The Hidden Costs of Competitive Tendering

- Labor and Health Effects on Norwegian Bus Drivers

Jansen, Halvard* & Grasdal, Astrid†

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Abstract

In this paper, we analyze the individual-level effects of implementing competitive tendering (CT) as a means to award bus routes in Norway. More specifically, we study the health and labor effects of such implementation on Norwegian bus drivers in the years between 2003-2016. Using event study methodology and variation in implementation dates across municipalities, we find significant short- and long-term effects of competitive tendering implementation on the sickness absence of bus drivers in tendered municipalities. This is also reflected in a somewhat increased disability pay in the long-term. Furthermore, there is evidence of short-term effects on labor income as well as on GP reimbursements and on the prevalence of cardiovascular symptoms diagnosed.

1 Introduction

Competitive tendering or the auctioning of services in the public sector can be seen as a tool meant to improve cost efficiency and service quality in targeted industries. While there exists evidence of reduced aggregate costs in industries after the implementation of tendering, there has also been widespread concern about the mechanisms through which costs are saved when public sector industries are reformed (Hensher and Wallis, 2005; Milne *et al.*, 2012). An example is Lloyd and Seifert (1995) in their review of the 1990 reform of UK health services, as they state:

> The aim of making the health service more efficient relies upon reducing unit labour costs; in a labour intensive sector, with technological innovations limited to particular areas and the problems associated with cutting pay, this inevitably means emphasis on the use and productivity of labour (Lloyd and Seifert, 1995, p.1).

*Corresponding author. Department of Economics, University of Bergen, Postbox 7800, 5200 Bergen. (halvard.jansen@uib.no)

†Department of Economics, University of Bergen, Postbox 7800, 5200 Bergen. (astrid.grasdal@uib.no

The above excerpt summarizes a concern that would be present in the case of increasing efficiency through privatization or competitive tendering in any labor intensive industry. The reasoning is simple - making cost reductions a primary focus will likely lead to detrimental effects for workers in the relevant industry. When labor costs constitute a major share of industry costs, which is typical, reductions in costs will have to imply either reducing the amount of workers, reducing the workers' effective incomes through reducing non-pecuniary benefits (as there are problems associated with cutting pay) or increasing the intensity of work. The sentiment is corroborated by Walsh and O'Flynn (2000), referencing Colling and Ferner (1995) and Bach (1989), who conclude that the British evidence from competitive tendering show that the reduced costs may primarily stem from the erosion of wages and working conditions, increase in the intensity and pace of work as well as layoffs.

In this paper, we use individual-level data to examine the effects of implementing competitive tendering in the Norwegian bus industry. While there are many studies on the impacts of increasing competition in various industries, broad empirical evidence on the human costs associated with such implementations is hard to find due to both the complexity of the situation and the high level of detail one would need for such research in terms of data. In this paper, to the best of our knowledge, we therefore contribute to the literature through being the first to use registry data to assess the individual level effects of competitive tendering. While the subject matter of this paper is effects of increased competition in a single industry in one country through an industry reform, we claim that there are lessons to take home from this study that are relevant both for different types of industries and for other countries.

While the paper focuses on the effects of the Norwegian implementation of competitive tendering in local bus transport, the more general and perhaps ultimately most interesting interpretation of the case is that this is a clear-cut example of an industry reform where the relationship between employer and employee becomes more distanced. Additionally, as argued by previous literature, cost reductions typically accompany an intensification of the use of labor in labor intensive industries. In other words, the effects of this specific reform on employees' labor and employment outcomes can plausibly represent a combination of the effect of intensifying the use of labor in an industry and the effect of shorter contracts and less stable expectations on workers' well-being.

The main research question of the paper is:

> What effects has the implementation of competitive tendering in Norway's public transportation by bus had on the health and labor outcomes of affected workers?

The research question is answered through using recent advancements in event study methodology, an extension to the classical difference-in-differences framework that allows for a more robust

estimation of dynamic treatment effects than two-way fixed effects models (Abraham and Sun, 2018; Callaway and Sant'Anna, 2019). We exploit variation in treatment timing in order to assess the first-time implementations of competitive tendering in all applicable Norwegian municipalities between 2003 and 2014. The anonymized data is yearly and follows the employment status, labor incomes and different benefit transactions for all individuals who were active bus drivers at any point in the relevant period. While some municipalities introduced competitive tendering before 2003, meaning that bus drivers working there cannot serve as either treatment or control group, the vast majority of extensive tenders happened in the studied period. In other words, the results of this study should be highly representative of the total tendering experience of the relevant industry.

Overall, we find that implementing competitive tendering leads to an increase the take-up of sickness benefits for affected workers in tendered municipalities. The estimated differential increase relative to non-tendered municipalities is about 28 percent of the average pre-treatment level of sick leave benefits. The increase is gradual and delayed, but significant in the short-term as well as the long-term. This implies that the effect might reflect adaption to the new system and likely an increased intensity of work. There is also evidence for a transient increase in aggregate labor earnings for affected bus drivers. As the effect is isolated around the treatment incident and a temporary increase in wages is deemed unlikely, the result likely reflects an increase in aggregate hours worked. More specifically, the effect begins in the year that a contract is awarded, meaning that it is the last year of contract for many affected bus drivers and the year leading up to a new contract rather than a natural situation for new wage negotiations. Additionally, there is no evidence of layoffs systematically following Norwegian bus tenders in our results. An increase in aggregate hours worked has some merit intuitively as well because of the administrative and practical changes involved in introducing the competitive tendering system and changing the relationship between employers and employees in the industry. Additionally, bidding processes often result in new bus companies taking over operations in a region, which likely also involves an additional need for hours worked in the take-over period.

Following the introduction, we present a short summary of related literature as well as details about the institutional setting of the study. Subsequently, the data, methods and strategy of identification used in the paper are documented in separate sections. Finally, the results are presented before the paper culminates in a discussion of said results and accompanying concluding remarks.

2 Related Literature

Relative to the quite extensive literature on the industry-wide cost reductions caused by competitive tendering, the quantitative literature on individual-level effects of tendering is sparse. However, it does exist, and the main lesson from this literature is that one can expect a certain deterioration of employment conditions, work satisfaction and arguably labor income. Walsh and O'Flynn (2000), referencing Colling and Ferner (1995) and Bach (1989), state that British evidence from competitive tendering show that the reduced costs may primarily stem from the erosion of wages and working conditions, increase in the intensity and pace of work as well as layoffs. Walsh and O'Flynn (2000) also contribute with an original study on compulsory competitive tendering (CCT) in Australia, where they did not find any overall effect on the wage level. Despite this non-finding, they conclude that employment conditions suffered erosion through less favorable working hours and a reduction or abolishment of premium rates and supplementary allowances for affected workers.

For the Norwegian bus industry, Longva and Osland (2010a) provide a comprehensive summarizing report of different potential effects of tendering. Among other things, they conclude that bus drivers experiencing tenders tend to report higher levels of stress compared to bus drivers who do not experience tenders in the same period. They motivate a potential link between competitive tendering and increased sickness absence, but simultaneously state that concrete evidence on the link between increased intensity of work and sickness absence is hard to find. In particular, there seems to be no evidence of long-term effects of competitive tendering. This can plausibly be explained by data restrictions in much of the previous literature.

In direct relation to auctions and the implementation of competitive tendering, Aarhaug *et al.* (2018) provide an analysis of tendering contracts and price developments after such implementation in the Norwegian bus industry. They emphasize the general finding in the literature that industry-wide costs are initially reduced by the implementation of competitive tendering. This was documented by Hensher and Wallis (2005) in a study reviewing the international experiences of competitive tendering as a contracting mechanism for subsidizing transportation. They find that first-time implementations of competitive tendering typically lead to a 20-30 percent decrease in the levels of subsidy in the bus industry. Despite of this, Hensher and Wallis (2005) find no reductions in subsidy levels following subsequent rounds of tenders. For the Norwegian setting, Bekken *et al.* (2006) found that costs were reduced by ten percent following the initial tenders and that this mostly resulted in reduced subsidies for the industry. Vigren (2016) corroborates this story in the case of the Sweden in his analysis of the cost efficiency of competitive tendering in Sweden's public transporting system.

In total, it is evident that competitive tendering succeeds in reducing industry-wide costs and

reducing necessary subsidies for public transportation, and that the effect comes from the first round of tenders. Meanwhile, how these costs are saved is less obvious, and this paper explores how some of these efficiency gains may come at the expense of workers' health and economic outcomes.

3 Institutional Setting and Employment in the Bus Sector

The onset of competitive tendering came in response to both its perceived cost-saving qualities and the anticipation of EU regulation mandating such competition[1]. The EU mandate was formally announced in 2007 and put into effect in 2009, while trials of competitive tendering had started in Norway already in the 1990s (1370/2007). Norway, as a member of the European Economic Area, naturally adhered to the EU directive and all Norwegian counties partly or fully used tendered contracts as of 2019.

Before the implementation of competitive tendering in Norway, bus route contracts were awarded through negotiated contracts between local governments and bus operating companies. This changed gradually in the 1990s and 2000s with the onset of competitive tendering and the anticipation of EU law. In response to this trend, the counties of Norway gradually established administrative bodies in charge of procurement of bus services through tendered contracts (PTA) (Longva and Osland, 2010b)[2]. These companies have the authority to award contracts for the operation of regional bus routes through auctions or tenders. According to Aarhaug *et al.* (2018), the contracts can generally be separated into net and gross cost contracts. After the implementation of competitive tendering, the contracts in the Norwegian industry for public transportation by bus typically last five years and are in almost all cases gross cost contracts. This means that the winner of the auction typically receives a lump-sum, reflecting the auction-winning bid, to take on the costs of the relevant bus routes. In the case of gross contracts, all income from ticket sales belongs to the county administrative companies. The contrasting net contracts, which are rare in Norway, simply mean that the operating company receives the revenues from ticket sales in addition to handling the operating costs. The prevalence of gross contracts means that almost all bus operators face a combination of lump-sum incomes and variable costs. This necessitates a certain cost-minimization perspective if one believes that the bus operators are aiming to maximize profits, which is one main reasons why one would expect increased effort from the employer to reduce costs, potentially to the detriment of the working conditions and environments of employees.

In the case of public transportation by bus, general guidelines for wages and wage growth for professional drivers are negotiated centrally between the Norwegian Transport Worker Union

[1]Self-provision by local governments being a key exception to this mandate.

[2]By 2020, every county other than Hedmark has chosen to create such a procurement company in charge of bus contracts. The alternative is to let the local government itself run bus operations in the county.

representing the workers and NHO Transport representing the employers. This means that there is limited potential for tenders to directly affect the wage levels of Norwegian bus drivers in tendered municipalities, although the systematic shift towards tendering may influence the industry-wide wage growth over time. In addition, an amendment to the law of transporting professionals was made in 2009 (Endringslov til yrkestransportloven, 2009). Relating directly to the tendering process, this amendment required the companies winning an auctioning round for a bus route contract to make job offers to the employees of the displaced company previously operating the relevant routes. This necessarily increased the job security of Norwegian bus drivers and may have tempered potential negative effects of the competitive tendering process on individuals.

Operating companies are the companies that employ bus drivers and bid on the tenders administered by the county administrative companies. Contemporaneous with and strongly motivated by the onset of competitive tendering in Norway, these bus companies have gradually changed the way they operate. The bilateral contracts between local governments and operating companies were generally much longer-lasting and the operating companies were often smaller and more locally specialized than what is now the case. After the implementation of competitive tendering, the auction mechanism has led to larger scale companies winning bus routes all over the country due to their ability to place better bids and this has led to mergers and acquisitions of smaller bus companies all over Norway. The drive to be more competitive in tenders has increased the size and focus on professionalism in the average bus company operating local bus routes throughout the country. The timing of these acquisitions and mergers are mostly concurrent with the tenders themselves due to the competition being the motivating factor, and the effects that these organizational changes may have on bus drivers should be picked up as part of the effect of introducing competitive tendering to an area.

Norway's strong institutions and labor rights provide an interesting setting in which competition might decrease operating costs without it necessarily stemming from layoffs or decreases in wages. Following the introductory excerpt from Lloyd and Seifert (1995), workers' amenities are often among the first victims of efficiency-improving policies in labor intensive industries. In the bus industry, this would generally translate to a stricter focus on time management, schedule optimization and a reduction of breaks between routes. This should be transferable to both bus industries in most countries and to other labor-intensive industries. In essence, we strongly argue that the Norwegian example should be of interest to the international community.

The Norwegian labor market for bus drivers has a few eye-catching characteristics and developments. Descriptive and qualitative evidence as well as industry reports indicate that the labor market for bus drivers in Norway is fairly tight. For instance, the demographics of Norwegian bus drivers are telling.

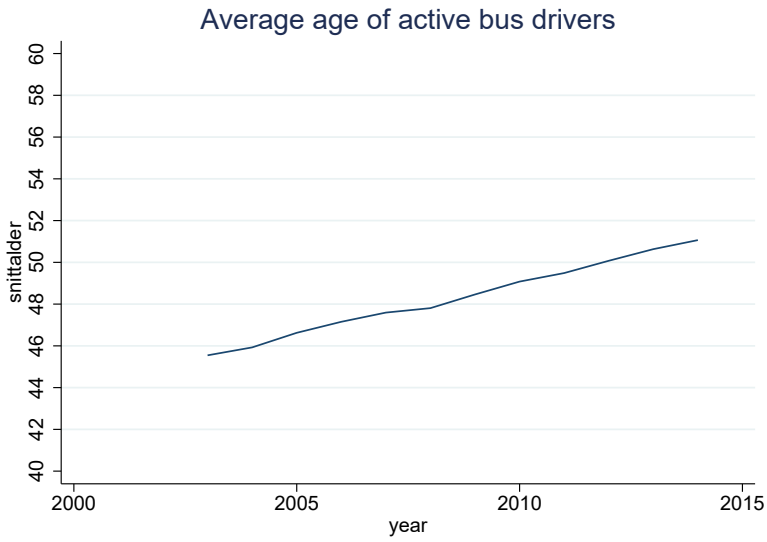

Figure 1: Average age of all currently active bus drivers in Norway: 2003-2014

In figure 1, we present the average age of currently active bus drivers between 2003-2014. The average age is increasing steadily and monotonically, meaning that the inflow of young bus drivers is not very high. There are certainly natural barriers to entry to the market in terms of time investments and necessary licensing fees, and this can be part of the explanation for the apparent lack of popularity of the profession among the young. In any case, there are clear signs of there being a limited supply of bus drivers of Norway regionally and nationally. This in turn implies that one would not expect the implementation of competitive tendering to lead to layoffs of bus drivers even in the absence of labor laws protecting the workers.

While the apparent shortage of bus drivers in Norway has a substantive effect on how we can interpret findings, this setting is in no way unique to Norway. According to an EU report on occupational supply shortages pertaining to 2015-2016, bus and truck drivers were classified as occupations with a supply shortage in 14 out of 26 reporting countries in Europe (McGrath and Behan, 2017). In other words, most of Europe reports similar labor supply conditions to Norway. It seems likely that the combination of a relatively low median income, a costly driver's license and an ever-increasing demand fueled by urbanization would make the imbalance in labor supply and labor demand for bus drivers highly widespread in most industrialized countries. Basic economic theory does predict that such an imbalance should disappear in the long run through increased wages as that is the efficient market solution. In the short-term, however, there may be several elements of market frictions that can sustain a supply shortage. The transportation business may for example suffer from a general lack of appeal to younger generations in many countries, and

there may exist considerable information friction in terms of knowing how to attain the necessary qualifications and licenses to practice. The latter point may especially be the case for the young and unemployed.

4 Data

The main source of data for this paper is the Norwegian administrative registries. Notably, we use data verified by the Norwegian Tax Authority on personal income and welfare transfers as well as various employment-related data from the Norwegian Labour and Welfare Administration. All such data is on the individual level and is linked and anonymized by Statistics Norway. We can then sample all individuals who are bus drivers in a certain municipality in a certain year through occupational codes, municipality indicators and indicators for whether an individual has an active working relationship in a certain municipality and year. The central outcomes used in the study are number of sick days per month, sick leave benefits per year, yearly labor income, disability benefits, employment indicators and GP reimbursements as well as the prevalence of diagnoses related to high blood pressure and symptoms of cardiovascular disease.

The sick pay and labor income data uses the years 2006-2014 due to personal income data before 2006 not being decomposed into sick pay, net labor income and parental benefits while this is possible in the later period. Important to note about the data on sickness benefit transfers is that it reflects transfers from the Norwegian Labour and Welfare Administration only. This implies that it corresponds to marginal sick leave beyond 14 days as shorter periods are covered by the employer. For the sick leave data in days, covering 2003-2014, all reported sick leave beyond 6 days is documented, meaning that it captures more of the total amount of sick leave uptake.

In table 1, we show a brief summary of some descriptive statistics for the study, including the amount of observations in each cohort that fit the inclusion criteria for the treatment and control group and the mean age and gender characteristics for these groups. As the table shows, there is no systematic difference between the treated and control groups between cohorts, and the characteristics are mostly quite stable. The gender of bus drivers is largely male and the mean age is growing slightly over time from the mid 40s to low 50s.

Table 2 shows differences in a few key outcomes between the treated cohorts and their control groups. As one can see, no treated group is exactly equal to their control, but the differences do not seem to be systematic for any of the variables as both the signs and magnitudes vary in a non-discernible pattern. There is substantial correlation between days sick and sick pay, which is expected as the variables both measure long-term absence from work due to sickness. From the descriptive statistics we can see that the typical amount of days sick is around 30 and the average

Table 1: Number of observations and average age of individuals in treatment and control groups

	#Observations		Mean Age		
Cohorts	Treated	Control	Treated	Control	Difference
2004	1338	6583	44.8	45.5	-0.7
2005	184	6031	48.4	45.9	2.5
2006	138	5872	46.5	46.6	-0.1
2007	365	4083	47.8	47.4	0.4
2008	269	3303	49.5	48.4	1.1
2009	2057	2983	46.7	48.8	-2.1
2010	350	2584	52.0	49.8	2.2
2011	497	2110	48.1	50.8	-2.7
2012	421	1627	51.3	51.6	-0.3
2013	442	975	51.6	52.2	-0.6
2014	470	850	51.8	52.7	-0.9

Note: Cohorts are defined by the year of announcement of the results for the first tender in a municipality.

Table 2: Pre-treatment levels of key outcome variables

	Days sick			Sick pay			Labor income		
Cohorts	Treated	Control	Difference	Treated	Control	Difference	Treated	Control	Difference
2004	44.2	42.0	2.2	NA	NA	NA	NA	NA	NA
2005	16.5	37.9	-21.4	NA	NA	NA	NA	NA	NA
2006	30.4	36.2	-5.8	NA	NA	NA	NA	NA	NA
2007	25.3	38.0	-12.7	11.8	17.8	-6.0	286.0	268.1	17.9
2008	31.7	35.3	-3.6	15.3	17.0	-1.7	296.2	281.8	14.4
2009	39.5	35.8	3.7	20.1	17.7	2.4	296.3	292.2	4.1
2010	30.1	38.5	-8.4	16.1	19.6	-3.5	292.5	294.6	-12.1
2011	34.1	35.5	-1.4	16.9	18.8	-1.9	296.8	294.3	2.5
2012	44.1	33.1	11.0	21.0	18.0	3.0	288.5	303.0	-14.5
2013	34.0	32.4	1.6	18.1	17.8	0.3	319.8	310.0	9.8
2014	32.2	27.3	4.9	16.6	13.7	2.9	302.5	319.8	-17.3

Note: Sick Pay and Labor income are in thousands of 2002-NOK

yearly sickness benefit paid out by the Norwegian government is between 17 and 18 thousand 2002-NOK. The average labor income (welfare benefits are excluded) seems to be increasing over time for Norwegian bus drivers and looks to settle at slightly above 300 thousand 2002-NOK for the last few cohorts.

In addition to the rich individual level data, we have gathered roll-out dates of almost all tendering processes in Norway before 2016. We had access to the roll-out data of Aarhaug *et al.* (2018) and supplemented this with original research and inquiry.[3]

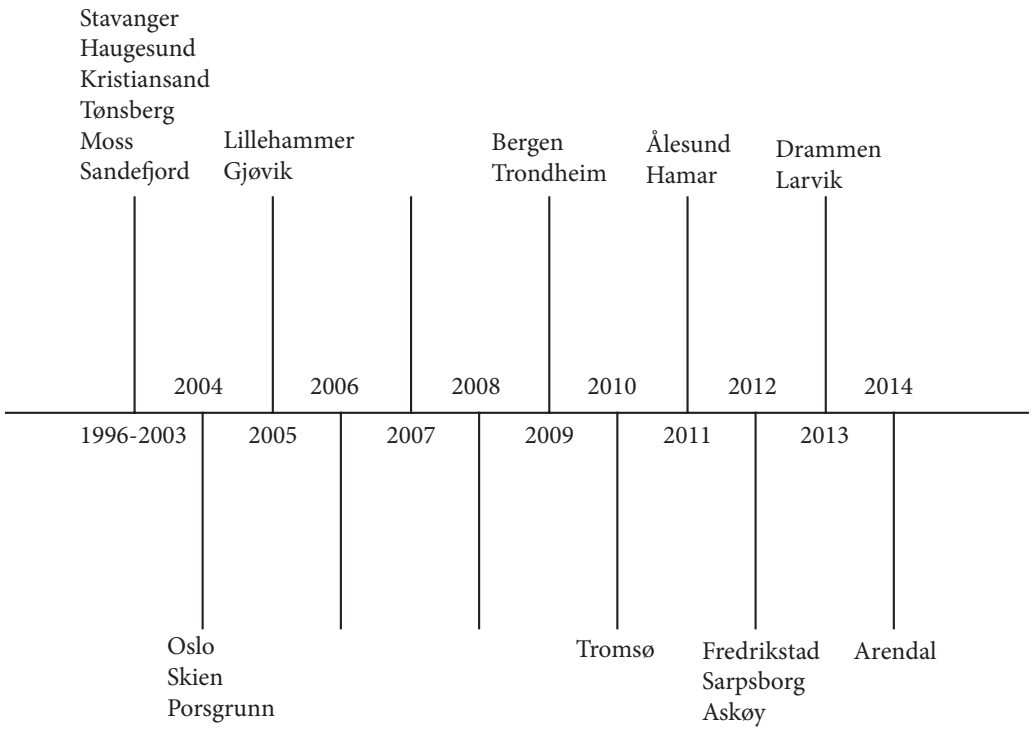

Figure 2: Non-exhaustive timeline of major first-time tender result announcements within populous Norwegian areas

A timeline of major first-time tender result announcements is presented in Figure 2. Tenders in smaller municipalities are not listed, meaning that the empty years in 2006-2008 for instance do not imply that there were no tender result announcements in these years. As table 1 implies in terms of the number of observations in each cohort, there were newly tendered municipalities in every year between 2004 and 2014. An example of how the cohorts work is that bus drivers in Bergen and Trondheim are part of the control group for the bus drivers experiencing the tender

[3]We had personal correspondence with bus operators, contract negotiators and all of the county administrative companies in Norway in search of these dates.

in Oslo in 2004. In general, the control group for any cohort consists of the bus drivers that are employed in the reference year (one year before the onset time for the treated group) and work in municipalities that have not yet been tendered. When estimating the dynamic treatment effects, the control group gradually becomes smaller due to the untreated bus drivers eventually becoming treated. For instance, bus drivers in Bergen and Trondheim (conditioned on being employed in 2003) are valid as a control group for bus drivers from Oslo in 2004, but not in 2009 when these municipalities implement competitive tendering as well.

5 Econometric Approach

In this paper, we use event-study methodology to estimate the dynamic average treatment effect on the treated (ATT) for different treatment cohorts defined by onset dates for treatment. The software used to conduct our analysis is R with the event study package created by Bradley Setzler and David Novgorodsky of the University of Chicago[4]. The method, which can be described as a direct extension to the classical difference-in-differences framework, leans on the assumption of parallel trends and on the lack of anticipatory behavior before treatment. Like in any potential outcomes framework, we compare outcomes for treated units with a counterfactual represented by a control group. In this paper, a driver is treated ($D_{it} = 1$) if he is an active bus driver in a municipality being tendered for the first time. We measure occupational status a year before the announcement of a tender result ($t = e$), typically corresponding to two years before the start of the contract ($t = e + 1$). The control group for the particular cohort with treatment in year e is the set of active bus drivers in $t = e - 1$ that work in a municipality that will not be treated for at least four years. This time frame of four years is to account for possible anticipation effects in the control group of those that have not yet been treated. In general, we can have the following model with fixed effects (α_i being individual-fixed effects, γ_T being relative time-fixed effects and $D_{it}\delta$ being an indicator for treatment of unit i in time t interacted with the treatment effect coefficient vector δ):

$$Y_{it} = \alpha_i + \gamma_T + D_{it}\delta + \epsilon_{it}$$

The above equation is quite general, with the possible inclusion of age as a covariate in the individual-fixed effects version or with additional covariates such as nationality[5] and gender if individual-fixed effects are not included. In the final version of our model, we use the three mentioned covariates in a matching procedure as explained later in this section.

[4] https://github.com/setzler/eventStudy

[5] Represented as a simple dummy variable equal to 1 if the individual was born in Norway and 0 if not.

Abraham and Sun (2018) give a fairly detailed account of the general empirical strategy that essentially boils down to estimating separate cohort-specific ATTs (CATTs) for every cohort before weighting these CATTs into ATT estimates using cohort sizes. Following Gibbons *et al.* (2018), they call the weighting method interaction weighting (IW), and its primary benefit is in its ability to estimate treatment effects that are not necessarily static or stationary. The most common alternative method of estimating treatment effects in situations with multiple treatment timings is a linear two-way fixed model, which has the unfortunate quality that they assume immediate and lasting effects of treatment, meaning that dynamic treatment paths are not meaningfully estimated (Abraham and Sun, 2018).

Using the notation of Abraham and Sun (2018), we denote the dynamic CATT estimate for a cohort (E_i) with treatment time e as $\hat{\delta}_{e,l}$, l being the number of periods after treatment:

$$\hat{\delta}_{e,l} = \frac{\mathbb{E}_N[(Y_{i,e+l} - Y_{i,s}) \cdot \mathbf{1}\{E_i = e\}]}{\mathbb{E}_N[\mathbf{1}\{E_i = e\}]} - \frac{\mathbb{E}_N[(Y_{i,e+l} - Y_{i,s}) \cdot \mathbf{1}\{E_i \in C\}]}{\mathbb{E}_N[\mathbf{1}\{E_i \in C\}]}$$

Y is here the outcome of interest, s represents the baseline period of comparison and $\mathbf{1}(E_i = e)$ indicates whether an individual i is treated in time e while $\mathbf{1}(E_i \in C)$ indicates whether the individual is in the control group due to not yet being treated. The IW method advocated by Abraham and Sun (2018) weights these cohort-specific estimates $\hat{\delta}_{e,l}$ by cohort sizes N_e relative to the number of individuals that have been treated in total by time e:

$$\hat{v}_l = \sum_{e=1}^{T-1-l} \frac{N_e}{\sum_{e=1}^{T-1-l} N_e} \cdot \hat{\delta}_{e,l}$$

This weighted average treatment effect in period l relative to treatment, denoted by $\hat{v}_l$ in the above equation, is the estimate of interest in the model. In this paper, it will represent how the average Norwegian bus driver responds (in time l relative to treatment and in comparison to untreated individuals) after experiencing the implementation of a competitive tendering scheme in a municipality that did not already have it.

Abraham and Sun (2018) also describe a way to meaningfully include covariates and to relax the assumption of unconditional parallel trends. Based on earlier work by Abadie (2005) and Chernozhukov *et al.* (2017), Abraham and Sun (2018) propose a matching method using covariates to estimate propensity scores for control units. The estimator used in this case is called an inverse propensity reweighting (IPW) estimator. In essence, if a non-treated unit is dissimilar to the average of the treated cohort, the unit will be given a low propensity score and be less important in the CATT estimation. The method adds a certain flexibility to the inclusion of covariates in comparison to the standard individual fixed effects model. In the practical analysis, we calculate the IPW estimate of $\hat{\delta}$ using the logit-method before weighting these into the IW-estimator $\hat{v}_l$ as

described above. Using the IPW method, we can relax the assumption of unconditional parallell trends into an assumption of conditional parallel trends. Thus, the two assumptions needed to causally interpret the ATT estimates are parallel trends conditional upon covariates and the lack of anticipation that may influence treatment outcomes and pre-treatment behavior.

5.1 Identification

The strategy used to identify an average treatment effect is as important to the event-study approach as it is to any difference-in-differences method. First of all, as the objective is to compare the post-treatment outcome paths of treated individuals to the contemporary outcome paths of control group individuals, the inclusion and exclusion criteria of the study are vital. In essence, we need to decide what conditions that either qualify or disqualify individuals from being part of the treatment and control groups. In this paper, we attempt to estimate the effect of first-time tenders in Norwegian municipalities on bus drivers. This means that identifying the treated individuals was quite easy. A treated individual is simply a bus driver who worked in a municipality that announced the winner of its first tender in the following year, meaning that the driver worked in a soon-to-be tendered municipality in T-1.

The process of defining the control group is slightly more problematic, but also important in terms of how results are to be interpreted. Ideally, the control group reflects a counterfactual, and it represents what would have happened to the treated cohort had the tendering process not been implemented in their working municipality. In this paper, a cohort's control group is defined by individuals working as bus drivers in the year before the treatment cohort's time of treatment, and in a municipality that has not yet experienced the shift from bilateral contracting to competitive tenders. In addition, we exclude individuals who live in municipalities that will be treated within three years of the cohort's treatment year and individuals who move into a treated municipality in time T or T+1. This is to ensure that we are actually capturing the effect of implementing competitive tendering and that the control group is not contaminated with exposure to the treatment.

The question is then whether any of these restrictions, especially to the control group, has the potential to induce bias or selection to the treatment outcomes. Essentially, we have to balance the interests of relevance and selection. Posing inclusion criteria to the treatment group cohorts and to the accompanying control groups will increase the ability to ensure that the treatment group consists of individuals that in fact does receive treatment and that the control groups consists of individuals that do not. We find no evidence of significant and systematic pre-trend differences in the ATT-estimates of interest, which means that we cannot refute the assumption of conditional parallel trends that is needed for causal estimation.

For the question of anticipation, which is likely the more problematic assumption of the two that are in effect, it is indeed possible that bus drivers may anticipate the implementation of competitive tendering in advance. We make the case, however, that the planned implementation of competitive tendering on the national scale makes the issue of selection through relocation less of an issue. In addition, we measure the post-treatment period as starting ($T = 0$) in the year of announcement of the first tender-winning company in a municipality, which in almost all cases is the year before the actual start of the contract. Since this is the case, the main incentive to react before a contract take-over should be in the announcement year. This is of course an assumption, but leaving a year for potential reactions to the impending competitive tendering situation should be sufficient to pick up most of the future-looking behavior. In addition, conditioning on the employment of bus drivers many years in advance in a soon-to-be tendered municipality as the indicator for being treated would lessen the relevance and precision of the ATT estimate as well. This is both because new bus drivers in the following few years before the start of the contract would not count as treated and because there would be more people indicated as treated that retire organically before the structural change. The latter of these is naturally true for the control groups as well, but this fact would decrease the difference between the treatment and control group outcomes in a way that is fully independent of the actual treatment. In essence, it would cause unnecessary attenuation bias.

In finding no indications of there existing significant pre-treatment effects for the relevant outcomes of our study, we claim that anticipation effects should be of insignificant magnitude if they exist. In other words, while it is theoretically possible that there could be anticipation in our paper, the differences in both magnitude and statistical significance of estimated post-treatment effects relative to pre-treatment effects suggest that anticipation at worst creates a small bias and that it does not matter for the causal interpretation of this paper's results.

A third assumption in any event study is the exogeneity of treatment timing. The problem of potential anticipation is of course linked to this, but the most important question is whether individuals can influence treatment timings. In this paper, it seems more likely that the timings are largely contingent upon existing contracts for bus routes in regional municipalities, and that the end dates of these contracts should be close to arbitrary and create good variation in treatment timings. The most obvious influence the bus drivers can have on their own treatment timing is the ability to move to another county or to another occupation. For similar reasons as discussed about anticipation, the main incentive to move or to change occupation should come in the years T and T+1 with the actual change in local bus route management and the year leading up to that. The model that we use in this paper would pick this up as a treatment effect as the bus drivers are identified as treated or non-treated based on occupational status two years before the

new contracts begin[6]. Ultimately, we find no such evidence of differential effects on moving to other occupations and there are no indications of any significant and systematic pre-treatment differences across cohorts.

6 Results

The key finding of this study is that sick leave uptake seems to increase for treated cohorts in the short- and long-term after a tender and that labor income responds positively in the short-term. Figure 3 presents the graphical form of an event-study with the cohort-weighted ATTs for sick day leave estimated for several relative times $T = l$ (every cohort has a separate treatment year e which represents their $T = 0$). Event Time 2 then represents that $l = 2$, that we are two years after the announcement year of the winning tender bid and one year after the typical contract start. The interpretation of the point estimate is that treated bus drivers four years after the announcement of a tender result take out about seven days more sick leave as a yearly average compared to bus drivers who do not experience a competitive tendering process in time e, and that this effect is statistically significant. Also, it is notable that every post-treatment period showcases a significant, positive effect, with some evidence of adaption or increasing effect of treatment over the first few years.

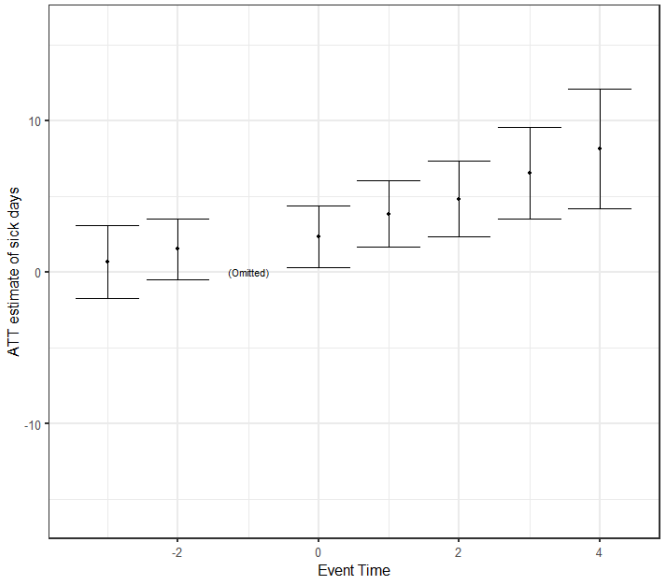

Figure 3: Sick days, data from 2003-2016

[6]With the exception of a couple of incidences where the tendering contract begins at the end of the same year that the winner is announced.

The bands in Figure 3 show the cohort-weighted ATTs with 95 percent confidence intervals around the estimated differential effect of competitive tendering on the bus drivers in affected municipalities compared to bus drivers in non-affected municipalities. These results indicate that the amount of sick leave days a bus driver takes out on average within a year increases his working municipality has its first-time tender, and that the effect is rising for the four-year period following the tender. Additionally, there are no significant pre-treatment differences for relative years before the year of reference ($T = -1$ is the year which we are conditioning employment in for both the control group and the treatment group, and is therefore our choice of reference year), meaning that there is no reason to believe that there are intrinsic or selection-based differences on average between the treated and control cohorts that drive the results. One could ask whether this is an example of some linear trend in the treatment effects, but a longer time-frame reveals that there are no pre-treatment effects in the preceding years and a stabilizing long-term effect of about ten to twelve days of sick leave. Figure 11 in the appendix illustrates this.

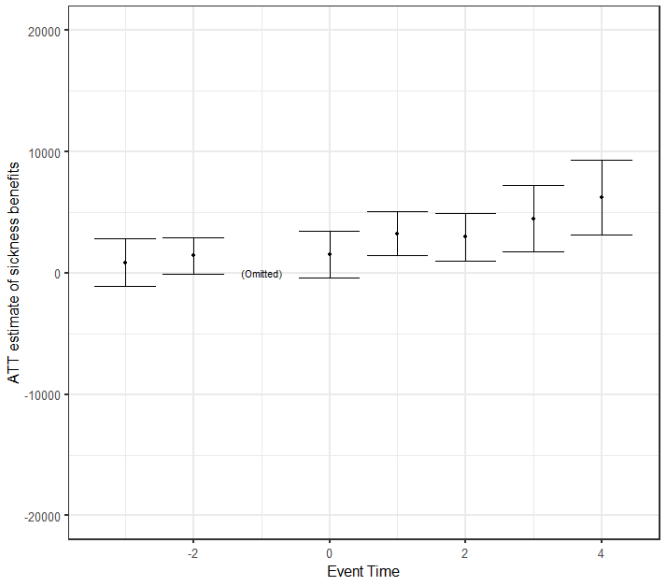

Figure 4: Sick leave benefits, data in real 2002 NOK from 2006-2016

In Figure 4, presenting the cohort-weighted ATTs for sick leave benefits, we observe a similar pattern to what is seen in Figure 3. The results imply that sick leave uptake increases in the long run - with short-term increase that itself gradually increases in the four years after treatment. The effect in T=0 is insignificant, while the effect in all later periods is significant and positive. The estimated effect in T=1 and T=2 is an increase in sick pay of around 2500 NOK per year in 2002-kroner. This represents about 14 percent as the mean pre-treatment level of sick leave benefits is at around 17500 NOK. The treatment effect rises to about twice that size in T=3 and T=4. There

are no signs of pre-treatment effects in the figure, which lessens the concern for potential selection effects.

In the sick leave benefit sample, we only have data from Statistics Norway on the outcome after 2006. In general, administrative data on monetary transactions are less prone to measurement error than more qualitative data on length of employment, job seeking or days of sick leave. Since this is the case, and total sick leave benefits are meant to measure a similar response as reported days of sick leave, the monetary outcome is our preferred outcome variable.

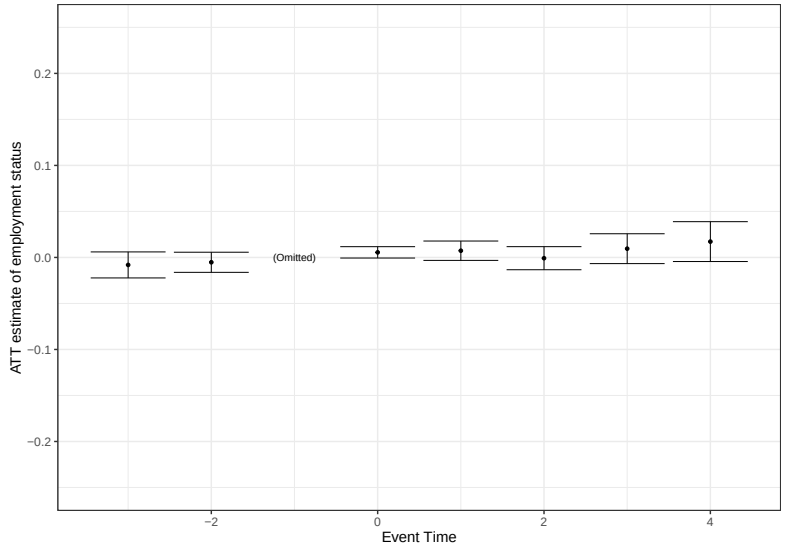

Figure 5: Employment indicator, 2003-2014

In Figure 5, an LPM estimation of employment[7] is presented. No significant results are found for any relative times, meaning that we cannot find any evidence of increased unemployment following competitive tenders in Norway for bus drivers. In other words, we fail to reject the hypothesis that competitive tenders do not systematically lead to the layoffs of bus drivers in Norway. Considering the labor laws of Norway and the apparent scarcity of bus drivers in the industry, this was to be expected.

In Figure 6, we present an ATT-estimation of the effect of implementing competitive tendering on labor income. The estimate indicates that total labor income increases in the short-term, in T=0 and T=1, but that this increase is only temporary as there is no difference between the weighted treatment groups and the weighted control groups in the later periods. As the wage levels are centrally negotiated through unions and the employment level of bus drivers did not dramatically increase, we interpret this short-term increase in aggregate labor income as largely reflecting an

[7]Defined as having income over 2G (basic income units as defined by Norwegian Labor and Welfare Administration) in real NOK.

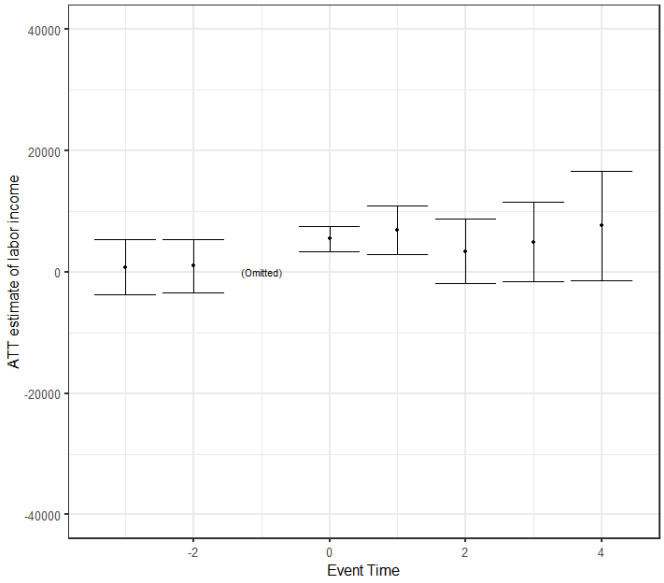

Figure 6: Labor earnings, data in real Norwegian kroner from 2003-2016

increase in the intensive margin of labor. In other words, it is likely that bus drivers simply worked more hours on average in the year following the announcement and around the start of the contract (T=1). This may well be because the restructuring and realignment from one system to the next, as well as the possible change in employer, can lead to a higher demand of labor. If wages are inflexible in the Norwegian scenario, changes in the average number of hours worked is the likely alternative explanation.

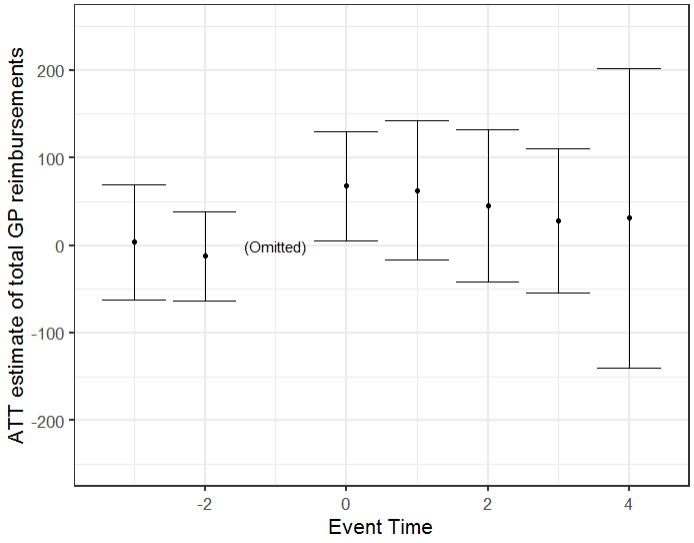

Figure 7: GP reimbursement, data in nominal NOK spanning 2006-2016

Figure 7 shows the effect of competitive tendering on average GP reimbursements, which in general imply that one visits the GP and gets a diagnosis or sick leave notice and the amount of money reimbursed depends on the severity of the health problem and the amount of work involved for the GP. The total amount of money reimbursed could be seen as a health measure due to this. As one can see in the figure, there is evidence of a temporary increase in the average yearly GP reimbursement per bus driver. This may be directly linked to sick leave to some degree due to the need to visit a GP in order to get a sick leave notice. The increase in reimbursements is significant in T=0, meaning the year of announcement, amounting to about 60 NOK on average per bus driver, but ceases to be significant in the periods afterwards.

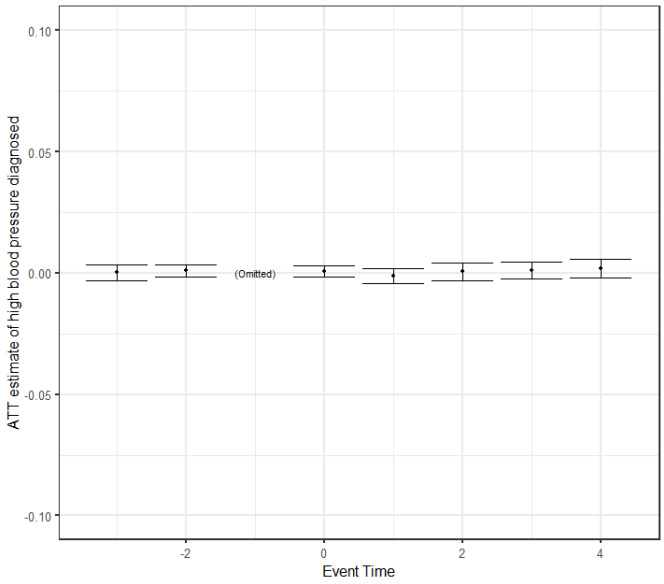

Figure 8: Blood pressure diagnoses, data spanning 2006-2016

In Figure 8, we present the effect of competitive tendering on the frequency of blood pressure diagnoses, which is a physical and highly serious diagnosis related to elevated stress levels. As the figure shows, there is no evidence of any increase in the frequency of such diagnoses. In other words, while it may still be true that the industry reform and tendering induced a more stressful workday for many bus drivers, there is no evidence of it leading to physical harm in terms of increased blood pressure.

Figure 9 shows that there is a slight response in T=0 for cardiovascular symptom incidence, but otherwise corroborates the story told in Figure 8. The increase in symptom incidence is transient and disappears after the year of tender announcement. However, the presence of these reported symptoms suggests that there may exist real adverse health effect due to stress around the time of implementation.

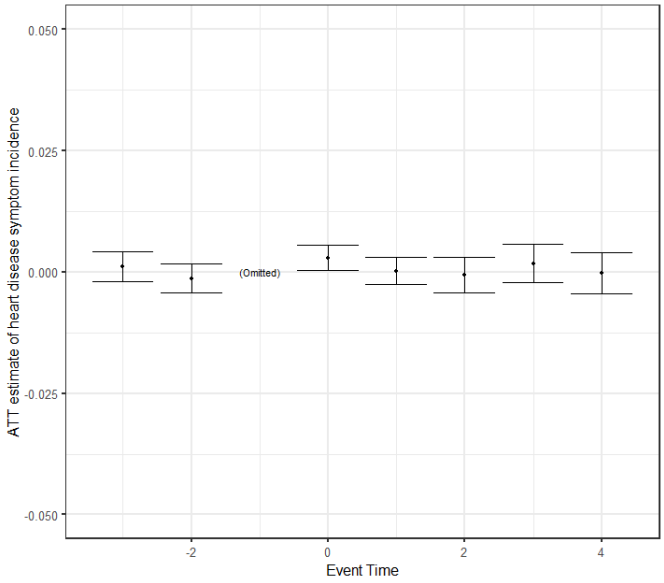

Figure 9: Cardiovascular symptoms, data spanning 2006-2016

In addition to the cohort-weighted results, we present a full normalized[8] outcome path for sickness benefits for all cohorts' treatment and control groups. The colors in the legend represent different cohorts or treatment years while the solid lines indicate a treated group. For example, the red dotted line tracks the changes in sickness benefits of the control group of the 2007 cohort relative to this group's sickness benefit payout in 2006. Although the graph contains a lot of information at once, it is evident that there is some general divergence after T-1 relative to before T-1 for most cohorts and that the treated group systematically receives more sickness benefits following treatment relative to the control group development in the equivalent period. In other words, the pre-treatment outcome paths of the different cohorts' treated and control groups typically diverge less than the post-treatment outcome paths, and the post-treatment outcome paths systematically tell the story of treated groups having increased relative sickness benefit payouts.

7 Discussion

In this study, we find an increase in sick leave uptake for Norwegian bus drivers after their municipality's first tender. This seems to be true both in the short-term and the long-term. An important question is then how to interpret increased sick leave in terms of health and other outcomes. As mentioned earlier in the paper, the proposed mechanism is that an intensification of the work-day

[8]Meaning that the levels of sickness leave benefits in the year before announcement are set to zero and this graph tracks the development of benefit payments relative to the levels in T-1 for each cohort's treatment and control group.

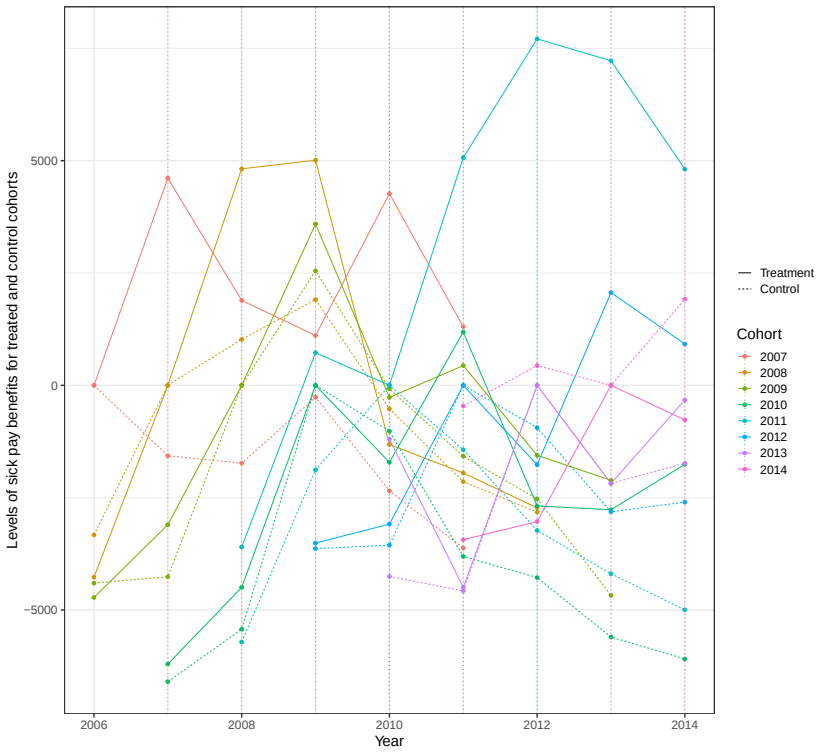

Figure 10: Differential Treatment-Control development of sick leave benefits for all cohorts relative to levels in T-1, data in 2002-NOK spanning 2006-2014. Different colors correspond to separate cohorts and the solid line are treatment groups while dotted lines represent control groups.

for bus drivers causes them to take up more sick leave. To understand how this translates to health, we need to better understand the significance of sick leave itself. Broadly speaking, we may be able to simplify the issue of interpreting sick leave by viewing it as a combined result of both physical injuries related to the intensity of work such as back pains and of workers choosing to work less due to reduced well-being at the work place. The problem is that diagnoses commonly associated with reduced willingness to work are mental and musculoskeletal diagnoses, both of which can be natural and real consequences of increased intensity of work as well. For instance, less time for breaks between bus routes will almost necessarily lead to more stressful working days and increase the physical toll of working for a bus driver. It is impossible to tell whether such diagnoses directly reflect health or whether they reflect a reduced willingness to work due to alienation or stress.

We find no evidence of any increase in blood pressure diagnoses, but a slight increase in symptoms related to cardiovascular issues for the affected bus drivers (this includes symptoms of increased blood pressure). These which would be among the most serious stress-induced diagnoses and hardest to feign due to reduced well-being and willingness to work for an alienated employee.

However, as there are no long-term effects for cardiovascular symptoms, the long-term increases in sick leave uptake should be due to the prevalent and often subjective diagnoses of musculoskeletal and neurological nature. In other words, we cannot reject the hypothesis that the increase in sick leave benefits and sick days taken following the implementation of tendering is caused by reduced well-being at work for the employees in the Norwegian bus industry.

A potential explanation for a reduction in well-being for employees following competitive tendering is that such an industry reform causes general changes in the relationship between employer and employee. This is especially the case due to the shortening of contracts and the systematic uncertainty about the future place of employment that follows the implementation of competitive tendering. This is especially the case when compared to the older system of bilateral contracts that was prevalent in the Norwegian bus industry prior to the onset of competitive tendering. We can surmise that this may cause some estrangement in the employer-employee relationship, and this may again reduce well-being at work. It is hard to disentangle the difference between health and well-being, as some stress-related diagnoses that are related to mental health may reflect reduced general health as well. However, differential increases in mental health issues could still be classified as non-physical and reflecting a wish to work less at a particular workplace due to either increased intensity of work or an alienated employer-employee relationship relative to before the implementation of tendering in a specific municipality.

Another factor that may cause a feeling of estrangement between employer and employee is the prevalence of mergers and acquisitions of local bus companies contemporaneous with and almost necessarily caused by the implementation of competitive tendering. This would often mean that the smaller local employers are bought by larger companies operating on the national scale, and the relationship between such companies and their employees could represent a large shift for workers who have been employed in smaller scale bus companies travelling the same routes for years or decades. This would also represent an aspect of the industry reform potentially causing stress and reduced well-being and through this reducing the willingness to work and therefore increasing long-term absence attributed to sickness.

Other than the spectrum of diagnoses that may reflect different types of behavior, it is worth noting that sick leave benefits is a monetary transfer from the Norwegian Government for marginal sick days beyond the fourteen first days off of work. In other words, it reflects being absent from the work force for more than half a month. This means that the results reflect a quite substantial increase in the long-term absence from work for the already established bus drivers in municipalities that experience the first wave of competitive tendering.

Another central result is that there seems to be a short-term increase in aggregate labor income around the shift when the municipality has its first tendering experience. This could possibly reflect

extra demand for working hours in the period around the tendered contract's start, being a type of adjustment cost. While it is theoretically possible for there to be wage increases in the tendered municipalities, it is highly unlikely that this would happen in the year of announcement (T=0) as the new contracts typically start the year after this (in T=1). In other words, it should be more likely that the average labor income increase is caused by the average number of hours worked being slightly higher around the shift in contracting regime and the potential take-over of a new operating company.

While none of the above results are contradictory to a priori beliefs and hypotheses, we argue that this paper offers novel and valuable empirical evidence that has been noticeably lacking in the literature. Using the event-study method and the rich registry data of Norway, we have documented a negative individual-level effect of the large scale implementation of competitive tendering in the public transport sector. The increase in sick leave uptake likely reflects the intensification of workers' daily routines and the hidden costs of the cost-saving measures that often follow schemes to make industries more competitive. The increase in GP reimbursements mean that the usage of GPs increases and is an indication of this having health consequences. However, there is no evidence of any cardiovascular symptoms or increases in blood pressure diagnoses caused by the tendering. The labor income response is slightly less interesting, other than as a possible indication of a higher number of hours worked in the period surrounding a tender. Implementation of competitive tendering and the closing of some routes and opening of new ones likely strains the work force to some degree. It possible that this is part of the explanation for the short-term increase in sick-leave uptake when the winner of a tender is announced. Higher demand for work and more stress in the short-term could easily influence the sick leave patterns of bus drivers.

8 Conclusion

In this paper, we document an increase in sick leave uptake as a response to first-time tenders of local bus transport in Norwegian municipalities. The increase is quite substantial in magnitude, constituting about 28% of the average pre-treatment level of sickness benefits[9]. This is likely a combination of both an intensification of the work day and a less stable employer-employee relationship now that bus drivers may be forced to change employers every five or six years in the case that their current employer loses the bid for the local bus routes. We find a minor increase in the usage of GP consultations around the time of implementation, but no significant increases in serious heart-related diagnoses. We also see some evidence of increased average labor income in the year of the tender result announcement and in the year of implementation, which could reflect

[9] A point estimate of around 5000 2002-NOK relative to a pre-treatment average of 17 to 18 thousand 2002-NOK.

an increased work load due to the ongoing restructuring of the industry.

In terms of external validity, we argue that the main results of this study should be transferable to other settings as well. The mechanism of cost-saving measures intensifying the usage of labor and this affecting the stress and health of workers should be present in any industry that is somewhat labor intensive. In Norway, public transport by train and health services are perhaps particularly relevant. The mechanism, as described, is in fact exactly what Lloyd and Seifert (1995) argued in 1995 about the British health industry and its privatization. The argument and the hypothesis of privatization, contracting out and public tenders affecting the work force is an old one, and we argue that this paper provides solid and quite large-scaled empirical evidence of negative effects caused by such measures. We argue that we can isolate the effect of competitive tendering on health or well-being quite well to the degree that sick leave uptake is a good proxy for such outcomes. Additionally, countries with fewer or weaker protective measures for workers should expect more drastic responses to competitive tendering in terms of labor outcomes. While there is no evidence of layoffs in this study, policy-makers in countries with less labor protection could justifiably be worried about wages and unemployment being affected by these types of cost-saving measures.

The results in terms of long-term absence from work stress the point that policy-makers should be aware of the negative side-effects that cost-saving measures such as the introduction of competitive tendering may have in different industries. Knowing about harmful side-effects of a policy might either encourage policy-makers to think twice before implementing it or to at least weigh the potential benefits against potential negative effects that are empirically documented. The benefits of contracting out and competitive tendering are obvious in terms of industry costs decreasing, which can lead to a lower need for subsidies in the case of public transportation. However, individual level effects can be hard to disentangle and generalize, and this study is an attempt at tackling this problem.

Future research on the individual level effects of competitive tendering could do similar types of analyses on any other industry, and documenting the same kinds of effects in other countries or industries would be an interesting result. Quantifying negative individual-level effects of industry restructuring is quite important in terms of understanding the ramifications that industry-wide cost-saving measures may have. Additionally, increased use of welfare services such as sick leave is costly in itself and if a policy is expected to have such effects, policy makers should be aware of this.

References

Aarhaug, J., Fearnley, N., Gregersen, F. A. and Norseng, R. B. (2018). 20 years of competitive tendering in the norwegian bus industry–an analysis of bidders and winning bids. *Research in Transportation Economics*, **69**, 97–105.

Abadie, A. (2005). Semiparametric difference-in-differences estimators. *The Review of Economic Studies*, **72** (1), 1–19.

Abraham, S. and Sun, L. (2018). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *SSRN 3158747*.

Bach, S. (1989). *Too high a price to pay?: a study of competitive tendering for domestic services in the NHS*. 25, Industrial Relations Research Unit, School of Industrial and Business .

Bekken, J.-T., Longva, F., Fearnley, N. and Osland, O. (2006). Norwegian experiences with tendered buss services. *European Transport, 30, 29-40*.

Callaway, B. and Sant'Anna, P. H. (2019). Difference-in-differences with multiple time periods. *Available at SSRN 3148250*.

Chernozhukov, V., Chetverikov, D., Demirer, M., Duflo, E., Hansen, C. and Newey, W. (2017). Double/debiased/neyman machine learning of treatment effects. *American Economic Review*, **107** (5), 261–65.

Colling, T. and Ferner, A. (1995). Privatization and marketization. *Industrial Relations: Theory and Practice in Britain, Oxford: Blackwell*.

Endringslov til yrkestransportloven (2009). Lov om endringar i yrkestransportlova og jernbaneloven. 2009-0474, LOV-2009-06-19-108.

Gibbons, C. E., Serrato, J. C. S. and Urbancic, M. B. (2018). Broken or fixed effects? *Journal of Econometric Methods*, **8** (1).

Hensher, D. A. and Wallis, I. P. (2005). Competitive tendering as a contracting mechanism for subsidising transport: the bus experience. *Journal of Transport Economics and Policy (JTEP)*, **39** (3), 295–322.

Lloyd, C. and Seifert, R. (1995). Restructuring in the nhs: the impact of the 1990 reforms on the management of labour. *Work, Employment Society*, **9** (2), 359–378.

Longva, F. and Osland, O. (2010a). Anbud på norsk. *Tidsskrift for samfunnsforskning*, **51** (03), 387–415.

— and — (2010b). Regulating the regulator: The impact of professional procuring bodies on local public transport policy and its effectiveness. *Research in Transportation Economics*, **29** (1), 118–123.

McGrath, J. and Behan, J. (2017). A comparison of shortage and surplus occupations based on analyses of data from the european public employment services and labour force surveys. *Labour shortages and surpluses*, european Commission.

Milne, R. G., Roy, G. and Angeles, L. (2012). Competition, quality and contract compliance: Evidence from compulsory competitive tendering in local government in great britain, 1987–2000. *Fiscal Studies*, **33** (4), 513–546.

Vigren, A. (2016). Cost efficiency in swedish public transport. *Research in Transportation Economics*, **59**, 123 – 132, competition and Ownership in Land Passenger Transport (selected papers from the Thredbo 14 conference).

Walsh, J. and O'Flynn, J. (2000). Managing through contracts: the employment effects of compulsory competitive tendering in australian local government. *Industrial Relations Journal*, **31** (5), 454–470.

9 Appendix

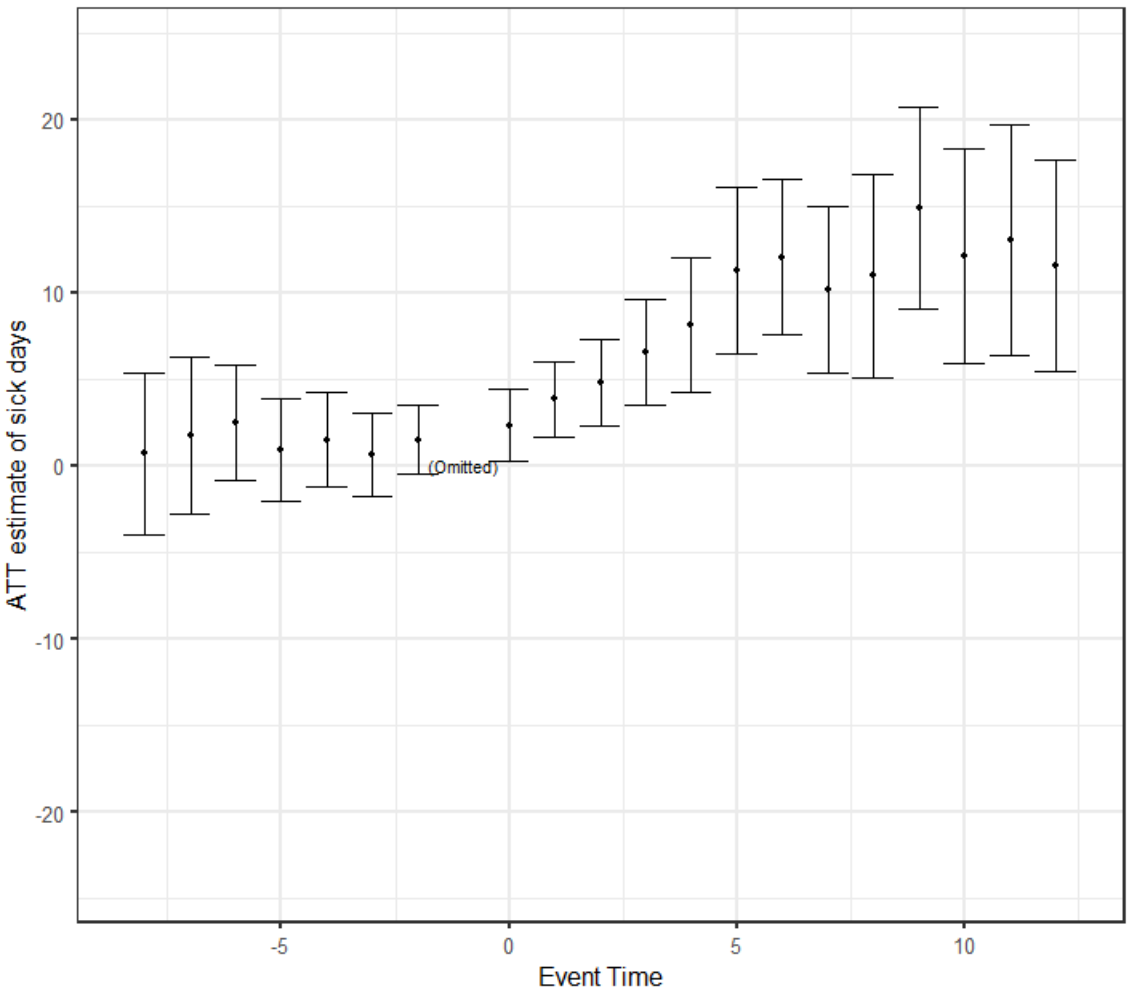

Figure 11: Sick days, data from 2003-2016, longer time-frame