Labor Market Effects of COVID-19 in Sweden and its Neighbors: Evidence from Novel Administrative Data

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Abstract

This paper studies the labor market effects of non-pharmaceutical interventions (NPIs) to combat the COVID-19 pandemic. We focus on the Nordic countries which showed one of the highest variations in NPIs despite having similar community spread of COVID-19 at the onset of the pandemic: While Denmark, Finland and Norway imposed strict measures ('lockdowns'), Sweden decided for much lighter restrictions. Empirically, we use novel administrative data on weekly new unemployment and furlough spells from all 56 regions of the Nordic countries to compare the labor market outcomes of Sweden with the ones of its neighbors. Our evidence suggests that the labor markets of all countries were severely hit by the pandemic, although Sweden performed slightly better than its neighbors. Specifically, we find the worsening of the Swedish labor market to occur around 2 to 3 weeks later than in the other Nordic countries, and that its cumulative sum of new unemployment and furlough spells remained significantly lower during the time period of our study (up to week 21 of 2020).

Keywords: COVID-19 pandemic, lockdown, labor market effects

JEL-codes: I18, J64

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1 Introduction

The vast majority of countries have implemented strong non-pharmaceutical interventions (NPIs) to slow the spread of COVID-19. While the effectiveness of these policies in terms of health outcomes have been shown in several studies (see, e.g., Conyon, He, and Thomsen, 2020; Flaxman et al., 2020; Glogowsky, Hansen, and Schächtele, 2020; Huber and Langen, 2020; Juranek and Zoutman, 2020), there are important concerns about the potential damage NPIs cause to the economy and labor markets (Andersen et al., 2020; Kong and Prinz, 2020). Specifically, the severe restrictions and social distancing measures many countries have enforced ('*lockdowns*') are assumed to inflict stark economic pain (Baldwin and Weder di Mauro, 2020; Chetty et al., 2020). Thus, the decision problem governments are facing is often seen as a trade-off between public health and the health of the economy (Lin and Meissner, 2020).

In this paper we use novel high-frequency (weekly) regional unemployment and furlough spells from all four Nordic countries to evaluate the economic effects of NPIs. We employ this data to study the differential labor market effects of one of the most prominent policy variations observed during the COVID-19 pandemic. Sweden departed substantially from its neighbors in the response to the spread of the disease, refraining from closing schools, shutting down businesses or shops. Our estimation strategy draws on this natural experiment in the Nordics, comparing countries which were similarly exposed to the COVID-19 pandemic but responded to it in different ways.

The Nordic countries represent an ideal laboratory to study the differential impact of NPIs on labor market outcomes. First, the Nordic countries are similar with regard to the general economic environment (e.g., GDP per capita, trade openness), their labor markets, health care sectors and the general institutional background. Second, due to geographical proximity and their economic interrelations these countries experienced similar trajectories of the COVID-19 pandemic: The 100th case of a confirmed infection occurred in Norway on the 4th, in Sweden on the 6th, in Denmark on the 9th and in Finland on the 12th of March. The measures to slow the spread of COVID-19, however, differed substantially between the four countries. Starting in week 11 of 2020, Denmark, Norway and Finland responded with strong NPIs to limit social interaction, while Sweden imposed much lighter restrictions. Table 1 depicts the dates of the introduction of various measures along with an overall government stringency index, developed by Hale et al. (2020). The index shows that Norway and Denmark imposed the toughest restrictions followed by Finland, and the much weaker response of the Swedish government to the pandemic.

The measures had direct implications for many types of economic activity: In Norway,

Table 1: Timing of closures and containment in Nordic countries

Measure	**Denmark**	**Finland**	**Norway**	**Sweden**
		Day in March 2020		
School Closing	*13*	16	*12*	–
Workplace closing	*13*	16	12	–
Cancel public events	*18*	*12*	*12*	*12*
Close public transport	–	–	–	–
Restrictions on internal movements	–	28	16	–
International travel controls	11	19	15	19
Stringency index (maximum in week 11 – 13)	72.2	67.3	75.9	32.4

Notes: Dates in italics indicate that a measure was general in scope. The stringency index is a compound of eight closing measures and is ranged between 0 and 100, where a higher index represents stronger overall restrictions; see Hale et al. (2020).

Finland and Denmark, the hospitality industry (such as bars, nightclubs, restaurants or hotels) was largely shut down, personal services (e.g., hair dressers, masseurs or dentists) were closed, shopping centers had to stop operating, and public transport was limited. In contrast, Sweden decided for much less strict measures, with restaurants and bars kept open (under certain proximity restrictions), and private businesses and shops being allowed to operate freely. In fact, Google's COVID-19 Community Mobility Reports show different mobility patterns for Sweden than for the other three countries, especially in the first weeks after the lockdowns (see Figure 1). We also observe a decline in Sweden. However, it is less pronounced than in the other Nordic countries. That indicates that there are behavioral responses caused by the lockdown measures in addition to the threat of the virus. In other words, the NPIs do constrain the choices of the population.

Despite the very different NPIs imposed to curb the spread of COVID-19 between Sweden and its neighbors, all countries introduced similar government programs to soften the impact of the pandemic on the economy and labor markets. Specifically, Denmark and Sweden almost simultaneously introduced a novel short-time work compensation/furlough program in the mid of March.[1] Both programs guarantee between 75% and 90% of the salary of workers which are currently not needed but kept on payroll of their companies. The salary cap for furloughed workers are similar in both countries (EUR 4,150 vs. 4,000 per month). In a similar vein, Finland made its existing furlough program more generous due to the crisis, with replacement rates varying between 80 and 100% for workers reducing their working hours during the pandemic. Norway also made its existing furlough program more accessible and more generous over the course of the COVID-19 crisis. The only

[1] In the following, we will use the terms *short-time work compensation* and *furloughs* interchangeably.

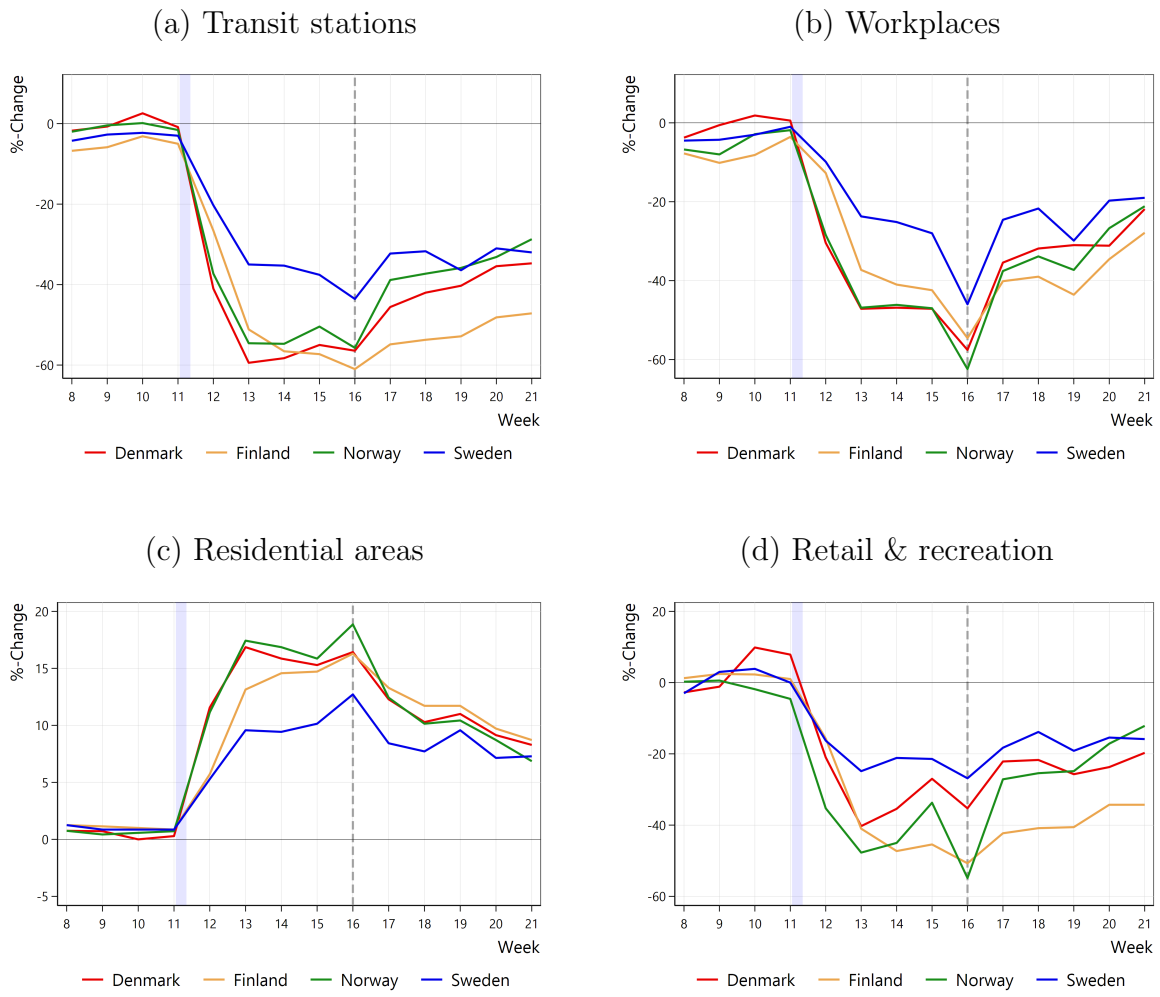

Figure 1: Economic activity in Nordic countries

Notes: The figures show how visits and length of stay at different places changed compared to the median weekly value, using the 5 week period from January 3 to February 6, 2020 as comparison. The blue shaded vertical line indicates the date of the lockdowns from Table 1, which is around March 13 (week 11). The dashed vertical line indicates Easter holidays (week 16). Source: Google LLC "Google COVID-19 Community Mobility Reports." `https://www.google.com/COVID19/mobility/` [July 15, 2020].

notable difference between the four countries is that Sweden only allowed a part-time reduction in working hours up to 60% (80% after May), whereas the other 3 countries also allow a worker to be furloughed up to a 100%. To account for the degree of working time reduction of the furlough spells, we express the number of furlough spells in full-time equivalents (FTE). Overall, labor market institutions responded in a similar fashion to the crisis across all Nordic countries, with the furlough programs being an especially popular policy (Alstadsæter et al., 2020b; Bennedsen et al., 2020; OECD, 2020). Although program generosity may vary in the details, across all four countries the incentives of affected businesses were large to participate in the respective furlough program.

Since all Nordic countries were similarly exposed to the pandemic but only Sweden refrained from strict NPIs, a comparison of unemployment and furlough spells between Sweden and the other Nordic countries allows to study the labor market effects of the restrictions. Therefore, we collect novel administrative data on weekly new unemployment and furlough spells from the Nordic countries at the regional level. It is a key strength of our study to not only cover the effect of the crisis on unemployment, but also on the number of people filing for one of the national furlough programs. In our data we find that the number of furloughed workers during the pandemic is significantly larger than the number of workers that became unemployed. Therefore, including furloughed workers is of crucial importance when studying the labor market impact of the pandemic. To our knowledge, we are the first study employing high-frequency data on furlough spells from all Nordic countries.

A drawback of our data is that we observe inflow into unemployment but not outflow from it. For furloughs, we only observe the outflow for Denmark and Sweden (i.e. we have stock data). However, we think this is of less importance when interested in the short-term effects of the COVID-19 crisis on the labor market. Specifically, during the height of the pandemic there was only little outflow from unemployment, because hiring of new people came to a halt almost completely. This has been documented for the U.S. job market with many of the newly non-employed stopped looking for work during the first weeks after the start of the pandemic in March (Coibion, Gorodnichenko, and Weber, 2020; Forsythe et al., 2020). Furthermore, for Denmark and Sweden we do not observe substantial outflows from the respective furlough program during the time period of our study (see Appendix A.1). Thus, we think our data provides a comprehensive and valid representation of the short-term labor market impact of the COVID-19 crisis.

Empirically, we compare labor market outcomes between Swedish regions and its Nordic neighbors in an event-study framework. Our comparison focuses on the regional number of new weekly unemployment and furlough spells between week 1 and week 21 of 2020 with the corresponding figures in 2019. Week 11 serves as the event date, when the lockdowns of Denmark, Finland and Norway were implemented. To adjust for the general business cycle and seasonal effects we include a set of region-year and country-week fixed effects.

Overall, our result suggest that the labor markets of all Nordic countries were hit hard by the pandemic, as well as by the subsequent NPIs. Starting in week 11 of 2020, we observe a sharp increase in newly unemployment and furlough spells especially for Norway and Denmark, but also for Finland. Sweden shows a similar but less pronounced peak in new unemployment and furlough spells, lagging behind the surge of its neighbors by around 2 to 3 weeks. When using the cumulative (total) number of new weekly unemployment

and furlough spells, we again find the labor markets of Denmark and Norway to have suffered the most, followed by Finland and Sweden. Employing weekly regional stock data of furloughs (which is only available for Denmark and Sweden) shows a similar pattern. Specifically, we find a very large increase in Denmark exactly around the time of the lockdown in week 11, and for Sweden a similar but somewhat less strong increase around 2 to 3 weeks thereafter. In sum, the results from the unemployment and furlough data mirror the pattern from the Google mobility data shown in Figure 1: The lockdowns of Norway and Denmark seem to have had the largest impact, followed by Finland and Sweden. Furthermore, even after lifting the lockdown, neither everyday life as recorded in the Google data nor the labor market returned immediately back to normal, but rather recovered only gradually from it.

To quantify the differences in unemployment and furlough spells, we also employ difference-in-differences (DID) regressions. We find the DID coefficient of the cumulative sum of unemployment and furlough spells to be around 1,360 spells higher per 100,000 of population for Denmark in week 21 compared to Sweden. It suggests that Denmark would have accumulated around 30% less unemployment and furlough spells if lighter restrictions similar to Sweden would have been implemented. Our estimates are similar but higher than what Andersen et al. (2020) estimated using bank transaction data from Swedish and Danish bank clients. Specifically, they find a 25% drop in spending for Sweden versus a 29% drop for Denmark, with the difference of 4 percentage points amounting to a 14% larger drop for Denmark compared to Sweden. Qualitativly, our results are also in line with the recent IMF's *Country Focus* (IMF, 2020), showing that Sweden experienced a small increase in GDP for the first quarter of 2020, contrary to almost all other advanced economies. However, our results seem to contradict findings in Kong and Prinz (2020) who find only small effects of NPIs on UI claims across U.S. states. We believe the Nordic countries provide a setting of (i) more similar exposure (regarding time and space) to the spread of COVID-19, while at the same time having (ii) much larger variation in NPI strictness than most U.S. states. For instance, the 100th confirmed case occurred in New York on the 8th, in New Jersey on the 16th, in West Virginia on the 29th and in Wyoming on the 31st of March. In contrast, the 100th confirmed case in Sweden, Denmark and Norway happened within 5 days. Furthermore, the issuing of NPIs across U.S. states often differed only by a few days or weeks (see Table A.1 of Kong and Prinz (2020)), whereas Sweden had a much lower stringency index throughout the entire pandemic.[2] However, it is important to note that our analysis ends in week 21, 2020. Thus, our results can

[2]Unfortunately, the stringency index of Hale et al. (2020) does not exist for U.S. states, but using Google's COVID-19 Community Mobility Reports, for instance, confirms that the differential decline between Sweden and its neighbors in workplace visits was larger than between the 50 U.S. states (see Figure A.2 in the Appendix).

only be informative about the short-term effects of the COVID-19 crisis as well as the subsequent lockdowns on the labor market. For instance, our data period is too short to examine whether the recovery in the months after the re-opening occurred slower in Sweden than in the other Nordic countries.

The paper proceeds as follows. The next section introduces the institutional background and in particular the unemployment and furlough programs implemented in the Nordic countries. Section 3 presents the data and provides some descriptive statistics. Section 4 elaborates the empirical specification to identify the impact of NPIs on labor markets and presents the empirical results. Section 5 concludes.

2 Institutional Background

Many countries around the world have created short-term worker programs to avoid large mass-layoffs of workers. In the following, we briefly describe the different programs of the Nordic countries.

2.1 Denmark

Denmark introduced its new short-time work compensation program on March 9th 2020. This new program allows partaking companies to receive a government refund of 75% of the salaries paid to their retained workers. The requirement for a company to be eligible is that it otherwise would have laid off a minimum of 30% of its workforce (Bennedsen et al., 2020). Furloughed workers keep their jobs and salaries but are not allowed to work, meaning that their working time is reduced by 100%. There is a salary cap on the maximum level of support at 30,000 DKK (around 4,000 EUR) per month for full-time employees (Rothwell and Drie, 2020).[3]

2.2 Finland

In Finland, there exists no short-time work compensation program as such. However, companies can temporarily layoff employees due to financial or production-related reasons (so called furloughs). This furlough system already existed before but was made more generous and accessible due to COVID-19. A furloughed worker continues to have a valid employment contract with the employer, but the employer stops wage payments

[3] `https://danishbusinessauthority.dk/assistance-businesses-denmark-during-corona-virus-diseaseCOVID-19` [July 15, 2020]

temporarily due to the lack of work. Furloughed workers are entitled to the same UI benefits as unemployed workers. All workers, including furloughed workers who work reduced hours (i.e., part-time furloughed), may be entitled to partial UI benefits on top of wage income. Especially the partial UI benefit scheme is generous in Finland, with replacement rates varying between 80 to 100% (Kyyrä, Pesola, and Rissanen, 2017). There is no cap to the (partial) UI benefit in Finland, but the replacement rate declines with the previous (full-time) wage.

2.3 Norway

Similar to Finland, Norway already had a short-time work and unemployment program in place prior to the pandemic. Originally, a furloughed employee reduced working hours by at least 50%, with the state paying 62.4% of the lost income, up to approximately 31,000 NOK (around EUR 2,900) per month for a full-time unemployed. The government strengthened the program with effect on March 20 by granting 100% pay, capped at 31,000 NOK per month, for the first 20 days. From day 21 on, the part of the income below 25,000 (around 2,300) is replaced at 80%, whereas the coverage remains unchanged for the other parts of the income (Alstadsæter et al., 2020a). Furthermore, the minimum required reduction in working hours decreased to 40%.

2.4 Sweden

Sweden, similar to Denmark, created a novel short-time work compensation program coming into effect on March 16th 2020 (Hensvik and Nordström Skans, 2020). The new program can be used when companies are faced with temporary financial or production challenges as a consequence of the COVID-19 pandemic. The most important distinction between Sweden's program, and that of its Nordic neighbors is that a company's employees can reduce their working hours only up to a maximum of 60% (up to 80% after 1st of May) while the government provides financial support in the form of a short-time work allowance. In our analysis we deal with this difference, by comparing full-time equivalent (FTE) furlough spells (see section 3.2 for more detail). The financial support reduces an employer's costs for personnel by around 50% (70% after 1st of May), while workers will retain almost 90% of their original pay (KPMG, 2020). The salary cap for financial support is 44,000 SEK (around 4,150 EUR) per month.[4]

[4] `https://tillvaxtverket.se/english/short-time-work-allowance.html` [July 15, 2020]

3 Data

3.1 Data Sources

During the pandemic, the administrations of the Nordic countries started to produce weekly reports on the new number of individuals being laid-off or put on furlough. Most of the reports they issued during these weeks focused on inflow into unemployment and furlough. Thus, we have access to high-frequency weekly inflow data on the new number of unemployment as well as furlough spells for all regions of Denmark, Norway, Finland, and Sweden for the years 2019 and 2020.[5] In addition, for Sweden and Denmark we also have data on the stock number of people currently on furlough, which allows us to also examine outflows from the respective furlough program.

For Denmark, we received data on the weekly number of new unemployed through Statistics Denmark. We received furlough data from *Erhvervsstyrelsen*, the Danish Business Authority which manages the program. For Sweden, we received data on the weekly number of new unemployed through the national employment agency. Furlough data was collected through *Tillvaxtverket*, the government agency managing the furloughs. For both Denmark and Sweden, the furlough programs were newly introduced due to the Corona crisis, which means that no prior data exists (in Sweden, the first data on furloughs is from week 12, for Denmark from week 11). In our data we replace the missing observations for Sweden and Denmark prior to week 12 and in 2019 with zeroes, consistent with the fact that the program did not exist. For Finland, we downloaded the data from the *Helsinki Graduate School of Economics* webpage. Helsinki GSE created a special webpage collecting and analysing data around the COVID-19 pandemic.[6] The Norwegian data we received from *NAV*, the Norwegian Labour and Welfare Administration. The furlough programs of both Finland and Norway existed prior to the pandemic, which gives us data on the weekly number of new furlough spells also for 2019.

3.2 Calculating Full-time Equivalents for Furloughs

As it has been described above, the institutional arrangements regarding part-time/partial furloughs differ between the four countries. For instance, in Denmark every person being furloughed is on full-time furlough, meaning that working time is reduced by 100%. In contrast, a furloughed person in Sweden continues to work partially, since working hours

[5] Statistics Denmark provides the regional weekly numbers before 2020 as the average from the years 2015-2019 only.

[6] `https://www.helsinkigse.fi/korona-data/` [July 15, 2020]

can only be reduced by a maximum of 60% (up to 80% after 1st of May). In Finland and Norway, both part-time (i.e., a partial reduction in working hours) and full-time furlough (100% reduction) is possible. Since the working time reduction of a furlough spell indicates how severely a labor market has been hit by the crisis, we want to take this into consideration. Specifically, to account for the different intensities of the furlough spells and to make them more comparable, we will express the number of furloughs as full-time equivalents (FTE). To do so, we first need information on the number of part-time as well as of full-time furlough spells. Second, we have to find a way to account for the average degree of the hours reduction the part-time furloughed are taking (which we do not have in the data).

Receiving the number of partial furlough spells is relatively straightforward. For Denmark, the share of part-time furloughs is zero, since everyone on the furlough program needs to reduce working time by a 100%. In Sweden, only part-time furloughs are possible, which means that everyone in our furlough data is part-time furloughed. For Norway, we have weekly information on the number of part-time as well as of full-time furlough spells, but only on the national level. We use this share of part-time furlough spells on the national level as a proxy to calculate the number of part-time furloughs on the regional level. For Finland, we only received data on the number of full-time furlough spells. However, a government report on the Finnish furlough program from May 2020 finds that only around 15% of all furloughs are actually part-time (Elinkeinoministeriö, 2020). Thus, for Finland we will use the 15% stated in the report to infer the part-time share for all Finnish regions.

In a second step, we need to take into account the degree of the hours reduction the part-time furloughed are taking in order to calculate the corresponding FTE. This data does not exist for any of the countries, neither on the individual nor aggregate level. Therefore, we decided to use the maximum possible reduction of working time possible in Sweden (60% before 1st of May, 80% thereafter), and use this degree of hours reduction also for the part-time furloughed in the other countries to calculate the FTE. The vast majority of furlough spells of the other three countries are actually full-time, namely 72% for Norway, 85% in Finland, and 100% in Denmark. Thus, the assumption about the working time reduction of the part-time furloughed do not matter greatly for these three countries, since most furlough spells are full-time. In the Appendix A.3 we present robustness checks where we change the assumed working time reduction for the partially furloughed. Overall, we receive qualitatively similar results.[7]

[7] An alternative way would be to *not* calculate FTEs but use the unadjusted absolute number of furlough spells recorded in the raw data. This would treat every furloughed employee the same, irrespective of whether the person is full-time furloughed or not. Given that in Sweden no full-time furloughs exist, this approach would overestimate the actual extent of working time reduction in Sweden and bias our results downwards.

3.3 Descriptive Statistics

The main variables of interest in our study are the weekly new unemployment and furlough spells, both measured on the regional level. All our dependent variables are measured in FTEs as explained above, and we normalize them by the population of the respective region and year. Table 2 shows the average number of weekly new unemployment, furlough as well as the cumulative sum of weekly new unemployment and furlough spells for the weeks 11 to 21 and the years 2019 and 2020, respectively.

Table 2: Descriptive statistics

Variable	**Denmark**	**Finland**	**Norway**	**Sweden**
Number of observations (regions)	210 (5)	779 (19)	462 (11)	882 (21)
Population (1,000)				
Mean	1,162.88	291.00	486.17	493.88
Min.	589.76	29.88	241.24	59.64
Max.	1,846.02	1,708.43	1,241.12	2,409.46
New weekly unemployment spells (mean of regions)[a)]				
2019	116.41	162.36	39.80	59.50
2020	186.92	167.31	95.94	115.58
New weekly furlough spells (mean of regions)[a)]				
2019	–	19.56	7.73	–
2020	341.62	359.32	530.52	232.08
Cumulative unemployment and furlough spells[a)]				
2020	6,272.38	6,314.31	7,136.35	4,604.45

Notes: [a)]Only weeks 11 to 21, all numbers per 100,000 population.

As we can see in the table, from 2019 to 2020 the average weekly number of new unemployment spells increased by about 3% in Finland, by more than 50% in Denmark and more than doubled in Norway and Sweden. More dramatic is the growth in furlough spells, shown in the bottom lines of Table 2. Two things are worth noting: First, we see how important it is to also obtain data on furlough spells when studying labor markets during the COVID-19 crisis: The average number of new weekly furlough spells are around 2 to 6 times higher than the average number of new weekly unemployment spells. Second, it becomes already evident from this table that the labor markets of all Nordic countries were severely hit by the COVID-19 pandemic.

Table 2 also shows the average size and population of the regions used in our study. We observe 5 Danish regions in our sample, with an average population size of 1.2 Million

people. The other Nordic countries include more regions (19 in Finland, 11 in Norway and 21 in Sweden) with lower population size (around 300 Tsd. in Finland, and about 500 Tsd. in Norway and Sweden).

4 Empirical Analysis

4.1 Specification and Identification of Labor Market Effects

Our data is structured as a panel with a country-region (cr) cross section and a year-week (jw) time dimension. Hence, the observational unit is at the cr, jw-level. Our main outcome variables (y) are (i) weekly new unemployment spells, (ii) the weekly new unemployment plus furlough spells, and (iii) the cumulative sum of these spells over time. Our regression model is given by

$$y_{cr,jw} = \eta_{r,j} + \alpha_{c,w} + \beta_{c,w} D_{j=2020} + \varepsilon_{cr,jw}, \tag{1}$$

where $y_{cr,jw}$ denotes the respective outcome for region r of country c in week w of year j. $\eta_{r,j}$ are region-year-fixed effects, $\alpha_{c,w}$ denote country-week fixed effects controlling for seasonal fluctuations in the respective outcome, and $D_{j=2020}$ is a dummy which equals 1 if the year is 2020, and zero else. The main coefficient of interest is $\beta_{c,w}$ which measures deviations in the respective outcome in week w in 2020 compared to the same week w in year 2019.[8] Week 10 serves as the baseline, i.e., $\beta_{c,10}$ is normalized to 0. Standard errors are clustered on the country-region level.

4.2 Results

Figure 2 present the results from estimating equation (1). Panel a uses the weekly new unemployment spells as outcome variable, whereas Panel b is based on the weekly new unemployment plus furlough spells. Note that the figures use different scales, since the number of furlough spells is so much larger than the number of unemployment spells in all four countries. A couple of things are notable when looking at the two figures. First, the coefficients for the periods prior to the lockdown in week 11 are quantitatively small, move basically in parallel, and do not exhibit a trend. This confirms that during the first weeks of 2020 the labor markets of the four countries were on similar trajectories once accounting for region-year and country-week fixed effects. This parallel trend changes

[8]For Denmark, we do not have data from 2019 only but the average from the years 2015-2019.

abruptly in the week of the lockdown (week 11), when the number of new unemployment spells increases tremendously in Denmark, Finland and Norway. Sweden lags behind this development of its neighbors by a few weeks, with the peak number of new unemployment spells being in week 14. Overall, panel *a* of Figure 2 shows that the pandemic dwarfs other regional and seasonal specific labor market fluctuations.

When studying weekly new unemployment plus furlough spells together (panel *b* of Figure 2), a similar but more dramatic picture emerges. Again, and in line with Bennedsen et al. (2020) as well as Alstadsæter et al. (2020b), we find the increase to be sudden and sharp for Denmark and especially for Norway. In Sweden and Finland, the labor market worsens more gradually, with the peak number of weekly new unemployment plus furlough spells being in week 14. In sum, we find that the two strict lockdowns of Denmark and Norway had an immediate and strong effect on their national labor markets. The somewhat less strict and later lockdown of Finland (see Table 1) delayed the worsening of the labor market by around 2 weeks. Interestingly, also the Swedish labor market seems to have been hit hard by the escalating pandemic, but with a slightly better performance compared to its neighbors.

The differential timing in the surge of the weekly new numbers may mask some differences in the total sum of unemployment and furlough spells across the four countries. Therefore, we also employ the cumulative sum of new unemployment and furlough spells as dependent variables. Panel *c* displays the regression coefficients when using cumulative new unemployment, and panel *d* when employing cumulative new unemployment plus furloughs as the respective outcome. When looking at the combined measure (panel *d*), we again find that the labor markets of Denmark and Norway seem to have suffered the most. This mirrors what we have already observed in the mobility data shown in Figure 1: The lockdowns of Norway and Denmark seem to have had the largest impact, followed by Finland and Sweden.

In order to estimate the differences between Sweden and its neighbors more directly, we employ an event-study difference-in-differences (DID) analysis in which Sweden serves as the control group and where treatment takes place in week 11:[9]

$$y_{cr,jw} = \eta_{r,j} + \alpha_{c,w} + \gamma_{jw} + \beta_{c,w} D_{w \geq 11} + \varepsilon_{cr,jw}, \tag{2}$$

where γ_{jw} denote week-year fixed effects. In this model, $\beta_{c,w}$ denotes the DID between country c and Sweden (the omitted category) between week w and week 10.

Results are reported in Figure 3 where we focus on the cumulative sum of the weekly un-

[9] A table with conventional DID estimates can be found in the Appendix, see Section A.2.

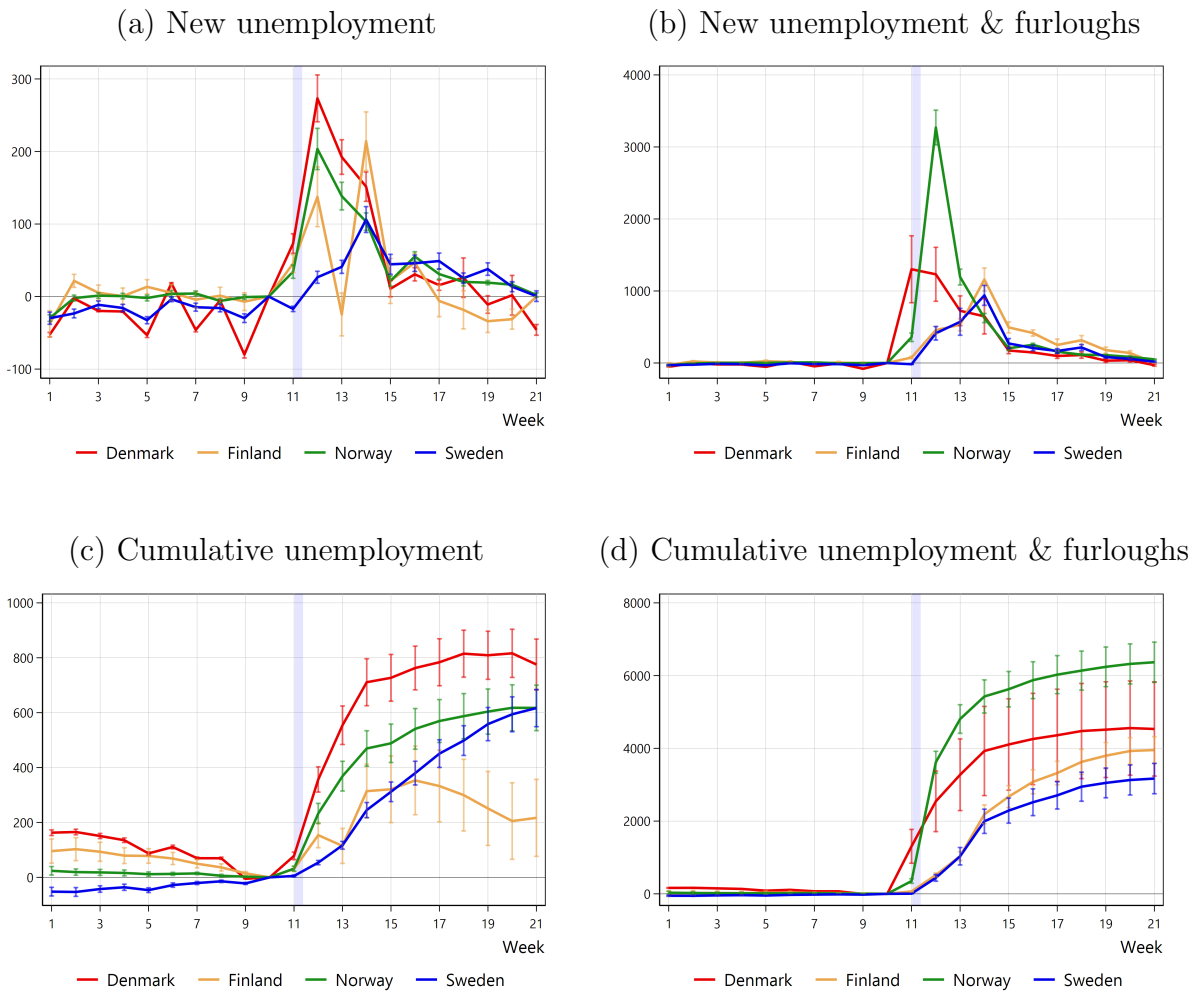

Figure 2: Seasonally and regionally adjusted unemployment/furloughs per 100,000

Notes: The figure shows the event-study coefficients estimated from equation (1), including 95%-confidence intervals (standard errors clustered on the country-region level). The blue shaded vertical line indicates the week of the lockdowns in Denmark, Finland and Norway (week 11). Panel *a* employs new weekly unemployment spells, panel *b* new weekly unemployment plus furlough spells, panel *c* cumulative unemployment spells, and panel *d* cumulative unemployment plus furlough spells as the respective outcome (all per 100,000 population).

employment and furlough spells as outcome variable. We see that after week 10, Denmark as well as Norway see a strong spike in the cumulative sum of unemployment and furlough spells relative to Sweden. After week 13, the coefficients for both Denmark and Norway decline gradually, but remain significantly larger compared to Sweden up to week 21. Finland tracks the Swedish development much closer, and the increase in the cumulative sum of unemployment and furlough spells is insignificant for some coefficients.

In order to quantify the effects, we use the estimated coefficient of week 21 from our DID estimation (equation (2)) and compare it to the overall level of the same outcome variable in the same week once seasonal and regional effects are controlled for. Specifically, we use

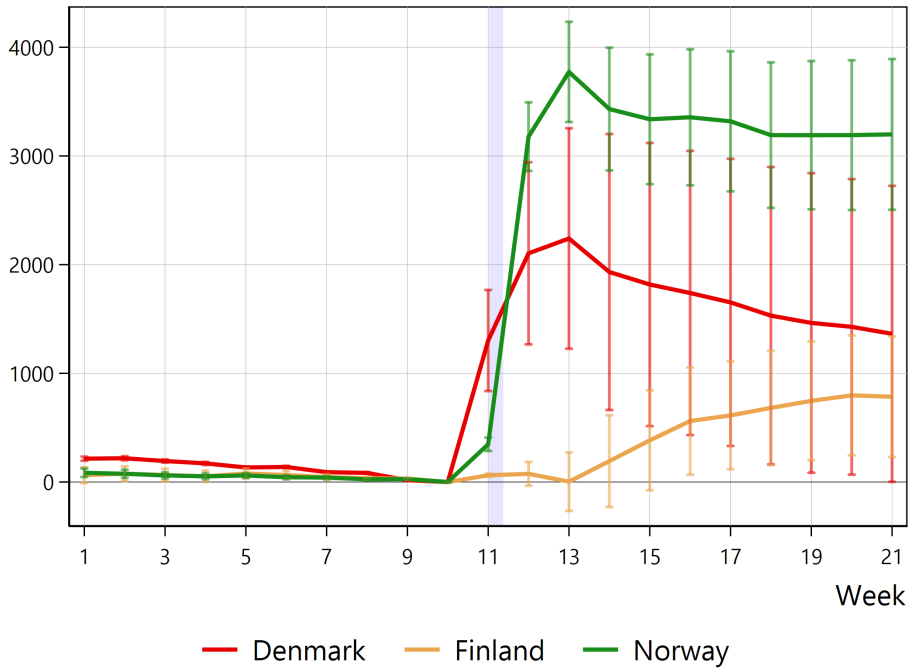

Figure 3: Seasonally and regionally adjusted cumulative unemployment + furloughs per 100,000

Notes: The figure shows the the leads and lags estimated from equation (2), including 95%-confidence intervals (standard errors clustered on the country-region level). The outcome variable is the cumulative sum of unemployment plus furlough spells per 100,000 population. The blue shaded vertical line indicates the week of the lockdowns in Denmark, Finland and Norway (week 11).

the DID coefficient for Denmark in week 21, which is ca. 1,360 per 100,000 population (depicted in Figure 3, as well as in Table A. 1 in the Appendix). The overall level of the cumulative sum of the weekly new unemployment plus furlough spells for Denmark is around 4,200 in week 21, once corrected for seasonal and regional differences (see Panel *d* of Figure 2). Thus, following the Swedish model of no strict lockdown, Denmark would have accumulated 30% less unemployment plus furlough spells up to calendar week 21. For Norway and Finland, the estimated difference regarding the cumulative sum of the weekly unemployment and furlough spells compared to Sweden in week 21 is ca. 50% and 25%, respectively.

The estimate for Denmark appears to be in the same ballpark but somewhat higher than what Andersen et al. (2020) find using bank transaction data from Swedish and Danish bank clients. Specifically, they find a 25% drop in spending for Sweden versus a 29% drop for Denmark, and interpret the difference as the causal effect of the lockdown. This difference points to a differential impact of the lockdown of about 14%, based on the drop

of activity in Denmark ($\approx 4/29$).[10]

5 Conclusion

This paper studies the labor market effects of non-pharmaceutical interventions (NPIs) to combat the COVID-19 pandemic. We focus on the Nordic countries which showed one of the highest variations in NPIs despite having similar exposure to the spread of COVID-19 at the onset of the pandemic. Empirically, we use novel data on weekly new unemployment and furlough spells from all 56 regions of the Nordic countries to compare the labor market outcomes of Sweden with the ones of its neighbors.

We find that the labor markets of all four countries were severely hit by the pandemic, with Sweden performing slightly better than its neighbors. Specifically, we find the worsening of the Swedish labor market to occur with a time lag of 2 to 3 weeks compared with its neighbors, and that its cumulative sum of new unemployment and furlough spells remains significantly lower up to week 21 of 2020.

Juranek and Zoutman (2020) show that the lockdown in Denmark and Norway was successful in terms of reducing the pressure on the health care system and mortality. However, our study indicates that the lockdown comes at a cost in terms of labor market performance, at least in the short run. Whether the benefits outweigh the costs depend in part on ethical judgment which is beyond the scope of this paper.

It is important to note that our study only focuses on the 10 weeks after the the initial lockdown in the beginning of March. Thus, we cannot make statements regarding the mid- or long-term recovery once the lockdown is lifted and the spread of COVID-19 was under better control. For instance, it might be the case that countries with a stricter lockdown are able to recover faster once the economy opens up again (Correia, Luck, and Verner, 2020). Unfortunately, we do not have sufficient data to examine this claim. However, we can say that up to calendar week 21, labor markets across all Nordic countries were severely affected, with the largest negative effects for Norway and Denmark. Finland and Sweden performed somewhat better, which mirrors the pattern in Google's mobility data.

Overall, most forecasts agree that Sweden with its large trade exposition will also face a severe recession this year, but it is too early to say whether its distinct strategy will prolong the recession or aid the recovery. Future research should aim to estimate the

[10]For Finland and Norway, we don't know of any other study estimating the economic effect of the NPIs with which our estimates could be compared with.

longer-term labor market impact of COVID-19, of the different lockdown policies, as well as the subsequent re-openings.

References

Alstadsæter, Annette, Julie Brun Bjørkheim, Wojciech Kopczuk, and Andreas Økland (2020a). "Norwegian and US policies alleviate business vulnerability due to the Covid-19 shock equally well". *Unpublished Working Paper*.

Alstadsæter, Annette, Bernt Bratsberg, Gaute Eielsen, Wojciech Kopczuk, Simen Markussen, Oddbjørn Raaum, and Knut Røed (2020b). "The first weeks of the coronavirus crisis: Who got hit, when and why? Evidence from Norway". *Covid Economics* 15, 63–87.

Andersen, Asger, Emil Hansen, Niels Johannesen, and Adam Sheridan (2020). "Pandemic, shutdown and consumer spending: Lessons from Scandinavian policy responses to COVID-19". *arXiv:2005.04630*.

Baldwin, Richard and Beatrice Weder di Mauro (2020). *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*. London: CEPR Press.

Bennedsen, Morten, Birthe Larsen, Ian Schmutte, and Daniela Scur (2020). "Preserving job matches during the COVID-19 pandemic: Firm-level evidence on the role of government aid". *Covid Economics* 27, 1–21.

Chetty, Raj, John N. Friedman, Nathaniel Hendren, Michael Stepner, and The Opportunity Insights Team (2020). "How did covid-19 and stabilization policies affect spending and employment? A new real-time economic tracker based on private sector data". *NBER Working Paper* No. 27431.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber (2020). "Labor markets during the COVID-19 crisis: A preliminary view". *NBER Working Paper* No. 27017.

Conyon, Martin J., Lerong He, and Steen Thomsen (2020). "Lockdowns and COVID-19 deaths in Scandinavia". *Covid Economics* 26, 17–42.

Correia, Sergio, Stephan Luck, and Emil Verner (2020). "Pandemics depress the economy, public health interventions do not: Evidence from the 1918 flu". *Unpublished Working Paper*.

Elinkeinoministeriö (2020). "Työllisyyskatsaus". *Toukokuu 2020*.

Flaxman, Seth, Swapnil Mishra, Axel Gandy, H. Juliette T. Unwin, Thomas A. Mellan, Helen Coupland, Charles Whittaker, Harrison Zhu, Tresnia Berah, Jeffrey W. Eaton, Mélodie Monod, Imperial College COVID-19 Response Team, Azra C. Ghani, Christl A. Donnelly, Steven M. Riley, Michaela A.C. Vollmer, Neil M. Ferguson, Lucy C. Okell, and Samir Bhatt (2020). "Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe". *Nature* 583, 1–8.

Forsythe, Eliza, Lisa B. Kahn, Fabian Lange, and David Wiczer (2020). "Labor Demand in the time of COVID-19: Evidence from vacancy postings and UI claims". *Journal of Public Economics,* forthcoming.

Glogowsky, Ulrich, Emanuel Hansen, and Simeon Schächtele (2020). "How effective are social distancing policies? Evidence on the fight against COVID-19 from Germany". *CESifo Working Paper* No. 8361.

Hale, Thomas, Anna Petherick, Toby Phillips, and Samuel Webster (2020). "Variation in government responses to COVID-19". *Blavatnik School of Government Working Paper* No. 2020/031.

Hensvik, Lena and Oskar Nordström Skans (2020). *IZA COVID-19 Crisis Response Monitoring: Sweden*. Bonn: Institute of Labor Economcs.

Huber, Martin and Henrika Langen (2020). "The impact of response measures on COVID-19-related hospitalization and death rates in Germany and Switzerland". *arXiv:2005.11278v3*.

IMF (2020). "Sweden: Will COVID-19 Economics be Different?" *IMF Country Focus,* `https://www.imf.org/en/News/Articles/2020/06/01/na060120-sweden-will-covid-19-economics-be-different` [July 17, 2020].

Juranek, Steffen and Floris Zoutman (2020). "The effect of social distancing measures on intensive care occupancy: Evidence on COVID-19 in Scandinavia". *CESifo Working Paper* No. 8262.

Kong, Edward and Daniel Prinz (2020). "The impact of shutdown policies on unemployment during a pandemic". *Covid Economics* 17, 24–46.

KPMG (2020). "Short-Time Work in Selected Countries". *KPMG Global Legal Services*.

Kyyrä, Tomi, Hanna Pesola, and Aarne Rissanen (2017). "Unemployment insurance in Finland: A Review of recent changes and empirical evidence on behavioral responses". *VATT Research Report* No. 184.

Lin, Peter Zhixian and Christopher M. Meissner (2020). "Health vs. wealth? Public health policies and the economy during Covid-19". *NBER Working Paper* No. 27099.

OECD (2020). "Country Policy Tracker: Employment and Social Measures". *OECD Country Policy Tracker*.

Rothwell, Jonathan and Hannah Drie (2020). "The effect of COVID-19 and disease suppression policies on labor markets: A preliminary analysis of the data". *Brookings COVID-19 Memos,* `https://www.brookings.edu/research/the-effect-of-covid-19-and-disease-suppression-policies-on-labor-markets-a-preliminary-analysis-of-the-data/` [July 15, 2020].

A Appendix

A.1 Stock of Furloughs

As described in Section 3, we only have data on the stock of furloughs for Sweden and Denmark. This stock data is useful for two reasons: First, it enables us to check whether our results based on weekly new unemployment and furlough spells (inflow only) would turn out differently if stock data would be used. Second, it helps us assess whether unemployment or furloughs drop considerably once a lockdown is lifted. If this would be the case, then using our measure of the cumulative sum of new unemployment and furlough spells (as, e.g., in Figure 2) would mask such a development.

As mentioned above, we have stock data on the weekly number of total furloughs only available for Denmark and Sweden. Thus, we run our regression based on equation (1) with the stock of furloughs as dependent variable only for these two countries. Figure A.1 shows that the stock of furloughs plateau out at around week 15 for Denmark and week 18 for Sweden respectively. However, a considerable decrease in the stock number of furlough spells can not be observed in either of the two countries. Thus, Figure A.1 suggests that for the time period of our study, using the cumulative sum of new unemployment and furlough spells (which we have access to for all four countries) seems sufficient to analyze the labor market effects during the height of the COVID-19 crisis.

A.2 Difference-in-Difference results

In this section we summarize results from our difference-in-differences (DID) analysis. Column (1) of Table A. 1 uses weekly new unemployment spells, and column (2) uses weekly new unemployment plus furlough spells as the respective outcome. The coefficients shown in the first two columns are based on a conventional DID, estimating one post-treatment effect that represents the average effect over all post-lockdown weeks. We find that over the entire treatment period of week 11 to 21, Denmark has on average 149 (per 100,000 population) more new unemployment plus furlough spells per week compared to Sweden. Finland has roughly 78 more new unemployment plus furlough spells per week and 100,000 inhabitants than Sweden, and Norway around 300.

Column (3) of Table A. 1 uses the cumulative sum of new unemployment plus furlough spells as outcome variable. Column (3) is based on Equation (2), but we only display the coefficient estimated for week 21. This coefficient corresponds exactly with what is depicted for week 21 in Figure 3, which is also the coefficient we use in the main text to

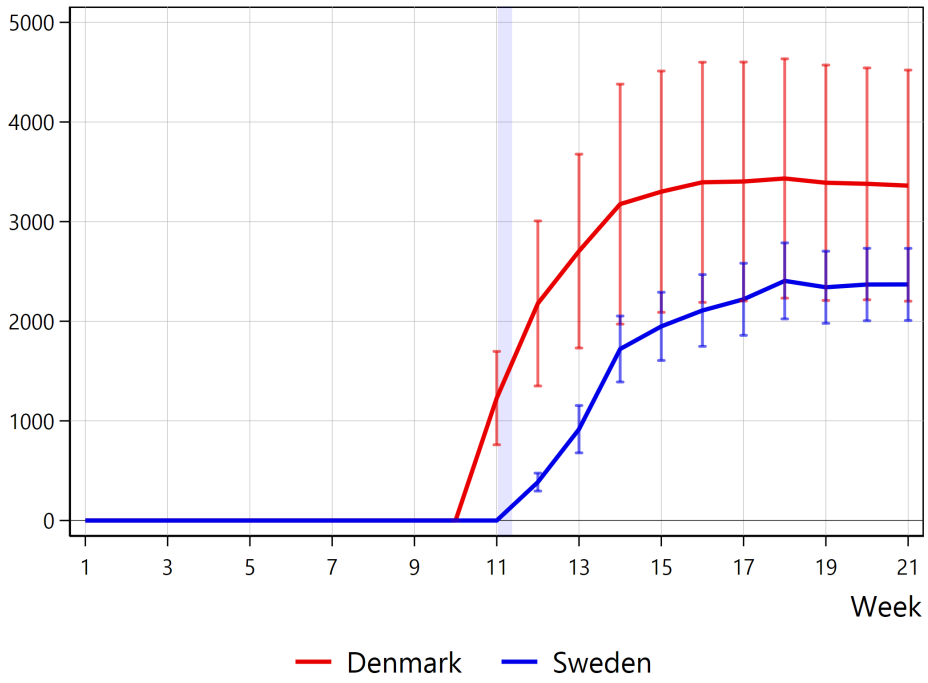

Figure A.1: Seasonally and regionally adjusted stock number of furloughs per 100,000

Notes: The figure shows the event-study coefficients estimated from equation (1), using the cumulative stock of furloughs rather than inflows (all per 100,000 population). The whiskers indicate the 95%-confidence intervals (standard errors clustered on the country-region level). The blue shaded vertical line indicates the week of the lockdowns in Denmark (week 11).

quantify our results. We find that up to week 21, all three other Nordic countries have a significantly higher cumulative sum of new unemployment plus furlough spells compared to Sweden.

A.3 Sensitivity due to changes in FTE calculation

As mentioned in Section 3.2, we want to alternate the assumed degree of working time reduction of the part-time furloughed when calculating the FTEs in order to check sensitivity. In our baseline results above we assumed that part-time furlough spells reduce their working time by the maximum possible reduction in Sweden (60% before 1st of May, 80% thereafter). As a sensitivity check, we now assume that the part-time furloughs reduce their working-time only by 50%. Again, we apply this to all part-time furloughs in our data.

Table A. 2 replicates Table A. 1. We see that all estimated coefficients remain statistically significant, but increase in size. This increase in the size of the coefficients is most likely

Table A. 1: Difference-in-Difference results

DID-comparison	**UE**	**UE & FU**	**UE & FU** Week 21
Denmark # Sweden	39.878***	149.420**	1,363.665*
	(5.758)	(61.486)	(680.952)
Finland # Sweden	-21.392**	77.725***	784.544**
	(8.675)	(26.859)	(277.302)
Norway # Sweden	10.098*	301.985***	3,198.487***
	(5.178)	(30.955)	(346.753)
Observations	2,333	2,333	2,333

Notes: Column (1) uses weekly new unemployment spells, column (2) weekly new unemployment plus furlough spells, and column (3) the cumulative sum of new unemployment and furlough spells as the respective outcome variable. Column (3) only shows the coefficient for week 21. All estimates per 100,000 population. ***, ** and * indicates significance at the 1%-,5%- and 10%-level. Standard errors are clustered on the country-region level.

driven by the larger share of part-time furloughs in Sweden (where all furloughs are part-time) compared to the other countries. Overall, we receive qualitatively similar results compared to our preferred estimates shown in Table A. 1.

Table A. 2: DID results when part-time furloughs reduce working time by 50%

DID-comparison	**UE**	**UE & FU** (FTE)	**UE & FU** (FTE) Week 21
Denmark # Sweden	39.878***	190.089***	1,811.019***
	(5.758)	(60.672)	(671.806)
Finland # Sweden	-21.392**	114.414***	1,169.030***
	(8.675)	(24.600)	(252.396)
Norway # Sweden	10.098*	322.852***	3,429.082***
	(5.178)	(28.632)	(320.800)
Observations	2,333	2,333	2,333

Notes: Column (1) uses weekly new unemployment spells, column (2) weekly new unemployment plus furlough spells, and column (3) the cumulative sum of new unemployment and furlough spells as the respective outcome variable. Column (3) only shows the coefficient for week 21. All estimates per 100,000 population. ***, ** and * indicates significance at the 1%-,5%- and 10%-level. Standard errors are clustered on the country-region level.

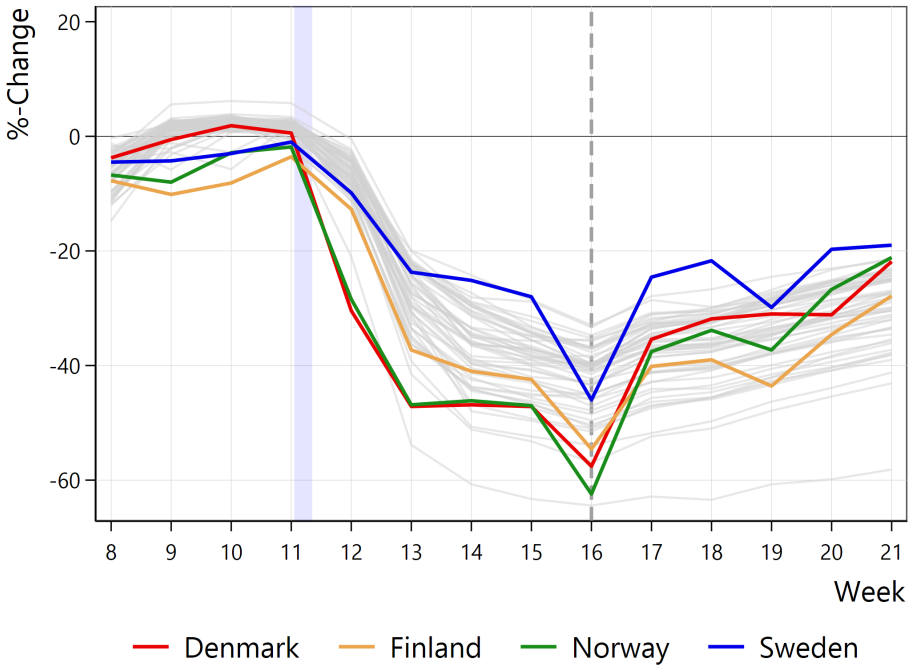

Figure A.2: Workplace visits in the Nordic countries and all U.S. states

Notes: The figure shows how workplace visits changed compared to the median weekly value, using the 5 week period from January 3 to February 6, 2020 as comparison. The U.S. states are shown in shades of light-grey colors. The blue shaded vertical line indicates the date of the lockdowns in Denmark, Finland and Norway from Table 1, which is around March 13 (week 11). The dashed vertical line indicates Easter holidays (week 16). Source: Google LLC "Google COVID-19 Community Mobility Reports." `https://www.google.com/COVID19/mobility/` [July 15, 2020].

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