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Can Placement of Governmental Sector Jobs Spur Private Sector Employment and Performance?

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DISCUSSION PAPER SERIES

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ABSTRACT

Can Placement of Governmental Sector Jobs Spur Private Sector Employment and Performance?*

We analyse the impact of establishment of governmental sector jobs on private sector employment based on Norwegian population-wide administrative-register data. Based on precise geographical information on the location of jobs, differential treatment intensities yield identification of causal effects. The results suggest that governmental employment has positive effects on private sector employment in the close proximity of the stimulus area. In the same area, we also observe positive short-term effects on wage growth and on firms' sales. Over time, only employment effects prevail. Two different types of placebo tests give support to the causal interpretation of the main results.

JEL Classification: J61, R23

Keywords: regional labour markets, central government jobs, job creation

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1. Introduction

Public sector employment constitute an important part of total employment in many OECD-countries, and therefore it is of interest to analyse how a larger public sector affects the functioning of the private sector. Norway stand out as one of the OCED countries that has largest share of public sector employment. OECD (2016) shows that Norway, together with Denmark are the countries with the largest shares. Therefore, it should be of especial importance to analyse how public sector employment affects the functioning of the private sector in an environment where the public sector constitutes an important part of the economy. In several countries, e.g., the UK and US, there is a debate on the relocation of public jobs from their capitals.¹

In Norway, there is a broad political consensus that state jobs should be geographically dispersed. Governments of different political flavours have aimed to facilitate for regional growth and development through placement of public jobs throughout the country. The political goal is that a spatial dispersion of state owned establishments can contribute to more dynamic and well-functioning local labour markets, with better recruitment opportunities for businesses and better career opportunities for employees (se e.g., st.melding 2015-2016).

Increased public employment can affect private sector employment through many channels. When a new job is created in the public sector, additional jobs may be created in the private sector through increased demand for locally produced goods. But, this potential positive effect may be offset by general equilibrium effects, if wages and prices are affected by the increase in public employment. If so, the multiplier effect may be dampened through crowding out effects, i.e., increase of public employment comes at the expense of private sector

¹ See e.g. discussion in Berube (2019)(<https://www.brookings.edu/research/moving-federal-jobs-out-of-washington-could-work-if-its-done-correctly/>) and CentreforCities (2017) (<https://www.centreforcities.org/wp-content/uploads/2017/08/17-08-09-Should-we-move-public-sector-jobs-out-of-London.pdf>). January 19th 2020 Boris Johnson caused newspaper headlines by suggesting that the House of Lords should be moved to York.

employment growth, by employees working in the public sector that otherwise would have worked in the private sector.

Increased public sector may also change the composition of employment in private sector, by changing the balance between tradeable and non-tradeable sectors. Firms in the tradeable sector produces goods or services that are traded internationally. They will often be price takers and therefore, they cannot increase prices as a response to increased wages. On the other hand, increased employment in the public sector may increase the demand for non-tradeable goods, for example in private services.

The main goal of this paper is to analyse the regional impacts of creating governmental sector jobs on private sector employment. We focus on state governmental jobs, since the relocation and creation of these jobs are centrally determined and thus from the outset less affected by local conditions.² But, we also present analyses on the effects on wages and firm sales. We do so by exploiting information about new governmental jobs in the local region; either from relocation of governmental workplaces, or establishment of new governmental workplaces. Based on precise geographical information on the location of public jobs, we can create bands of different spatial length through which we analyse the size of the effect. The bands are 0 km (inside the same neighbourhood), 0-1 km, 0-2 km, 0-3 km, 0-4 km, 0-5km, and 0-50 km. The period of the governmental employment stimulus is 2003-2008. The evaluation periods for the impact on private sector employment are 2003-2008 and to 2003-2012.

Our results suggest that governmental employment has positive effects on private sector employment. The main effects for the whole sample shows that the effects are stronger in close proximity to the governmental jobs stimulus. We also find positive effects on both firm sales growth and wages in the private sector.

² A majority of the public jobs in Norway is organised and determined at the municipality or county level by the local (municipal/county) government, and these employment decisions are strongly related to local conditions.

Parallel to the increasing size and importance of public sector in most industrialised countries, the economic research on the importance of public sector employment has increased, but further research is required to better understand the extent to which public sector employment affects the functioning of the private sector (Caponi 2017). First, there is a macroeconomic literature analysing the impact of public employment on both private sector employment and unemployment. Results from this literature differ. Edin and Holmlund (1997) report that public employment reduces unemployment in the short run, but has no impact in the long run. Boeri et al. (2000) and Algan et al (2002) both find, using data for several OECD-countries, that public employment crowds out private sector employment.

Our paper relates more strongly to the empirical micro-economic literature on the impacts of public employment on the private sector. Becker et al. (2018) analyse the rise of Bonn as the new capital of Western Germany at the end of World War II. They find that total employment and population in Bonn increased substantially after the war relative to a group of 40 control cities. They also find that the impact of government jobs on private sector employment was modest and concentrated in the non-tradable sector. Faggio and Overman (2014) use English data to analyse the impact of public sector employment on local labour markets. They find that public sector employment has no significant effect on total private sector employment, but public sector employment affects the sectoral composition of the private sector, by increasing employment in non-tradeable sector while crowding out employment in tradable sector.

The paper most relevant for our paper is Faggio (2019). She investigates local labor market impact of a UK relocation initiative –the 2004 Lyons Review. The review resulted in the dispersal of about 25,000 civil service jobs out of London and the South East towards other UK destinations. Results show that the relocation initiative raised private sector employment in receiving areas and changed the sectoral distribution of local employment towards services.

As Faggio (2019), we face econometric challenges since neither do we know which geographical area(s) that is (are) affected, nor is (are) the destination area(s) randomly chosen. Faggio (2019) solved these issues, by firstly construct treatment intensity variables as a non-parametric function of the distance to the relocation site: adapting the approach from Gibbons et al. (2011). Then she compared neighbouring areas at increasing distance from a relocation site. This treatment intensity approach, which can be considered an extension of a difference-in-difference approach with heterogeneous treatment effects (see Angrist and Imbens, 1995) exploit the temporal and spatial variation in the data. We follow her empirical strategy. We extent the literature in several ways: first, the findings of Faggio (2019) are based on relocation of public jobs within Britain: a competitive economy, mostly densely populated area, with a limited public sector. Our analyses focus on Norway, a geographically narrow and outstretched country with long distances and sparsely populated, but with a large public sector, geographically widely distributed. Thus, the settings contrast Faggio (2019). Second, the labour supply responses as identified by Faggio (2019) might be mitigated by pay policy changes. Third, new public jobs might not affect private employment strongly, but still yield strong impacts on sales. Finally, we add on Faggio (2019) by analysing long-term effects of public sector employment, i.e., by extending the period of analyses to 2012.

The paper proceeds as follows: the next section presents some contextual information. Next, we present the data, sample, and variables, followed by a section on the empirical approach. Then, section 5 presents the results, and section 6 concludes.

2. Contextual information

In an international context, Norway has an ambitious policy for creating regional development and economic balance between regions (OECD 2008). Regional policy and district policy in Norway covers all parts of the country. A general stated political goal of the regional and district

policy, is to create regional balance through economic growth, and create equal living conditions and sustainable regions throughout the country, and aims to create both regional development and regional distribution. The Norwegian regional and district policy has many similarities to the regional policy in the EU. The EU Regional Development Fund (ERDF) is organised according to the requirements that the different region in Europe have. A central feature for ERDF is to promote economically and socially integration by reducing imbalances between European regions. In addition, the ERDF has in recent years given a distinctive priority to specific types of areas, such as urban area (to reduce economic, environmental and social problems in cities), rural areas area, sparsely populated areas and mountain regions. As in the EU, Norwegian regional and district policy is focussed on sustainable growth, equalization of imbalances, and thematic concentration with focus on specific regions. A common principle is that the effort should be based on the possibilities and challenges that the particular regions face (St.meld. 18: 2016-2017).

Placement of central government establishments is an important part of a larger public policy on spatial distribution of public jobs and establishments. Historically, there is a broad political consensus in Norway that state-owned establishments should be spread out geographically. This to ensure growth, development and robust labour markets in the whole country. This goal has been stated by several governments (see for example “Vedlegg til Meld. St. 18 (2016-2017) “Berekraftige byar og sterke distrikt.»). The period we use for identifying public employment; 2003-2007, is a period where the Government actively decided to relocate seven relatively large state agencies out of Oslo. The decision was made in 2003, and carried out in the period 2003-2007.³ The relocation compromised approximately 900 employees. This relocation reform was evaluated in 2009 (Asplan Viak, 2010) with respect to several regional

3 St. meld. nr.17 (2002–2003) Om statlige tilsyn. The seven agencies were: The Directorate for Civil Protection and Emergency Planning, (DSB), the Norwegian Competition Authority, the Coastal Administration, the Civil Aviation Authority, the Media Authority, the Post and Telecommunications Authority, and the Maritime Directorate.

outcomes. Their main result was that the regional effects were modest, with respect to regional employment. Our study has a broader perspective; we exploit other types of data by using detailed administrative register data, we use another methodological approach (explained later), we extend the result period, and we include all establishments and relocation of central government establishments, not only the 7 relocated establishments included in the reform. During the period 2003-7 140 governmental workplaces employing over 13000 workers were relocated or created.

Our sample of establishments is limited to central government establishments (“Stats- og trygdeforvaltningen”). These establishments comprise all state-owned non-market-oriented establishments that are directly controlled by central political and administrative authorities. This latter characteristic is favorable for our research question since it implies that location of these establishments are under political control. Important tasks for these establishments are the production of different public services and distribution of welfare benefits. Examples of core units include the ministries, the underlying directorates, the agencies (“tilsyn”), the labour and welfare administration (NAV) with its underlying local units, and all state owned universities and colleges. Some part of this sector is always located in the capital, like the ministries, but for most units, there is a political choice where the units should be located. Together, this sector constitutes a relatively large share of total employment in the public sector (approximately 1/3 of public sector employment, based on own calculations from register data).

3. Data, sample and variables

We exploit high quality Norwegian register data, collected and organised by Statistics Norway. The starting point is the registration of all state-sector workplaces in a local region in the period 2003-2007. First, we sample all state-sector workplaces registered as active by the end of 2007. From this group of workplaces we limit the sample to workplaces that are either new-

established workplaces (state-owned workplaces that were not present in 2003), and state-workplaces that are relocated (they existed in 2003, but in another county). For both types of workplaces, we limit the sample to workplaces that have 25 employees or more in 2007.

Central government workplaces are defined by their institutional sector. We use the classification of institutional sector, defined by Statistics Norway, and include only workplaces registered as *Central government* workplaces (“Stats- og trygdeforvaltningen”), i.e., workplaces with code 110.⁴

Our key observational unit in the analyses, i.e., the regional unit of analysis is the local region, the neighbourhood (“Grunnkrets”). The neighbourhood should comprise a stable population over time, with at least 200 inhabitants. There are approximately 13,000 neighbourhoods in Norway. This is the most detailed administrative regional unit in Norway. For example, usually several neighbourhoods comprise one postal code, it is quite common that one voting district comprises several neighbourhoods, and similarly, one school district comprises several neighbourhoods. Except for the capital Oslo, the average distance between each neighbourhood is around 3 km, but this vary slightly between counties (with Oslo’s 700m, and Norway’s northernmost county Finnmark’s 11 km as outliers).

The key dependent variables are private sector employment growth, sales growth and log hourly wage growth. Let us define these variables more in detail.

Employment: This measure the employment growth from 2003 to 2008 (or from 2003 to 2012) for all private sector firms located in neighbourhood *n*. Information on the number of jobs created in the private sector is taken from annual firm-level register data (“Virksomhet og foretaksregisteret” - VOF), containing information on the number of employees in each firm in the private sector.

⁴ The definition of institutional sector was changed in 2012, but since this is after our period of establishment of firms, we use the old coding system.

Sales: This measure total private sector sales growth from 2003 to 2008 (or from 2003 to 2012) for all private sector firms located in neighbourhood n.

Wages: We construct three wage measures, described under A), B) and C):

A) Growth in private sector neighbourhood average log hourly wage from 2003 to 2008 (or from 2003 to 2012) for employees in all private sector firms located in neighbourhood n.

B) Growth in private sector neighbourhood average log hourly wage for stayers from 2003 to 2008 (or from 2003 to 2012) for private sector firms located in neighbourhood n, i.e., where the averages are calculated only for workers employed by firms in neighbourhood n both in 2003 and 2008 (or 2003 and 2012).

C) In this case, we pool all worker data for Norway 2003-2012 for both private and public sectors, and estimate an auxiliary linear log hourly wage regression of log hourly wage on year dummies, age vigintile dummies and worker fixed effects, and then predict the residual hourly wage, and use this residual when we repeat the strategy of B). Thus we measure the growth in private sector neighbourhood average residualised log hourly wage for stayers from 2003 to 2008 (or from 2003 to 2012) for private sector firms located in neighbourhood n, i.e., where the averages are calculated only for workers employed by firms in neighbourhood n both in 2003 and 2008 (or 2003 and 2012).

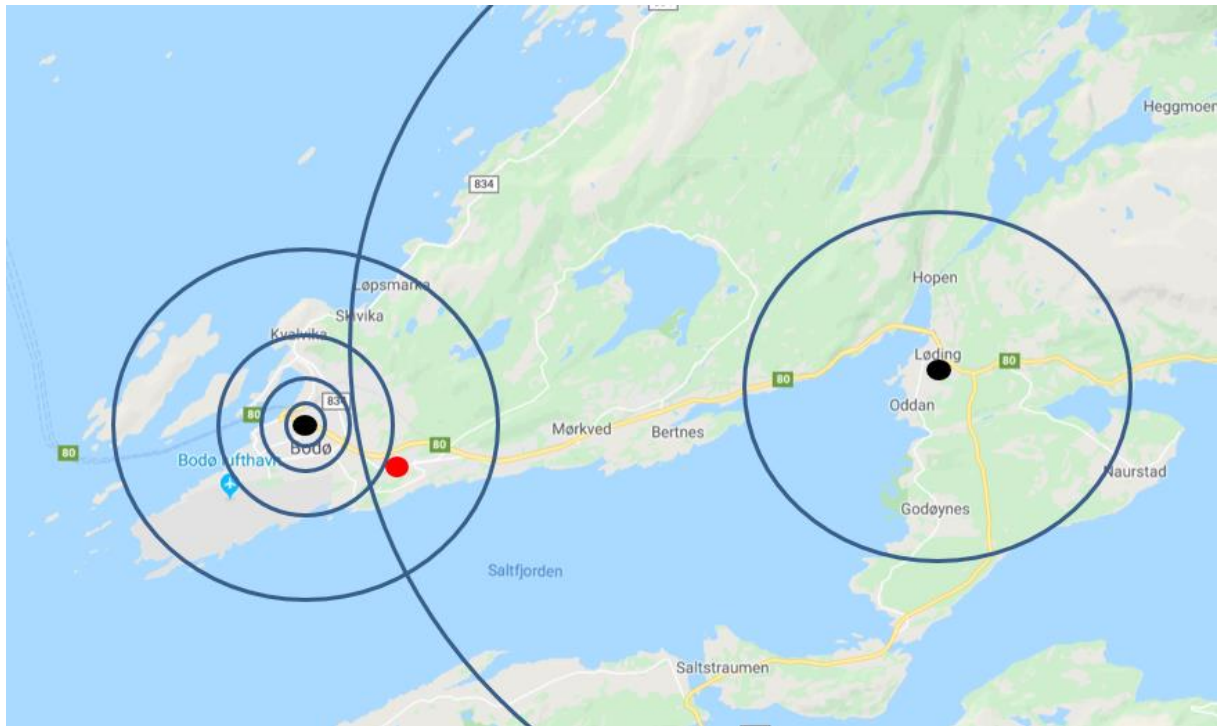
Why do we study the impact on hourly wages by these three measures? The first measure comprises both compositional impacts (within a neighbourhood) and impacts on wages conditional on composition. By focussing on stayers, we fix neighbourhood composition. By focussing on the residualised wages for stayers, we take into account differential impact conditional on fixed worker skills.

In addition to these dependent variables, our analyses add several controls (see Table A1 for descriptive statistics on dependent and independent variables).

The key independent variables then express the number of new governmental jobs around the neighbourhood at different distances. In each neighbourhood, we construct centroids around the neighbourhood. Around each centroid, we construct several distance bands, measuring the Euclidean distance between the centroid of the neighbourhood and the surrounding neighbourhoods: 0 km, 0-1 km, 0-2 km, 0-3 km 0-4 km 0-5 km, and 0-50 km. Finally, in each of these distance bands, we then measure the total number of new or relocated governmental jobs in the period 2003-2007. Thus, the treatment intensity interacts the number of jobs and the distance. Note, however, that we as Faggio (2019), measure these treatment intensities in a cumulative fashion, so we are able to get coefficient directly capturing the direct effect of each band (Faggio, 2019: 58).

In Figure 1 and 2, we focus on two examples on how to understand these distance band. First, in Figure 1 we show the relocation of the Civil Aviation Authority to Bodø, which is indicated by a red dot. For the neighbourhood in the centre of Bodø (black dot on the left), we that this implies no new governmental jobs in this neighbourhood, but still within one of the circles rather close to the centre. For the neighbourhood at Løding (black dot to the right), these new jobs are much further away.

Figure 1. Measuring the number of new or relocated governmental jobs within different distance band from a neighbourhood. Example 1.



Note: For the neighbourhood in the centre of Bodø city, the relocation of the Civil Aviation Authority to Bodø (red dot), implies new governmental jobs within one of the circles closer to the centre of this neighbourhood. For the neighbourhood at Løding to the right, these new jobs are much further away.

Figure 2. Measuring the number of new or relocated governmental jobs within different distance bands from a neighbourhood. Example 2.



Note: For the neighbourhood in the centre of Trondheim city (1301), the relocation of three governmental workplaces (red dots), implies new governmental jobs within the circles closer to the centre of this neighbourhood. Governmental employment is aggregated across all new workplaces within the same distance band. For the neighbourhood at Strindheim to the right, these new jobs are much further away.

In Figure 2, we depict a similar case in the city of Trondheim, where three governmental workplaces appears during 2003-7. Two of these workplaces are within the same distance band from the neighbourhood in Trondheim centre (black dot on the left). In this case, we aggregate the total number of new governmental jobs across the two governmental workplaces.

In the empirical analyses we analyse the impact of *all* central government jobs, but we also carry out heterogeneity analyses, distinguishing between types of governmental activities: i) Finance/technology and business services, ii) Public administration, and iii) Education/Health and social services, and we analyse whether effects are heterogeneous across private sector industries.

4. Methodological approach

Our ambition is to say something causal about the relationship between placement of public jobs, here represented by governmental jobs, and private sector employment. There are methodological challenges associated with this ambition. Most importantly, this is due to non-randomly assigned placement of governmental workplaces.

If public workplaces are established or reallocated to regions with high or low economic growth, the estimates measuring the impact of public employment will be biased, if the chosen control regions do not represent a good contra-factual alternative development if the public employment did not occur. Another problem is that we do not know which geographical area(s) that is (are) affected. To reduce the impact of this problem we construct a treatment intensity variable, inspired by the approach in Faggio (2019), assuming that effects are additive and vary by distance. This can be seen as a variant of the familiar differences-in-difference, with heterogeneous treatment effects, where the treatment and control regions are not specified directly, but where distance bands of different lengths measure the different treatment intensities. The conventional treatment dummies in a DD-setting are replaced with treatment intensity variables.

Norway is divided into about 13,000 local regions, so-called neighbourhoods. A neighbourhood is a smaller geographical area than a postal code, and comprise a stable population and structures over time.

For all neighbourhoods n with economic activity in $t \in (2003, 2008) \vee (2003, 2012)$, we then estimate variants of the following equation:

$$1) \Delta Y_n^t = \gamma^0 \Delta N_n^0 + \sum_d \gamma^d \Delta N_n^d + \beta^k Z_{n,2002}^k + \theta_m + \varepsilon_n,$$

$t \in (2003, 2008) \vee (2003, 2012)$, $d \in 0-1 \text{ km}, 0-2 \text{ km}, 0-3 \text{ km}, 0-4 \text{ km}, 0-5 \text{ km}, 0-50 \text{ km}$,

where ΔY_n^t denote change (growth) in private sector outcome variable (either from 2003 to 2008 or from 2003 to 2012), ΔN_n^0 expresses the total number of new governmental jobs between 2003 and 2007 in neighbourhood n (thus within distance 0 km from neighbourhood n), ΔN_n^d expresses the total number of new governmental jobs between 2003 and 2007 in distance band d around neighbourhood n . The distance bands are $d \in \{0-1 \text{ km}, 0-2 \text{ km}, 0-3 \text{ km}, 0-4 \text{ km}, 0-5 \text{ km}, 0-50 \text{ km}\}$. θ_m expresses municipality fixed effects associated with municipality m (where $n \in m$). Next, $Z_{n,2002}^k$ expresses vectors of predetermined neighbourhood controls measured in 2002: number of inhabitants, share of women, share high/low educated inhabitants, average age, employment share at the 2-digit industry level, and finally, in some specifications, employment growth 2002-3. ε_n expresses a standard error term. When estimating 1) we will adjust the standard errors to take into account municipality level clustering. Estimation of 1) will rest on simple linear regressions, except when the outcome variable measure sales growth. Due to this outcome measure extremely dispersed nature (see Figure A1 and A2 in the appendix), we focus instead on median (RIF) regressions (see Firpo et al (2009) and Rios-Avila (2020)).

Note that we exclude neighbourhoods within Norway's capital Oslo, since our focus is the relocation or creation of new governmental jobs outside Oslo. Thus our estimation is not affected by the movement of central governmental jobs within Oslo.

In our analyses, we focus on three different kinds of outcomes described in detail in Section 3: employment, sales and hourly wages. We primarily focus on all private sector workplaces, but we also construct similar industry-specific outcome measures, where we differentiate between 6 broad industries: manufacturing, construction, trade, transport, finance/technical/scientific/business services, and education/health/social services.

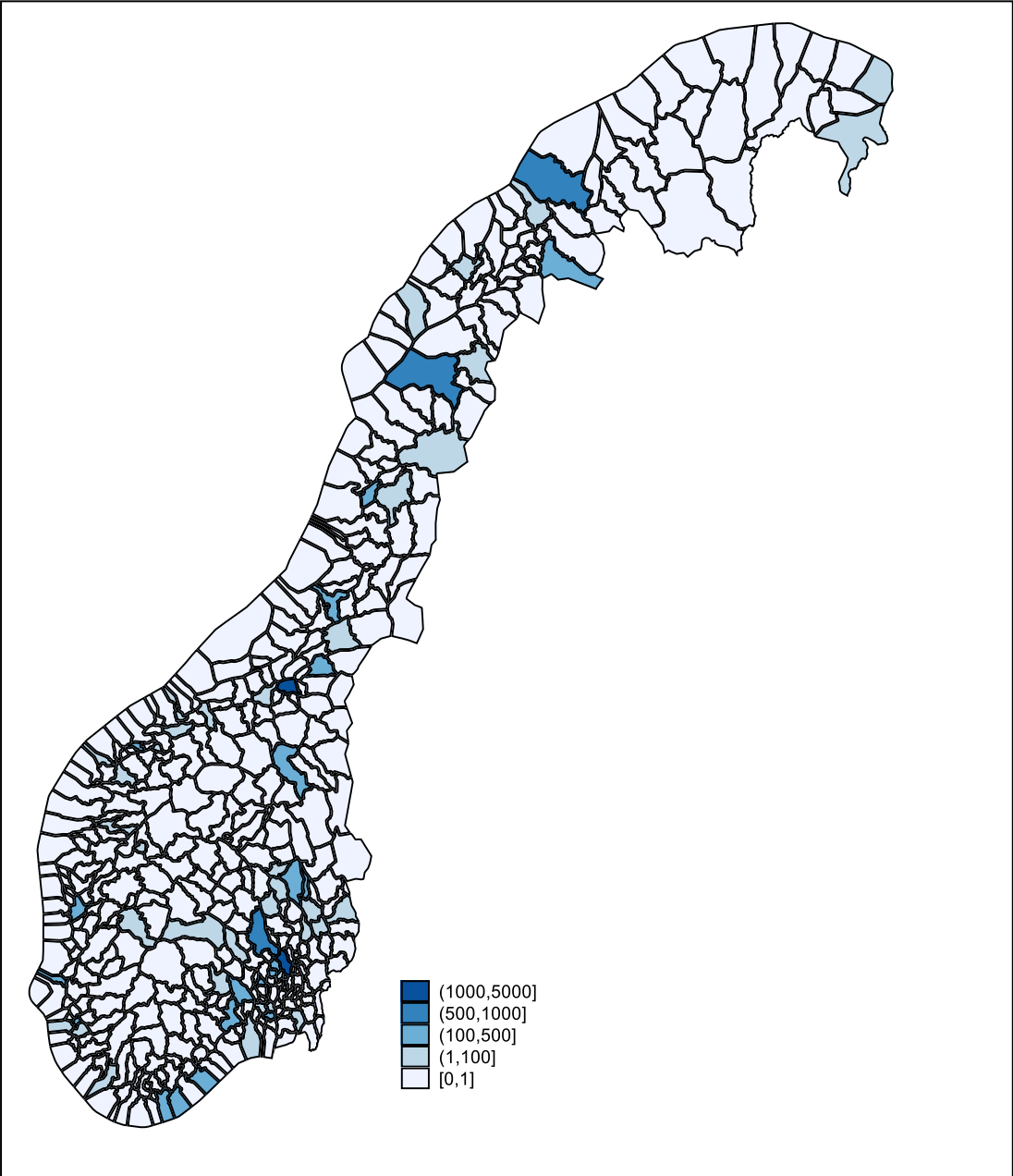
5. Results

Main results

First, Figure 3 presents how the establishment of new or relocated governmental sector jobs are distributed across Norwegian municipalities (there are approximately 430 municipalities in Norway). The period of relocation or job creation is 2003-2007. 140 governmental workplaces employing a total of 13015 workers were relocated or created during this period. The figure shows that the new governmental jobs are distributed across a widespread area, covering most parts of Norway. It is noteworthy that also some of the more sparsely populated regions in the northern part of the country are well represented among the municipalities that receive many public sector jobs.

Table 1 presents descriptive statistics on created or relocated governmental jobs in the period 2003-2007, for all and split by education, and industry. On average, 92 new public jobs are created, the distribution between low- (45.9) and high-educated jobs (47.07) are fairly even. The last three columns show how the mean values are distributed in Services, Public administration, and Education and Health. Education and Health consists of larger firms. This explains the large mean value of public jobs for this group.

Figure 3. Establishment of new public jobs across Norwegian municipalities



Note: The number of new created or relocated governmental jobs during the pre-period 2003-2007 across the Norwegian municipalities.

Table 1. Newly created or relocated governmental jobs 2003-7. Descriptive statistics.

	All	Low- edu.	High edu.	Finance/tech/ business services	Public admin.	Educ/Health/ Social services
Employment	92.96	45.90	47.07	75.30	95.50	96.88
	(116.01)	(75.46)	(60.07)	(110.40)	(93.80)	(127.53)

Note: N: 140 governmental workplaces employing a total of 13015 workers were relocated or created during 2003-7.

Table 2 presents results from estimation of equation (1). The dependent variable is private sector employment growth 2003-2008 (model 1-3), and 2003-2012 (model 4-6). For both periods, we include the following bands: 0 km, 0-1 km, 0-2 km, 0-3 km, 0-4 km, 0-5 km, and 0-50 km. The first model includes pre-trend municipality fixed effects, the second adds area demography control, and the third adds area industrial controls. All models include fixed municipality effects.

For the period 2003-2008, we find positive effects of governmental employment on private sector employment, using all three specifications. The positive effects are limited to the neighbourhood where the governmental employment increase, and in the closest band (0-1 km). By far, the size of the effects are strongest in the neighbourhood where the public employment increase. Looking at the most elaborated model (Model 3), the coefficient for the 0 km suggests that the arrival of one public job in the area increase the number of private sector jobs by 3.659 additional private sector jobs in the same area. Looking at long-term effects (2003-2012), the pattern and size of the coefficients are quite similar.

Table 2. The impact of newly created and relocated governmental jobs on local private employment growth.

	2003-2008			2003-2012		
	1	2	3	4	5	6
0 km	2.533** (0.543)	2.514** (0.543)	3.659** (0.971)	2.178** (0.460)	2.134** (0.457)	3.033** (0.872)
0-1 km	0.123** (0.039)	0.115** (0.041)	0.133** (0.061)	0.235** (0.074)	0.233** (0.071)	0.238** (0.083)
0-2 km	0.016 (0.032)	0.015 (0.030)	0.047 (0.061)	0.006 (0.033)	0.001 (0.034)	0.024 (0.064)
0-3 km	-0.009 (0.026)	-0.012 (0.026)	-0.004 (0.036)	0.001 (0.029)	0.001 (0.030)	0.005 (0.041)
0-4 km	0.022 (0.039)	0.024 (0.036)	0.021 (0.023)	0.037 (0.035)	0.030 (0.033)	0.037 (0.046)
0-5 km	0.014 (0.016)	0.006 (0.016)	0.014 (0.027)	-0.008 (0.023)	-0.021 (0.022)	-0.017 (0.030)
0-50 km	-0.015 (0.015)	-0.015 (0.015)	-0.004 (0.007)	-0.005 (0.013)	-0.008 (0.013)	-0.001 (0.004)
Controls:						
Area demography		Yes	Yes			Yes
Area industrial composition			Yes			Yes
Pretrend			Yes			Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
R2-adj	0.008	0.010	0.299	0.009	0.015	0.157
N	12078	12078	12078	12078	12078	12078

Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Dependent variable: Private sector employment growth 2003-2008 (model 1-3) and private sector employment growth 2003-2012 (model 4-6). Methods: linear FE regressions (within municipality-transformed variables). Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses. ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

In summary, the results in Table 2 suggest positive effects of governmental employment on private sector employment in the close proximity of the positive stimulus. Positive spillover effects to connected bands are found, but limited to the closest band. Our results are quite

similar to the results in Faggio (2019), reporting positive employment effects in the close proximity of the arrival of the public job.

Next, we ask the question whether increased governmental employment adds positively to the level of sales among private sector firms. When Faggio (2019) identifies positive spillover effects, this must reflect increased labour demand following increased economic activity in vicinity of the new public jobs. However, increased economic activity does not have to yield increased labour demand. Table 3 presents the results. The dependent variable is now private sector sales growth 2003-2008 (model 1-3), and 2003-2012 (model 4-6). The same controls are included as in Table 2.

Focussing on the period 2003-2008, we find that sales of private sector firms on median are positively affected by the introduction of public employment, but limited to the same neighbourhoods that experienced increases in public employment. However, we find no effects at all in the period 2003-2012. Thus, taken at face value, this implies that at the median, the employment spillover effects found in Table 2 imply reduced labour productivity, and in the long-run, this is even true also in the neighbourhoods that experience new governmental jobs.

Finally, the placement of new governmental jobs in a neighbourhood might influence the local pay policies. Private firms competing for labour might respond by bidding up wages. Thus, an interesting question is whether wages are affected by the arrival of governmental sector jobs. Table 4 presents the results from these analyses. The dependent variables are our three measures of average private sector log hourly wage growth from 2003 to 2008 (and 2003 to 2012): Observed wage growth, Observed wage growth for stayers, and residual wage growth for stayers. In all models, we include controls from the most elaborated model (Model 3 in Table 3).

Table 3. The impact of newly created or relocated governmental jobs on local private sales growth. .

	2003-2008			2003-2012		
	1	2	3	4	5	6
0 km	26.041**	24.809**	24.097**	2.729	-1.702	-2.909
	(6.239)	(6.219)	(5.954)	(10.772)	(11.149)	(8.206)
0-1 km	-0.891	-0.552	-0.285	-0.217	1.034	0.972
	(3.329)	(3.188)	(2.722)	(6.181)	(5.667)	(4.881)
0-2 km	-1.521	-1.683	-1.730	0.648	0.303	0.152
	(3.160)	(2.988)	(2.564)	(2.788)	(2.565)	(1.713)
0-3 km	-1.129	-1.368	-1.226	-1.689	-1.376	-1.110
	(2.813)	(2.881)	(2.652)	(3.537)	(3.225)	(3.062)
0-4 km	3.055	2.284	1.225	2.515	1.693	1.511
	(2.776)	(2.641)	(2.652)	(2.882)	(2.734)	(2.329)
0-5 km	2.028	1.593	1.405	0.533	0.399	0.300
	(2.640)	(2.387)	(2.174)	(2.603)	(2.071)	(2.003)
0-50 km	0.557	0.396	0.381	0.489	0.100	0.068
	(0.373)	(0.395)	(0.377)	(0.462)	(0.426)	(0.511)
Controls:						
Area demography		Yes	Yes		Yes	Yes
Area industrial composition			Yes			Yes
Pretrend			Yes			Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.057	0.064	0.071	0.075	0.106	0.114
N	12078	12078	12078	12078	12078	12078

Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Dependent variable: Private sector sales growth 2003-2008 (model 1-3) and private sector sales growth 2003-2012 (model 4-6). Methods: linear median FE regressions (models 3-4) based on Firpo et al (2009) and Rios-Avila (2020). Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Bootstrapped standard errors adjusted for municipality-clustering presented in parentheses ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

Table 4. The impact of newly created and relocated governmental jobs on private local average log hourly wage growth

	Growth 2003-2008 (logX100)			Growth 2003-2012 (logX100)		
	Observed	Observed stayers	Residual stayers	Observed	Observed stayers	Residual stayers
0 km	0.033* (0.015)	0.021** (0.008)	0.012* (0.006)	0.017 (0.014)	0.004 (0.009)	0.008 (0.008)
0-1 km	-0.005 (0.006)	-0.005* (0.002)	-0.003* (0.001)	-0.006 (0.006)	-0.007 (0.004)	-0.001 (0.002)
0-2 km	-0.009 (0.005)	-0.001 (0.002)	0.002* (0.001)	-0.004 (0.004)	-0.003 (0.002)	-0.001 (0.001)
0-3 km	0.001 (0.001)	-0.001 (0.002)	0.001 (0.001)	0.003 (0.004)	-0.001 (0.001)	0.003* (0.001)
0-4 km	0.006 (0.003)	-0.001 (0.001)	0.001 (0.001)	0.004 (0.003)	-0.002 (0.003)	0.001 (0.001)
0-5 km	-0.008 (0.007)	-0.001 (0.002)	-0.003 (0.003)	-0.004 (0.003)	-0.002 (0.002)	-0.001 (0.002)
0-50 km	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.005)	-0.003 (0.002)
Controls:						
Area demography	Yes	Yes	Yes	Yes	Yes	Yes
Area industrial composition	Yes	Yes	Yes	Yes	Yes	Yes
Pretrend	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.127	0.128	0.075	0.152	0.132	0.087
N	11754	11754	11754	11650	11650	11650

Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Dependent variable: Observed: Growth in average private sector log hourly wage from 2003 to 2008 (or 2003 or 2012); Observed_stayer: Growth in average private sector log hourly wage from 2003 to 2008 (or 2003 or 2012) for stayers, i.e., for workers present in the neighbourhood 2003 and 2008 (or 2003 and 2012), Residual_stayers: Growth in average private sector residualised wages from 2003 to 2008 (or 2003 or 2012) for workers present in the neighbourhood 2003 and 2008 (2003 and 2012), based on the residuals from log hourly wage regressions controlling for fixed worker effects, year dummies and age vignitle dummies for all private and public sector workers during the period 2002-2012. Methods: linear FE regressions (within municipality-transformed variables). Each neighbourhood average log wage growth observation is weighted by the total number of individual wage observations underlying the average. Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses. ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

Focussing on the spatial area where the governmental employment happen (0 km), we find positive wage effects of governmental employment on private sector wages for the period 2003-2008. But, the coefficients for the closest band (0-1 km), the positive effects are turned to negative effects, even if they are much smaller in sizes. For the longer period (2003-2012), we generally find no significant wage effects, with some (probably) arbitrary exceptions. Thus the results for wages are strongly reminiscent of the result for sales. When new governmental jobs are moved to a neighbourhood, economic activity increases locally temporarily, private sales increases while private workplaces satisfy their increase their labour demand, partly by bidding up wages. However, in the long run, the activity in the neighbourhood is harmonized with the surrounding neighbourhoods, thus any positive wage and sale impacts disappear, but the employment effects persist due to being less adjustable given Norway's employment protection legislation.

Robustness checks

Our aim is to uncover causal relationships between governmental employment and private sector employment. However, although governmental jobs are centrally determined, we cannot assume that the arrival of governmental jobs are not randomly drawn across the country. To reduce the potential bias from selective placement of governmental employment we include a series of fixed effects, and also include control for pre-trends. Still, to analyse the robustness of the results, we conduct two placebo-analyses. Table 5 and 6 presents results from placebo analyses for employment, sales, and wages. The placebo analysis in Table 5 is conducted by randomly draw public employment across the country. The spatial random placement is then regressed on employment, wages, and sales. We should not expect to find any systematic relationship between the random placement and the outcome variables.

Table 5. The impact of newly created and relocated governmental jobs on local private employment growth, sales growth and wage growth. 2003-2008. PLACEBO-analyses.

	Employment growth		Sales growth		Log Wage growthX100	
	1	2	3	4	5	6
0 km	-2.946 (8.328)	-14.411 (12.288)	549.234 (1498.123)	655.281 (1193.724)	1.106 (1.591)	1.028 (1.584)
0-1 km	-0.072 (0.039)	-0.082 (0.077)	-1.938 (6.508)	-1.299 (5.014)	0.002 (0.004)	0.002 (0.004)
0-2 km	-0.002 (0.058)	0.033 (0.060)	-0.074 (3.667)	-0.448 (2.586)	0.004 (0.004)	0.004 (0.004)
0-3 km	-0.010 (0.070)	-0.036 (0.096)	-2.408 (4.596)	-2.208 (3.697)	-0.002 (0.004)	-0.003 (0.004)
0-4 km	0.088 (0.065)	0.052 (0.064)	4.464 (6.171)	4.522 (5.392)	0.001 (0.001)	0.001 (0.001)
0-5 km	-0.011 (0.094)	0.011 (0.090)	-0.268 (3.871)	-1.164 (3.383)	-0.008 (0.005)	-0.007 (0.005)
0-50 km	0.001 (0.010)	0.005 (0.010)	1.407 (0.955)	1.172 (0.989)	0.001 (0.001)	0.001 (0.001)
Controls:						
Area demography		Yes		Yes		Yes
Area industrial composition		Yes		Yes		Yes
Pretrend		Yes		Yes		Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.014	0.255	0.055	0.071	0.075	0.077
N	12119	12119	12119	12119	11872	11872

Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Dependent variable: Private sector employment growth 2003-2008 (model 1-2), private sector sales growth 2003-2008 (in 1000 NOK) (model 3-4) and growth in average private sector log hourly wage from 2003 to 2008 (model 5-6), where wages are measured for stayers only (workers present in the neighbourhood 2003 and 2008) only. Methods: linear FE regressions (within municipality-transformed variables) (models 1-2, 5-6); Median FE regressions (models 3-4) based on Firpo et al (2009) and Rios-Avila (2020). In the wage regressions, each neighbourhood average log wage growth observation is weighted by the total number of individual wage observations underlying the average. Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses (for models 3-4: bootstrapped). ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

Table 6. The impact of newly created and relocated governmental jobs 2003-7 on local private employment growth and sales growth. 1997-2002. PLACEBO-analyses.

	Employment growth			Sales growth		
	1	2	3	4	5	6
0 km	0.019 (0.029)	0.016 (0.028)	-0.278 (0.248)	1.697 (3.666)	-1.769 (3.554)	-1.914 (4.195)
0-1 km	-0.011 (0.018)	-0.015 (0.017)	-0.022 (0.018)	1.978 (1.522)	1.596 (1.358)	1.786 (1.375)
0-2 km	0.021** (0.005)	0.021** (0.006)	0.015 (0.010)	0.345 (1.295)	0.026 (1.031)	0.026 (1.045)
0-3 km	-0.002 (0.005)	-0.005 (0.007)	-0.010 (0.009)	0.304 (1.080)	0.444 (1.059)	0.463 (0.757)
0-4 km	0.002 (0.008)	0.004 (0.008)	0.002 (0.007)	-0.689 (0.679)	-0.999 (0.803)	-1.034 (0.793)
0-5 km	0.001 (0.007)	0.004 (0.008)	-0.002 (0.006)	0.500* (0.224)	0.305 (0.181)	0.607 (0.662)
0-50 km	-0.005 (0.003)	0.005 (0.003)	0.001 (0.001)	-0.005 (0.013)	-0.008 (0.013)	-0.276 (0.201)
Controls:						
Area demography		Yes	Yes			Yes
Area industrial composition			Yes			Yes
Pretrend			Yes			Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
R2-adj	0.020	0.035	0.248	0.074	0.228	0.243
N	10657	10657	10657	10657	10657	10657

Note: Observations of neighbourhoods outside the capital with positive employment in 2002 (see text). Dependent variable: Private sector employment growth 1997-2002 (model 1-3) and private sector employment growth 1997-2002 (model 4-6). Methods: Methods: linear FE regressions (within municipality-transformed variables) (models 1-3); Median FE regressions (models 4-6) based on Firpo et al (2009) and Rios-Avila (2020). Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses. ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

The placebo analysis in Table 6 is done by analysing the impact of governmental employment in periods prior to the arrival of governmental employment. We should not expect to any effects of governmental employment on private sector employment prior to the arrival of the jobs.

Table 5 and 6 present primarily non-significant relationships between governmental employment and the three outcome variables. This is reassuring and supports the causal interpretation we have put forward.

Heterogeneity analyses

In this sub-section, we conduct several heterogeneity analyses along several dimensions. In Table 7, we present separate results for the three types of governmental activities: i) Finance/tech-scientific and business services, ii) Public administration, and iii) Education/Health and social services.

For employment growth, in the “treatment” neighbourhood, we find positive effects for all three kinds of governmental activities, the point estimates indicating strongest impact (albeit insignificant) for *Finance/tech-scientific and business services*, but for both *Public administration* and *Education/health and social services*, the impacts are strongly significant.⁵ When we focus on sales, we see this pattern repeated for also sales and to a certain degree for wages. The creation of public administration jobs do not affect private sector wages.

What about the spillover effects? For *Education/health and social services*, there is also significant positive employment and sales spillover effects into the closest band (0-1 km). The point estimates indicates the presence of positive spillover effects in *Finance/tech-scientific and business services* as well, while *Public administration* in general appears to be associated with negative spillover effects. We find no strong pattern when it comes to spillover effects related to wages.

⁵ Fewer and smaller new public firms in Finance/tech-scientific and business services make the estimates for concerning the creation and relocation of these firms less precise.

Table 7. The heterogeneous impact of newly created and relocated governmental jobs on local private employment growth and wage growth. For 3 types of governmental activities.

	Employment growth		Sales growth		Wage growth	
	2003-8		2003-8		2003-8	
	1	2	3	4	5	6
Finance/tech and business services						
0 km	7.053 (4.282)	8.973 (5.557)	7.031 (4.331)	8.325 (5.401)	0.080* (0.031)	0.159** (0.054)
0-1 km	2.243 (1.520)	3.520 (2.145)	2.889 (1.574)	3.819 (2.108)	-0.029 (0.022)	-0.030 (0.029)
0-2 km	-0.169 (0.199)	-0.349 (0.274)	-0.536** (0.208)	-0.746** (0.263)	0.002 (0.001)	0.010 (0.016)
0-3 km	-0.181 (0.134)	-0.072 (0.351)	-0.186 (0.229)	0.012 (0.401)	0.001 (0.006)	0.008 (0.007)
0-4 km	0.020 (0.241)	0.142 (0.243)	0.098 (0.156)	0.178 (0.196)	0.004 (0.005)	0.001 (0.005)
0-5 km	0.115 (0.102)	0.012 (0.111)	0.022 (0.105)	-0.074 (0.148)	-0.007 (0.006)	0.002 (0.007)
0-50 km	0.028 (0.117)	-0.058 (0.115)	0.054 (0.149)	-0.008 (0.148)	-0.001 (0.006)	-0.010 (0.009)
Public administration						
0 km	3.562* (1.720)	7.462* (3.511)	4.893* (2.168)	7.903* (3.961)	-0.018 (0.052)	-0.010 (0.038)
0-1 km	-4.871 (4.010)	-6.177 (5.052)	-3.730 (4.027)	-4.551 (4.862)	-0.064 (0.050)	-0.144** (0.051)
0-2 km	-0.195 (0.274)	-0.078 (0.348)	-0.050 (0.339)	0.007 (0.394)	-0.030 (0.018)	-0.031 (0.019)
0-3 km	0.281 (0.389)	0.292 (0.506)	0.084 (0.356)	0.107 (0.473)	0.005 (0.004)	0.017 (0.010)
0-4 km	0.139 (0.230)	0.143 (0.225)	0.037 (0.269)	0.050 (0.378)	-0.029** (0.006)	-0.044** (0.008)
0-5 km	-0.023 (0.111)	-0.061 (0.130)	-0.079 (0.112)	-0.092 (0.124)	0.002 (0.011)	0.013 (0.009)
0-50 km	-0.449 (0.308)	-0.252 (0.157)	-0.510 (0.314)	-0.371 (0.199)	-0.001 (0.004)	-0.001 (0.004)
Education/Health and social services						
0 km	2.615** (0.603)	3.675** (1.021)	2.055** (0.551)	2.827** (0.940)	0.015 (0.011)	0.027** (0.008)
0-1 km	0.121** (0.043)	0.119** (0.048)	0.214** (0.082)	0.212** (0.074)	-0.005* (0.002)	-0.006 (0.004)
0-2 km	0.011 (0.032)	0.025 (0.052)	-0.004 (0.034)	0.003 (0.055)	-0.001 (0.002)	0.004 (0.003)
0-3 km	-0.023 (0.017)	-0.018 (0.026)	0.003 (0.021)	0.008 (0.030)	-0.002 (0.002)	-0.002 (0.003)
0-4 km	0.003 (0.034)	-0.005 (0.052)	0.027 (0.025)	0.013 (0.036)	0.001 (0.001)	0.005** (0.002)
0-5 km	0.022 (0.021)	0.036 (0.023)	0.016 (0.040)	0.018 (0.040)	-0.001 (0.002)	-0.001 (0.003)
0-50 km	0.005 (0.014)	0.001 (0.012)	0.009 (0.016)	0.001 (0.015)	0.001 (0.001)	0.001 (0.001)
Controls:						
Area demography		Yes		Yes		Yes
Area industrial composition		Yes		Yes		Yes
Pretrend		Yes		Yes		Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes

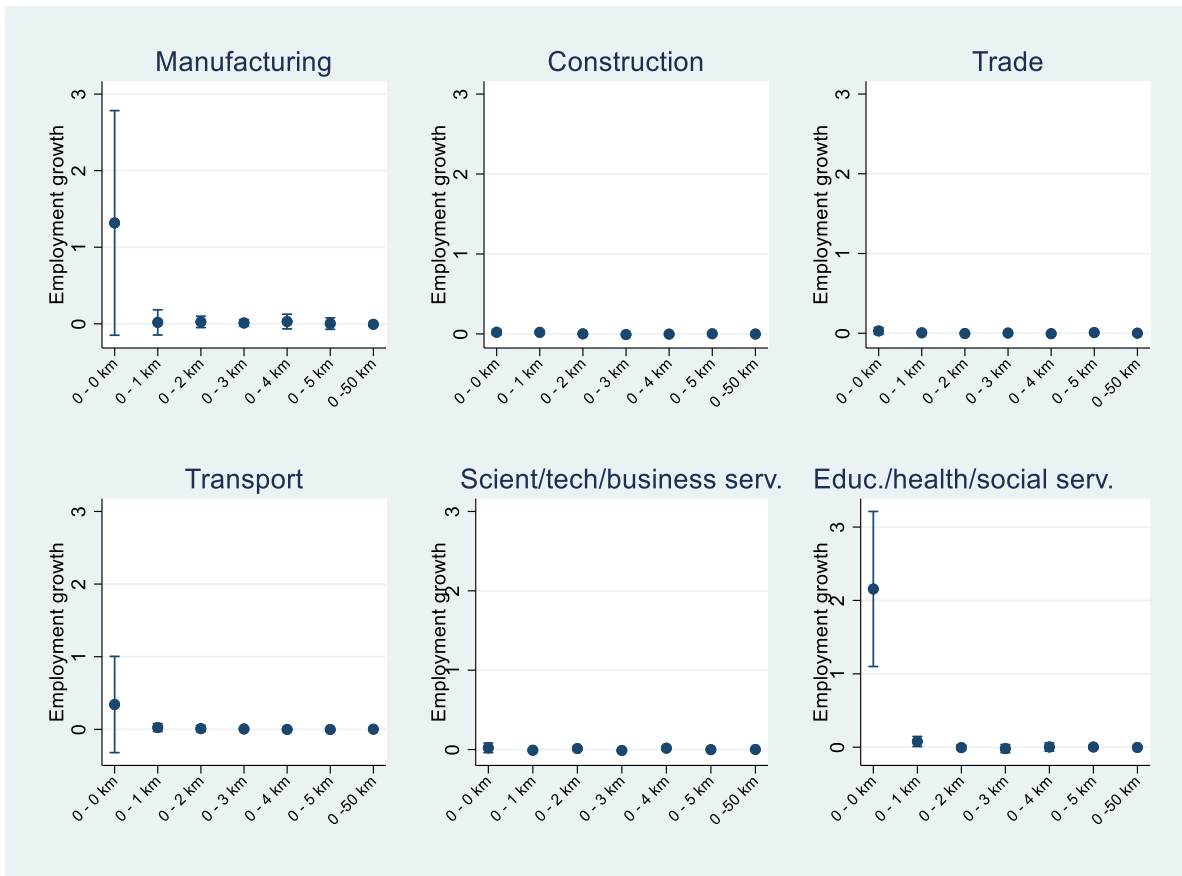
R2	0.052	0.294	0.052	0.168	0.112	0.092
N	12078	12078	12078	12078	12078	12078

Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Dependent variable: Private sector employment growth 2003-2008 (model 1-2), private sector sales growth 2003-2008 (model 3-4) and private sector log hourly wage growth 2003-2012 for stayers (model 5-6). Methods: linear FE regressions (within municipality-transformed variables) (models 1-2, 5-6); Median FE regressions (models 3-4) based on Firpo et al (2009) and Rios-Avila (2020). In the wage regressions, each neighbourhood average log wage growth observation is weighted by the total number of individual wage observations underlying the average value. Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses (for models 3-4: bootstrapped). ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

What kind of private sector activities benefit from the relocation and creation of these governmental jobs? In Table A2, we present the results from heterogeneity analyses for six different industries in the private sector. Figures 4-6 summarise these results.

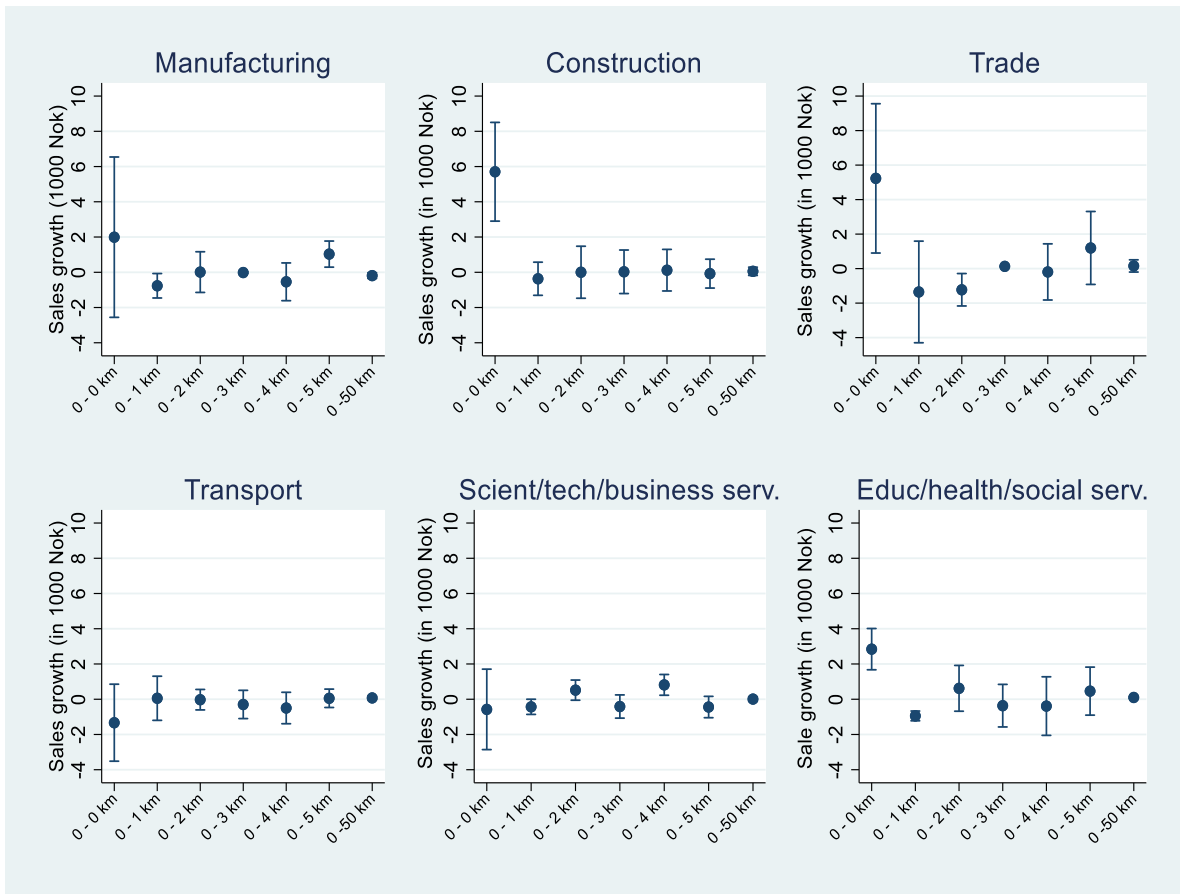
Figure 4 shows that for employment, we observe positive effects for *Manufacturing* and for the industries *Education, health and social services*, whereof the impact in the latter industries is strongly significant. In Norway, *Education, health and social services* are relative small as a private sector industry, these activities are typically organised in the public sector. Still, for example, a considerable number of kindergartens are privately owned. However, when we in Figure 5 turn to sales, we see that also the industries *Construction* and *Trade* experience a hike in sales in the neighbourhood where the governmental jobs are relocated or created. Finally, when it comes to wages, no clear pattern is visible, although we see increased wages in the industries of *Scientific/tech and business services*. This could be attributed to the possibility that the new governmental jobs are being in direct competition with the private sector, but as seen in Table A3, this is probably wrong. By far the strongest driver of private sector wage growth in *Scientific/tech and business services* are *Public administration* jobs. Still, some competition exist, since we see that the governmental jobs within *Education, health and social services* are important for private sector wages within this sector.

Figure 4 The industry-specific impact of newly created and relocated governmental jobs on local private employment growth from 2003 to 2008.



Note: Parameter estimates (and standard errors) from linear regressions on observations of neighbourhoods outside the capital with positive employment in 2003. See Table A2 (Panel A and note) for details.

Figure 5 The industry-specific impact of newly created and relocated governmental jobs on local private sales growth from 2003 to 2008.



Note: Parameter estimates (and standard errors) from median regressions on observations of neighbourhoods outside the capital with positive employment in 2003. See Table A2 (Panel B and note) for details.

Figure 6. The industry-specific impact of newly created and relocated governmental jobs on local private log hourly wage growth from 2003 to 2008.



Note: Parameter estimates (and standard errors) from linear regressions on observations of neighbourhoods outside the capital with positive employment in 2003. See Table A2 (Panel C and note) for details.

6. Conclusions

In this paper, we analyse the impact of establishment of governmental sector jobs on private sector employment. We define establishment of governmental sector jobs by two channels: (i) through establishment of new state sector workplaces, and (ii) through relocation of state sector workplaces. The period of evaluation is 2003-2008 and 2003-2012.

Based on precise geographical information on the location of governmental jobs, we can create bands of different spatial length through which we analyse the size of the effect. The bands are 0 km, 0-1 km; 0-2 km, 0-3 km, 0-4 km, 0-5 km, and 0-50 km. The period of the governmental employment stimulus is 2003-2008. We use three output measures: employment, wages and firm sales.

The results suggest that governmental employment has positive effects on private sector employment. The main effects for the whole sample shows that the effects are stronger in close proximity to the governmental jobs stimulus. The coefficient for the 0 km suggests that the arrival of one public job in the area increase the number of private sector jobs by 3.659 additional private sector jobs in the same area. The stimuli has spillover effects to the closest band (0-1 km). The coefficient suggest that one public job in the area increase the number of private sector jobs by 0.133 additional private sector jobs in the closest band. We also find that public employment has positive effects on firm sales and wages, limited to the same neighbourhood where the increases in governmental employment happened.

To check the robustness of the results we conduct two different placebo-analyses. All results are non-significant in the placebo-analyses, which is reassuring considering the causal interpretation of the results we have put forward.

The impacts of governmental employment are heterogeneous. The impact of governmental employment on private sector employment is stronger in private sector industries that to a large extent resembles public sector, namely “Education, health and social services.”

We do, however, observe evidence of increased private sector activity in form of sales growth in the neighbourhood experiencing governmental job relocation or creation. In the long term, except for employment, these positive effects of governmental job relocation or creation appear to vanish.

Our results are mainly in line with results in Faggio (2019), reporting positive effects of public employment on private sector employment, in close proximity of the stimulus. Since these results come from quite different labour markets, this adds robustness to the empirical literature on impacts of public employment.

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Appendix

Table A1. Descriptive statistics

Variable	Mean	St. dev.	Variable	Mean	St. dev.
Employment growth 03-08	26.44	281.42	Employment growth 03-12	45.79	324.19
Sales growth 03-08	29377.96	416416.90	Sales growth 03-12	78973.57	1253705
Log wage growth 03-08	0.17	0.18	Log wage growth 03-12	0.28	0.18
Log wage growth-stayer 03-08	0.10	0.17	Log wage growth-stayer 03-12	0.20	0.19
Log wage growth-stayer-residual 03-08	0.003	0.14	Log wage growth-stayer-residual 03-12	0.001	0.15
Number of inhabitants	176:98	179.00			
Average age	40.99	7.67			
Share of women	0.47	0.10			
Share of immigrants	0.06	0.07			
Share of high-skilled workers	0.22	0.13			

Note: N: Observations of 12078 neighbourhoodsXyears outside the capital with positive employment in 2003.

Table A2. The industry-specific impact of newly created and relocated governmental jobs on local private employment growth, sales growth and log hourly wage 2003-8.

	Manu- facturing	Con- struction	Trade	Transport	Scientific and business services	Education, health and social services
A) Private employment growth						
0 km	1.317 (0.748)	0.021 (0.018)	0.029 (0.022)	0.342 (0.338)	0.022 (0.031)	2.156** (0.539)
0-1 km	0.018 (0.084)	0.020 (0.008)	0.006 (0.007)	0.025 (0.027)	-0.009 (0.011)	0.078** (0.035)
0-2 km	0.025 (0.038)	0.002 (0.003)	-0.003 (0.004)	0.010 (0.022)	0.013 (0.008)	-0.005 (0.019)
0-3 km	0.011 (0.022)	-0.007 (0.004)	0.003 (0.004)	0.005 (0.011)	-0.011 (0.005)	-0.019 (0.028)
0-4 km	0.029 (0.049)	-0.002 (0.007)	-0.005 (0.010)	-0.001 (0.013)	0.017 (0.010)	0.003 (0.029)
0-5 km	0.003 (0.038)	0.003 (0.003)	0.009 (0.006)	-0.002 (0.011)	-0.001 (0.001)	0.003 (0.012)
0-50 km	-0.007 (0.004)	-0.001 (0.001)	0.001 (0.001)	0.002 (0.002)	0.001 (0.001)	-0.003 (0.004)
B) Private sales growth (in 1000 Nok)						
0 km	1.992 (2.322)	5.704** (1.429)	5.230* (2.208)	-1.332 (1.115)	-0.576 (1.165)	2.843** (0.597)
0-1 km	-0.767** (0.354)	-0.368 (0.480)	-1.354 (1.502)	0.054 (0.639)	-0.431* (0.219)	-0.946** (0.141)
0-2 km	0.010 (0.589)	0.002 (0.753)	-1.227** (0.479)	-0.026 (0.296)	0.516 (0.292)	0.619 (0.663)
0-3 km	-0.015 (0.028)	0.028 (0.630)	0.130 (0.834)	-0.298 (0.409)	-0.414 (0.336)	-0.366 (0.616)
0-4 km	-0.541 (0.547)	0.118 (0.602)	-0.193 (0.830)	-0.499 (0.455)	0.815** (0.301)	-0.389 (0.848)
0-5 km	1.032** (0.378)	-0.077 (0.418)	1.196 (1.078)	0.052 (0.266)	-0.443 (0.309)	0.460 (0.695)
0-50 km	-0.189* (0.084)	0.054 (0.120)	0.154 (0.181)	0.074 (0.055)	0.009 (0.067)	0.101** (0.028)
C) Private log hourly wage growth (X100)						
0 km	-0.002 (0.009)	-0.011 (0.033)	0.017 (0.013)	0.060 (0.050)	0.063* (0.030)	-0.011 (0.011)
0-1 km	0.001 (0.004)	0.008 (0.008)	-0.006 (0.005)	0.009 (0.009)	-0.017** (0.004)	-0.004** (0.001)
0-2 km	-0.005* (0.002)	-0.001 (0.002)	-0.005* (0.002)	-0.002 (0.005)	-0.004 (0.004)	0.001 (0.001)
0-3 km	0.004 (0.003)	-0.004 (0.003)	-0.001 (0.002)	0.001 (0.004)	-0.001 (0.004)	0.002 (0.002)
0-4 km	0.002 (0.003)	0.001 (0.004)	0.001 (0.003)	-0.003 (0.004)	0.002 (0.003)	-0.002 (0.003)
0-5 km	-0.002 (0.003)	-0.001 (0.004)	-0.002 (0.003)	0.004 (0.004)	-0.004 (0.005)	-0.001 (0.002)
0-50 km	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)
Controls in both Panel A), B) and C):						
All regressions comprise a constant, municipality fixed effects, neighbourhood demography and industrial composition controls, and pretrends.						
N	11118	10598	9357	8302	9983	9221

Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Dependent variable: Panel A) Private sector employment growth 2003-2008, Panel B) Private sector sales growth 2003-8 (in 1000

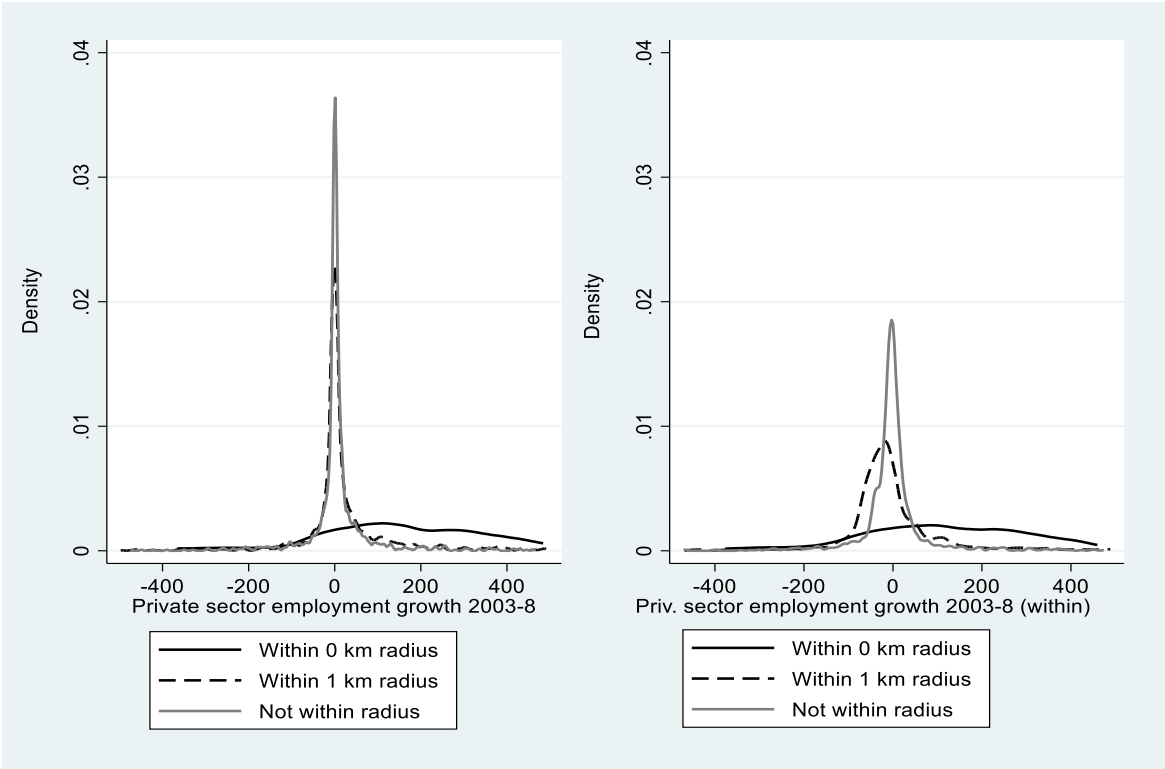
NOK), Panel C): Average neighbourhood log hourly wage growth 2003-8 (X100). Methods: Panels A) and C): linear FE regressions (within municipality-transformed variables); Panel B) Median FE regressions, based on Firpo et al (2009) and Rios-Avila (2020). In Panel C), each neighbourhood average log wage growth observation is weighted by the total number of individual wage observations underlying the average. Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses. ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

Table A3. The heterogeneous impact of newly created and relocated governmental jobs on employment growth, sales and log hourly wage growth from 2003 to 2008 in Scientific and business services, and in Education, health and social services. For 3 types of governmental activities.

	Scientific and business services			Education, health and social services		
	Employment	Sales	Wages X100	Employment	Sales	Wages
Finance/tech and business services						
0 km	0.577* (0.249)	-2.780 (5.582)	0.058 (0.069)	5.892 (4.027)	3.846 (4.001)	0.021 (0.032)
0-1 km	-0.054 (0.133)	2.293 (3.022)	0.040 (0.027)	1.072 (0.980)	-4.268 (2.784)	-0.050** (0.019)
0-2 km	-0.106 (0.061)	0.260 (1.491)	-0.001 (0.035)	0.044 (0.150)	-1.036 (1.871)	0.017 (0.020)
0-3 km	-0.068* (0.034)	-2.407 (1.409)	-0.002 (0.013)	0.014 (0.140)	-1.102 (0.728)	0.016 (0.018)
0-4 km	0.050 (0.036)	0.935 (0.602)	0.030* (0.013)	0.062 (0.163)	0.247 (1.030)	0.003 (0.007)
0-5 km	0.007 (0.026)	-0.214 (0.560)	-0.032* (0.012)	0.028 (0.051)	0.713 (0.649)	-0.001 (0.008)
0-50 km	-0.012 (0.028)	1.741* (0.756)	0.005 (0.020)	0.001 (0.042)	0.880 (1.613)	-0.009 (0.011)
Public administration						
0 km	-1.067 (0.734)	-4.703 (4.322)	0.513** (0.181)	1.962 (2.066)	-2.588 (4.301)	0.010 (0.067)
0-1 km	-0.316 (0.204)	0.630 (3.877)	-0.064 (0.075)	-4.951 (3.630)	-0.308 (5.942)	-0.050 (0.040)
0-2 km	0.121** (0.032)	2.345** (0.848)	0.026 (0.017)	-0.195 (0.279)	0.419 (0.606)	-0.017 (0.017)
0-3 km	-0.013 (0.055)	-0.862 (1.116)	-0.049** (0.013)	0.413 (0.310)	-0.945 (1.719)	0.019 (0.010)
0-4 km	0.049 (0.031)	-0.258 (0.883)	0.007 (0.015)	0.071 (0.147)	-1.106 (0.910)	0.001 (0.001)
0-5 km	0.039 (0.024)	-1.450 (0.867)	-0.002 (0.008)	-0.078 (0.068)	0.553 (1.560)	-0.001 (0.010)
0-50 km	-0.032 (0.033)	-0.009 (0.287)	0.005 (0.005)	0.004 (0.016)	0.429 (0.852)	0.001 (0.006)
Education/Health and social services						
0 km	0.031 (0.040)	0.325 (1.002)	0.065* (0.028)	2.314** (0.058)	2.620** (0.972)	0.012 (0.012)
0-1 km	-0.009 (0.011)	-0.517 (0.266)	-0.017** (0.004)	0.098* (0.044)	-0.722 (0.909)	-0.003** (0.001)
0-2 km	0.009 (0.008)	0.370* (0.187)	-0.001 (0.005)	-0.015 (0.016)	0.763 (0.600)	0.002 (0.002)
0-3 km	-0.008* (0.004)	-0.295 (0.296)	0.004 (0.004)	-0.042 (0.022)	-0.216 (0.259)	0.001 (0.001)
0-4 km	0.020 (0.011)	0.907** (0.375)	0.001 (0.004)	0.007 (0.028)	0.327 (0.644)	-0.001 (0.003)
0-5 km	-0.009 (0.013)	-0.618** (0.229)	-0.001 (0.004)	0.023** (0.008)	-0.384 (0.611)	-0.001 (0.003)
0-50 km	-0.005 (0.003)	-0.043 (0.097)	0.001 (0.004)	0.001 (0.004)	-0.011 (0.243)	0.001 (0.001)
Controls::						
All regressions comprise a constant, municipality fixed effects, neighbourhood demography and industrial composition controls, and pretrends.						
N	8633	8633	9357	9757	9757	9221

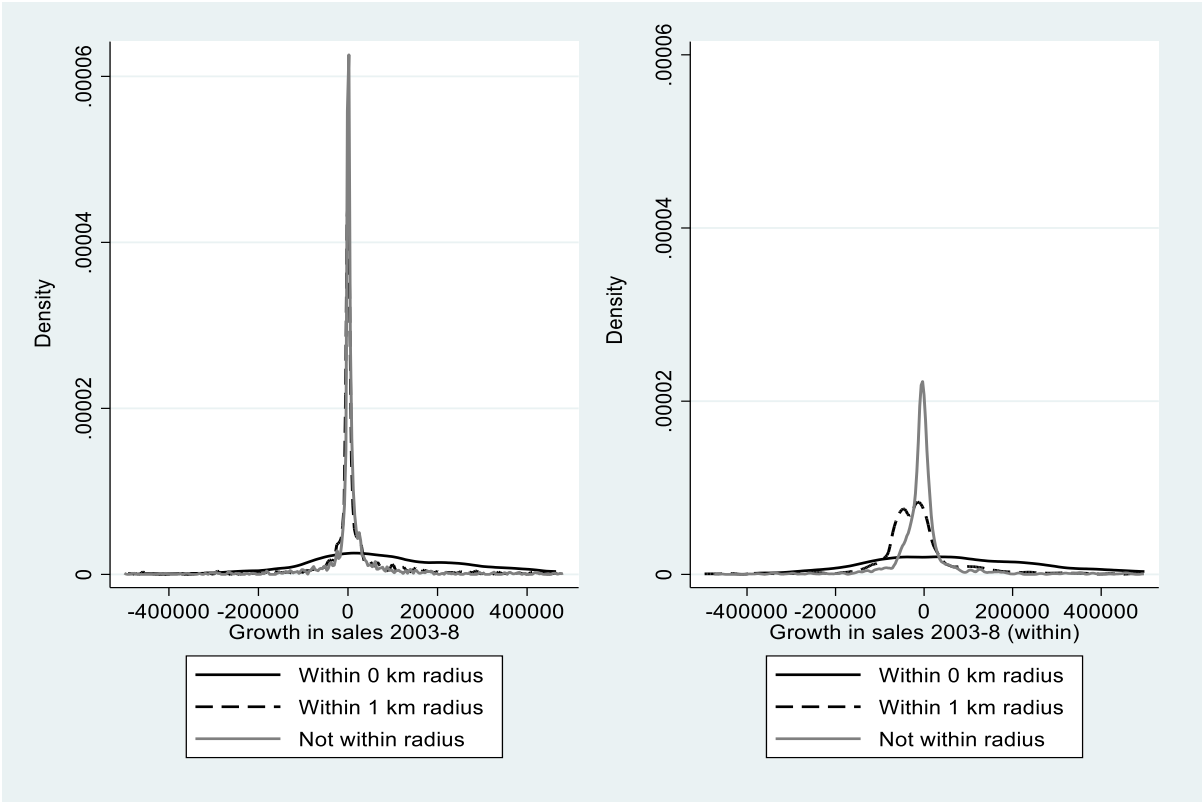
Note: Observations of neighbourhoods outside the capital with positive employment in 2003. Each column present the results from separate regressions. Dependent variable denoted by column head: Employment: employment growth 2003-2008; Sales: sales growth 2003-8 (in 1000 NOK); Wages: Average neighbourhood log hourly wage growth 2003-8 (X100). Methods: Employment and wages: linear FE regressions (within municipality-transformed variables); Sales: Median FE regressions, based on Firpo et al (2009) and Rios-Avila (2020). In the sales regressions, each neighbourhood average log wage growth observation is weighted by the total number of individual wage observations underlying the average. Controls: all models comprise fixed municipality effects and a constant. Area demography: Number of inhabitants, share of women, share of immigrants, share of high-skilled workers, average age. Area industrial composition: vector comprising the employment share at 2-digit industry level 2002. Pretrend: local employment growth 2002-3. Standard errors adjusted for municipality-clustering presented in parentheses. ** and * denote 5 and 1 percent level of significance, respectively. Significant estimates indicated in bold.

Figure A1 The distribution of neighbourhood employment growth from 2003 to 2008.



Note: The distribution of neighbourhood employment growth 2003-8. Employment growth in the right-hand side figure is within-municipality transformed, i.e., it measures the deviation from municipality mean growth. See text for detail.

Figure A2 The distribution of neighbourhood sales growth from 2003 to 2008.



Note: The distribution of neighbourhood sales growth 2003-8. Sales growth in the right-hand side figure is within-municipality transformed, i.e., it measures the deviation from municipality mean sales growth. See text for detail.