



Private-public wage gap and return to experience: Role of geography, gender and education[☆]



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ABSTRACT

Analyses of the static private-public wage premium are available for most industrialized countries and the higher education level in the public sector has been shown to be important. We address three shortcomings in these studies – the return to work experience accumulated in the two sectors, the role of geography, and gender differences. Rich register data for Norway allow for observation of work experience by sector and region, and the dynamic gap resulting from different returns to sector experience can be calculated. When selection on observable and unobservable worker characteristics is controlled for, the estimates show that experience accumulated in the private sector has higher return than public sector experience. Geography matters, and both the static gap and the dynamic experience effect are higher in cities. For the low educated, the additional return to private experience is a city phenomenon only. Gender differences are important for high-educated workers. High-educated women have less additional return to private sector experience than high-educated men and receive the same gain from experience accumulated in cities and in the rest of the country. The dynamic experience effect adds to the static private wage premium, and for high-educated male workers it accounts for about 2/3 of the total wage gap including 10 years of experience.

1. Introduction

The static private-public wage gap varies across countries with different labor market and public sector institutions and policies. Broad research overviews such as [Giordano et al. \(2014\)](#) and [Lausev \(2014\)](#) show some common characteristics across countries – the wage distribution is more compressed in the public sector, and wages for low-skilled workers are higher relative to the private sector. While raw wage gaps typically are to the advantage of the public sector, controlling for the high education level in the public sector explains a large part of the sector differences. Our contribution is to address three shortcomings in this literature – the evolution of the wage gap resulting from different returns to experience in the two sectors, the importance of geography for the private-public gap, and gender differences. The different returns to experience define the dynamic private-public wage gap. Based on rich register data for Norway with observation of sector- and region-specific

experience of individual workers over time, we estimate the experience effects and how the static and dynamic private-public wage gaps vary between cities and the rest of the country for male and female workers.¹

A separate literature deals with the private-public compensation premium over the life cycle of workers. Structural models are estimated and calibrated to calculate differences in lifetime earnings between workers in the private and the public sectors. [Postel-Vinay and Turon \(2007\)](#) calculate the lifetime earnings gap as the sum of lifetime earnings assuming discounting to the time of first entry into the labor market, 40 years career in each sector, and pension income of 40% of their last wage for another 20 years. [Dickson et al. \(2014\)](#) apply the structural model for several European countries and conclude that wage differences between the sectors are largely smoothed out over the life cycle. It follows that the static wage gap may overstate the lifetime premium in many countries. The return to experience by sector is important for this dynamic effect. The underlying estimates show large variation across countries in the gap

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¹ In this paper, the private-public wage gap is always defined as the premium of the private sector with respect to the public sector.

in return to experience between private and public employees. However, these analyses are not based on observed individual experience by sector, but a calculation of potential experience assuming workers stay in one sector. [Gomes and Wellschmied \(2020\)](#) extend the scope of life cycle effects by adding the valuation of job security and retirement pensions. The theory approach of the structural models incorporates public sector in search models of the labor market, notably [Gomes \(2018\)](#) and [Bradley et al. \(2017\)](#).

A few studies of the static private-public wage gap include potential or actual work experience as a control variable, and [Maczulskij and Pehkonen \(2011\)](#) estimate the return to aggregate experience for workers in the two sectors. The methodological challenges of estimating the static private-public wage gap concern heterogeneity and selection. [Bargain et al. \(2018\)](#) and [Hospido and Moral-Benito \(2016\)](#) offer discussion of how recent studies have dealt with the selection problem. Register data allow for individual level panel analysis correcting for selection based on observables and unobservables. The identification of the static wage gap is based on shifters between private and public sectors compared to stayers in models with worker fixed effects. In the estimation strategy, we concentrate on the experience effects that exploit experience observed for all workers (stayers and shifters). The approach is inspired by the analysis of the dynamic urban wage premium developed by [De la Roca and Puga \(2017\)](#) and extended to capture the role of education by [Carlsen et al. \(2016\)](#).

Recent research has suggested alternative approaches to deal with further methodological challenges. [Rattsø and Stokke \(2019\)](#) suggest an identification strategy correcting for the bias resulting from the heterogeneity of unobservable characteristics between shifters and 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. [Schanzenbach \(2015\)](#) adds observed IQ-scores as an alternative to worker fixed effects. The endogeneity of the choice of sector remains a challenge in most studies. The early literature, notably [Dustmann and van Soest \(1998\)](#), introduce ‘switching models’ including parent characteristics and other family descriptives as instruments. Recent attempts include [Disney and Gosling \(2003\)](#) studying contracting-out reforms and [Maczulskij \(2013\)](#) comparing twins.

The private-public wage gap may vary across regional labor markets related to the urban wage premium. There are some descriptive studies of geographic variation in the gap, but we do not know of any test of a city effect taking into account selection. Private sector wages reflect regional variation in labor market conditions and are influenced by agglomeration effects increasing labor productivity in cities (see recent overviews by [Duranton and Puga, 2020](#), and [Ahlfeldt and Pietrostefani, 2019](#)). Public sector wages guided by policy typically are oriented towards equality, also in the geographic dimension. It follows that private-public wage gaps may be larger in cities. We test whether the static and dynamic private-public gaps have a city effect, separating between large cities and the rest of the country.

Gender differences at labor markets represent a large research area, and in our context, wage level and return to experience by sector may differ between male and female workers and whether they are located inside or outside cities. Analyses of spatial differences in the gender wage gap find smaller wage differences between men and women in larger cities ([Phimister, 2005](#); [Hirsch et al., 2013](#); [Bacolod, 2017](#)). [Manning and Swaffield \(2008\)](#) show how the gender wage gap develops with experience. [Stokke \(2020\)](#) includes private and public workers and concludes that lower return to experience for women is an important part of the gender wage gap. There are descriptive studies of differences in the gender wage gap between the private and the public sectors, but not tests of the differences taking into effect selection, and also not combining gender with geography.

The register data for Norway cover hourly wages and worker characteristics from 2001 to 2010, with information on actual work experience dating back to 1993. Heterogeneity is investigated with respect to education, geography and gender. Low- and high-educated workers are defined at or above the high-school level, respectively, and have different wage profiles. Geography concentrates on the city effect, separating the seven largest cities (above 150,000 inhabitants) from the rest of the country. Work experience in public administration is compared to experience in the private sector, and we separate between private stayers, public stayers, and shifters between sectors. We cover all native full-time workers aged 22–65, both male and female. The dataset includes approximately 6.75 million observations and 1.1 million individuals. The experience variables include overall experience, experience by type of sector (private and public), experience by type of region (cities vs. the rest of the country), and experience in the worker’s present firm (job tenure). Male and female wage gaps are analyzed separately. We do not have observations about occupation across the private-public divide, since occupations are mainly classified in the private sector and public job descriptions are different and with limited comparability to the private. We apply education field identification to control for occupation.

The static private-public wage gap is 4.5% controlling for selection on observables and unobservables, compared to the raw wage gap of 2%. Higher education level among public employees is a major factor. The wage gap varies by geography, 6.8% in cities and 2.4% in the rest of the country. The positive city effect is consistent with agglomeration gains that are increasing private wages, but are not matched by public wages. The positive city effect is observed for both low- and high-educated workers, although stronger for the high educated. The static wage gap is higher in cities than in the rest of the country for both male and female workers.

The analysis shows that experience accumulated in the private sector is more valuable than experience accumulated in the public sector, in particular in cities. Outside cities, the first-year return to public sector experience is 8.1%, while first-year return to private sector experience adds 0.5 percentage point. Public experience accumulated in cities gives 8.5% return the first year, while private experience in cities adds 1.2 percentage points to the return. The experience premium curves are concave, consistent with the broad literature on work experience. The results are at odds with the [Dickson et al. \(2014\)](#) estimates of the lifetime wage premia in European countries – they find that experience is generously rewarded in the public sector in most countries and thereby leads to low discounted private wage premium. Our result for the selection-adjusted static private sector wage premium in Norway is similar to their result for The Netherlands, but while they find a lifetime premium of about zero, we find that return to experience is increasing the private premium considerably.

Overall, the combined static and dynamic wage gap (assuming 10 years of experience) equals 11.6% in cities compared to 3.3% in the rest of the country. The dynamic experience effect adds to the static private wage premium, and for high-educated male workers, it accounts for about 2/3 of the total wage gap. High-educated women have less additional return to private sector experience than high-educated men and receive the same gain from experience accumulated in cities and in the rest of the country. Low-educated male and female workers gain less from shifting to the private sector, and the dynamic effect is a pure city phenomenon.

The econometric approach and the dataset are described in section 2. Section 3 estimates the static private-public wage gaps controlling for selection and investigating heterogeneity. We estimate and calculate the dynamic private-public wage gap in section 4 with emphasis on the city effect. Section 5 offers robustness analyses with respect to sample design, different specifications of geography, and possible impact of the financial crisis in 2008. Concluding remarks are given in section 6.

2. Econometric approach and data

The literature on the private-public wage gap is motivated by efficiency and equity issues related to different wage setting in the two sectors. Private sector recruitment and wage formation reflect the demand for labor in private firms. The wages balance supply and demand in heterogeneous labor markets modified by wage bargaining dependent on the strength of unions, typically stronger in manufacturing industry than services. Public sector demand for labor follows from political budget allocations. The recruitment is usually based on merit and pay determination results from wage bargaining with unions. Public sector wage formation is guided by policy, typically attempting equalization of wages both across individuals, education groups, and regions. It should be noticed that quantitative effects we find reflect the institutions and policies at work in Norway. Compared to other countries, unions in the private sector are strong and involved in national wage bargaining with employers. Still we observe large geographic differences in private wages reflecting differences in industrial structure, and also variation in productivity and profitability across local labor markets. Political guidelines contribute to the observed wage compression in the public sector. But the public wage system is not without flexibility, also along the geographic dimension, in particular since a large regional and local government sector is involved. Worker mobility between private and public sectors in principle is open for everyone, but the understanding is that differences in private and public pension systems constrain the mobility. As will come clear, shifters between the sectors still account for 2.4% of all workers, with the high educated more mobile than the low educated, similar to differences in geographic mobility.

To estimate the private-public wage gap, we use register data on hourly wages and worker characteristics from 2001 to 2010, with information on work experience dating back to 1993. 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,² 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. Information about work contracts dating back to 1993 is used to calculate actual full-time experience for each worker. We separate between overall experience, experience by type of sector (private and public), experience by type of region (cities and the rest of the country), and experience in the worker's present firm (job tenure). The experience variables are calculated in days and expressed in years. The education register covers the entire adult population and gives detailed information about workers' level and field of education. We also have information on the age, gender, immigrant status, industry affiliation, firm affiliation, and region of residence for all individuals.

We concentrate on native, full-time workers aged 22–65 employed in the private sector or in public administration. We separate between workers that remain in the private sector during 2001–2010 ('private stayers'), workers that remain in the public sector ('public stayers'), and workers that change sector during the period ('shifters'). Shifters are required to be in the dataset for at least three consecutive years: the year before the sector shift, the shift-year, and the year after the sector shift. Workers that are out of the labor market before the shift, as well as workers that shift back to the original sector within a year, are excluded. As long as workers do not change sector on January 1st, the wage in the shift-year represents a mix of private and public sector wages. We therefore exclude the shift-year and compare the year before the shift to

the year after the shift. The final dataset includes 6,752,856 observations and 1,105,433 different workers.³ Private sector stayers include 969,768 workers, while public sector stayers and shifters account for 109,470 workers and 26,195 workers, respectively. The workers are allocated to 54 industries, 89 labor market regions, and approximately 175,000 firms.

The geographical units used in the analysis are based on information about commuting flows between municipalities. They are constructed by Statistics Norway, which divides Norway into 89 travel-to-work areas, denoted "economic regions". The economic regions conform to NUTS-4 regions, as defined by the European Union standard of regional levels. This level of aggregation captures functional regions understood as common labor markets. To study the role of urbanity for the private-public wage gap, we separate between cities and the rest of the country. We define the city group as labor market regions with more than 150,000 inhabitants in 2010. The group consists of seven regions that cover the larger Oslo area (including the three neighboring regions Asker/Bærum, Lillestrøm and Drammen) and the other three main cities of Norway (Stavanger, Bergen and Trondheim).

Table 1 reports the observable characteristics of the workers, separating between private stayers, public stayers, and shifters, as well as between low-educated workers (high school and below) and high-educated workers (college and above). The average worker in our dataset is 42 years old and has an hourly wage of 252 NOK in constant 2010 prices (log wage of 5.529). Work experience and job tenure are on average 8.5 years and 4.5 years, respectively. The public sector has somewhat older workers with longer work experience and job tenure compared to the private sector. The composition of the workforce with respect to gender and education is very different in the two sectors with female and high-educated workers being overrepresented in the public sector. Women account for 46% of public sector workers, compared to only 28% in the private sector.⁴ More than half the workers in the public sector are high educated, while in the private sector, only ¼ of workers have higher education. Economic geography is an interesting dimension related to the education level. Overall, 44% of workers live in city regions, and there is not much difference between the sectors. However, 60% of high-educated workers in the private sector live in cities, compared to only 48% of those in the public sector. The high-educated part of the public sector is less concentrated to urban areas than high-

³ We exclude workers in the primary industries (agriculture, fishing, and forestry) and the education and health care industries. Workers in education and health care are dominated by professions with particular characteristics and the registers do not separate private from public employees in these subsectors. The original dataset consists of 9,988,639 worker-year observations. The tax register gives information on total annual earnings, rather than separate earnings for each work contract. In years where workers have more than two contracts, as well as in years where workers have one full-time and one part-time contract, the observations 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 worker observations where the contract duration is less than three months during a year. These restrictions reduce the dataset by 1,241,036 observations. Missing data on hours worked, annual earnings, level/field 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 1,722,352 observations. As mentioned, we exclude shifters that are out of the labor market a year or more before the shift or that are not observed in the new sector the year after the shift (the latter group is dominated by those shifting sector in 2010, the last year of the analysis). Together with the exclusion of the shift-year, this reduces the dataset by 134,578 observations. Finally, to avoid extreme observations, we exclude the top and bottom 1% of the wage distribution, which gives our dataset of 6,752,856 observations.

⁴ According to Statistics Norway official data, 20% of men and almost 50% of women work in the public sector. In our dataset, the corresponding shares are 9% for men and 17% for women. The lower public sector shares in our data, especially for female workers, follow from the exclusion of part-time workers and workers in education and health care sectors (the registers do not separate between private and public employees in these sectors).

² The employment register separates between three contract types: full-time contracts with at least 30 h of work per week, part-time contracts with 20–29 h of work per week, and part-time contracts with fewer than 20 h of work per week.

Table 1
Descriptive statistics.

	All workers	Private stayers	Public stayers	Shifters
Mean log hourly wages (in 2010 NOK)				
All workers	5.529	5.531	5.507	5.558
Low-educated workers	5.451	5.456	5.388	5.424
High-educated workers	5.729	5.761	5.616	5.657
Work experience (in years)				
All workers	8.5	8.4	9.6	9.1
Low-educated workers	8.6	8.5	10.0	9.5
High-educated workers	8.4	8.1	9.2	8.7
Job tenure (in years)				
All workers	4.5	4.4	5.6	3.5
Low-educated workers	4.7	4.6	6.4	3.8
High-educated workers	4.0	3.9	4.8	3.2
Age (in years)				
All workers	41.7	41.3	45.7	41.5
Low-educated workers	42.1	41.7	48.0	43.0
High-educated workers	40.8	40.1	43.5	40.4
Female (share)				
All workers	0.297	0.276	0.46	0.371
Low-educated workers	0.278	0.262	0.493	0.33
High-educated workers	0.346	0.322	0.429	0.401
City resident (share)				
All workers	0.436	0.436	0.422	0.469
Low-educated workers	0.382	0.384	0.36	0.377
High-educated workers	0.573	0.598	0.479	0.536
High-educated (share)				
All workers	0.281	0.244	0.522	0.579
Number of workers				
All workers	1,105,433	969,768	109,470	26,195
Low-educated workers	800,287	736,930	52,338	11,019
High-educated workers	305,146	232,838	57,132	15,176
Number of observations	6,752,856	5,886,561	675,911	190,384

Notes: We separate between workers that remain in the private sector during 2001–2010 (‘private stayers’), workers that remain in the public sector (‘public stayers’), and workers that change sector during the period (‘shifters’). Work experience and job tenure are calculated based on actual days worked from 1993 onwards (overall and at the worker’s present firm), expressed in years. City residents are defined as workers that are located in a city region with at least 150,000 inhabitants in 2010 (which includes 7 out of 89 regions). Low-educated workers have high school education or less, while high-educated workers have at least 1 year at college or university.

educated private sector workers.

Shifters between the private and the public sector account for 2.4% of all workers. The main difference between the shifters relative to private and public sector stayers is the level of education. The high educated are more mobile, and the share of high-educated workers among shifters equals 58%. When considering industries within the private sector, we find that shifters are overrepresented in business services and to some extent in construction, while they are underrepresented in manufacturing and retail (compared to private stayers), as documented in Table A.1. There are some differences between shifters from private to public compared to those shifting from public to private. On average, workers shifting from the public to the private sector are younger, have less work experience and job tenure, and are more likely to live in cities.

The analysis estimates the static and dynamic private-public wage

premium. To compare with the existing literature, we start by estimating the static private-public wage gap but extend previous analyses by allowing the wage gap to vary by geography. We run a hedonic regression of individual hourly wages for the period 2001–2010 that controls for time-varying observable worker characteristics (work experience and job tenure), and includes year, regional, and worker fixed effects:

$$\ln w_{ijrt} = \alpha_1 \cdot priv_{it} + \alpha_2 \cdot priv_{it} \cdot city_{r(it)} + \beta_1 \cdot Exp_{it} + \beta_2 \cdot T_{ijt} + \gamma_t + \mu_r + \eta_i + \varepsilon_{ijrt} \quad (1)$$

where w_{ijrt} is the hourly wage income for worker i employed in firm j in region r in year t , $priv_{it}$ is a dummy that equals one if the worker is employed in the private sector in year t and $city_{r(it)}$ is a dummy that equals one if the worker is located in a city in year t . Year, regional, and worker fixed effects are represented by γ_t , μ_r , and η_i , respectively. Exp_{it} represents years of work experience acquired by worker i up until time t , and T_{ijt} refers to years of experience acquired by worker i up until time t in firm j (the worker’s present job).⁵ The static private wage premium is estimated based on workers shifting between the private and the public sector and is given by the coefficient α_1 outside cities and $\alpha_1 + \alpha_2$ in cities. The estimates control for sorting of workers based on both time-varying observable characteristics and unobservable characteristics (abilities). The error term is given by ε_{ijrt} , while β_1 and β_2 are parameters. To correct for serial correlation the standard errors are clustered at the individual level. The regression is estimated both aggregate, separately for low- and high-educated workers, and separately for men and women.

We extend the specification in (1) to capture dynamic effects of work experience, where the return to experience is allowed to vary based on sector and region of accumulation:

$$\ln w_{ijrt} = \alpha_1 \cdot priv_{it} + \alpha_2 \cdot priv_{it} \cdot city_{r(it)} + \beta_1 \cdot Exp_{it} + \beta_2 \cdot T_{ijt} + \beta_3 \cdot Exp_priv_{it} + \beta_4 \cdot Exp_city_{it} + \beta_5 \cdot Exp_privcity_{it} + \gamma_t + \mu_r + \eta_i + \varepsilon_{ijrt} \quad (2)$$

where Exp_priv_{it} and Exp_city_{it} represent work experience acquired by worker i up until time t in the private sector and in cities, respectively, and $Exp_privcity_{it}$ measures private sector experience acquired in cities. If $\beta_3 > 0$, work experience accumulated in the private sector is more valuable than experience accumulated in the public sector. If $\beta_4 > 0$, work experience accumulated in cities is more valuable than experience accumulated in the rest of the country, and if $\beta_5 > 0$, experience accumulated in the private sector is more valuable when accumulated in cities compared to the rest of the country. The immediate static private wage premium is still given by the estimated coefficients on the private dummy ($\alpha_1 + \alpha_2$ in cities and α_1 in the rest of the country), while the wage premium after τ years of work experience is $\alpha_1 + \alpha_2 + (\beta_3 + \beta_5)\tau$ when the experience is accumulated in cities and $\alpha_1 + \beta_3\tau$ when the experience is accumulated in the rest of the country. While we rely on shifters between the two sectors to identify the static premium, the estimation of the dynamic experience effect is based on all workers (stayers and shifters).

3. Static private-public wage gap – geography, education and gender

We start by estimating the static private-public wage gap in order to compare with other countries and to investigate heterogeneity with respect to geography, level of education and gender. A simple regression including the private sector dummy and year dummies identifies the raw average wage gap between private and public sectors as 2%. Private wages are on average higher than public wages, while Dickson et al. (2014) show raw public wages somewhat higher than private wages on

⁵ The regressions include quadratic experience and tenure terms.

Table 2
Estimation of static private-public wage gap.

	All (1)	All (2)	All (3)	Low-educated (4)	High-educated (5)
Private	0.091*** (0.0009)	0.045*** (0.0019)	0.024*** (0.0022)	0.011*** (0.0034)	0.036*** (0.0029)
Private x city			0.044*** (0.0024)	0.029*** (0.0043)	0.048*** (0.003)
Experience	0.034*** (0.0002)	0.091*** (0.0006)	0.09*** (0.0006)	0.08*** (0.0007)	0.112*** (0.0012)
(Experience) ²	-0.0007*** (0.0000)	-0.0014*** (0.0000)	-0.0014*** (0.0000)	-0.0012*** (0.0000)	-0.0019*** (0.0000)
Job tenure	-0.005*** (0.0001)	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.006*** (0.0002)
(Job tenure) ²	0.0001*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0004*** (0.0000)
Secondary education	0.129*** (0.0011)				
Short higher education	0.348*** (0.0015)				
Long higher education	0.487*** (0.0017)				
Male	0.166*** (0.0007)				
Education field dummies	Yes	No	No	No	No
Worker fixed effects	No	Yes	Yes	Yes	Yes
Observations	6,752,856	6,752,856	6,752,856	4,852,538	1,900,318
R ²	0.29	0.76	0.76	0.72	0.77

Notes: The dependent variable is log hourly wages. All regressions include year and regional fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

average in a study of several European countries. When we separate male and female workers, both have a negative raw private-public wage gap, -1.3% and -0.8% respectively. The composition with respect to education and gender explains this. High education level in the public sector implies public wages higher than private wages for men and women separately. When we measure the raw gap for all workers, the effect of higher education level in the public sector is dominated by the high share of female workers in the public sector and the overall private-public gap is positive.

We narrow down the private-public comparison by taking into account observable individual characteristics and including regional and education field dummies, as shown in column (1) of Table 2. When comparing similar individuals with respect to level and field of education, gender, and years of experience and job tenure, the private-public wage gap equals 9.1%. As shown in the descriptive statistics in Table 1, public sector workers are positively selected in particular with respect to the level of education. The composition of the workforce must be taken into account for a sensible comparison of private and public sector wages. The effect of work experience on wages is non-linear. Wages increase with experience for the first 24 years, and one extra year of experience adds 2.2% to wages calculated at average experience (8.5 years). We notice that male workers on average have 16.6% higher wages than female workers in this dataset. The education wage premia are 12.9% for secondary education (compared to the less educated), 34.8% for short higher education (college) and 48.7% for long higher education (post graduate).

In a further investigation of the selection, we expand the model to account for unobserved characteristics of the individuals. In this case, shown in column (2) of Table 2, the private-public gap is reduced to 4.5%. The straightforward interpretation of the drop in the wage gap compared to only controlling for observable characteristics is that workers are negatively selected to the public sector with respect to unobservable abilities. However, we must take into account that the wage systems are different and wages in the public sector do not necessarily reflect productivity. Using worker fixed effects, and including year effects, the return to experience is identified by career interruptions. Without career interruptions for some workers, the experience variable increases by one year for all workers every year and in this case the return

to experience cannot be estimated. Consistent with the literature, the return to experience is much higher when worker fixed effects are included compared to OLS. One extra year of experience adds 6.7% to wages (calculated at average experience). A common understanding is that there is a negative correlation between ability and experience, possibly reflecting an age effect.

Geographic variation of the private-public wage gap has not been tested in panel models controlling for selection. The analysis of the geographic aspect separates between cities of more than 150,000 inhabitants and the rest of the country, see column (3) of Table 2. The additional private wage premium in cities is 4.4 percentage points and statistically significant. The private-public wage gap is 6.8% in cities and 2.4% in the rest of the country. Comparison of OLS and FE estimates indicates negative selection with respect to unobserved abilities into the public sector both in cities and the rest of the country (not shown). The positive city effect is consistent with agglomeration effects increasing private wages in cities that are not matched by public wages. This reflects relative wage compression in the public sector, emphasized by many authors including Dickson et al. (2014).

The analysis is expanded by combining the separation between cities and the rest of the country with different estimates for low-educated and high-educated workers. The results show that the positive city effect on the private-public wage gap is present for both education groups. Low-educated workers have a wage gap of 4% in cities and 1.1% outside cities (column (4), Table 2). The wage gap for high-educated workers is 8.4% in cities and 3.6% in the rest of the country (column (5), Table 2). The results show that both urbanization and education level capture important selection effects. A robustness check shows that the direction of the sector shift does not matter for the static wage gap (both aggregate and for the two education groups). The results are available from the authors (Table B.1 in the external online appendix).⁶

Many studies have shown gender differences at the labor market, also between private and public sectors. We offer a test of gender differences taking into account selection. The separate estimates for male and female

⁶ A set of tables describing alternative model specifications is available as an external online appendix: <https://sites.google.com/site/hildegunnestokke/>.

Table 3
Estimation of static private-public wage gap: Male vs. female workers.

	MEN			WOMEN		
	All	Low-educated	High-educated	All	Low-educated	High-educated
	(1)	(2)	(3)	(4)	(5)	(6)
Private	0.024*** (0.0027)	0.004 (0.0042)	0.041*** (0.0035)	0.024*** (0.0037)	0.023*** (0.0055)	0.026*** (0.005)
Private x city	0.051*** (0.003)	0.032*** (0.0053)	0.053*** (0.0037)	0.034*** (0.0042)	0.022*** (0.0072)	0.041*** (0.0053)
Experience	0.087*** (0.0007)	0.077*** (0.0008)	0.109*** (0.0015)	0.099*** (0.0011)	0.091*** (0.0013)	0.112*** (0.0019)
(Experience) ²	-0.0015*** (0.0000)	-0.0013*** (0.0000)	-0.0022*** (0.0000)	-0.0011*** (0.0000)	-0.0009*** (0.0000)	-0.0014*** (0.0000)
Job tenure	-0.005*** (0.0001)	-0.005*** (0.0002)	-0.004*** (0.0002)	-0.009*** (0.0002)	-0.009*** (0.0003)	-0.01*** (0.0004)
(Job tenure) ²	0.0002*** (0.0000)	0.0002*** (0.0000)	0.0003*** (0.0000)	0.0004*** (0.0000)	0.0005*** (0.0000)	0.0006*** (0.0000)
Observations	4,744,793	3,502,326	1,242,467	2,008,063	1,350,212	657,851
R ²	0.77	0.72	0.79	0.71	0.67	0.70

Notes: The dependent variable is log hourly wages. All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

workers are presented in Table 3. The main conclusions regarding the private-public wage gap hold for both groups. The wage gap is higher in cities than in the rest of the country, and the city effect is higher for high-educated compared to low-educated workers. The wage gap for men in cities is 7.5% versus 2.4% in the rest of the country, while for women the gap is 5.8% in cities and 2.4% outside cities. Among high-educated workers in cities, men and women have a private-public wage gap of 9.4% and 6.7%, respectively. We notice that for low-educated men outside cities, there is no significant difference in private and public sector wages, while low-educated women have a private sector premium. The additional premia in cities are similar for low-educated men and women.

4. Dynamic private-public wage gap

While private-public wage variation mainly has been studied as static wage gaps, we extend the analysis to dynamic differences between sectors as workers may accumulate more valuable experience in the private sector and in cities. The register data allow us to follow workers over time, across the private-public sector divide, and across locations.

The gain or loss from shifting sector consists of an immediate effect (the static gap) and over time the effect of different return to accumulated experience (the dynamic gap). To study the dynamic wage gap, we expand the model to allow for different returns to experience accumulated in the private and the public sector, based on equation (2) in section 2. The wage equation includes total work experience and separates out years of private sector experience (all experience variables include quadratic terms), while controlling for job tenure, as well as year, regional, and worker fixed effects. The basic dynamic model in column (1) of Table 4 is extended to test for different returns in cities and the rest of the country in column (2). The analysis is estimated separately for low-educated and high-educated workers in columns (3) and (4). Later, in Table 5, we report analysis of male and female workers separately.

When we consider all workers, the average immediate economic gain from shifting from the public to the private sector is 4.3% (given in column (1)), about the same as the estimated effect without controlling for private sector experience (see column (2), Table 2). First-year return to experience in the public sector is 8.3%, while first-year private sector return to experience adds 0.9 percentage point. The effect of having experience from the private sector is of economic importance – the dynamic effect adds to the static private wage premium. Assuming 10 years of experience, the combined static and dynamic wage gap equals 7.3%, which implies that the dynamic effect counts for about 40% of the total

Table 4
Estimation of static and dynamic private-public wage gap.

	All	All	Low-educated	High-educated
	(1)	(2)	(3)	(4)
Private	0.043*** (0.0019)	0.023*** (0.0022)	0.012*** (0.0034)	0.032*** (0.0029)
Private x city		0.043*** (0.0024)	0.028*** (0.0043)	0.046*** (0.003)
Experience	0.083*** (0.0007)	0.081*** (0.0008)	0.078*** (0.001)	0.095*** (0.0013)
(Experience) ²	-0.0009*** (0.0000)	-0.0009*** (0.0000)	-0.0009*** (0.0000)	-0.0013*** (0.0000)
Private experience	0.009*** (0.0004)	0.005*** (0.0006)	0.001* (0.0008)	0.013*** (0.0009)
(Private experience) ²	-0.0006*** (0.0000)	-0.0004*** (0.0000)	-0.0003*** (0.0000)	-0.0005*** (0.0000)
Experience in city		0.004*** (0.0007)	-0.003** (0.0012)	0.004*** (0.0009)
(Experience in city) ²		-0.0001*** (0.0000)	0.0001* (0.0001)	-0.0001* (0.0000)
Private experience in city		0.007*** (0.0008)	0.008*** (0.0013)	0.006*** (0.0011)
(Private experience in city) ²		-0.0003*** (0.0000)	-0.0003*** (0.0001)	-0.0004*** (0.0001)
Job tenure	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.007*** (0.0002)
(Job tenure) ²	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0004*** (0.0000)
Observations	6,752,856	6,752,856	4,852,538	1,900,318
R ²	0.76	0.76	0.72	0.78

Notes: The dependent variable is log hourly wages. All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

private wage premium.⁷ The average hides large variation related to the heterogeneity discussed below. The effect of tenure is negative throughout. The result indicates that long tenure gives no extra gain when experience already is controlled for. In a specification eliminating tenure as control variable, the return to experience is not affected.

⁷ Based on the estimated coefficients in column (1) of Table 4, the combined static and dynamic private-public gap after 10 years of experience follows as: $0.043 + 0.009 \cdot 10 - 0.0006 \cdot 100 = 0.073$.

In their analysis of the lifetime earnings premium in the UK, [Postel-Vinay and Turon \(2007\)](#) estimate the return to aggregate potential experience for stayers in the two sectors and find a first-year return of 6.6% in the private sector and 4.3% in the public sector. Their result is similar to what we find for Norway. They use the age of workers to calculate potential experience, while we analyze the effect of actual work experience dependent on the sector where it is accumulated. [Dickson et al. \(2014\)](#) extend the analysis of [Postel-Vinay and Turon \(2007\)](#) to several European countries. They find that reward to experience is different between sectors, but with no clear cross-country pattern. Public sector experience is more generously rewarded than private sector experience in Germany, France and The Netherlands, while the opposite is the case in Italy and Spain. Their estimates are aggregate numbers broken down by sector and are not based on observed experience of individual workers. The advantage of public workers when life-time earnings are calculated is related to pensions, that are not included in our analysis. In the literature about static private-public wage gaps, the worker experience is sometimes included as a control variable. [Morikawa \(2016\)](#) estimate the return to tenure in Japan and find first-year returns of 2.2% in the private sector and 1.75% in the public sector. In an analysis for Finland, [Maczulskij and Pehkonen \(2011\)](#) find similar return to experience in the two sectors. We have not found any studies that observe individual experience by sector over time.

The importance of economic geography, separating between the dynamic private sector wage premium based on whether private experience is accumulated in city regions or the rest of the country, is documented in column (2) of [Table 4](#). The static private-public wage gap is 4.3 percentage points higher in cities compared to the rest of the country. The dynamic component of the private wage premium also differs by geography. Outside cities, the first-year return to public sector experience is 8.1%, while first-year return to private sector experience adds 0.5 percentage point. Public experience accumulated in cities gives 8.5% return the first year, while private experience in cities adds 1.2 percentage points to the return. Outside cities the aggregate static wage gap equals 2.3%, which increases to 3.3% when the dynamic effect is added (calculated at 10 years of experience). In cities, the static wage gap of 6.6% almost doubles to 11.6% when the more valuable experience accumulated in the private sector is added.⁸ The dynamic effect is mainly a city phenomenon.

The return to experience for low-educated and high-educated workers is shown in columns (3) and (4) of [Table 4](#). The heterogeneity with respect to education is important for the dynamic gain of the public-private shift, and also depends on geography. Low-educated workers outside the city regions face a static private-public gap of 1.2%, while the return to experience is somewhat higher in the public than in the private sector, leading to a small decrease in the private wage premium over time. For low-educated workers in cities, the static private-public gap is 4%, which increases to 7% when the higher return to private experience accumulated in cities is taken into account. For the high educated, the static private-public gap equals 7.8% in cities compared to 3.2% in the rest of the country. The dynamic component of the private wage premium is also higher in cities. The extra first-year return to private experience for high-educated workers is 1.3 percentage points, and then

⁸ The calculation of the dynamic part of the private-public wage gap follows from the estimated coefficients on private experience in column (2) of [Table 4](#) and equals $0.005 \cdot x - 0.0004 \cdot x^2$ and $0.012 \cdot x - 0.0007 \cdot x^2$ for private experience accumulated outside cities and in cities, respectively, where x represents years of experience.

⁹ It should be noted that the group of reference is not the same across categories (high-educated private sector workers are compared with high-educated public sector workers, while low-educated private sector workers are compared with low-educated public sector workers), so the wage profiles cannot be compared across education categories. An alternative model formulation checking for significance of differences between the education groups is available from the authors (see [Table B.2 in the external online appendix](#)).

an additional 0.6 percentage point if the experience is accumulated in cities. For high-educated workers, the total private-public wage gap equals 11.2% and 17.8% in the rest of the country and in city regions, respectively (calculated for 10 years of experience).⁹

In an extension of the analysis, we allow the value of experience accumulated in the private sector to vary depending on where it is used (in the public or the private sector). In this way, we can study if the dynamic experience effect is portable across sectors. We capture this by including interaction terms between private sector experience terms and the dummy variable indicating whether you currently work in the private sector. The results are documented in Appendix [Table B.3](#). For low-educated workers, we have identified a positive dynamic effect of private experience accumulated in cities, and the estimates show that the additional value of this experience is portable across sectors. For the high educated, the extra first-year return to private sector experience is not much affected by whether it is currently used in the public or the private sector. The relationship between the additional return received when the private experience is accumulated in cities (compared to the rest of the country) and experience being used in the private sector is positive, but not statistically significant. The broad picture is that the additional return to experience accumulated in the private sector is portable across sectors. The result is consistent with the analysis of the urban wage premium by [De la Roca and Puga \(2017, p. 3\)](#). They find that ‘where workers acquire experience matters more than where they use it’. While they study the geographical dimension of where experience is used, we analyze the portability between the private and the public sectors.

The analysis is done separately for male and female workers in [Table 5](#). The main lesson is that women have lower additional return to experience in the private sector compared to men. Studying all men and all women in columns (1) and (4), respectively, we find that men have an additional return to private sector experience accumulated in cities of 1.6 percentage points in the first year, while women have additional first year return of 0.6 percentage point. Outside city regions, men have an additional first-year return of 0.6 percentage point, while women get an additional 0.2 percentage point. Interestingly, low-educated men and women have similar returns to experience. Outside cities, the first-year return to experience is the same independent on which sector it is accumulated, while the additional return to private experience accumulated in cities equals 0.9 percentage point and 0.7 percentage point for low-educated men and women, respectively. Additional return to private experience for the low educated is a city phenomenon for both genders. Among the high educated, women have lower additional return to private sector experience than men and receive no additional return in cities. The extra first-year return from private experience amounts to 0.6 percentage point independent of whether the experience is accumulated in cities or in the rest of the country. For high-educated men, the additional return from private sector experience equals 1.6 percentage points and 2.6 percentage points when accumulated outside and inside cities, respectively.

A consequence of these findings is that the private sector wage premium trajectories depend on the geographical location of workers. The calculated wage gaps above are based on 10 years of experience, and [Fig. 1](#) shows the trajectories of the private wage premium for male workers in cities and the rest of the country. For high-educated male workers outside cities, the private wage premium starts at 3.7% (the static private sector effect) and increases gradually to 14.4% after 10 years, whereas the private wage premium of high-educated male workers in cities increases from 8.7% to 23.8% (calculated based on the estimated coefficients of experience in column (3) of [Table 5](#)). In both cases, the dynamic experience effect accounts for about 2/3 of the total wage gap. The static private-public wage gap is higher in cities and the difference between city regions and the rest of the country increases over time. The return to experience is higher in the private sector, and in particular when the experience is accumulated in cities. For low-educated male workers in cities, the private wage premium increases from 3.7% initially to 6.7% after 10 years. The return to experience is higher in the private

Table 5
Estimation of static and dynamic private-public wage gap: Male vs. female workers.

	MEN			WOMEN		
	All	Low-educated	High-educated	All	Low-educated	High-educated
	(1)	(2)	(3)	(4)	(5)	(6)
Private	0.022*** (0.0027)	0.005 (0.0042)	0.037*** (0.0035)	0.023*** (0.0037)	0.024*** (0.0055)	0.023*** (0.005)
Private x city	0.048*** (0.003)	0.032*** (0.0053)	0.05*** (0.0037)	0.034*** (0.0042)	0.021*** (0.0072)	0.042*** (0.0053)
Experience	0.076*** (0.001)	0.075*** (0.0013)	0.089*** (0.0017)	0.093*** (0.0013)	0.088*** (0.0017)	0.102*** (0.0022)
(Experience) ²	-0.001*** (0.0000)	-0.0011*** (0.0000)	-0.0015*** (0.0000)	-0.0007*** (0.0000)	-0.0006*** (0.0001)	-0.001*** (0.0001)
Private experience	0.006*** (0.0007)	-0.000 (0.0011)	0.016*** (0.001)	0.002** (0.001)	0.001 (0.0013)	0.006*** (0.0015)
(Private experience) ²	-0.0004*** (0.0000)	-0.0002*** (0.0000)	-0.0006*** (0.0000)	-0.0004*** (0.0000)	-0.0003*** (0.0001)	-0.0003*** (0.0001)
Experience in city	0.002** (0.0009)	-0.003** (0.0017)	0.001 (0.0012)	0.008*** (0.0012)	-0.001 (0.0018)	0.008*** (0.0016)
(Experience in city) ²	-0.0000 (0.0000)	0.0002** (0.0001)	0.0000 (0.0001)	-0.0003*** (0.0001)	-0.0000 (0.0001)	-0.0003*** (0.0001)
Private experience in city	0.01*** (0.001)	0.009*** (0.0017)	0.01*** (0.0013)	0.004*** (0.0013)	0.007*** (0.0019)	0.001 (0.0019)
(Private experience in city) ²	-0.0005*** (0.0000)	-0.0004*** (0.0001)	-0.0006*** (0.0001)	-0.0000 (0.0001)	-0.0002** (0.0001)	-0.0000 (0.0001)
Job tenure	-0.005*** (0.0001)	-0.005*** (0.0002)	-0.005*** (0.0002)	-0.009*** (0.0002)	-0.009*** (0.0003)	-0.01*** (0.0004)
(Job tenure) ²	0.0002*** (0.0000)	0.0002*** (0.0000)	0.0003*** (0.0000)	0.0005*** (0.0000)	0.0005*** (0.0000)	0.0006*** (0.0000)
Observations	4,744,793	3,502,326	1,242,467	2,008,063	1,350,212	657,851
R ²	0.77	0.72	0.79	0.71	0.67	0.70

Notes: The dependent variable is log hourly wages. All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

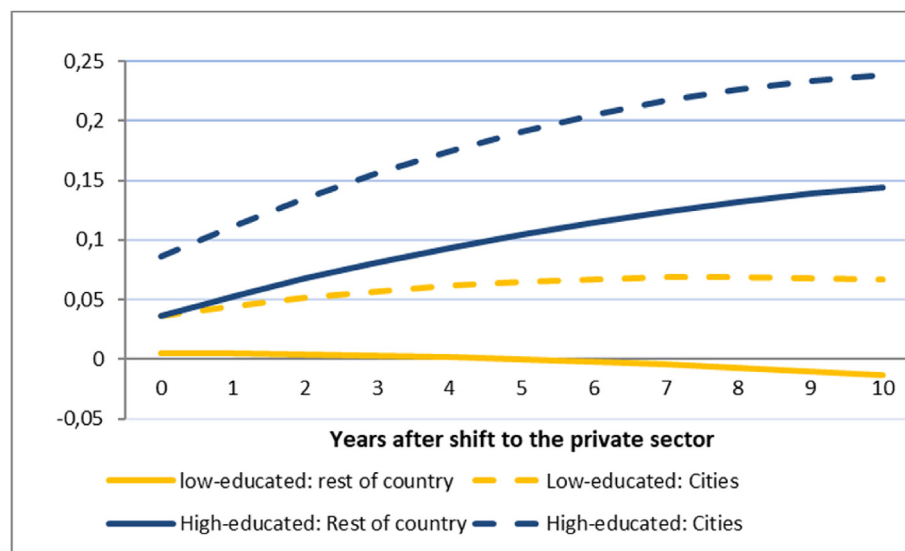


Fig. 1. Private sector wage premium trajectories for low- and high-educated male workers in cities and the rest of the country, years after shift to the private sector.

sector, but the magnitude of the effect is much smaller than for high-educated workers. For low-educated male workers outside cities the static private wage premium is close to zero, and the return to experience is somewhat higher in the public than in the private sector, leading to a small decrease in the private wage premium over time.

The private wage premium trajectories of women are shown in Fig. 2. The trajectories for high-educated women are lower than for high-educated men (mainly reflecting lower additional returns to private sector experience), while the trajectories for low-educated workers are more comparable across genders. Among women, the difference between the low and high educated is much smaller, as is the difference between

city and the rest of the country. The dynamic private-public gap is basically independent of geography for high-educated women, the small difference observed results from the static effect. As shown, low-educated workers have no gain over time in the periphery, and this is true for both male and female workers.

While Table 5 presents separate results for low- and high-educated workers, Appendix Table B.2 reformulates the model to test for the statistical significance of the differences across education groups. For male workers, the return to private sector experience is significantly higher for the high educated, while the additional return received if the private experience is acquired in cities is similar for low- and high-educated

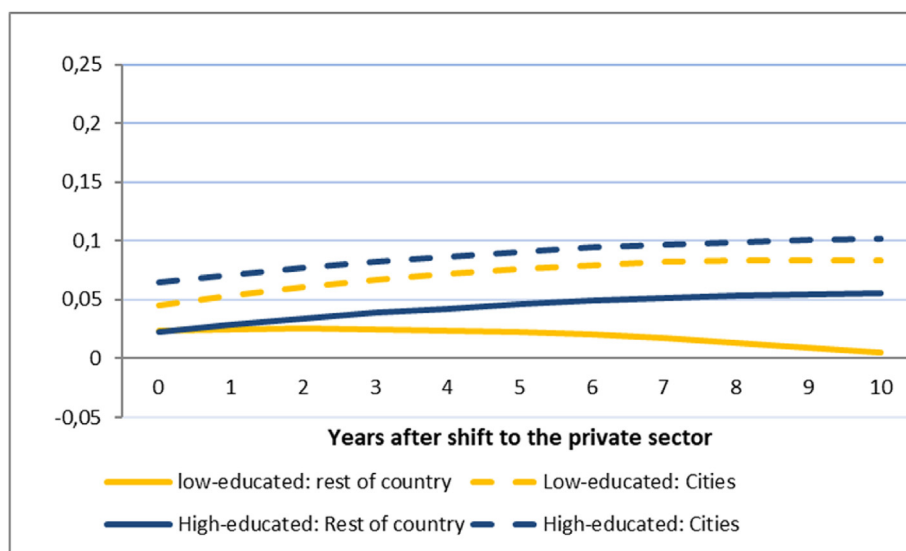


Fig. 2. Private sector wage premium trajectories for low- and high-educated female workers in cities and the rest of the country, years after shift to the private sector.

workers. For female workers, the return to private experience acquired outside cities is significantly higher for the high educated, while the return to private experience acquired in cities is similar across education groups.

The analysis adds to the understanding of the heterogeneity of the dynamic urban wage premium by sector. De la Roca and Puga (2017) and Carlsen et al. (2016) study the private sector in Spain and Norway, respectively. They find that experience accumulated in cities is more valuable than experience accumulated in the rest of the country. We reproduce their findings for the private sector (see column (2) of Table 4). First-year return to private sector experience accumulated outside cities is 8.6%, which increases by 1.1 percentage point if accumulated in cities. The additional return to city experience increases with the level of education, 0.5 percentage point for low-educated workers and 1 percentage point for the high educated. Furthermore, we find that the additional return for experience in cities is lower in the public compared to the private sector (0.4 percentage point vs. 1.1 percentage point). In the public sector, the city effect is only significant for the high educated.

5. Robustness

The robustness of the results is investigated in alternative model specifications. Four of them are presented in appendix tables. The first concentrates on ‘young’ workers where we have the full history of experience. Then two alternatives address the handling of geography. The last robustness analysis deals with the possible role of the financial crisis starting 2008. In addition, we have analyzed robustness with respect to dynamic specification and sample selection documented in an online appendix available from the authors (Appendix Tables B.4 – B.6).

A limitation of our analysis is that we only have worker experience data dating back to 1993, which is not the full history of experience for many workers. The analysis is repeated for a sample of workers for whom we have the full history of experience (workers born after 1967). The estimates are reported in Table A.2 and are comparable to Table 4. Since the number of shifters is much lower in this sub-sample, we concentrate on the results for return to experience based on all workers in this group. The main results regarding the higher return to experience in the private sector for the high educated and negligible return for low-educated workers remain. The extra return to experience for the high educated in the private compared to the public sector is larger in this sample of young workers. The higher return may reflect a cohort effect or a higher effect early in a worker’s career, since the measurement error is expected

to overestimate the effect of experience when all workers are included. Private experience in cities generates an additional increase in return. Consistent with the results for all workers in Table 4, return to private experience is a city phenomenon for the low educated. High-educated workers have higher return to experience both inside and outside city regions, but the return is higher in cities.

We have chosen to estimate the geographical aspect of the private wage premium by distinguishing the seven large city regions in Norway (with population above 150,000) and the rest of the economy. We investigate the robustness of this definition by introducing an alternative cutoff population size of 100,000 implying a city group with 13 regions. The results are reported in Table A.3. The conclusions hold for this larger group of cities, and consequently the city effects are present down to 100,000 inhabitants. Static and dynamic gains from shifting to the private sector are significantly higher in cities, both for low- and high-educated workers.

As a second check of robustness of the city effects, we include a separate group of small cities (between 65,000 and 150,000 inhabitants) in addition to the original city group with population above 150,000. The small city group consists of 13 regions and the results are shown in Table A.4. The static private-public wage gap in small cities lies in between the wage gap in cities and the rest of the economy. The extra gains of having private sector experience in cities are not affected by the inclusion of small city experience in the regression. For the low educated, we find no extra gain of having private sector experience in small cities. For high-educated workers, the additional first-year return to private experience is much lower when accumulated in small cities compared to cities (0.2 vs. 0.7 percentage points), and the small city effect is only significant at the 10% level. The findings imply that the additional return to private experience accumulated in cities is primarily concentrated to the largest cities.

The last robustness check reported here deals with the financial crisis. The economic shock hits the economy in 2008 and has disturbed the wage structure with respect to private versus public sectors. We address the short-term responses and add interaction terms for the post-2007 period for the static private premium in cities and in the rest of the country. The results are reported in Table A.5 and confirm a negative shift in the aggregate static private-public wage premium with the financial crisis. As seen from column (1), the private wage premium is 1.5 percentage points lower in the post 2007 period, indicating that private wages are hit relatively harder by the financial crisis. Separating between cities and the rest of the country, we find that the reduction in the private wage premium after the crisis is significantly smaller in cities.

Interestingly, the impact is very different for the low educated compared to the high educated. For the low educated, the pattern is similar to the aggregate with a reduction in the private wage premium of 2.3 percentage points and 1.4 percentage points outside and inside cities, respectively. For high-educated workers, the private wage premium increases by 1.7 percentage points after the financial crisis, both in cities and in the rest of the country. It should be noticed that for the period before the financial crisis, the additional city effect is 2.6% for low-educated and 4.9% for high-educated workers in this specification, basically the same as for the whole period (Table 4).

In addition, we have had a look at dynamic specification and sample selection. The dynamic formulation is discussed in relation to model (2) in section 2 and the implementation shown in Figs. 1 and 2. Instead of quadratic experience terms, we interact private experience, experience in city and private experience in city with total experience. The results documented in Appendix Table B.4 produce similar concave experience curves as in Table 4. Appendix Tables B.5 and B.6 check the robustness of the results with respect to sample selection. First, reintroducing the top and bottom 1% of the wage distribution into the dataset does not affect the main findings. Both static and dynamic gains from shifting to the private sector are still higher in cities. Second, we include shifters that are out of the labor market for up to three consecutive years before the shift-year. This increases the number of shifters by 3128 and increases the dataset by about 17,000 observations. The main findings remain.

6. Concluding remarks

We investigate the private-public wage gap using rich register data for Norway. The starting point is a panel analysis extended to include dynamic effects of experience. The estimates show that experience accumulated in the private sector has higher return than public sector experience. Geography matters, and both the static gap and the dynamic

experience effect are higher in cities. For the low educated, the additional return to private experience is a city phenomenon only. Gender differences are important for high-educated workers. High-educated women have less return to private sector experience than high-educated men and receive the same gain from experience accumulated in cities and in the rest of the country.

Corrected for individual observable and unobservable characteristics and taking into account the return to experience for 10 years of experience, the total static and dynamic wage gap is calculated. Heterogeneity is important and there is large variation dependent on education level, geography and gender. Overall, the combined static and dynamic private-public wage gap equals 11.6% in cities compared to 3.3% in the rest of the country. The dynamic experience effect adds to the static private wage premium, and for high-educated male workers, it accounts for about 2/3 of the total wage gap.

The private-public wage gap is important to understand wage inequality and regional labor markets. The public sector compresses the wage distribution by holding down wages for high-educated workers and reduces regional wage inequalities by holding down public sector wages in cities. Future research should address the background of the sectoral differences. It is of interest to test a hypothesis that the static and dynamic wage gaps reflect strong unions in the public sector, which can be investigated by studying variation within the private sector in the strength of unions.

Author statement

The authors share responsibility for the paper.

Declaration of competing interest

The authors have no conflicts of interest regarding this paper.

Appendix A

Table A.1
Allocation of workers across private sector industries: Private stayers vs. shifters

	Private stayers	Shifters Public → Private	Shifters Private → Public
<i>Industry</i>	<i>0.393</i>	<i>0.251</i>	<i>0.321</i>
Manufacturing	0.252	0.12	0.093
Construction	0.141	0.131	0.229
<i>Services</i>	<i>0.607</i>	<i>0.749</i>	<i>0.679</i>
Retail	0.199	0.086	0.081
Business services	0.215	0.455	0.447
Other services	0.193	0.208	0.151

Notes: The first column shows the allocation of private stayers across the five main industries in the private sector, as well as the aggregates for industry and services. The second and third columns show similar employment shares for workers shifting from the public to the private sector (in the first year after the shift) and for workers shifting from the private to the public sector (in the last year before the shift), respectively.

Table A.2
Estimation of private sector wage premium: Young workers (born after 1967)

	All (1)	Low-educated (2)	High-educated (3)
Private	0.003 (0.0036)	-0.023*** (0.0063)	0.016*** (0.0043)
Private x city	0.05*** (0.0034)	0.035*** (0.007)	0.051*** (0.004)
Experience	0.082*** (0.0012)	0.083*** (0.0018)	0.092*** (0.0019)

(continued on next column)

Table A.2 (continued)

	All	Low-educated	High-educated
	(1)	(2)	(3)
(Experience) ²	-0.001*** (0.0000)	-0.0012*** (0.0001)	-0.0014*** (0.0001)
Private experience	0.004*** (0.001)	-0.005*** (0.0016)	0.018*** (0.0014)
(Private experience) ²	-0.0003*** (0.0001)	0.0001 (0.0001)	-0.0005*** (0.0001)
Experience in city	0.001 (0.0012)	-0.008*** (0.0023)	0.002 (0.0015)
(Experience in city) ²	0.0001 (0.0001)	0.0004*** (0.0001)	0.0001 (0.0001)
Private experience in city	0.01*** (0.0013)	0.012*** (0.0024)	0.005*** (0.0017)
(Private experience in city) ²	-0.0005*** (0.0001)	-0.0005*** (0.0001)	-0.0004*** (0.0001)
Job tenure	-0.007*** (0.0002)	-0.007*** (0.0003)	-0.009*** (0.0004)
(Job tenure) ²	0.0003*** (0.0000)	0.0002*** (0.0000)	0.0006*** (0.0000)
Observations	2,790,353	1,902,324	888,029
R ²	0.70	0.67	0.71

Notes: The dependent variable is log hourly wages. The regressions are based on data for young workers born after 1967. All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table A.3

Estimation of private sector wage premium: Alternative city cutoff (100,000 inhabitants)

	All	Low-educated	High-educated
	(1)	(2)	(3)
Private	0.015*** (0.0024)	0.006 (0.0037)	0.024*** (0.0031)
Private x city	0.047*** (0.0025)	0.032*** (0.0042)	0.05*** (0.0033)
Experience	0.08*** (0.0008)	0.077*** (0.0011)	0.095*** (0.0014)
(Experience) ²	-0.0009*** (0.0000)	-0.0009*** (0.0000)	-0.0013*** (0.0000)
Private experience	0.005*** (0.0006)	0.002* (0.0009)	0.013*** (0.001)
(Private experience) ²	-0.0004*** (0.0000)	-0.0003*** (0.0000)	-0.0004*** (0.0000)
Experience in city	0.004*** (0.0007)	-0.001 (0.0012)	0.004*** (0.001)
(Experience in city) ²	-0.0001*** (0.0000)	0.0000 (0.0001)	-0.0001** (0.0000)
Private experience in city	0.006*** (0.0008)	0.005*** (0.0012)	0.006*** (0.0011)
(Private experience in city) ²	-0.0002*** (0.0000)	-0.0002*** (0.0001)	-0.0004*** (0.0001)
Job tenure	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.007*** (0.0002)
(Job tenure) ²	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0004*** (0.0000)
Observations	6,752,856	4,852,538	1,900,318
R ²	0.76	0.72	0.78

Notes: The dependent variable is log hourly wages. The city group is defined as regions with more than 100,000 inhabitants in 2010, which includes 13 out of 89 regions. All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table A.4
 Estimation of private sector wage premium: Including small cities (65,000–150,000 inhabitants)

	All	Low-educated	High-educated
	(1)	(2)	(3)
Private	0.014*** (0.0026)	0.005 (0.004)	0.023*** (0.0035)
Private x city	0.052*** (0.0028)	0.035*** (0.0047)	0.056*** (0.0037)
Private x small city	0.022*** (0.0034)	0.02*** (0.0055)	0.02*** (0.0044)
Experience	0.08*** (0.0008)	0.078*** (0.0012)	0.095*** (0.0014)
(Experience) ²	-0.0009*** (0.0000)	-0.0009*** (0.0000)	-0.0013*** (0.0000)
Private experience	0.005*** (0.0007)	0.001 (0.001)	0.012*** (0.001)
(Private experience) ²	-0.0003*** (0.0000)	-0.0002*** (0.0000)	-0.0004*** (0.0000)
Experience in city	0.005*** (0.0008)	-0.003* (0.0013)	0.004*** (0.001)
(Experience in city) ²	-0.0001*** (0.0000)	0.0001* (0.0001)	-0.0001 (0.0000)
Private experience in city	0.008*** (0.0008)	0.008*** (0.0013)	0.007*** (0.0012)
(Private experience in city) ²	-0.0004*** (0.0000)	-0.0003*** (0.0001)	-0.0005*** (0.0001)
Experience in small city	0.001 (0.0009)	-0.000 (0.0014)	-0.000 (0.0012)
(Experience in small city) ²	-0.0000 (0.0000)	0.0000 (0.0001)	0.0001 (0.0001)
Private experience in small city	0.002* (0.001)	0.001 (0.0015)	0.002* (0.0014)
(Private experience in small city) ²	-0.0002*** (0.0000)	-0.0001** (0.0001)	-0.0003*** (0.0001)
Job tenure	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.007*** (0.0002)
(Job tenure) ²	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0004*** (0.0000)
Observations	6,752,856	4,852,538	1,900,318
R ²	0.76	0.72	0.78

Notes: The dependent variable is log hourly wages. The city group is defined as regions with more than 150,000 inhabitants in 2010 (7 regions). Small cities are regions with population in the range 65,000–150,000 in 2010 (13 regions). All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Table A.5
 Static private-public wage gap and the financial crisis

	All	All	Low-educated	High-educated
	(1)	(2)	(3)	(4)
Private	0.051*** (0.0019)	0.031*** (0.0022)	0.02*** (0.0034)	0.03*** (0.0029)
Private x post2007	-0.015*** (0.0007)	-0.019*** (0.001)	-0.023*** (0.0013)	0.017*** (0.0016)
Private x city		0.041*** (0.0025)	0.026*** (0.0044)	0.049*** (0.0031)
City x post2007		0.01*** (0.0013)	0.002 (0.002)	0.011*** (0.0018)
Private x city x post2007		0.01*** (0.0015)	0.009*** (0.0021)	-0.000 (0.0022)
Experience	0.091*** (0.0006)	0.09*** (0.0006)	0.08*** (0.0007)	0.112*** (0.0012)
(Experience) ²	-0.0014*** (0.0000)	-0.0014*** (0.0000)	-0.0012*** (0.0000)	-0.0019*** (0.0000)
Job tenure	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.006*** (0.0001)	-0.006*** (0.0002)
(Job tenure) ²	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0004*** (0.0000)
Observations	6,752,856	6,752,856	4,852,538	1,900,318
R ²	0.76	0.76	0.72	0.77

Notes: The dependent variable is log hourly wages. The variable *post2007* is a dummy that equals one for the period 2008–2010. The city group is defined as regions with more than 150,000 inhabitants in 2010. All regressions include year, regional and worker fixed effects. Robust standard errors (clustered by workers) are given in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 percent level, respectively.

Appendix B. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.regsciurbeco.2020.103571>.

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