workers with high school education. To capture the geographic dimension of the wage gap, we separate between three region types: the larger Oslo area, other cities with at least 65,000 inhabitants in 2010, and the periphery.[3] The public sector consists of the three industries public administration, health care, and education, while the remaining 53 industries constitute the private sector.

Panels A and B of Table 1 report observable characteristics of male and female workers, respectively, both aggregate and separately for high school and college-educated workers. Among men, 43% are college educated, while almost 2/3 of female workers in the dataset have a college degree. Overall, 36% of male workers are employed in manufacturing (including construction), 44% in services, and

[1] The employment register separates between three contract types: full-time contracts with at least 30 hours of work per week, part-time contracts with 20–29 hours of work per week, and part-time contracts with fewer than 20 hours of work per week.

[2] We exclude workers in the primary industries (agriculture, fishing, and forestry), as well as workers without a high school degree. This gives a dataset of approximately 10.2 million worker-year observations. The tax register gives information on total annual earnings, rather than separate earnings for each work contract. Workers with more than two contracts during a year, as well as workers with one full-time and one part-time contract, are excluded. For workers with two full-time contracts, we allow for a maximum of three months of overlap between the contracts. We also exclude workers whose contract length is less than three months during a year. These restrictions reduce the dataset by about 1.5 million observations. Missing data on hours worked, annual earnings, level of education, or industry affiliation, together with exclusion of workers that change education level after entering the labor market as full-time employees, further excludes approximately 1.45 million observations. Workers with 1-2 years of higher education, but no degree, are also excluded (about 0.43 million observations). To avoid extreme observations, we exclude the top and bottom 1% of the wage distribution. This leaves a dataset of about 6.67 million observations.

[3] We apply the same definition of the larger Oslo area as in Bhuller (2009). It consists of 11 of the 89 labor market regions and has a total population of almost 1.5 million in 2010. Other cities (at least 65,000 inhabitants) include 15 regions and have an average population of 135,000. Lastly, the periphery consists of the remaining 63 regions, where the average population is about 20,000.

20% in the public sector. Among the college educated, the public sector share is higher (36%), while high school educated workers are relatively more likely to work in manufacturing. Female workers are overrepresented in the public sector with an overall employment share of 56%, which increases to 68% among the college educated. Women with high school education is relatively more likely to work in services. The geographic allocation of workers is roughly similar across men and women with 30-35% in Oslo, 42-44% in other cities, and 23-26% in the periphery. The share of workers located in Oslo is higher for the college educated than for workers with high school education, and the difference between the education groups is larger for men than for women. The share of workers in other cities is similar across education groups, while the share of workers in the periphery is higher among the low educated, especially for male workers.[4]

Table 1 about here

The longitudinal data at the individual level allows for investigation of heterogeneity of wage inequality. College wage premium relative to high-school education serves as measure of inequality. The education level of the workers is taken as given and is constant for all workers in the sample. The main heterogeneity addressed concern gender and geography. Identification of sectoral and regional wage differences is based on shifters between the private and the public sector and movers between regions. As seen from Table 2, there are 68,493 shifters (accounting for 7% of workers and 9% of observations) and 101,343 movers (10% of workers and 13% of observations).[5] Compared to workers that do not shift between sectors, shifters are more likely to live in Oslo and to be college-educated and female. Workers that move geographically are younger, less likely to work in manufacturing and more likely to be college-educated, compared to non-movers. The age distributions of shifters and movers (in the shift/move-year) are illustrated in Figure 1. The age of workers that shift between the private and the public sector is more equally distributed than the age of workers that move geographically, which is more concentrated to young workers.

Table 2 and Figure 1 about here

As discussed by Baum-Snow (2015), the main threat to identification is that unobservables are correlated with decisions – here change in sector of employment and migration between geographic

[4] Descriptive statistics within the private and the public sector are given in an online appendix available from the authors.

[5] Some workers shift between sectors or move between regions more than once, so in total, we have 82,577 sector shifts and 127,080 geographic moves.

areas. Positive unobserved personal shocks may be associated with shifting to the private sector and moving to a larger city. Omitted variables can play a role in the background. Baum-Snow and Pavan (2013) deal with the potential endogeneity of moves with the use of a structural model. Combes et al. (2012a) examine distributions of fixed effects in different cities in France and argue that selective migration is not a serious problem for the city size coefficients. The choice of private versus public sectors is less studied, but Rattsø and Stokke (2019) suggest an identification strategy correcting for the bias resulting from the heterogeneity of unobservable characteristics between public-private shifters and public stayers. In their analysis, shifters early in the period studied are compared with workers still in the public sector that shift later. Late shifters serve as counterfactual for early shifters to the private sector, and the findings indicate some overestimation due to positive selection of shifters to the private sector. In this analysis, we extend the identification based on shifters and movers by including firm quality.

The analysis starts by estimating the aggregate skill wage premium while allowing the premium to vary between the private and the public sector. We run a hedonic regression of individual hourly wages for the period 2001–2014 that controls for observable worker characteristics:

$$ln\, w_{irst} = \alpha_1 \cdot coll_i + \alpha_2 \cdot coll_i \cdot pub_{it} + \alpha_3 \cdot pub_{it} + X_{it}\beta + \gamma_t + \lambda_r + \eta_s + \varepsilon_{irst} \qquad (1)$$

where w_{irst} is the hourly wage income for worker *I* employed in industry *s* in region *r* in year *t*, $coll_i$ is a dummy that equals one if the worker is college educated, and pub_{it} is a dummy that equals one if the worker is employed in the public sector in year t. The vector of worker characteristics (X_{it}) includes controls for gender and age, while year, regional, and industry fixed effects are represented by γ_t, λ_r, and η_s, respectively. The error term is given by ε_{irst}. Due to limited overlap in occupations between the private and the public sector, as well as between low- and high-educated workers, the regression does not control for occupation fixed effects. The estimated college wage premium is given by the coefficient α_1 in the private sector and by $\alpha_1 + \alpha_2$ in the public sector. Relative wage compression in the public sector implies $\alpha_2 < 0$. The skill wage premiums are estimated both aggregate and separately for male and female workers.

To address selection into the private and public sectors based on unobserved abilities and account for differences in firm quality we extend the specification in equation (1) to include worker and firm fixed effects (μ_i and σ_{it}, respectively). In our dataset, workers do not change their level of education after entering the labor market as full-time employees and firms do not change between the private and

the public sector. This implies that the regression with fixed effects can only estimate the interaction term between the dummies for college education and public sector employment:

$$ln\, w_{irst} = \alpha_2 \cdot coll_i \cdot pub_{it} + X_{it}\beta + \gamma_t + \lambda_r + \eta_s + \mu_i + \sigma_{it} + \varepsilon_{irst} \quad (2)$$

In this case, the identification is based on workers shifting between the private and the public sector during the period of study. The coefficient α_2 represents the additional college premium received in the public sector compared to the private sector and a negative estimate implies public sector wage compression. By comparing the estimated coefficients for the interaction term with and without worker fixed effects, we can shed some light on the selection into the private sector for different education groups and for men versus women. To formally test for the degree of selection bias, we apply the method of Combes et al. (2012b) to compare worker fixed effects distributions for workers in the private and the public sector for each gender-education group.

Handling selection based on unobservables is a challenge in an analysis of private and public sector workers. Wages in the private sector are determined by market forces and are assumed to reflect productivity differences across gender, education groups and cities. The estimates of worker fixed effects measure unobserved ability of workers influencing their productivity. Public sector wages are determined in processes under political control and in addition the productivity of public services is hard to evaluate given that they are not sold at the market. There is no clear relationship between wages and productivity in the public sector. The estimated worker fixed effects for public sector workers are understood as an approximation of their ability.

We extend the specification in equation (2) to allow for geographic heterogeneity in skill wage premiums:

$$\begin{aligned} ln\, w_{ist} = {} & \alpha_2 \cdot coll_i \cdot pub_{it} + \textstyle\sum_{k=1}^{2}((\alpha_{3,k} + \alpha_{4,k} \cdot pub_{it}) \cdot coll_i \cdot city_{k,it}) \\ & + \textstyle\sum_{k=1}^{2}\big(\alpha_{5,k} + \alpha_{6,k} \cdot pub_{it}\big) city_{k,it} + X_{it}\beta + \gamma_t + \eta_s + \mu_i + \sigma_{it} + \varepsilon_{ist} \end{aligned} \quad (3)$$

where $city_{1,it}$ and $city_{2,it}$ are dummy variables that equal one if the worker is located in the larger Oslo area and in other cities, respectively.[6] The periphery regions act as the reference category. With

[6] Since the specification includes firm fixed effects, the coefficients on the city dummies and the interaction terms between city dummies and the public dummy ($\alpha_{5,k}$ and $\alpha_{6,k}$, respectively) are identified from individuals who work in the same firm but live in different geographic areas. These coefficients are not reported in the result section and do not affect the estimated skill wage premiums.

this specification, we can estimate the skill wage premiums across the three region types, while allowing for separate effects in the private and the public sector.

The reference category is the college wage premium for private sector workers in the periphery. For periphery regions, the additional skill premium received in the public sector compared to the private sector is given by α_2. The geographic variation in the skill premium follows from the estimated coefficients. The additional skill premium for private sector workers in the larger Oslo area and in other cities (compared to the periphery) are given by $\alpha_{3,1}$ and $\alpha_{3,2}$, respectively. For public sector workers, the additional college wage premium received in the larger Oslo area and in other cities are given by $\alpha_{3,1} + \alpha_{4,1}$ and $\alpha_{3,2} + \alpha_{4,2}$, respectively. It follows that the additional skill premium received in the public sector compared to the private sector is given by $\alpha_2 + \alpha_{4,1}$ and $\alpha_2 + \alpha_{4,2}$ in the larger Oslo area and in other cities, respectively. If $\alpha_{4,1} \neq 0$ and/or $\alpha_{4,2} \neq 0$, the difference in skill wage premiums across sectors has a regional dimension and there is spatial variation in the degree of public sector wage compression. To allow for heterogeneity among periphery regions, we also apply a specification that separates between four region types: the larger Oslo area, other cities, periphery regions with well-developed private labor markets, and periphery regions dominated by the public sector.

3. Public sector wage compression – sources and gender differences

Private and public sectors have different wage systems and private-public wage gaps vary across countries dependent on policy design, industrial structure, and labor markets institutions. The main stylized fact is that the public sector has relative wage compression as referred to in the introduction. Based on this observation, the common understanding is that the public sector contributes to wage equality. See interesting discussions by Dickson et al. (2014), Hausmann et al. (2020), and Lausev (2014).

The public sector is held accountable for labor market practices and open democratic states can hardly avoid the principle of equal pay for equal work. The achievements vary, but the pressure is clearly in this direction. At the political level, public sector wage policies are oriented towards equality – raising wages at the bottom of the wage distribution and holding back at the top. Lower wages for the high educated in public versus private sectors are observed in many countries. Hausmann et al. (2020) and Hospido and Moral-Benito (2016) address skill and education in private-public comparisons. In the private sector, wages are determined in a combination of market determination and bargaining

between employers and unions, with large differences in institutional setups and strengths among involved interests. It should be taken into account that full welfare differences of private and public contracts are hard to measure, and the observed wage differences can be understood as compensating differentials for other aspects of the employment conditions, notably job risk and pension systems. Dickson et al. (2014) attempt to do a broader comparison, but we limit ourselves to wages here.

Consistent with most of the literature, we measure wage inequality by the college wage premium and estimate the degree of public sector wage compression by separating private and public sectors, as described by equations (1) and (2) in section 2. The estimation is based on about 6.67 million observations of private and public sector workers during 2001–2014. The results are given in Table 3, for all workers in panel A and separately for men and women in panels B and C, respectively. Relative compression of public sector wages implies lower college wage premium in the public compared to the private sector. Without controlling for any worker characteristic, the skill wage premium is 24.5% and 20% in the private and the public sector, respectively (column 1). Public sector wage compression is present in the raw data for both male and female workers, although much stronger for men. The raw unadjusted male skill premium is 12%-points lower in the public compared to the private sector, while the sectoral difference is only 2%-points for female workers. This is consistent with the observations of Card et al. (2020) for the US and Canada.

Table 3 about here

Introducing observable controls and capturing unobservables by worker and firm fixed effects, we find that these factors fully explain the raw differences in skill premiums in the private and public sectors. There is no significant difference in adjusted skill premium between private and public sectors for male workers in Norway, while for women, the adjusted skill premium is relatively higher in the public sector. The analysis is documented in columns (2) – (6) of Table 3, where we gradually extend the controls for worker characteristics to identify the true degree of relative wage compression between sectors.

Starting out from the raw unadjusted sectoral difference in male college wage premium of 11.7 percentage points, controlling for age in column (2) does not affect the gap much. The additional effect of regional fixed effects in column (3) reduces the difference in sectoral skill wage premiums to 9.4 percentage points. If college-educated workers are relatively more likely to work in cities (where

wages are higher), the unadjusted skill premium is too high. This is the case in the private sector, where 42.5% of college-educated men work in the larger Oslo area compared to only 23.6% of high school educated men. In the public sector, the difference in the urban-rural location between low- and high-educated workers is much less (the share of workers in the larger Oslo area is 31.4% and 26.4% for the college and high school educated, respectively). In column (4), we account for potential industry differences between low- and high-educated workers by controlling for industries within the private sector. This further reduces the difference between sectors, and the skill wage premium is now 5 percentage points lower in the public compared to the private sector. This implies that college-educated male workers are more likely to be employed in high-wage private industries compared to workers with high school education.

In columns 5 and 6 we account for unobservables captured by worker and firm fixed effects, interpreted as worker ability and firm quality. The results with worker fixed effects in column (5) show that the difference in ability between high- and low-educated workers is larger in the private than in the public sector. This contributes to the public sector wage compression. Taking into account that high-ability college-educated men are more likely to self-select into the private sector (relative to high-ability high school educated men) reduces the sectoral difference in the skill wage premium to 2.1 percentage points. Firm quality is accounted for in column (6). If the college educated are relatively more likely to work in high-quality firms, the skill wage premium is overestimated when firm fixed effects are not included. We find that the difference in firm quality between college and high school educated workers is larger in the private than in the public sector. Failing to account for unobserved firm quality overestimates the degree of public sector wage compression. As seen from column (6), this factor eliminates the rest of the difference in wage compression for male workers between private and public sectors.

For female workers, the public sector wage compression in the raw data is much smaller than for men. The skill wage premium is 2.2 percentage points lower in the public compared to the private sector. Inclusion of region and industry fixed effects decreases the relative wage compression in the public sector. College-educated women in the private sector are more likely to work in cities (compared to high school educated women), while in the public sector, the city share varies less across low- and high-educated women. Also, college-educated women are overrepresented in high-wage private industries. Taken together, this gives an estimated skill wage premium that is 3.2 percentage points *higher* in the public compared to the private sector for female workers. Controlling for worker fixed effects reduces the additional premium in the public sector to 1.5 percentage points. Compared to

high-ability high school educated women, high-ability college-educated women are more likely to self-select into the public sector, contrary to the findings for men. Failing to control for worker fixed effects will in this case underestimate the degree of relative wage compression in the public sector. Including firm fixed effects reveals that the difference in firm quality between college and high school educated workers is somewhat larger in the private than in the public sector. In the preferred specification, the skill wage premium is 2.1 percentage points higher in the public compared to the private sector (significant at 1% level). The public sector contributes to larger inequality among women.[7]

The degree of selection into the private sector is investigated by comparing worker fixed effects distributions for private and public sector workers. The fixed effect of each worker is related to the sector where the worker is employed in 2014 or the last year available in the dataset. Figure 2 compares the worker fixed effects distributions across sectors for four worker groups defined by gender and level of education. To formally test for the degree of selection bias, the distribution of worker fixed effects in the private sector is approximated by taking the distribution of worker fixed effects for public sector workers, shifting it by an amount *A*, and dilating it by a factor *D*. Table 4 reports the estimated shift parameters for the different worker groups. For college-educated men, the ability distribution of private sector workers lies 0.053 units to the right of the ability distribution of public sector workers and the difference between the two distributions is significant at the 1% level. For high school educated men, the estimated shift parameter is much lower (0.018) and is not significant at the conventional 5% level. This implies that high-ability college-educated men are much more likely to sort into the private sector than high-ability high-school educated men. For women, we find the opposite pattern. The degree of selection into the private sector is lower (and less statistically significant) for college-educated than for high-school educated workers, with estimated shift parameters of 0.027 and 0.037, respectively. These findings are consistent with the estimates in Table 3, where worker selection into the private sector based on unobserved ability explains part of the observed public sector wage compression for men, while for women, it contributes to more dispersed

[7] In Table 3, the coefficients in columns (5) and (6) are identified based on workers that shift between the public and the private sector, while the first four columns are based on all workers. Shifters are overrepresented in public administration and underrepresented in the health care industry and to some extent in the education industry. Public administration accounts for 25% of public sector workers and as much as 43% of the shifters. The health care industry accounts for almost half the workers in the public sector, while only a third of the shifters go to or from this industry. This implies that the health care industry contributes relatively more to the estimations in columns (1) – (4) than in columns (5) – (6). To check if this affects our findings with respect to selection into the private sector, we re-estimate the wage regressions in Table 3 with workers in health care and education excluded. The results are documented in the online appendix and show that the degree of public wage compression is about 2 percentage points higher, both in the raw data and in the final estimation controlling for observable and unobservable characteristics. Importantly, by comparing the estimated coefficients with and without worker fixed effects, we find that the selection bias due to unobserved worker ability has opposite signs for male and female workers, as in Table 3.

wages in the public sector. Without controlling for worker fixed effects, the degree of relative wage compression in the public sector is overestimated for male workers and underestimated for female workers.[8]

Table 4 and Figure 2 about here

4. Geographic heterogeneity in public sector wage compression

To capture the geographic dimension of wage inequality, we separate between the larger Oslo area, other cities, and periphery regions. The skill wage premium is allowed to vary across both regions and private-public sectors, as described by equation (3) in section 2. The differences in skill premiums are identified based on movers between the geographic regions and shifters between private and public sectors. The results are documented in panel A of Table 5, separating between men and women.

We start out with the estimated city-size wage inequality premium in the private sector. The skill wage premium for men in the larger Oslo area is 3.4 percentage points higher than in the periphery (second row, column 1). The additional premium in other cities is 1.2 percentage points. Female private sector workers with college education have 2.3 and 1.2 percentage points higher premium in the larger Oslo area and in other cities, respectively, compared to the periphery (column 3, second and fourth row). It follows that the city-size wage inequality premium in the private sector is present for both men and women. The geographic effect can be related to the background urban wage premia. As documented by Carlsen et al. (2016), the wage gain in cities increases with workers' level of education. The estimates of skill wage premiums in the public sector indicate a different wage setting influencing both regional and gender variation. The skill wage premium for men in the public sector is 1.5 percentage points lower in Oslo than in the periphery (0.034-0.049 in rows 2 and 3, column 1). The lower skill premium reflects that public sector wages are more compressed in cities than in the periphery. For female public sector workers, the skill wage premium varies less between geographic areas, but tend to be relatively higher in cities (0.5 percentage points higher in Oslo than in the periphery).

Table 5 about here

[8] In the online appendix, we offer a comparison of ability distributions across education groups. The findings indicate opposite effects of selection on relative wage inequality for male and female workers, consistent with the results in Tables 3 and 4.

Based on the estimated coefficients in panel A, we can compare the degree of wage compression in the private and the public sector along the geographic dimension. Panel B of Table 5 sums up the additional skill wage premiums offered in the public compared to the private sector for the different geographic areas (Oslo, other cities, periphery). A negative value results when the skill premium is lower in the public than the private sector. The finding is that geography matters for wage inequality, in particular among male workers. For men, the aggregate result in column (6) of Table 3 of similar skill wage premium across sectors hides important geographic heterogeneity. As seen from the first column, the additional premium in the public sector is negative and significant in the larger Oslo area (-2.2 percentage points), while it is positive and significant in other cities and in the periphery (1.3 and 2.7 percentage points, respectively). For women, the result shows that the positive additional premium in the public sector found in column (6) of Table 3, holds in all regions. The estimated effect is decreasing with urbanization – from 3.1 percentage points in the periphery to 1.3 percentage points in the larger Oslo area, shown in column (3). Our findings imply that the public sector reduces urban wage inequality for men, while increasing female wage inequality, in particular in the periphery. Public sector wage compression is a male phenomenon and only prevalent in large cities.[9] [10]

Since geographic mobility is higher among workers early in their career (documented in Figure 1), we study whether the geographic heterogeneity in public sector wage compression varies with the age of workers. We separate between young workers (aged 25-32) and old workers (aged 33-55). Young workers account for 26% of the observations, 52% of geographic moves and 26% of sector shifts. The finding that the public sector increases wage inequality among women is driven by workers in their early career (see estimates in Table 6). For young female workers, the college wage premium is much higher in the public than the private sector, from 4 – 5 percentage points sector difference in Oslo and other cities to 9 percentage points in the periphery, all significant at the 1% level. For women later in

[9] As a check of robustness, we exclude the shift- and move-year of shifters and movers, respectively. The wage in the shift-year could represent a mix of private and public sector wages (depending on when during the year the worker changed sector). Similar, the wage in the move-year could be a mix of wages at two different geographic locations. However, since our focus is on the relative wage between high-school and college-educated workers, the corresponding measurement error is likely to be small. The re-estimations given in the online appendix show that the main findings remain. Public sector wage compression is a male phenomenon only prevalent in large cities, while public wages raise inequality outside cities.

[10] The regressions in Table 5 control for worker selection based on unobserved ability into the private sector and into large cities. By comparing regressions with and without worker fixed effects, we can study the degree of selection bias. In section 3, we find opposite effects for male and female workers regarding selection into the private sector. This gender difference in selection bias with respect to sector of employment are found in all region types, although the self-selection of high-ability college-educated women into the public sector (relative to high-ability high school educated women) is weaker in Oslo than in other cities and in the periphery. Further, we find that high-ability workers sort into large cities, and the degree of selection is stronger for college educated than for high school educated workers. This holds for both genders and in both sectors.

their career, there is no significant difference in skill premiums across sectors. This indicates that the public sector bid up wages to recruit high-educated female workers in the early stages of their career. For men, public sector wage compression in large cities is confirmed for both young and old workers, while relatively higher public sector skill premium in the periphery mainly applies to male workers early in their career, similar to women.

Table 6 about here

As an alternative regional classification, we separate out the three largest cities from the 'Other city' group (Bergen, Stavanger, Trondheim) to check whether they show signs of relative public sector wage compression for male workers, as in the larger Oslo area. The 'Other city' group is now divided into 'Top 3 other cities' (average population of 300,000) and small cities (average population of 95,000), while the larger Oslo area and the periphery are defined as before. The results are documented in the online appendix. The main finding is that relatively more compressed male wages in the public sector is only seen in the largest urban area (Oslo) and not in other large cities. There is no significant difference in the degree of relative wage compression within the 'Other city' group. For women, the skill premium is relatively higher in the public sector for all region groups and the estimated effect is decreasing with urbanization. While small cities have additional premium in the public sector of 3.8 percentage points (comparable to the magnitude in the periphery), the three large cities outside Oslo have an estimated additional public sector skill premium of 1.6 percentage points (similar to the effect in Oslo).

In a further analysis of the geographic dimension, we investigate the heterogeneity of periphery labor markets. In regions with less developed private industries, the public sector tends to dominate the local labor market, while the richer parts of the periphery enjoy economic growth driven by private industries. We distinguish between two types of peripheral labor markets based on the intensity of the public sector. Periphery regions where the public sector accounts for more than 40% of employment are defined as having high public sector presence. Columns (2) and (4) of Table 5 document the results. For female workers, the skill wage premium is higher in the public than the private sector in all regions. The additional premium in the public sector is highest in periphery regions where the public sector dominates (3.7 percentage points), but the difference between the two types of periphery regions is not significant. Interestingly, for male workers, the higher skill premium in the public sector in the periphery is entirely driven by periphery regions with high public sector presence (where the skill premium is 4 percentage points higher in the public compared to the private sector), while in periphery regions with low public employment share, there is no significant difference in male

skill premiums across sectors. In periphery regions with high public sector presence, the public sector contributes to higher wage inequality for both men and women.

As a check of robustness, we divide the college educated into workers with 3-4 years of college education ('college-only') and postgraduates (more than 4 years of higher education) and estimate the skill premium (relative to workers with high school education) for both groups. Among male college-educated workers, about 1/3 have a postgraduate degree (in both sectors). For women, the share of postgraduates is 23% overall and somewhat higher in the private than the public sector. As seen from Table 7, the main findings remain. Relative public sector wage compression only applies to male workers in large cities and the effect is stronger for postgraduates than for workers with 'college-only' (estimated coefficients of -0.039 and -0.01, respectively). For female workers, the skill premium is relatively higher in the public sector in most cases. The only exception is for postgraduates in Oslo, where there is no significant difference in the skill premium between the two sectors.

Table 7 about here

5. Concluding remarks

The contribution of this analysis is to investigate the role of public sector wages for wage inequality. The broad finding is that public sector wage compression is a male phenomenon and only prevalent in large cities. Wage setting for female workers in the public sector leads to increasing wage inequality in all regions, particularly in the periphery. Selection with respect to sector, geography and firms must be taken into account to understand how public wages affect wage inequality.

The results motivate further analysis of urban wage inequality combining the influence of labor markets and agglomeration effects. The background of the variation in agglomeration effects across education groups is not well known. Another area worth further study is the wage policy of governments. Our evidence shows that in the periphery, the skill premium is larger in the public sector compared to the private sector. It is of interest to understand more of the handling of regional wage and price variation for different education groups within the public sector. At the regional level, general equilibrium adjustments are expected in the interaction of private and public sector labor markets. We do not pursue such mechanisms here, but promising frameworks for future work is the structural model of Bradley et al. (2017) on public wages and the empirical analyses of private-public labor market interaction by Domeij and Ljungqvist (2019) and Faggio and Overman (2014).

References

Acemoglu, Daron, and David Autor. 2011. Skills, tasks and technologies: Implications for employment and earnings. *Handbook of Labor Economics*. Vol. 4B, Elsevier BV.

Autor, David. 2014. Skills, education, and the rise of earnings inequality among the "other 99 percent". *Science* 344(6186): 843-850.

Bargain, Oliver, and Blaise Melly. 2008. Public sector pay gap in France: New evidence using panel data. IZA Discussion Papers 3427.

Bargain, Oliver, Audrey Etienne, and Blaise Melly. 2018. Public sector wage gaps over the long run: Evidence from Panel Administrative data. IZA Discussion Paper No. 11924.

Bastos, Paulo, Natalia P. Monteiro, and Odd Rune Straume. 2014. The effect of private versus public ownership on labour earnings. *Oxford Economic Papers* 66(4): 983-1005.

Baum-Snow, Nathaniel. 2015. Causal inference in urban and regional economics. *Handbook of Regional and Urban Economics*. Vol. 5A, Elsevier BV.

Baum-Snow, Nathaniel, and Ronni Pavan. 2013. Inequality and city size. *Review of Economics and Statistics* 95(5): 1535-1548.

Baum-Snow, Nathaniel, Matthew Freedman, and Ronni Pavan. 2018. Why has urban inequality increased? *American Economic Journal: Applied Economics* 10(4): 1-42.

Bhuller, Manudeep. 2009. Division of Norway into labor market regions. Statistics Norway, 2009/24 (in Norwegian).

Bradley, Jake, Fabien Postel-Vinay, and Helene Turon. 2017. Public sector wage policy and labor market equilibrium: A structural model. *Journal of the European Economic Association* 15(6): 1214-1257.

Carlsen, Fredrik, Jørn Rattsø, and Hildegunn E. Stokke. 2016. Education, experience, and urban wage premium. *Regional Science and Urban Economics* 60(1): 39-49.

Campos, Maria, and Mario Centeno. 2012. Public-private wage gaps in the period prior to the adoption of the Euro: An application based on longitudinal data. Working Papers 1, Banco de Portugal, Economics and Research Department.

Card, David, Thomas Lemieux and W. Craig Riddell. 2020. Unions and wage inequality: The roles of gender, skill and public sector employment. *Canadian Journal of Economics* 53 (1) : 140-173.

Combes, Pierre-Philippe, Gilles Duranton, Laurent Gobillon, and Sebastien Roux. 2012a. Sorting and local skill and wage distributions in France. *Regional Science and Urban Economics* 42(6): 913-930.

Combes, Pierre-Philippe, Gilles Duranton, Laurent Gobillon, Diego Puga, and Sebastien Roux. 2012b. The productivity advantage of large cities: Distinguishing agglomeration from firm selection. *Econometrica* 80(6): 2543-2594.

De Fraja, Gianni. 1993. Union and wages in public and private firms: a game theoretic analysis. *Oxford Economic Papers* 45: 457-469.

Dickson, Matt, Fabien Postel-Vinay, and Helene Turon. 2014. The lifetime earnings premium in the public sector: The view from Europe. *Labour Economics* 31: 141-161.

Domeij, David, and Lars Ljungqvist. 2019. Public sector employment and the skill premium: Sweden versus the United States 1970-2012. *Scandinavian Journal of Economics* 121 (1): 3-31.

Faggio, Giulia, and Henry Overman. 2014. The effect of public sector employment on local labour markets. *Journal of Urban Economics* 79: 91-107.

Finan, Frederico, Benjamin A. Olken, and Rohini Pande. 2017. The Personnel Economics of the Developing State. *Handbook of Economic Field Experiments*. Vol. 2, Elsevier BV.

Glaeser, Edward, Matt Resseger, and Kristina Tobio. 2009. Inequality in cities. *Journal of Regional Science* 49(4): 617-646.

Hausmann, Ricardo, Ljubica Nedelkoska, and Sehar Noor. 2020. You get what you pay for: Sources and consequences of the public sector premium in Albania and Sri Lanka. Center for International Development at Harvard University, Working Paper No. 376.

Hospido, Laura, and Enrique Moral-Benito. 2016. The public sector wage premium in Spain: Evidence from longitudinal administrative data. *Labour Economics* 42, 101-122.

Lausev, Jelena. 2014. What has 20 years of public-private pay gap literature told us? Eastern European transitioning vs. developed economies. *Journal of Economic Surveys* 28(3): 516-550.

Leknes, Stefan, Jørn Rattsø, and Hildegunn E. Stokke. 2022. Assortative labor matching, city size, and the education level of workers. *Regional Science and Urban Economics* 96, 103806.

Lindley, Joanne, and Stephen Machin. 2014. Spatial changes in labour market inequality. *Journal of Urban Economics* 79: 121-138.

Moretti, Enrico. 2013. Real wage inequality. *American Economic Journal: Applied Economics* 5(1): 65-103.

Postel-Vinay, Fabien, and Helen Turon. 2007. The public pay gap in Britain: Small differences that (don't?) matter. *The Economic Journal* 117:523, 1460-1503.

Rattsø, Jørn, and Hildegunn E. Stokke. 2019. Identification of the private-public wage gap. *Labour Economics* 59: 153-163.

Figure 1. Age distributions: Shifters and movers

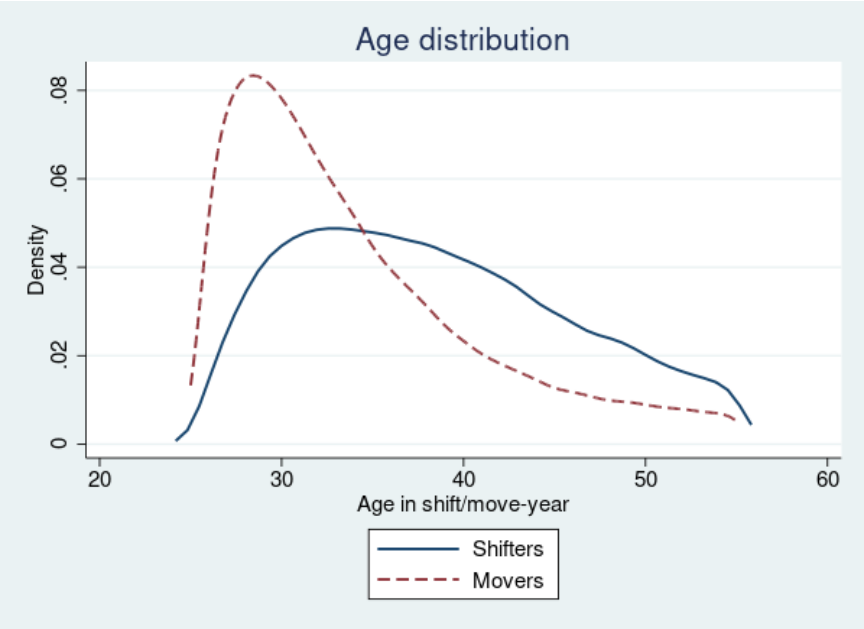

Figure 2. Worker fixed effects distributions: Private vs. public sector

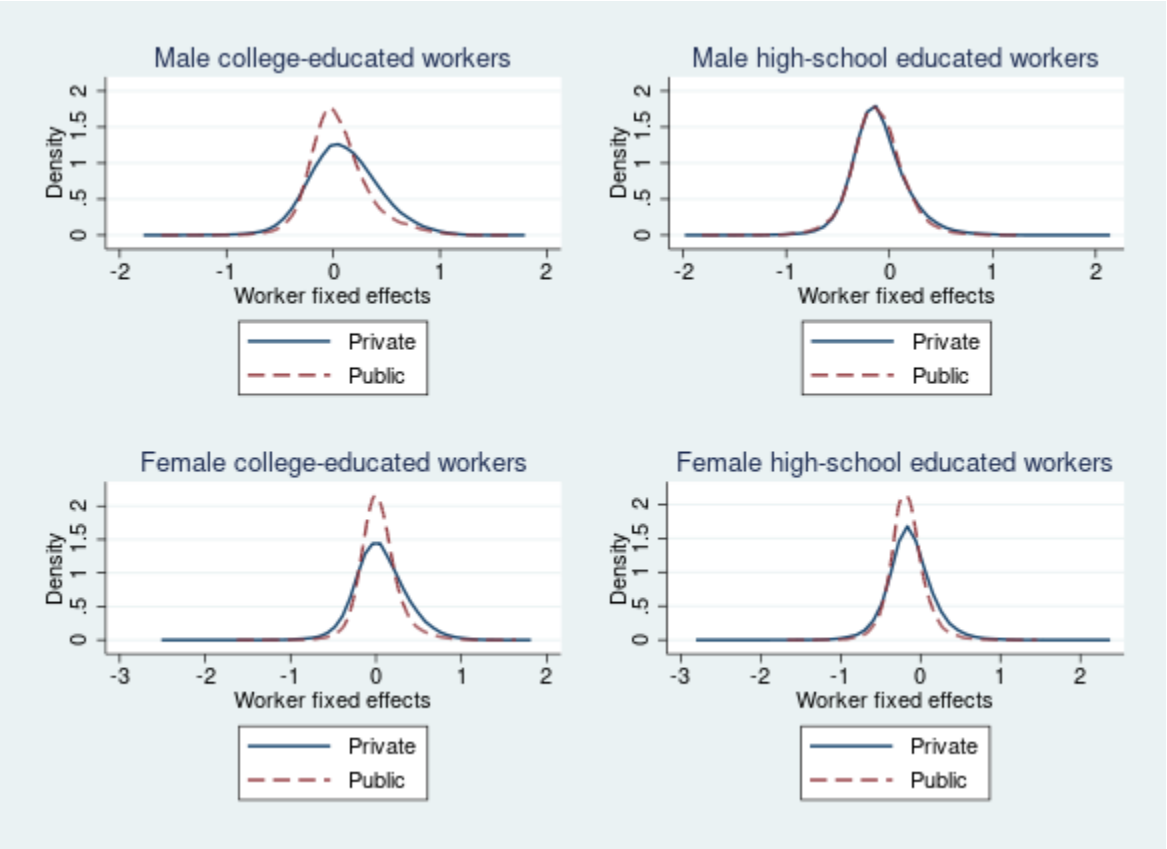

Table 1. Descriptive statistics (mean values) by gender and level of education

	ALL	HIGH SCHOOL	COLLEGE
Panel A: MEN			
Log hourly wage (in 2010 NOK)	5.58	5.49	5.69
Age	39.3	39.2	39.5
Sector of employment:			
Manufacturing	0.362	0.487	0.192
Services	0.441	0.434	0.451
Public	0.197	0.079	0.357
Location:			
Larger Oslo area	0.301	0.238	0.386
Other cities	0.436	0.446	0.422
Periphery	0.263	0.316	0.192
Periphery with low public employment share	0.153	0.191	0.103
Periphery with high public employment share	0.11	0.125	0.089
No. of observations	3,922,562	2,255,650	1,666,912
Share of observations		0.575	0.425
Panel B: WOMEN			
Log hourly wage (in 2010 NOK)	5.40	5.27	5.47
Age	39.1	39.4	38.9
Sector of employment:			
Manufacturing	0.099	0.151	0.071
Services	0.341	0.516	0.246
Public	0.56	0.333	0.683
Location:			
Larger Oslo area	0.355	0.32	0.374
Other cities	0.415	0.426	0.409
Periphery	0.23	0.254	0.217
Periphery with low public employment share	0.123	0.142	0.112
Periphery with high public employment share	0.107	0.112	0.105
No. of observations	2,746,072	968,746	1,777,326
Share of observations		0.353	0.647

Notes: The dataset covers native, full-time workers aged 25–55 during 2001–2014. We separate between workers holding a high school degree and workers with college education. Sectors of employment include manufacturing (including construction), private service industries, and the public sector (public administration, health care, and education). The geographic dimension separates between the larger Oslo area (consisting of 11 labor market regions), other cities with at least 65,000 inhabitants in 2010 (15 regions), and the periphery (the remaining 63 regions). We further distinguish between two types of periphery regions based on the intensity of the public sector. Periphery regions where the public sector accounts for more than 40% of employment are defined as having high public sector presence (applies to 27 of the 63 periphery regions).

Table 2. Descriptive statistics (mean values) for shifters/non-shifters and movers/non-movers

	SECTOR OF EMPLOYMENT		GEOGRAPHIC LOCATION	
	Shifters	Non-shifters	Movers	Non-movers
Log hourly wage (in 2010 NOK)	5.47	5.51	5.53	5.5
Age	38.3	39.3	35.3	39.8
Male	0.531	0.594	0.609	0.585
High school education	0.353	0.496	0.312	0.508
College education	0.647	0.504	0.688	0.492
Sector of employment:				
Manufacturing	0.131	0.265	0.196	0.262
Services	0.395	0.4	0.425	0.396
Public	0.474	0.334	0.379	0.342
Location:				
Larger Oslo area	0.385	0.317	0.339	0.321
Other cities	0.399	0.43	0.387	0.433
Periphery	0.216	0.253	0.274	0.246
No. of workers	68,493	932,611	101,343	899,761
Share of workers	0.068	0.932	0.101	0.899
No. of observations	592,229	6,076,405	840,941	5,827,693
Share of observations	0.089	0.911	0.126	0.874

Notes: *Shifters* refers to workers that shift between the private and the public sector at least once during the period of study, while *Movers* refers to workers that move between two of the region types (Larger Oslo area, Other cities, Periphery). The values for hourly wage, age, sector of employment and resident location refer to the average over the period of study, while other variables are constant over time.

Table 3. Sources of public sector wage compression

	ln *w* (1)	ln *w* (2)	ln *w* (3)	ln *w* (4)	ln *w* (5)	ln *w* (6)
Panel A: ALL WORKERS						
College	0.245***	0.269***	0.242***	0.201***		
	(0.0009)	(0.0009)	(0.0008)	(0.0009)		
College x Public	-0.046***	-0.056***	-0.039***	0.002	-0.004	0.014***
	(0.0014)	(0.0012)	(0.0012)	(0.0012)	(0.0025)	(0.0024)
Public	-0.191***	-0.137***	-0.132***	-0.16***	-0.078***	
	(0.001)	(0.001)	(0.001)	(0.0015)	(0.0022)	
Obs.	6,668,634	6,668,634	6,668,634	6,668,634	6,668,634	6,535,737
R^2	0.17	0.25	0.28	0.34	0.25	0.20
Panel B: MALE WORKERS						
College	0.27***	0.272***	0.244***	0.2***		
	(0.0011)	(0.001)	(0.0011)	(0.0011)		
College x Public	-0.117***	-0.112***	-0.094***	-0.05***	-0.021***	0.003
	(0.0021)	(0.0021)	(0.0021)	(0.0022)	(0.0033)	(0.0034)
Public	-0.092***	-0.112***	-0.108***	-0.128***	-0.072***	
	(0.0017)	(0.0017)	(0.0017)	(0.0022)	(0.0029)	
Obs.	3,922,562	3,922,562	3,922,562	3,922,562	3,922,562	3,852,930
R^2	0.17	0.21	0.24	0.32	0.29	0.24
Panel C: FEMALE WORKERS						
College	0.252***	0.265***	0.24***	0.198***		
	(0.0015)	(0.0015)	(0.0014)	(0.0014)		
College x Public	-0.022***	-0.025***	-0.01***	0.032***	0.015***	0.021***
	(0.0018)	(0.0017)	(0.0017)	(0.0017)	(0.0036)	(0.0039)
Public	-0.131***	-0.145***	-0.136***	-0.173***	-0.083***	
	(0.0012)	(0.0012)	(0.0012)	(0.0024)	(0.0036)	
Obs.	2,746,072	2,746,072	2,746,072	2,746,072	2,746,072	2,671,529
R^2	0.18	0.21	0.23	0.28	0.19	0.16
Year FEs	*v*	*v*	*v*	*v*	*v*	*v*
Age/gender		*v*	*v*	*v*	*v*	*v*
Regional FEs			*v*	*v*	*v*	*v*
Industry FEs				*v*	*v*	*v*
Worker FEs					*v*	*v*
Firm FEs						*v*

Notes: The dependent variable is log hourly wages. The industry fixed effects are based on industries within the private sector, which means that in columns (4) and (5), the coefficient on the 'Public' dummy (not in interaction terms) refers to wages in the public sector relative to the reference industry in the private sector ('wholesale trade') for high school educated workers. In columns (5) and (6), the R^2 reported is within workers. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table 4. Comparison of worker fixed effects distributions across sectors

	Shift ($\hat{A}$)	R^2	Obs.
Panel A: MEN			
Private vs. public sector, college-educated workers	0.053***	0.815	210,172
	(0.0121)		
Private vs. public sector, high school educated workers	0.018*	0.513	288,153
	(0.0106)		
Panel B: WOMEN			
Private vs. public sector, college-educated workers	0.027*	0.934	251,278
	(0.0139)		
Private vs. public sector, high school educated workers	0.037**	0.959	137,562
	(0.0156)		

Notes: The distribution of worker fixed effects for private sector workers is approximated by taking the distribution of worker fixed effects for public sector workers, shifting it by an amount *A* and dilating it by a factor *D*. The estimation is done separately for each education-gender group. The table reports the estimated shift parameters, while the estimated dilation parameters are available upon request. Bootstrapped standard errors are given in parenthesis (re-estimating worker fixed effects in 100 bootstrapped iterations based on 10% random samples with replacement). The methodology is developed and explained by Combes et al. (2012b). ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table 5. Geographic heterogeneity in public sector wage compression

	MEN		WOMEN	
	(1)	(2)	(3)	(4)
Panel A: Wage regressions by gender				
College x Public	0.027***	0.04***	0.031***	0.037***
	(0.0051)	(0.0067)	(0.0069)	(0.0097)
College x Oslo	0.034***	0.034***	0.023***	0.027***
	(0.0036)	(0.0047)	(0.0063)	(0.0085)
College x Oslo x Public	-0.049***	-0.062***	-0.018**	-0.025**
	(0.0063)	(0.0076)	(0.0081)	(0.0106)
College x Other city	0.012***	0.012***	0.012**	0.016*
	(0.003)	(0.0044)	(0.0059)	(0.0083)
College x Other city x Public	-0.014***	-0.027***	-0.004	-0.011
	(0.0057)	(0.0072)	(0.0077)	(0.0104)
College x Periphery low		-0.001		0.006
		(0.0051)		(0.0098)
College x Periphery low x Public		-0.031***		-0.013
		(0.009)		(0.0125)
Obs.	3,852,930	3,852,930	2,671,529	2,671,529
R^2	0.24	0.24	0.16	0.16
Panel B: Summing up the geographic heterogeneity in public sector wage compression				
	Additional premium in the public sector			
Larger Oslo area	-0.022***	-0.022***	0.013**	0.012**
	(0.005)	(0.005)	(0.0054)	(0.0054)
Other cities	0.013***	0.013***	0.027***	0.026***
	(0.0043)	(0.0043)	(0.0054)	(0.0054)
Periphery	0.027***		0.031***	
	(0.0051)		(0.0069)	
Periphery with low public		0.009		0.024***
employment share		(0.0069)		(0.009)
Periphery with high public		0.04***		0.037***
employment share		(0.0067)		(0.0097)

Notes: Panel A documents wage regressions by gender. The dependent variable is log hourly wages. All regressions include year, industry, worker and firm fixed effects, as well as controls for age. In columns (1) and (3), the reference category is all periphery regions, while in columns (2) and (4), the reference category is periphery regions with high public sector presence (the public sector accounts for more than 40% of employment). The variable 'Periphery low' refers to the remaining periphery regions with public employment share below 40 percent. The R^2 reported is within workers. Based on the estimated coefficients in Panel A, the geographic heterogeneity in public sector wage compression is summed up in Panel B. It gives the additional college wage premium offered in the public sector compared to the private sector for different region types. Columns (1) and (3) separate between the larger Oslo area, other cities and the periphery, while in columns (2) and (4), periphery regions are divided into two groups based on the intensity of the public sector. A negative value implies that the skill wage premium is lower in the public sector, consistent with public sector wage compression. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table 6. Geographic heterogeneity in public sector wage compression: Young vs. old workers

	Young workers		Old workers	
	MEN	WOMEN	MEN	WOMEN
	(1)	(2)	(3)	(4)
Panel A: Wage regressions for young and old workers, by gender				
College x Public	0.047***	0.09***	0.013*	-0.001
	(0.0121)	(0.0172)	(0.0065)	(0.0096)
College x Oslo	0.055***	0.044***	0.006	0.003
	(0.0057)	(0.0103)	(0.0052)	(0.0101)
College x Oslo x Public	-0.066***	-0.046***	-0.027***	0.001
	(0.0119)	(0.0173)	(0.0083)	(0.0112)
College x Other city	0.017***	0.035***	-0.003	0.000
	(0.0047)	(0.0099)	(0.0044)	(0.0092)
College x Other city x Public	-0.017	-0.041**	-0.004	0.01
	(0.0113)	(0.0167)	(0.0075)	(0.0108)
Obs.	934,367	659,295	2,865,879	1,964,354
R^2	0.16	0.07	0.22	0.19
Panel B: Summing up the geographic heterogeneity in public sector wage compression				
	Additional premium in the public sector			
Larger Oslo area	-0.019*	0.044***	-0.014**	0.000
	(0.0108)	(0.0135)	(0.0064)	(0.0069)
Other cities	0.03***	0.049***	0.009	0.009
	(0.0103)	(0.0146)	(0.0055)	(0.0071)
Periphery	0.047***	0.09***	0.013*	-0.001
	(0.0121)	(0.0172)	(0.0065)	(0.0096)

Notes: Panel A documents wage regressions for young (25-32 years of age) and old (33-55 years of age) workers by gender. The dependent variable is log hourly wages. All regressions include year, industry, worker and firm fixed effects, as well as controls for age. The reference category is periphery regions. The R^2 reported is within workers. Based on the estimated coefficients in Panel A, the geographic heterogeneity in public sector wage compression is summed up in Panel B. It gives the additional college wage premium offered in the public sector compared to the private sector for different region types. A negative value implies that the skill wage premium is lower in the public sector, consistent with public sector wage compression. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table 7. Geographic heterogeneity in public sector wage compression: College-only vs. postgraduates

	Additional premium in the public sector	
	MEN	WOMEN
	(1)	(2)
Panel A: College-only vs. high school		
Larger Oslo area	-0.01*	0.02***
	(0.0054)	(0.0058)
Other cities	0.018***	0.03***
	(0.0046)	(0.0057)
Periphery	0.032***	0.031***
	(0.0055)	(0.0073)
Panel B: Postgraduates vs. high school		
Larger Oslo area	-0.039***	-0.001
	(0.0058)	(0.0063)
Other cities	0.002	0.022***
	(0.0054)	(0.0066)
Periphery	0.016**	0.031***
	(0.0067)	(0.0091)

Notes: The table shows the additional college wage premium offered in the public sector compared to the private sector, separating between workers with "college-only" (3-4 years of higher education) and postgraduates (more than 4 years). We define three region types; the larger Oslo area, other cities with at least 65,000 inhabitants in 2010 and the periphery. Selection bias is accounted for. The underlying regressions used to calculate the additional premium in the public sector are given in the online appendix. A negative value implies that the skill premium is lower in the public sector, consistent with public sector wage compression. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.