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IZA DP No. 18264

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ABSTRACT

Sick or Unemployed? Examining Transitions into Sickness Insurance at Unemployment Benefit Exhaustion*

Spikes in exits at unemployment insurance (UI) benefit exhaustion into other benefit schemes such as sickness insurance (SI) are well-documented. These spikes could be driven by relatively healthy workers maximizing their total duration of benefit receipt, or workers in ill health who remain on UI while incapable of working. While the first explanation calls for a stricter SI and UI system, the second highlights the need for increased information provision. We study the importance of these explanations by first documenting a spike in exits into SI at UI benefit exhaustion in the Netherlands. Comparing detailed health and labor market characteristics of exit cohorts, we show that the spike is unlikely to be driven by maximizing behavior of relatively healthy workers. Instead, our results point to catch-up of initial non-take-up of SI by workers with substantial mental and physical health conditions. This opposes earlier work on substitution between UI and SI/DI.

JEL Classification: H53, H75, J65

Keywords: sickness benefits, unemployment Insurance, spikes, non-take-up

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1 Introduction

A well-known phenomenon is that exit rates from unemployment insurance (UI) into work increase considerably at UI benefit exhaustion. To explain the existence of these spikes, workers' moral hazard in search behavior, (hyperbolic) discounting, and storable job offers have been put forward (Marinescu & Skandalis, 2021; Card et al., 2007; Boone & Van Ours, 2012; Kyyra et al., 2019; Paserman, 2008). Since the work of Card et al. (2007), research has been broadened to workers who leave the unemployment registers without work at the end of UI benefit entitlement. When these workers have health conditions that hinder them from work resumption, they can apply for adjoining sickness insurance (SI) or disability insurance (DI) programs.

While spikes into employment are mostly interpreted as moral hazard, the interpretation out-of-the-labor-force spikes into SI and DI is less straightforward. In line with moral hazard, they may follow from benefit maximization of workers with relatively mild health conditions and a high value of leisure. This group of workers may decide to apply for adjoining SI or DI schemes when UI benefits are exhausted, thus extending their total duration of benefit receipt (Henningsen, 2008; Roed & Westlie, 2012; Lindner, 2016). These incentives to delay a benefit application until the last possible moment exist in many countries, including the UK, Belgium, the Netherlands and Finland, and US states where eligibility for short-term or long-term disability benefits depends on the workers' employment history (Spasova et al., 2016). Yet another, often overlooked, explanation for spikes into SI/DI is that they may represent initial non-take-up – see e.g. Ko & Moffitt (2022). In this case, workers unable to work due to health conditions should have applied for adjoining SI or DI schemes, but remain on UI until benefit exhaustion. Presumably, these workers have limited awareness of the adjoining SI and DI schemes until the moment of UI benefit exhaustion. This then calls for sufficient monitoring and the provision of information during UI receipt to foster the timely take-up of workers into SI and DI benefit schemes. So far, however, detailed and monthly information on health conditions just before and at the moment of UI benefit exhaustion is scarce, and empirical work disentangling explanations for spikes into SI is non-existent.

This paper is the first that aims to disentangle these two explanations for out-of-the-labor force spikes, using detailed and monthly administrative information on health conditions around and after the moment of UI benefit exhaustion of Dutch unemployed workers. We argue that explanations for and the subsequent implications of a spike into SI at the end of UI entitlement critically depend on the health conditions of workers. If workers with less severe health conditions are over-represented in the spike, benefit-maximizing behavior is likely driving the increased inflow into SI. These workers have the option to rationally choose to delay and increase their total social security wealth from UI and SI benefits. When workers with more severe health conditions are equally represented in exits in and before the spike, however, there is a catch-up of initial non-take-up of SI benefits. Workers may in this case be initially unaware of the option to apply for SI, but are informed at the end of UI benefits on their entitlement conditions and then apply. Concurrently, behavioral biases such as status-quo bias may also explain why unhealthy workers remain on UI benefits, instead of immediately switching to SI.

To determine whether the spike in SI is driven by benefit-maximizing behavior or by initial non-take-up, we estimate flexible models on a sample of approximately one million UI spells that started between 2013 and 2015. We compare workers who have been on UI for the same time, but who differ in their remaining months of UI entitlement. The variation we exploit in UI eligibility is driven by differences in the employment history of individual workers: assuming that workers have common elapsed time effects and that employment history impacts outcomes continuously, we estimate spike effects. We first estimate regressions for the monthly exit rate from UI into SI, allowing us to infer the relative size of the spike compared to the inflow into SI before UI benefit exhaustion. To investigate the persistence of the spike, we also estimate models for continued receipt of SI benefits, and, ultimately, receipt of DI benefits.

We next compare SI applicants just before and at the spike of UI benefit exhaustion in terms of their medical consumption, demographics, and labor market outcomes prior to unemployment. For medical consumption, we focus specifically on mental health. This is because a considerable share (> 40%) of the inflow into the DI system comprises individuals suffering from mental health issues and mental healthcare is observed on a daily basis. For non-mental healthcare, we observe less detailed, annual information. Mental health is arguably harder to verify, which could have negative implications for the use of mental healthcare as a proxy for underlying health issues. However, our results are very similar when using annual data, mental or non-mental healthcare, strengthening the external validity of our findings.

We find a spike in exits out of UI into SI: UI recipients are 30% more likely to apply for SI when they reach the month of UI benefit exhaustion, compared to earlier months. In relative terms, the spike is larger than for exits into employment (about 10%). When measured as the continued receipt of SI benefits over a sequence of months, the relative risk increases to about 60% and returns to about 40% after (medical) assessments by the social benefit administration that occur after about 12 months of sickness benefit receipt. The spike into SI is not mirrored by differences in health outcomes, indicating that delayed applications of workers with similar health conditions are driving the spike at benefit exhaustion. This suggests the presence of initial non-take up of SI. Since UI and SI benefit levels are equal (both replace 70% of old wages), the delayed SI applications largely imply a relabeling and fiscal consequences are therefore limited. Still, the initial non-take-up of SI benefits calls for early and targeted information interventions during UI to ensure that UI recipients with health problems enter SI and receive targeted rehabilitation services.

While health conditions of the spike cohort are similar to the pre-spike cohort up to UI benefit exhaustion, we do find differences in health outcomes if SI enrollees thereafter. Starting from the receipt of SI benefits, the exit rates out of SI during the first four months of sickness are considerably lower for the spike cohort, resulting in less severe health conditions than for the pre-spike cohort. Presumably, self-screening effects of relatively healthier workers leaving the SI program is less important for the spike cohort. Again, this calls for timely screening interventions on the recovery of workers in the first months of SI receipt.

The spike effect for exits into employment we find is comparable to e.g. Card et al. (2007) for Austria and Roed & Westlie (2012) for Norway. The spikes of exits out of the labor force found by Card et al. (2007) and Kyyra et al. (2019) are larger than the spike into sickness benefits we find, but this is probably due to the eligibility constraints for SI. We expand on the literature by examining the (long-term) targeting effects of benefit schemes. Our study comes closest to Roed & Westlie (2012) and Henningsen (2008), who analyze the importance of incentives for benefit shifting in Norway and Denmark at the moment of benefit exhaustion, to Lindner (2016) who examines the impact of changing UI benefit levels on DI inflow in the US and to Larsson (2006) and Hall & Hartman (2010) who examine the role of financial incentives in benefit shifting between UI and SI in Sweden. While all these papers focus on financial incentives for benefit switching, we add to the literature by showing that increased switching between UI and DI can also be caused by non-financial reasons, i.e. a catch-up of initial non-take-up of unhealthy workers.

Our findings also add to a considerably broader literature on screening and targeting of social insurance. Theoretical work in this field addresses the implications of classification errors arising from imperfect information about the individual's true disability status (Parsons, 1991; Kleven & Kopczuk, 2011). Empirical studies look at the impact of changes in the rigor of the screening process on DI applications and inflows, but usually with limited attention to targeting (Autor & Duggan, 2014; Autor et al., 2015; Markussen et al., 2017; Liebert, 2019; Haller et al., 2024; Kantarcı et al., 2023).[1] More recently, Deshpande & Li (2019) and Godard et al. (2024) study the targeting effects due to self-screening and screening into DI. Both find deterrence effects of increased application costs, which predominantly impacted potential applicants with less severe conditions. Finally, Deshpande & Lockwood (2022) investigate the welfare effects of DI benefit receipt for workers with less-severe conditions but weak labor market positions. They argue that DI benefits are desirable for this group, even though their health conditions are relatively mild. We add to this literature by examining how both the health conditions and labor market position of those who remain on SI evolve.

This paper proceeds as follows. The institutional setting is described in Section 2. Section 3 discusses our data and provides the first descriptive evidence of spikes in exit rates. Sections 4 and 5 lay out the empirical strategy and present the results. Finally, Section 6 concludes.

2 Institutional setting

In this section we provide an overview of the eligibility criteria and benefit conditions of unemployment insurance (UI) and sickness/disability insurance (SI/DI) in the Netherlands for the time period under investigation. A common aspect of the schemes is that they are mandatory for all workers and that the Dutch Employee Insurance Agency (UWV) is responsible for their implementation. At the end of the section, we discuss how the institutional setting can create incentives to delay an SI/DI application.

2.1 Unemployment Insurance (UI) benefits

To be eligible for UI, applicants must have worked at least 26 of the previous 36 weeks and at least four of the last five calendar years. Below a certain earnings cap, UI benefits are equal to 75% of the pre-UI wage earnings in the first three months and 70% of the pre-UI wage earnings in the subsequent months. The maximum benefit entitlement period is determined

[1] Related to this work, various studies show evidence on the presence of substitution effects between UI and sickness or DI schemes, see e.g. Koning & Van Vuuren (2010), Autor & Duggan (2003), Borghans et al. (2014) Hofmann (2014) and Berg et al. (2019).

by the employment history of workers: each additional year of employment increases the UI entitlement period by one month, with a maximum of 24 months of benefit receipt.[2]

UI benefit recipients are assigned to a caseworker from UWV. While this caseworker has substantial discretion in determining the exact job search requirements, recipients should adhere to the following requirements. First, they must actively search for a new job, accept job offers, and apply to at least four jobs per month. Second, UI recipients must attend meetings with their caseworker; the frequency of these meetings ranges between once every week and once every two months. During these meetings, the caseworker can impose additional job search requirements, such as attending (online) interview training modules or job skills training. Third, benefit recipients must register all job search-related activities on an online platform. Violations of job search requirements can result in deductions in the benefit payments or full withdrawal of benefits. At the same time, caseworkers have discretion to (temporarily) loosen or completely alleviate some of these requirements when unemployed workers are deemed to have personal circumstances that hinder the job search process.

When UI benefits are exhausted, workers can apply for social assistance benefits that are administered by local municipality offices. Benefits amount to 50% of the statutory minimum wage for individuals in households with two social assistance recipients and 70% of the statutory minimum wage in single households. Contrasting to UI, social assistance benefits are means-tested on earnings from income, assets and partner income. In effect, UI benefit exhaustion may thus imply a substantial drop in income.

2.2 Sickness Insurance (SI) benefits

When UI benefit recipients become sick, they can apply for adjoining sickness insurance (SI) benefits.[3] Applying for DI benefits is possible during the entire duration of UI benefit receipt, but once UI eligibility ends workers can no longer apply for SI. SI functions as a mandatory two-year period that all workers have to go through before they can apply for DI. SI provides insurance against loss of income due to temporary or short-term sickness which could eventually lead to permanent disability with (long-term) disability benefits. SI benefits replace 70%

[2] To determine the employment history of workers, elapsed employment histories up to January 1*st* of 1998 are set equal to the age at that moment minus 18 (De Groot & Van der Klaauw, 2019)

[3] Public SI benefits are not relevant for workers with permanent contracts for whom the employers' responsibilities cover the full two-year waiting period that precedes applications to public Disability Insurance (DI) benefits (Koning & Lindeboom, 2015). Sick workers with a temporary contract are entitled to SI benefits once their contract expires.

of the pre-application earnings, which implies that UI and SI benefits are similar in magnitude.

SI applications are initiated by workers. At the start of UI, the specifics on eligibility for SI are part of a bigger information package on the UI benefit conditions. Qualitative research conducted by the Dutch Employee Agency (UWV) shows that UI recipients initially have limited knowledge about their SI eligibility (UWV, 2022). Awareness of their eligibility to SI most likely increases two months before the end of UI entitlement, when they receive a separate letter specifically informing them that both their eligibility to both UI and SI will end. This information is more targeted and relevant at that time, rendering it more salient.

Workers apply for SI at the front offices of UWV. Caseworkers call these workers after a few days[4] and register the health conditions of the workers. Job-search requirements related to UI benefit receipt are suspended from the moment unemployed workers call in sick until the moment they (are deemed to) have recovered. Although there is no need of a doctor's certificate for SI applications and most claims are initially awarded, caseworkers may forward cases to medical assessors if they doubt the plausibility and severity of illness. Workers may then be summoned for a meeting with the caseworker. Depending on the assessed severity and permanence of conditions, another phone call is planned at the moment of expected recovery or at the end of the first month of illness at the latest. From then on, continued cases are taken over by a team with the caseworker, a medical assessor, and a vocational expert.

Workers reporting sick are subject to a phase-in period where there is continued receipt of UI benefits. The duration of the phase-in period is equal to the remaining UI entitlement duration, with a maximum of 13 weeks; thereafter, workers start receiving SI benefits. Regardless of the duration of the phase-in period, workers can only apply for disability insurance (DI) benefits two years after reporting sick. The remaining UI benefit entitlement stays valid after SI or DI benefit receipt ends. These settings induce a financial incentive for workers to delay SI applications up until the end of UI entitlement: as long as workers face a positive probability of not being awarded full DI benefits and if the (expected) duration of SI benefit receipt exceeds the remaining UI entitlement period, a one-month delay in SI applications implies a one-month increase in the total period of benefit receipt. With a phase-in period of 13 weeks, workers may thus gain 13 weeks of benefit payments at most by applying for SI benefits in the very last week of UI entitlement.[5]

[4] If the caseworker does not get into contact with the worker, the application is frozen for the time being.

[5] Similar incentives to delay an SI benefit application exist in other countries such as the UK, Belgium and Finland where eligibility for sickness or disability benefits depends on one's employment history (Spasova et al., 2016). In these countries, eligibility for UI is often reduced one-to-one during the receipt of sickness benefits.

The first intensive screening for SI recipients by UWV takes place about one year after the start of SI benefit receipt. This "first-year assessment" is similar to the claims assessment for DI two years after the onset of illness: medical assessors determine the conditions and limitations of workers and vocational experts determine the "most-earning jobs" that are still feasible to estimate the worker's loss of earnings capacity. SI and DI assessments are performed by medical examiners and occupational experts from UWV, and are independent of any treatment being provided by medical doctors within the healthcare system.[6]

For the first-year assessment, only workers with an estimated loss of at least 35% of their old earnings capacity continue receiving SI benefits; those whose a loss in earnings capacity is deemed to be smaller may apply for any remaining entitlement periods in UI or adjoining social assistance benefits (if relevant). After two years of SI benefit receipt, SI entitlement ends and the worker will either receive full DI benefits (when the loss of earnings capacity exceeds 80%), partial benefits (when the loss of earnings capacity is between 35% and 80%) or no DI benefits at all (when the loss of earnings capacity is less than 35%).[7]

2.3 Incentives to delay

If eligibility for SI is linked to eligibility for UI, this can give rise to incentives to delay an SI application. This is the case in the Netherlands but for example also in the UK, Belgium, Finland and several US states. To illustrate these incentives, Figure 1 shows the impact of delaying an SI application on the benefit receipt of an individual whose duration of SI receipt exceeds their remaining UI entitlement. In Online Appendix Section B.2, we discuss these incentives in more detail and provide a comprehensive theoretical framework.

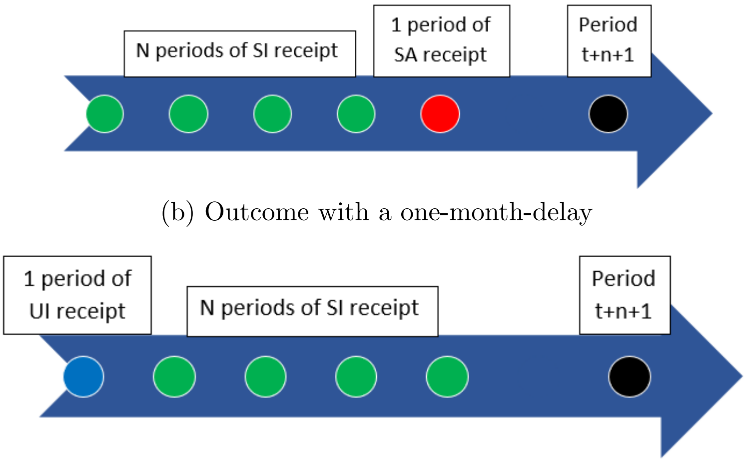
The top panel of Figure 1 show the outcome if an individual chooses to apply for SI benefits in the current period. In this case, the individual will receive SI benefits for N months. After that, UI eligibility will be exhausted and hence this individual can only apply for social assistance (SA) benefits. Alternatively, the individual can choose to delay application by one month. In this case he/she first receive UI benefits for one month followed by N months of SI receipt (panel B). Given that SA benefits are lower than SI and UI benefits, the monetary value of all combined benefit receipt is thus higher when the SI application is delayed by one month. Following the same logic, the total value of benefit receipt is maximized by delaying

[6]Note that applicants can provide information from their medical doctor to support their application. Medical assessors from UWV can ask for this information, but applicants have the right to deny such a request.

[7]Full DI benefits levels equal SI benefits levels (70% of pre-disability earnings). Partial DI benefits are proportional to the estimated loss of earnings capacity.

Figure 1: Choice problem for delaying SI application by one month

(a) Outcome without delay



(b) Outcome with a one-month-delay

the SI application as long as possible and applying in the last month of UI eligibility.

Having said this, delaying an SI application comes with some costs. This particularly holds for individuals with health conditions. First, they have to adhere to job search requirements while receiving UI. Arguably, this imposes a larger burden on unhealthier individuals, resulting in smaller net gains from delay. Second, unhealthier individuals will on average receive SI benefits for a longer period of time (N).[8] With a larger N, the present value of receiving SI benefits instead of SA benefits in month $N+1$ becomes smaller, rendering the incentive to delay smaller as well. Both of these effects imply that the incentives to delay an SI application are larger for relatively healthy individuals.

If the spike in SI inflow is driven by these incentives to delay applications, we would thus expect the health of individuals applying at the end of their UI eligibility to be better than the health of individuals applying for SI benefits before the end of their UI eligibility. Alternatively, the spike could be driven by initial non-take-up of SI benefits. This non-take-up can for example be caused by a lack of awareness of SI eligibility or by status quo bias. Once these individuals receive a letter informing them of their (ending) SI eligibility, a catch-up of initial non-take-up can occur. In this case, we would expect the health of those applying before and at the end of their UI eligibility to be similar.

[8] If the health condition is severe enough and permanent, applicants will receive SI/DI benefits until retirement and there are no incentives to delay the application.

3 Data

We use various administrative data sources, which are merged at the individual level. The first data set contains information from the Dutch Employee Agency (UWV) on the UI receipt for all Dutch inhabitants between January 2013 and December 2015.[9] For each UI spell, we observe the exact starting and ending date and the maximum entitlement period. With this data set, we construct samples at risk of applying for SI benefits while on UI. The second data set contains all SI spells over the same time period, containing the starting day, the total duration of sickness, and the outcomes of the first-year and disability claim assessments (if relevant). Third, we use data from Statistics Netherlands to construct monthly time series on employment, working hours, labor income, and the receipt of various social assistance benefits. This allows us to track destinations and labor market outcomes of workers leaving UI or SI. Finally, we have annual information on healthcare costs and monthly information on the number of minutes of mental healthcare treatments. Given the mandatory setup and broad coverage of insurance, it contains information about almost all healthcare treatments for all Dutch citizens. For mental health, we have detailed data on the number of minutes patients are treated each day and the corresponding mental health diagnosis. For non-mental healthcare and for mental healthcare, the data contain the yearly expenditures on categories of healthcare. We use these categories to construct total expenditures on mental healthcare and total expenditures on non-mental healthcare.[10]

We observe approximately 1.4 million UI spells. For each unemployed worker, we only use the first UI spell we observe in the data, resulting in a total sample of approximately one million workers. Table 1 shows descriptives of individuals with three months and one month of remaining UI entitlement. The first two rows of Table 1 report exit probabilities into sickness insurance and employment. To eyeball the evolution of these outcomes over a longer time period before UI benefit exhaustion, Appendix Figure A.2 shows monthly exit rates into SI or employment stratified by maximum UI duration.

The difference in monthly exit rates into SI indicates the presence of a spike at UI benefit exhaustion, with an increase from 1.77% to 2.40%. At this point, it should be noted that the baseline probability to enter SI, and – after the two-year sickness period – DI is already high compared to inflow rates of the employed population. Specifically, the probability of applying

[9]We also have UI records starting before January 2013, but there was no use of first-year assessments earlier than that date. To be able to interpret our results consistently, we, therefore, excluded these observations.

[10]See Appendix Table A.1 for categorizations of types of expenditures.

for DI for someone on UI is approximately two percentage points each year, which is about five times the average of employed workers. In line with this, the level of mental healthcare use of the full sample of UI recipients is substantially higher than all employed workers (see Appendix Figure A.3).[11] For exits into employment, we observe slightly higher exit rates at benefit exhaustion as well. In relative terms, this increase is however less pronounced. The increases in exit rates, both towards SI and employment, may well reflect the impact of selection and underline the need for a more formal analysis that decomposes such effects.

The bottom panel of Table 1 zooms into the groups that exit UI three months and one month before their maximum UI entitlement. Columns (1) and (2) concern workers exiting UI into SI, and columns (3) and (4) concern workers exiting UI into employment. Not surprisingly, the strongest differences in averages follow from the comparison of those exiting into SI and employment. The use of healthcare is approximately three times as high among those who apply for SI. This group is also older, less likely to be native, and lower-educated.

When comparing cohorts exiting UI three months and one month before their maximum entitlement, workers reporting sick in their last month use more mental healthcare, but spend less on healthcare in total. Differences in demographics and pre-UI employment outcomes are limited between the two cohorts entering SI; this only concerns the average age and the fraction with a migration background. Differences between the two cohorts entering into employment are more pronounced. Workers finding a job in the last month of their UI entitlement tend to receive less mental healthcare, are older and have lower education levels. In line with this, they are less likely to have a fixed-term contract prior to entering UI. Additionally, they worked fewer hours per month but had similar monthly labor earnings.

Throughout our analyses, it is of key importance that we use health measures that proxy the risk of exits into SI and subsequently DI. To validate this, Figure 2 shows the average number of mental health treatment minutes received by unemployed workers who eventually apply for DI benefits, together with those who do not apply. Averages of mental health treatment minutes are centered around the end of the UI spell. Workers not applying for DI benefits are rarely treated, and there is no increase in treatment at UI benefit exhaustion. For workers who eventually apply for DI benefits, however, treatment of mental health problems is much more likely. For them the prevalence and intensity of treatments increase strongly

[11]The large difference in treatment minutes in Appendix Figure A.3 stems from differences in extensive margin effects, with recipients of UI being almost twice as likely to receive mental healthcare treatment than employed workers. This is suggestive evidence that some UI recipients would actually be eligible for SI benefits, but do not apply.

Table 1: Descriptive statistics of unemployed workers who apply for sickness insurance (SI) or exit to employment three months and one month before UI benefit exhaustion

Sample of UI recipients				
Exit probabilities	3 months[a]	1 month[b]		
To SI	1.77%	2.40%**		
To employment	8.92%	10.36%**		
Total number of observations (ind. * month)	7,084,192			

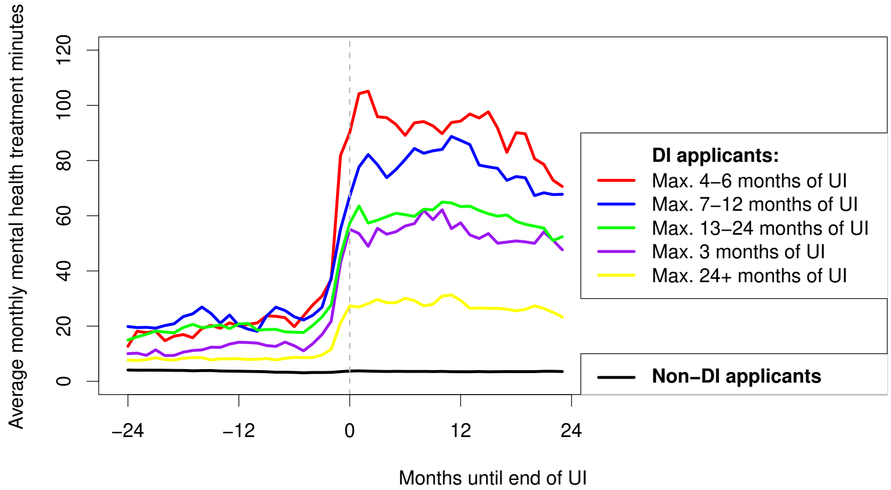
Cohorts exiting UI	**SI application**		**Employment**	
	3 months[a]	1 month[b]	3 months[a]	1 month[b]
Healthcare utilization:				
Probability to receive mental healthcare treatment	7.13%	8.21%	2.52%	2.12%**
Number of mental health treatment minutes[c]	165.5	219.2**	138.9	117.9**
Duration of treatment at end of UI in months[c]	6.0	6.2	2.7	2.9
Remaining (future) months of treatment at end of UI[c]	10.5	11.3	5.5	5.2
Annual physical healthcare cost	€3683,-	€3329,-	€1062,-	€995,-
Demographics:				
Male	48.5%	47.4%	52.1%	52.9%
Age	33.4	34.1**	28.7	29.5**
Native	63.2%	57.6%**	67.2%	63.5%**
Low education level	23.1%	24.4%	13.7%	15.8%**
Middle education level	56.0%	53.1%	54.6%	53.0%**
High education level	17.8%	18.5%	27.1%	26.2%
Pre-UI employment outcomes:[d]				
Monthly number of working hours	83.8	82.4	105.5	103.5**
Fixed-term contract	49.9%	48.5%	67.2%	64.1%**
Permanent contract	23.3%	23.2%	21.5%	22.8%**
Monthly labor earnings	€1691,-	€1761,-	€2018,-	€2042,-
Number of workers	3,969	3,911	14,258	12,521

Time varying measures measured in month/year of exit; [a] sample exiting UI three months before maximum UI entitlement; [b] sample exiting UI one month before maximum UI entitlement; [c] among sample receiving mental healthcare; [d] Pre-UI employment outcomes measured in last month before entering UI; significant difference between cohort exiting three months and one month before maximum UI entitlement at: * a 10% significance level; ** a 5% significance level

in the months prior to the end of UI (and hence the start of SI), indicating mental health problems before reporting sick. Mental healthcare utilization remains high in the years after inflow into SI, and does not seem to be affected by the assessments after one and two years of SI receipt. Finally, we observe marked level differences with respect to the maximum period of UI entitlement. Older groups with longer entitlement tend to use less mental healthcare, whereas younger groups with shorter entitlement are more likely to suffer from mental health problems.

One potential concern for the analyses that follow is that individuals seek healthcare to

Figure 2: Mental health treatment relative to the end of UI ("t=0") for (non-) DI applicants



justify their SI application. Healthcare utilization would then not be an accurate proxy for health conditions. In the Dutch context, however, this is unlikely. First, both the GP and the mental healthcare providers function as gatekeepers of the mental healthcare system. Only patients who are deemed by the GP to have mental health problems are directed to specialized mental healthcare. Mental healthcare providers then also conduct a second assessment to determine the need of specialized mental health treatment, or not. All workers shown in Figure 2 receiving mental healthcare must have passed these initial severity assessments. Second, both the intake process and the actual start of treatments may take several months, and the total time involved is uncertain. It is therefore unlikely that workers are able to time the actual start of mental health treatments.[12]

4 Spikes into SI

This section presents a formal analysis for the estimation of spike effects at the end of UI entitlement and their persistence throughout the two-year SI benefit period. Next, Section 5 analyzes differences in the composition between the pre-spike and spike cohorts to determine the drivers of the spike in SI inflow.

[12]Still, we will test for any strategic healthcare-seeking behavior by examining the evolution of healthcare utilization before (and after) SI applications.

4.1 Methodology

To detect spike effects, we examine the likelihood of reporting sick close to the maximum UI duration. We estimate the probability of an exit into SI in month s since the start of UI receipt, conditional on the elapsed time on UI. We denote t as the duration on UI. Conditional on UI receipt up until month s, the linear probability model for exits into SI in month s of UI benefit receipt is specified as:

$$SI_{i,s,\tau} = \alpha + \gamma_s + \delta_\tau + \psi_{T_i} + \phi_{T_i - s} + \varepsilon_{is} \qquad \text{for} \quad s \leq t\,, \tag{1}$$

with s as the elapsed duration of UI receipt, τ as calendar time and T_i as the maximum period of UI benefit entitlement for worker i ($i = 1, ..N$). For instance, for a worker enters into SI the second month of the UI duration, $SI_{i2,\tau}$ equals one. The parameter α is the intercept, and γ_s, δ_τ, and ψ_{T_i} represent fixed effects for calendar time, duration, and maximum UI entitlement, respectively. Vector ϕ represents our parameters of interest, capturing changes in the risk of reporting sick close to the maximum UI duration. In our baseline regressions, we normalize ϕ_3 to zero. This implies that the spike is measured relative to the third month prior to maximum UI entitlement. Duration fixed-effects represent both genuine duration dependence effects and sorting effects due to heterogeneity in observed and unobserved worker characteristics. Including duration fixed-effects ensures that we control for detrimental mental health effects of prolonged unemployment (Kuhn et al., 2009). As will be discussed later on, we can estimate the (partial) impact of sorting effects at a later stage by including individual characteristics as additional control variables. Confidence intervals for the relative risks are obtained with the Delta-method.

Since the sum of elapsed duration in UI and the residual entitlement of UI equals the maximum period of UI benefit entitlement, simultaneous estimation of δ, ϕ and ψ is only possible by imposing restrictions on some of the parameters. In our baseline specification, we therefore group workers with maximum entitlement periods of 4-6 months, 7-12 months, 13-24 months, and 24+ months. The estimation of ϕ and ψ exploits variation in duration on UI and residual UI entitlement for workers with similar, but not identical maximum UI entitlement periods. We thus compare similar individuals who have been on UI for the same amount of time, but among which some are closer to the end of their UI eligibility than others due to (small) differences in their employment history. Under the assumption that the impact of the employment history is continuous, we can estimate the effect of reaching the end of UI eligibility. As one of our robustness tests, we will also use a narrower grouping of maximum UI entitlement, yielding similar results.[13]

Next to the onset of a spike at UI benefit exhaustion, we also investigate the *persistence* of the spike during the period of SI benefit receipt, ultimately up to and including the moment of DI application after 24 months of SI benefit receipt. This allows us to study the possibility that the spike fades out or increases in size, both in substance and for specific groups that are initially most responsive to benefit exhaustion. Specifically, we re-estimate Equation (1) using as outcome SI risk dummies that are equal to one for workers entering SI at time s *and* subsequently receiving SI for at least m months ($1 \leq m \leq 24$), and zero otherwise. This way we examine the extent to which the increased likelihood of exiting into SI carries on over time. While the absolute risk level declines with respect to m, our primary interest then lies in the *relative risk* of entering and staying in the SI scheme at the spike at benefit exhaustion, as compared to the risk just before the spike.[14]

4.2 Results

Figure 3 shows the estimated duration effects for exits into SI (left-side panel) and exits into employment (right-side panel). Both panels show a significant increase in exits as workers approach their maximum UI duration. The spike towards employment is larger in absolute terms but smaller in its relative magnitude. The average monthly probability of entering the SI scheme is approximately 1%, while the average probability of finding employment is approximately 9%. In effect, the probability of reporting sickness increases by almost one-third, while the probability of finding employment increases by approximately one-fifth. The latter effect is comparable to De Groot & Van der Klaauw (2019), who use older data on UI spells from the Netherlands to study exits into employment.

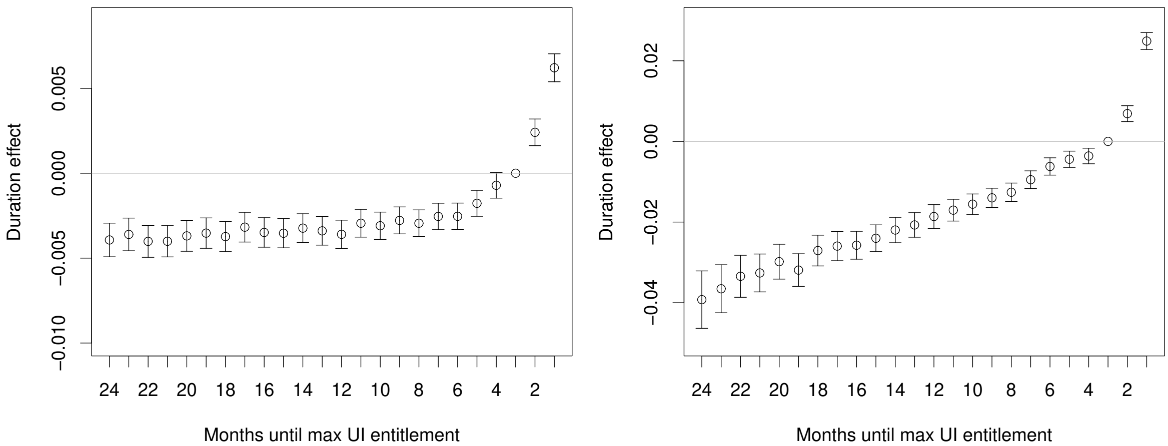
Since behaviors at UI benefits exhaustion may differ across groups with different UI entitlement lengths, we additionally re-estimate the duration effects stratified by maximum UI

[13]We will conduct various robustness tests that impose alternative restrictions on parameters. Specifically, we extend the pre-spike cohort and model elapsed and residual duration effects using polynomials instead of piece-wise fixed effects to allow for a fully flexible specification of maximum entitlement effects. The exact specifications can be found in the Appendix Section A.2.

[14]In the final month of the UI entitlement period, workers can only call in sick until a specific day that follows from the day they started receiving UI benefits. Hence, workers on average can only call in sick for 15 days, which reduces the probability of calling in sick in that month. We therefore effectively exclude the final month from our regressions.

Figure 3: Duration effects for exits into SI (left) and into employment (right)

(a) *Exits into SI* (b) *Exits into employment*

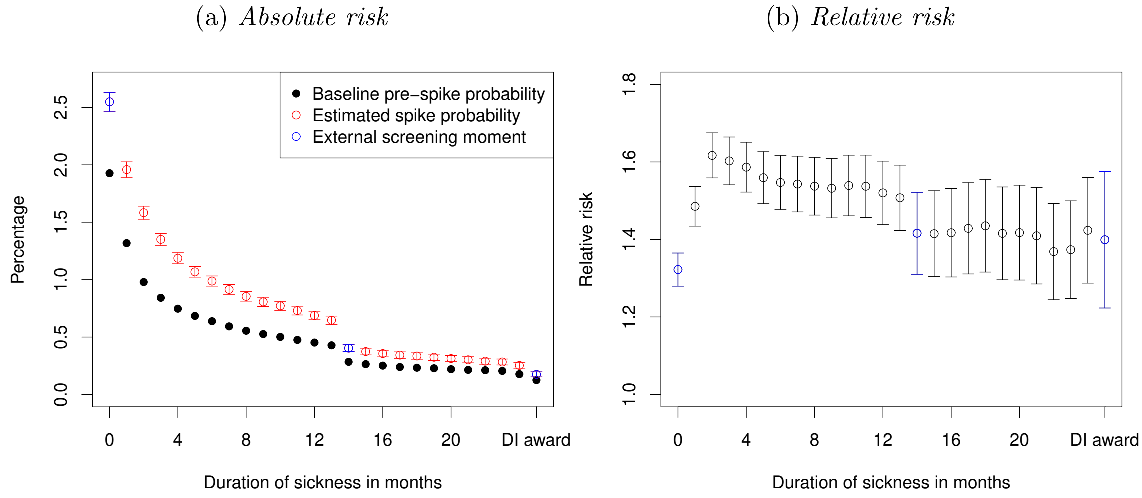


duration groups. The confidence intervals are substantially larger for these (smaller) samples, but point estimates are similar to those for the pooled sample (see appendix Figure A.5). This suggests that the spike is relevant for all groups. Furthermore, the estimated spike is robust with respect to a range of alternative specifications, as shown in Appendix Section A.2.

We next examine the persistence of the spikes into the SI scheme in Figure 4. We redefine the outcomes to risk indicators for SI receipt for at least m months ($m \leq 24$). The left panel shows the obtained probabilities of continued SI receipt for at least m months, while the right panel shows the relative risk, i.e. the probability of the spike-cohort as a ratio of the probability of the pre-spike cohort. The absolute risks clearly show a decreasing pattern for pre-spike and spike cohorts, with the majority of all workers exiting SI in the first four months. The next substantial decrease in SI receipt occurs at the one-year assessment. The maximum entitlement period ends after 24 months when the DI assessment takes place (if relevant).

Comparing the spike and pre-spike cohorts in Figure 4, we see that the exit rates out of SI benefits are higher for the pre-spike cohort in the first three months of SI receipt. While unemployed workers in the spike cohort have a 30% higher probability of starting SI benefit receipt, the relative risk increases to 60% for the continued SI receipt of three months. In the remainder of the first year of SI benefits, the relative risk stabilizes, indicating that exit rates evolve similarly in both cohorts in these months. The first-year assessment decreases the relative risk, likely reflecting the fact that relatively more workers in the spike cohort are screened out. After that, the relative risk remains stable at approximately 1.4, which is still slightly exceeding the initial relative risk of 1.3. Finally, the DI assessment after two years

Figure 4: Estimated absolute and relative risk (ratio of absolute risk spike-cohort and pre-spike cohort) of reaching specified SI benefit durations for worker exits



does not affect the relative risk. It remains above the initial relative risk of 1.3, implying that workers in the spike cohort have a higher likelihood of continued SI receipt for two years and, eventually, also a higher likelihood of eventually being awarded DI benefits.[15]

5 Compositional differences at the spike into SI

5.1 Methodology

We discussed earlier that the policy implications of the spike into SI at UI benefit exhaustion depend on the types of workers applying at that time. This implies that the health conditions of 'marginal' SI recipients at the spike are crucial. These health conditions can be inferred from comparisons between the spike and the pre-spike cohort into SI.

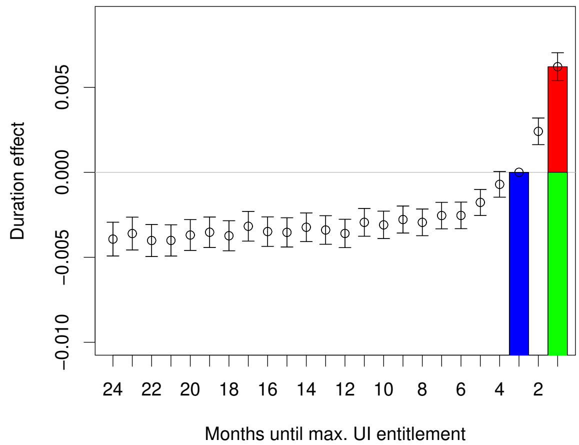
To illustrate how marginal SI applicants fit into our empirical framework, Figure 5 shows the estimated spike in SI inflow with worker groups highlighted in blue, green and red. The bar highlighted in blue consists of workers entering into SI before reaching their maximum UI entitlement (i.e. the 'pre-spike' cohort). The equally large bar highlighted in green also represents 'non-marginal' workers who enter into SI when reaching their maximum UI entitlement, but who would have done so regardless of their remaining UI eligibility.[16] The bar highlighted

[15]Further analysis of the rejection rates of both screening moments confirms that the spike cohort is slightly more likely to be screened out during the first-year assessment but equally likely to be screened out during the final DI assessment (See Online Appendix Section B.1).

[16]Note that the illustration in 5 abstracts from duration effects, which we incorporate in our estimation model. In effect, the green and blue groups therefore do not have to be of equal size.

in red comprises marginals who apply because they reached their maximum UI entitlement period. In effect, the spike cohort consists of marginal and non-marginal applicants, and the average compositional results of the spike cohort represent a weighted average of these groups.

Figure 5: Illustration of non-marginal (blue and green) and marginal (red) SI applicants



As argued earlier, incentives to delay an SI application are most substantial for relatively healthy workers. So if there is bunching of workers with better health conditions in the last month of UI receipt, the spike cohort should show better (average) health conditions than the pre-spike cohort. This is because we observe the weighted average of the healthier group of marginals and the equally healthy group of non-marginals. But when the spike is driven by a catch-up effect of initial non-take-up, marginals should have similar (or worse) health conditions as non-marginals. We therefore compare the health status of workers entering into SI in the last month of UI entitlement to that of workers entering into SI in the two months prior to the month of UI benefit exhaustion.

To estimate differences in the health status and other characteristics between the pre-spike and spike cohorts, we employ a specification that is similar to that of Equation (1), but considers worker characteristics of samples *conditional* on SI exits at elapsed time t as the outcome of interest:

$$X_{i,t,\tau} = \alpha + \gamma_t + \delta_\tau + \psi_{T_i} + \phi_{T_i - s} + \varepsilon_{is} \qquad \text{for} \quad SI_{is,\tau} = 1, \tag{2}$$

with $X_{it,\tau}$ indicating a characteristic of the worker and γ_t, δ_τ and ψ as duration, calendar-time, and maximum-duration fixed-effects. Again, the parameter of interest is ϕ, which indicates residual length-of-benefit effects on worker characteristics. For X we use measures of healthcare usage, demographics, and pre-UI labor market status. Health outcomes include the number of mental healthcare treatment minutes received per month, the probability of receiving mental healthcare treatment, and annual spending on non-mental healthcare. Demographic outcomes include age, gender, nationality, and education level. We also consider the number of monthly working hours, the monthly wage, and the type of contract (permanent or fixed-term) as pre-UI labor market outcomes.

Similarly to Equation (1), we estimate Equation (2) on variables that incorporate the persistence of the spike. Specifically, we consider the characteristics of UI recipients that leave UI for SI with a given residual entitlement length *and* continue receiving SI for at least m months ($1 \leq m \leq 24$). Again, the idea is that relative spike effects in the composition of workers entering SI may fade out as the time in SI proceeds. If spikes into SI consist of workers with only mild health conditions, one would expect these to have more opportunities to exit into employment and to be screened out in the first-year assessment. The fraction of workers with mild health conditions in the spike will then decrease with respect to m.

Inherent with our estimation approach, we infer differences in compositional outcomes of *conditional samples* of UI recipients. One concern is therefore that compositional changes in the stock of workers receiving UI may bias our results. For example, relatively healthy individuals might be more likely to exit UI into employment in the last months of their UI entitlement. This in turn would result in the sample still receiving UI benefits at UI benefit exhaustion being, on average, unhealthier than those just before UI benefit exhaustion. Returning to Figure 5, this would correspond to the group in green being in worse health than the group in blue. To account for such effects, we also estimate Equation (2) on the sample of UI recipients. This then reveals spike effects in the stock of UI recipients. We next subtract the compositional differences at the spike from the compositional differences obtained from the conditional sample of workers that exit into SI.[17] This yields a corrected spike difference that takes account of changes in the remaining stock of UI recipients.

5.2 Results (1): healthcare utilization

Table 2 shows the estimated spike differences for healthcare utilization outcomes, demographics and pre-UI employment outcomes. All differences are robust to various alternative specifica-

[17] Without selection into SI, differences in the samples receiving UI before and at UI benefit exhaustion should translate one-to-one into differences in the samples entering into SI.

tions, as shown in Appendix Section A.2. To gauge the size of the compositional difference, the table shows both mean values of the pre-spike cohort in column (1) and the estimated spike effect for the cohorts entering into SI in column (2). In addition, column (3) shows the estimated difference between the conditional cohorts when controlling for the impact of differences in the characteristics of the stock samples of UI recipients.[18] Note that the resulting estimates may deviate from the descriptive statistics reported in Table 1 that do not control for duration and maximum UI effects.

Table 2: Estimated differences in characteristics of pre-spike and spike cohorts into SI benefits

	3-month mean	**Spike difference**	**Corrected spike difference**[a]
Healthcare utilization			
Probability to receive mental healthcare	10.8	0.2	0.0
		(0.6)	(0.6)
Number of mental health treatment minutes	22.6	0.0	-0.4
		(2.2)	(2.3)
Duration of treatment at end of UI (months)	16.2	0.4	0.3
		(1.2)	(1.2)
Annual physical healthcare cost in euros	2928	474	414
		(256)	(273)
Demographics			
Male	43.2	1.7%	0.2%
		(1.13)	(1.29)
Age	32.3	1.3**	-0.6**
		(0.12)	0.14)
Native	59.8%	-6.5%**	-4.2%**
		(0.99)	(1.12)
Years of education	12.5	0.0	-0.1
		(0.1)	(0.1)
Pre-UI employment outcomes[b]			
Monthly number of working hours	87.4	-6.8**	-10.2**
		(1.8)	(2.1)
Fixed-term contract	66.8%	3.5%**	0.3%
		(1.1)	(1.1)
Log monthly labor earnings	7.2	-0.1*	0.0
		(0.1)	(0.1)
Number of workers	3,969	3,911	3,911

[a] Difference in composition between SI inflow cohorts corrected for difference in composition between samples receiving UI (Appendix Table A.3), [b] Pre-UI employment outcomes measured in last month before entering UI; significant difference between cohort exiting three months and one month before maximum UI entitlement at: * 10% significance; ** 5% significance.

[18]The differences between the samples on UI are shown in Appendix Table A.3.

Differences in the spike at UI benefit exhaustion

The first panel of Table 2 presents differences between the spike and pre-spike for various measures of healthcare utilization. We find precise, small and statistically insignificant differences in mental healthcare utilization between the cohorts that enter SI three and one month before their maximum UI duration. When correcting for differences in healthcare utilization of the stocks of individuals receiving UI, these differences remain similar.[19] For insight into the *timing* of mental health care treatments of entries in SI, we also estimate our baseline model on the *elapsed* and duration of mental health treatments at the end of the UI spell. By construction, we do this for (conditional) samples of workers with mental health treatments at that moment. If the spike in SI is caused by workers who could have reported sick earlier and without the incentives to bunch, the average duration of treatment at the the start of SI would be longer. We then again find no difference between the pre-spike and spike cohort.

To rule out that the (equal) mean elapsed durations hide strong differences in the distribution of elapsed duration, we also perform an F-test for equality of variances of the pre-spike and spike cohorts at the start of SI receipt. Since we cannot reject equal variances[20], we conclude there is no combined effect of delayed and faster applications in the spike. Note that similar results are obtained when examining the residual duration of treatment. This not only confirms that cohorts entering into SI are similar in terms of mental healthcare utilization, but also that the spike does not stem from the timing behavior of UI recipients during their mental health treatments.

We also use the annual healthcare data to examine whether the differences we observe in mental healthcare utilization are mirrored by similar differences in non-mental healthcare utilization. The resulting pattern is similar to that observed for mental healthcare utilization.[21] This does not support the idea that marginal applicants with less severe health conditions bunch and strategically time their applications. It rather suggests that the spike represents initial non-take-up of SI benefits or some acceleration of take-up that would have occurred later with continued entitlement to the SI scheme.

[19] To test whether the absence of differences in average treatment does not mask differences in the distribution of treatment, we additionally examine the probability of exceeding certain treatment threshold-percentiles. These estimation results are available upon request.

[20] The estimated variances amounted to 164 and 173 for pre-spike and spike cohorts, respectively, with a P-value of 0.09.

[21] Similar as for mental health treatment, we additionally examine the distribution of healthcare expenditure. For the cohorts entering into SI, we find no significant differences in the full distribution.

Differences during the SI spell

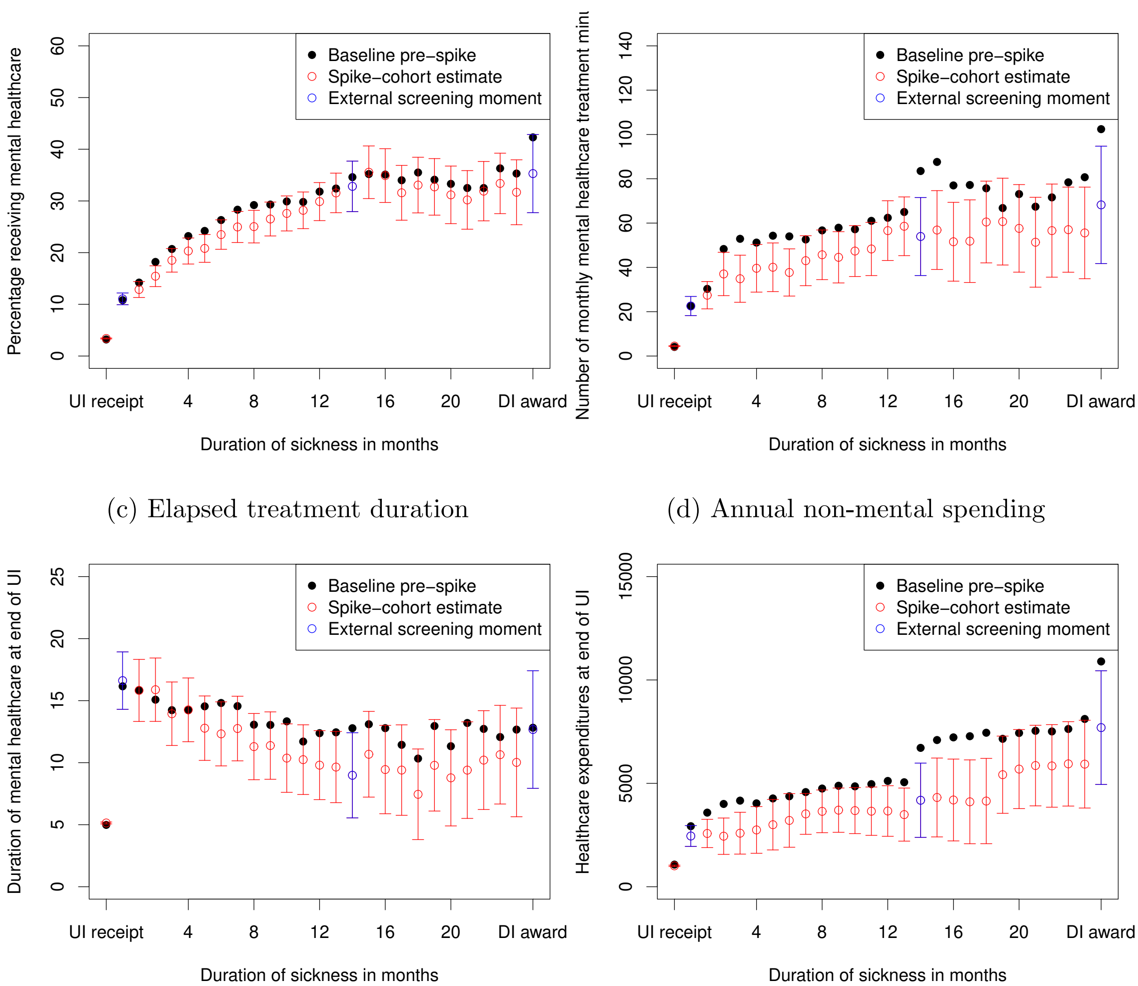
Similar to our earlier analyses on the persistence of the spike, we next compare cohorts while conditioning on the time they remain on SI. Specifically, Figure 6 shows the estimated results when comparing the pre-spike and spike cohorts, while conditioning on receiving SI benefits for at least m months with $1 < m < 24$. To interpret the magnitude of the differences, we show the mean values of the pre-spike cohort, and the estimated spike-cohort value (mean value of the pre-spike plus the estimated spike effect). The first dot in all panels for Figure 6 corresponds to the correction term used in column (3) of Table 2. The second dot displays the estimated spike effects in column (2) of Table 2. These estimates, printed in blue, show that at the start of SI receipt, the probability of receiving mental health treatments and the number of mental health treatment minutes are almost equal for the pre-spike and spike cohorts.

Panel (a) of Figure 6 shows a three percentage point lower incidence of mental health treatments for the remaining spike cohort in the following months of SI receipt. This difference cancels out after one year of SI receipt, probably mirroring an offsetting effect of the first-year-assessment. The number of treatment minutes after three months of SI receipt is also significantly and substantially (20%) smaller for the spike cohort and the elapsed treatment times shorter, as shown in panel (b) and (c). Given the small incidence differential, we interpret this as an intensive margin effect of treatments. The difference in treatment minutes widens during the first three months of SI, wherein a much larger fraction of workers leave SI for the pre-spike cohort. We next see that the difference in average treatment minutes stabilizes. This contrasts with the difference in incidence, which is no longer there after one year of SI receipt. It thus seems that the first-year-assessment more often screens out SI recipients in the spike without mental health treatments than those with positive but fewer treatment minutes.

Finally, the bottom right panel (d) of Figure 6 shows the annual non-mental healthcare spending at the moment of inflow into SI for the spike and pre-spike cohorts. The resulting pattern is similar to that observed for mental healthcare utilization: differences in exit rates during the first four months result in significantly lower average amounts of spending on non-mental healthcare for the remaining spike cohort.[22] The external assessments have a significant impact on the spending for both cohorts, but the gap remains constant.

[22] Similar as for mental health treatment, we additionally examine the distribution of healthcare expenditure. For the cohorts entering into SI, we find no significant differences in the full distribution.

Figure 6: Estimated differences in healthcare utilization of pre-spike and spike cohorts (95% confidence intervals)



(a) Incidence

(b) Treatment minutes

(c) Elapsed treatment duration

(d) Annual non-mental spending

Inferences on (self-)screening in SI

Assuming that non-marginal workers in the spike cohort are comparable to those in the pre-spike cohort, we infer that marginal workers in the spike use considerably less mental healthcare after some months of SI receipt. As an extreme case, the pre-spike cohort reaching three months of SI receipt is treated 50 minutes per month on average, as against 30 minutes per month for the spike cohort. With monotonous effects, marginal applicants would receive almost no mental health treatment minutes. Although this comparison provides an upper bound, it illustrates that marginal applicants in the spike who continue receiving SI are healthier. With such differences being absent at the start of SI receipt, there appears a stronger impact of self-screening of healthy pre-spike workers that leave SI benefits in the first months.

Since we track monthly information on mental healthcare utilization, our inferences represent the joint effect of (initial) selection effects and changes over time. This contrasts with the earlier comparisons, where variables were constants that were measured at the end of UI benefit entitlement. The differences in mental healthcare utilization shown in Figure 6 can therefore be driven by selection effects or genuine changes in health conditions of the pre-spike and spike survival cohorts. To investigate the importance of both, we redo the analysis using the (time-constant) mental healthcare utilization measured at the end of UI as the outcome. Since mental healthcare utilization is fixed at this moment, any differences are driven by selection. The observed pattern is then qualitatively similar: there are no significant differences in utilization at the end of UI among the samples entering into SI, but these do open up for (smaller) samples with longer SI durations due to different outflow rates out of SI (see Appendix Figure A.4). Still, the treatment differences are larger when the mental health treatment is kept fixed and measured at the end of UI. This stems from the fact that those exiting SI have a more favorable evolution of treatment utilization, and exit rates are higher in the pre-spike cohort.

To offset the potential effect of self-screening, we finally examine differences in the evolution of health by tracking unconditional cohorts' healthcare utilization from the moment of the start of SI receipt. This approach thus considers *all* pre-spike and spike workers, irrespective of continued SI receipt. The figure for the incidence of treatment is shown in Appendix Figure A.6. The evolution of treatment incidence is almost identical for the pre-spike and spike cohorts, confirming our finding that the underlying health of both cohorts is similar.

5.3 Results (2): demographics and pre-UI employment outcomes

To analyze whether the spike could be driven by selection on characteristics other than health, we next consider differences in demographics and pre-UI employment outcomes between cohorts before and at UI benefit exhaustion. The corresponding results are shown in the two bottom panels of Table 2. Alongside this, Appendix Figures A.7 and A.8 examine how differences in demographic and pre-UI employment characteristics between the pre-spike and spike cohorts change over the elapsed SI spells. For most outcomes, this yields very similar differences as for those at the end of UI benefit entitlement.

We find that the proportion of male workers is slightly larger in the spike sample that enters into SI benefits at UI benefit exhaustion. When we correct for differences in the samples on

UI, however, the estimated gender differences become negligible. Similarly, the significant and persistent age differential between the cohorts is almost fully driven by changes in the stocks of remaining UI recipients.[23] As for educational attainment, we do not see differences in averages between spike- and pre-spike cohorts.

We do find evidence that (marginal) applicants at the spike more often have a migration background. Although around one-third of this effect follows from compositional changes in the stock of UI recipients at the end of entitlement, there is a strong over-representation of migrant workers at the spike. While approximately 40% of those who report being sick in the pre-spike have a migration background, this percentage increases to 45% in the cohort reporting sick in the spike. Assuming that the average migration background of the non-marginal spike applicants is similar to that of the pre-spike cohort, we infer that 80% of the marginal applicants have a migration background.[24] It may well be that migrant workers are initially less aware of their entitlement to SI, and are therefore more responsive to notifications of this possibility as they approach their maximum UI entitlement.

Finally, the last panel of Table 2 compares monthly working hours, labor earnings, and the fraction of fixed-term contracts of pre-spike and spike cohorts. All these variables are measured one month before the start of UI receipt. Controlling for compositional differences in the stock of UI recipients, we only find that the spike cohort shows lower monthly working hours before entering UI, possibly reflecting differences in labor market performance.

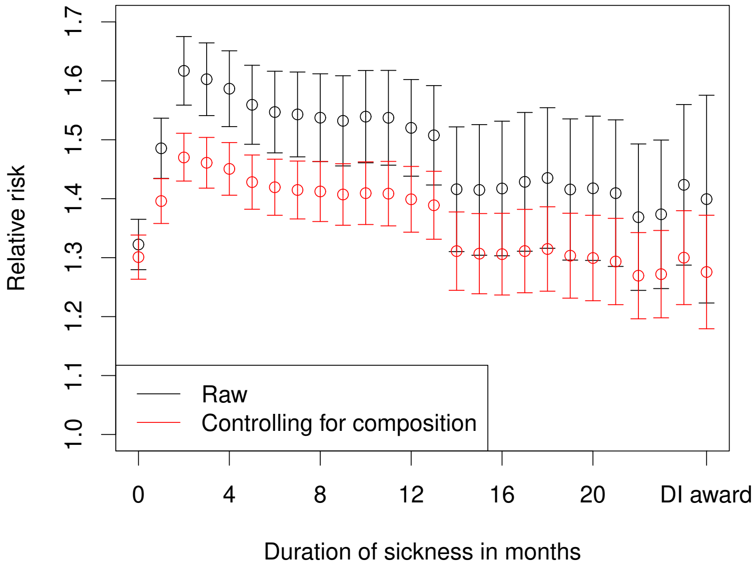
5.4 Synthesis

While differences in healthcare utilization between the spike and pre-spike cohort are small, our previous analyses also indicate that a significantly larger share of the spike cohort has a migration background and worse pre-UI labor market outcomes. If these groups – which are overrepresented in the spike – also have a higher risk of entering SI, this may partially explain the spike in inflow. To relate our analyses on the spike to those on compositional differences, we therefore investigate the extent to which the observed compositional differences explain the spike into SI. For this we re-estimate Equation (1) while including demographic, pre-UI labor

[23]Specifically, two workers with equal elapsed UI durations but a one-month difference in residual UI benefit entitlement will have one-month difference in total entitlement. This difference is mirrored by an age differential since older workers tend to have longer employment histories and longer UI entitlement. When we exclude the controls for the duration on UI, the estimated difference between the pre-spike and spike cohort is negligible.

[24]To determine the composition of the marginal applicants, we assume that the weighted average of marginal and non-marginal applicants equals the observed value (Almond & Doyle, 2011)

Figure 7: Relative risk of reaching specified SI benefit spells for pre-spike and spike worker cohorts with and without controlling for compositional differences (95% confidence intervals)



market status and healthcare utilization measures as controls. If compositional differences explain the spike in SI inflow, our controlled spike estimates should reduce in magnitude.

Figure 7 shows that the inclusion of the relevant control variables indeed partly explains the relative risk in inflow into and subsequent outflow out of SI. With controls, both the risk of entering SI and the risk of being awarded DI benefits become approximately 30% larger for the spike cohort than for the pre-spike cohort. Conditional on these observables, workers in the spike cohort entering SI are thus equally likely to be awarded DI benefits, relative to their counterparts in the pre-spike cohort.

To examine which variables contribute the most to the pre-spike and spike difference, we also perform an Oaxaca-Blinder decomposition in Appendix Section A.3. We then see that particularly age and educational attainment explain part of the spike in SI inflow. The other differences we observe, such as the migration background, pre-UI job characteristics, and healthcare utilization do not explain the difference in inflow into and subsequent outflow out of SI. Given the limited age differential between the pre-spike and spike cohort, the effect of age on the inflow into SI may appear striking. The effect is most likely driven by the link between the workers' age and pre-UI labor market history. With maximum entitlement period dummies as controls, the workers' age may capture an important part of differences in pre-UI labor market histories. In particular, we are able to identify older workers with relatively short maximum entitlement periods that have experienced earlier unemployment spells and therefore have a weaker labor market position. These differences are also informative on the return-to-work probability of SI recipients.

Although the inclusion of healthcare utilization and many of the other demographic characteristics as control variables does not impact the spike estimates, it is important to stress that healthcare utilization and most of the demographic characteristics are highly predictive of inflow into SI. The absence of changes in the spike estimate therefore stems from limited correlation between these variables and the indicators of being part of the spike cohort. The spike and pre-spike cohorts are similar in most characteristics, and it is unlikely that the spike comes from relatively healthy individuals maximizing their total benefit receipt. Rather, it seems to be driven by a catch-up of initial non-take up. The differences in migration background and pre-UI labor market outcomes between the spike and pre-spike cohort we find could indicate that among these groups, initial non-take-up of SI benefit, and hence also the catch-up effect, is larger.

6 Conclusion and discussion

From our analyses, the emerging picture is that the observed spike of unemployed workers entering the sickness insurance (SI) program at the end of UI entitlement represents initial non-take-up. Using various outcome variables, the healthcare utilization of pre-spike and spike cohorts is very similar at the moment of UI benefit exhaustion. This is in contrast to the idea that relatively healthy workers enter SI at the end of UI entitlement to extend the total period of benefit receipt. Our findings therefore align with workers in the spike initially being unaware of their entitlement to SI and/or prone to status-quo bias. We also regard this explanation as plausible, since unemployed workers receive a letter toward the end of their UI eligibility informing them that if they are sick, they should apply for SI benefits before the end of their UI entitlement.

That being said, we also find important differences in (later) outcomes of pre-spike and spike cohorts. Most notably, exit rates out of SI are considerably lower for the spike cohort, particularly during the first four months of SI receipt. Concurrently, there is a divergence in average (mental) healthcare utilization of the remaining samples. Presumably, this cohort has a weaker labor market attachment or work preferences that lower the odds of work resumption while receiving SI. While we cannot fully capture these characteristics in observed controls, it is plausible that behavioral failures that explain the spike – such as status quo bias – are also relevant in explaining the (ex-post) behavior in the SI scheme.

Since our analysis zooms into the spike from UI into SI, we have studied a limited sample. Approximately 31% of all UI recipients reach their maximum UI entitlement, and 2.4% of these call in sick compared to an SI inflow rate of 1.8% among UI recipients that have not yet reached their maximum entitlement. Considering high levels of healthcare treatments among the full population of UI recipients, however, it is likely that there is also non-take-up of SI benefits in the full population of UI benefit recipients. If so, the policy implications of increased SI inflow are markedly different compared to when that increased inflow is driven by relatively healthy individuals trying to maximize their total duration of benefit receipt.

Our findings have important implications for the design of both UI and SI. First, the non-take-up of SI calls for extra and timely and targeted information interventions for those on UI. In this respect, information interventions have proven to be effective in increasing take-up of for example Medicaid (Aizer, 2003), the SNAP program (Finkelstein & Notowidigdo, 2019) and SSDI in the US (Armour, 2018). UI caseworkers could also play a more active role in referring sick UI recipients to the SI system. Second, our findings imply that the spikes are not an argument for stricter screening on health while on UI. Rather, our results call for timely screening on recovery of the spike cohort during the first months of (subsequent) SI receipt to avoid unnecessary long SI spells. Obviously, this argument is also relevant for the larger population of workers with weak labor market positions that enter the SI scheme at any point in time during their UI spell.

While the setup of the Dutch UI and SI system has its unique features, part of our results can be extrapolated to other countries. In the UK, Belgium, Finland and several US states, eligibility for SI also depends on one's employment history (Spasova et al., 2016). For these countries, the (initial) non-take-up of schemes can also be a relevant explanation for observed spikes at the end of UI entitlement.

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A Appendix

A.1 Classification of healthcare expenditure categories

Table A.1: Construction of mental healthcare expenditures and physical healthcare expenditures based on expenditure categories used by Statistics Netherlands

Expenditure category[a]	Mental healthcare	Physical healthcare
General practitioner		X
Pharmacy		
Hospital healthcare		X
Paramedical healthcare		X
Apparatus		
Hospital transportation		
Birth care		
Health care expenditures incurred abroad		
Other cost		
First-line psychological healthcare	X	
Mental healthcare	X	
Basic-mental healthcare	X	
Specialist mental healthcare	X	
Geriatric rehabilitation healthcare	X	
Nursing without stay		X
Sensory disability healthcare		

Note: (a) Expenditure categories as used by Statistics Netherlands

A.2 Robustness analyses

In the baseline model, we group workers with maximum entitlement periods in order to separately identify and estimate elapsed and residual time effects in UI and maximum entitlement effects. Such parameter restrictions do not hold for elapsed and residual time effects. This section examines whether the results are also robust to alternative specifications. We examine the robustness of the spike in SI inflow and of the compositional differences. For compositional differences, we focus on the estimates for the cohorts entering into SI.[25] Table A.2 shows the estimated coefficients for the baseline specification and the various robustness specifications.

As a first test, we alter the definition of the pre-spike cohort. While the raw data shows a clear spike in the last month of UI benefit entitlement, several definitions could be used for the pre-spike cohort. In the baseline specification, the pre-spike cohort consists of workers receiving UI benefits three months before their maximum UI entitlement. Extending the pre-spike cohort to cohorts receiving UI up to 6 months of residual entitlement yields similar results, as shown in Table A.2. This indicates that cohorts entering into SI in earlier months are in fact very similar to those entering into SI in the three months before their maximum UI entitlement. Alternatively, we could expand the spike cohort by adding one additional month. However, as also seen in the raw data, the spike is most pronounced in the very last month. Including the cohort receiving UI two months before their maximum UI entitlement attenuates any differences we observe (not shown in the table).

As a second test, we impose a (smooth) polynomial specification for the impact of duration on UI. In our baseline specification, we model the impact of duration on UI as flexibly as possible by using fixed effects for each month of duration. With two polynomials, the resulting estimates are similar to those of the baseline specification.

Third, we allow for a more flexible specification for the impact of the maximum UI duration of workers. In the baseline specification, we include dummies for durations between 3 and 6 months, 6 and 12 months, 12 and 24 months, and more than 24 months.[26] A fully flexible specification for maximum UI duration is not possible, given that the elapsed duration on UI plus the residual UI entitlement equals the maximum UI entitlement. The most flexible specification of maximum UI entitlement groups is therefore conducted with two-month intervals. This does not affect any of the estimated coefficients, indicating that heterogeneity

[25] The results for compositional differences of cohorts being sick for at least m months with $1 < m < 24$ are very similar.

[26] These groups correspond to the categorization used by the Dutch Employee Agency.

due to variation in maximum UI durations is limited.

Finally, we turn to the main parameter of interest, which is the residual duration on UI. In our baseline specification, we again allow for the most flexible specification by including dummies for every residual duration. As shown in Figure 3, the estimated duration effects are fairly constant up until five months of residual duration. At this point, the estimated residual duration effects increase, with a clear spike in the last month. If we impose a semi-parametric specification on the residual duration, a polynomial of degree two in addition to a dummy for the spike-cohort, the estimated spike in inflow is largely unaffected. The reason for this is that the polynomial is fitted to the flat left tail of the residual duration. Using a higher-order polynomial does however impact some of the estimated compositional differences. In particular, the estimates for age, migration background, earnings, and fixed-term contract change significantly. For these outcomes, the left tail is not constant and highly susceptive to (small) non-linearities. The fitted value of the polynomial at the spike is therefore very different from the observed value, resulting in spike estimates that significantly differ from the baseline specification estimate. Given that the baseline specification is more flexible, we however believe that the baseline estimates are also more credible.

Table A.2: Estimation results of baseline model and robustness analyses

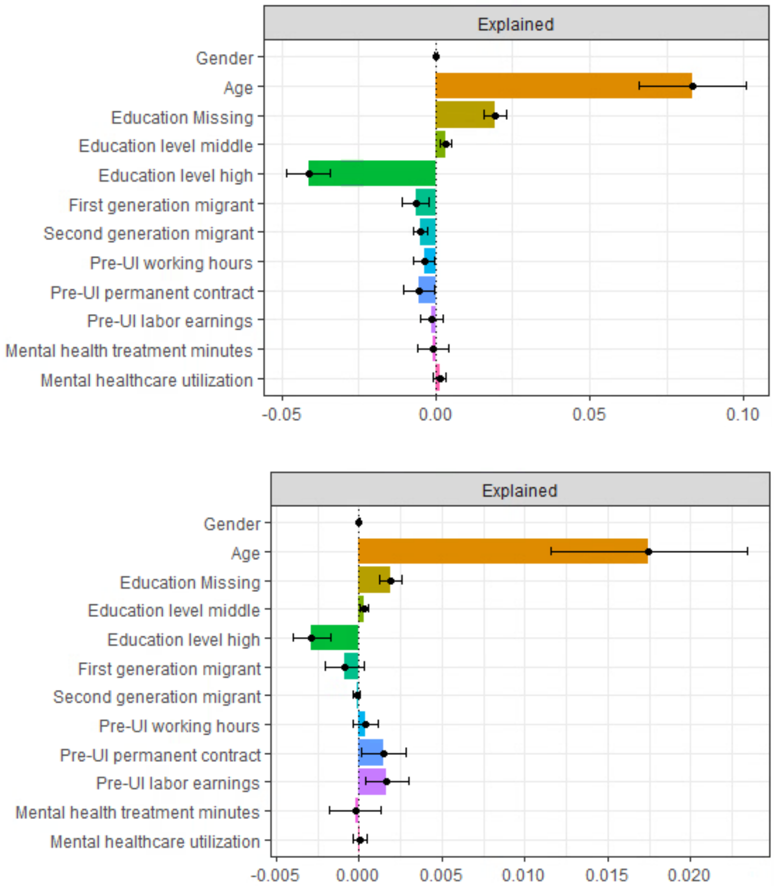
	Risk rates		**Demographics**			**Pre-UI outcomes**			**Health care utilization**		
Specification	**SI inflow**	**DI awards**	**Age**	**Male**	**Native**	**Hours worked**	**Earnings**[a]	**Fixed term**	**MH**[b] **treatment**	**MH minutes**	**Total spending**
Baseline model	0.66%**	0.07%**	-1.34**	-1.67%	-6.51%**	-2.65*	-5.58%*	4.23%**	0.29%	0.00	474.87
	(0.04)	(0.01)	(0.12)	(1.12)	(0.99)	(1.25)	(2.63)	(1.08)	(0.58)	(2.20)	(256.32)
Pre-spike of 6-3 months	0.66%**	0.07%**	-1.78**	-1.64%	-6.21%**	-2.92**	-6.78%**	3.76%**	0.94%*	0.85	-578.12*
	(0.04)	(0.01)	(0.10)	(0.90)	(0.79)	(1.00)	(2.10)	(0.86)	(0.47)	(1.76)	(205.20)
Polynomial elapsed UI spell	0.76%**	0.07%**	-1.30**	-1.85%	-6.76%**	-2.81*	-5.70%*	4.01%**	0.28%	-0.29	-542.04
	(0.04)	(0.01)	(0.12)	(1.13)	(0.99)	(1.25)	(2.63)	(1.08)	(0.58)	(2.20)	(256.02)
Flexible maximum UI entitlement groups	0.66%**	0.07%**	-1.39**	-2.30%*	-6.82%**	-2.73*	-5.15%	4.21%**	0.52%	0.22	-508.98*
	(0.04)	(0.90)	(0.80)	(1.13)	(1.00)	(1.26)	(2.63)	(1.08)	(0.58)	(2.21)	(257.07
Polynomial residual UI spell	0.63%**	0.05%**	0.41**	-2.20%*	-3.63%**	-2.38*	-2.52%	-0.07%	0.61%	0.32	-219.22
	(0.03)	(0.01)	(0.10)	(0.90)	(0.80)	(1.00)	(2.10)	(0.86)	(0.47)	(1.77)	(205.22)

*/** Difference is significant at a 5%/1% significance level.
[a] The outcome measure for earnings is log(Earnings+1). The estimated coefficient is approximately equal to the percentage difference in earnings between the pre-spike and spike cohorts.
[b]: MH = Mental Health

A.3 Synthesis – additional results

To determine to what extent compositional differences explain the spike in sickness reporting, we estimate the relative risk with and without control variables. This analysis shows that the impact of compositional differences is limited. In order to gain a better understanding of which variables explain part of the spike in sickness, we conduct an Oaxaca-Blinder decomposition on the spike in either sickness reporting or DI inflow.

Figure A.1: Oaxaca-Blinder decomposition of the spike in SI inflow



Figures A.1 shows the resulting Oaxaca-Blinder decompositions. The difference in SI inflow between the pre-spike and spike cohorts is 0.55 percentage points. Compositional differences between the two cohorts explain approximately 0.15 percentage points or 27% of the spike in inflow. Most notably, we see that the inclusion of age and educational attainment explains a substantial part of the spike in SI inflow. The other differences we observe, such as the migration background, pre-UI job characteristics, and healthcare utilization do not explain the difference in inflow into and subsequent outflow out of SI. Results for the spike in DI inflow are similar, albeit that the spike has a smaller absolute magnitude.

In light of the limited age differential between the pre-spike and spike cohort, the effect of age on the inflow into SI may appear striking. One explanation for this concerns the link between the workers' age and pre-UI labor market history. With maximum entitlement period dummies as controls, it is likely that the workers' age captures an important part of differences in pre-UI labor market histories. In particular, we can identify older workers with relatively short maximum entitlement periods that have experienced earlier unemployment spells and therefore have a weaker labor market position. These differences are also informative on the return-to-work probability of SI recipients.

A.4 Additional tables and figures

Figure A.2: Probability of exit into SI (left) or to start employment (right) for workers with UI benefits relative to their maximum UI duration ("t=0")

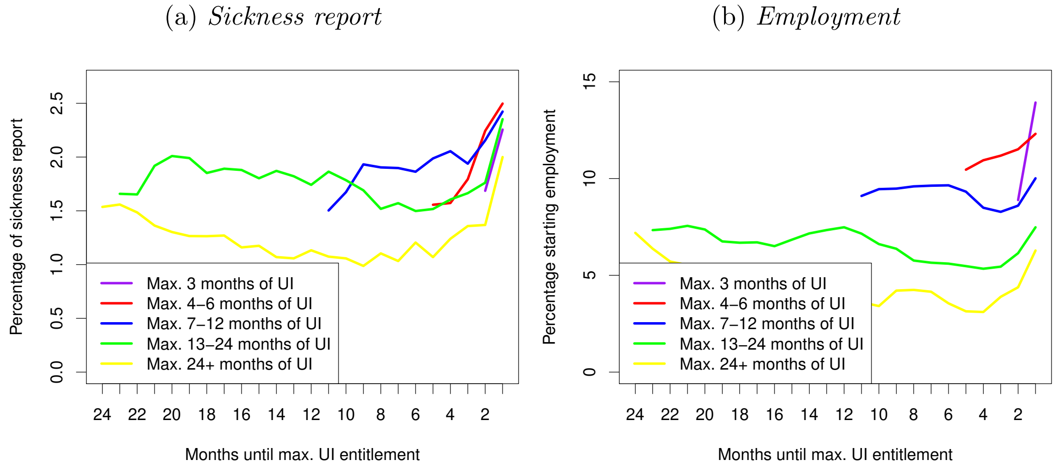


Figure A.3: Mental health treatment minutes received by workers on UI, and workers with an employment contract between 2012 and June 2015

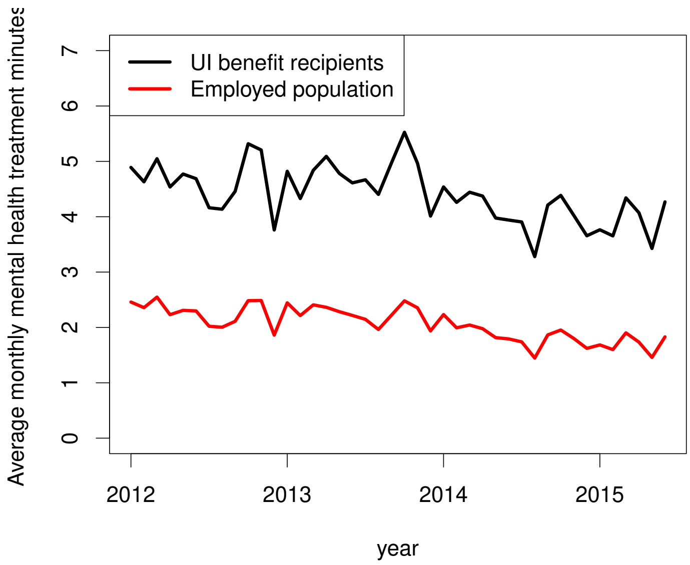


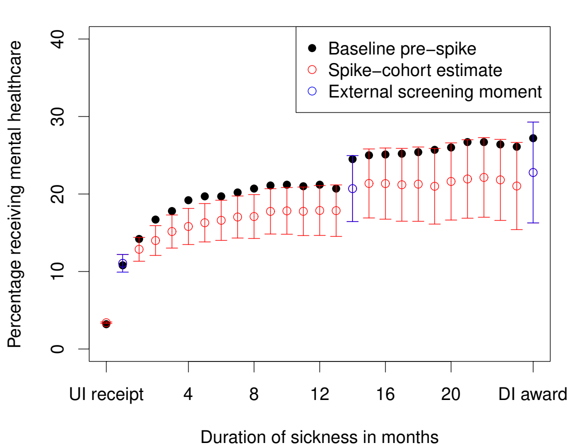
Table A.3: Estimated differences in characteristics of pre-spike and spike cohorts with UI benefits three and one month before UI benefit entitlement

	Stock sample UI recipients		**Sample SI applicants**		
Exit probabilities	3-month mean	Spike difference			
To SI benefits	1.9%	0.6%**			
		(0.0)			
To employment	8.7%	2.5%**			
		(0.1)			
Healthcare utilization:	3-month mean	Spike difference	3-month mean	Spike difference	Corrected spike difference[a]
Probability mental healthcare treatment	3.2	0.2**	10.8	0.2	0.0
		(0.0)		(0.6)	(0.6)
Mental health treatment minutes[c]	4.1	0.4**	22.6	0.0	-0.4
		(0.1)		(2.2)	(2.3)
Duration of treatment at end of UI in months[c]	5.0	0.1**	16.2	0.4	0.3
		(0.0)		(1.2)	(1.2)
Annual physical healthcare cost	1070	60**	2928	474	414
		(17)		(256)	(273)
Demographics:	3-month mean	Spike difference	3-month mean	Spike difference	Corrected spike difference[a]
Male	42.4%	1.5%**	43.2	1.7%	0.2%
		(0.16)		(1.13)	(1.29)
Age	32.5	1.9**	32.3	1.3**	-0.6**
		(0.02)		(0.12)	0.14)
Native	65.8%	-2.3%**	59.8%	-6.5%**	-4.2%**
		(0.13)		(0.99)	(1.12)
Years of education	13.5	0.1	12.5	0.0	-0.1
		(0.0)		(0.1)	(0.1)
Pre-UI employment outcomes:	3-month mean	Spike difference	3-month mean	Spike difference	Corrected spike difference[a]
Monthly number of working hours	92.4	3.4**	87.4	-6.8**	-10.2**
		(0.3)		(1.8)	(2.1)
Fixed-term contract	61.8%	3.2%**	66.8%	3.5%**	0.3%
		(0.0)		(1.1)	(1.1)
Log monthly labor earnings	7.4	-0.1**	7.2	-0.1*	0.0
		(0.0)		(0.1)	(0.1)
Number of workers	14258	12521	3969	3911	3911

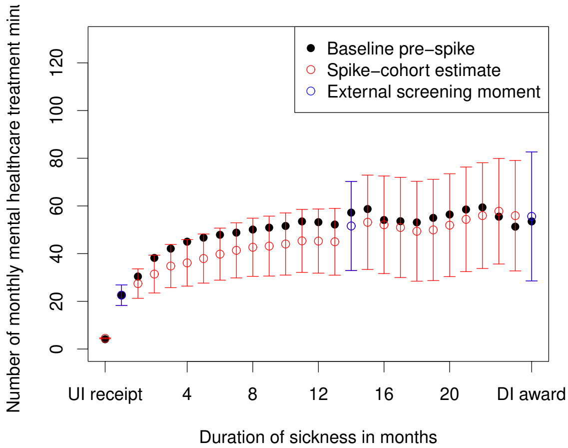
[a] Difference in composition between SI inflow cohorts (column 2) corrected for difference in composition between samples receiving UI (column 4), [b] Pre-UI employment outcomes measured in last month before entering UI; significant difference between cohort exiting three months and one month before maximum UI entitlement at: * a 10% significance level; ** a 5% significance level

Figure A.4: Estimated pre-spike and spike differences in (mental) healthcare utilization, based on (constant) outcomes at the end UI receipt (95% confidence intervals)

(a) Incidence



(b) Treatment minutes



(c) Residual duration minutes

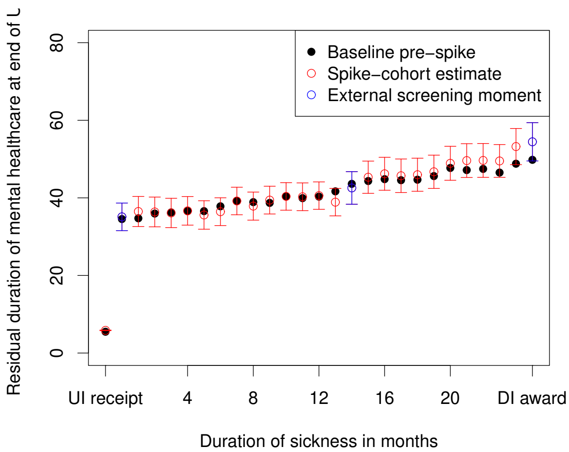


Figure A.5: Duration effects for exits into SI (left) and employment (right) across maximum UI entitlement groups, without control variables

(a) *Exits into SI* (b) *Exits into employment*

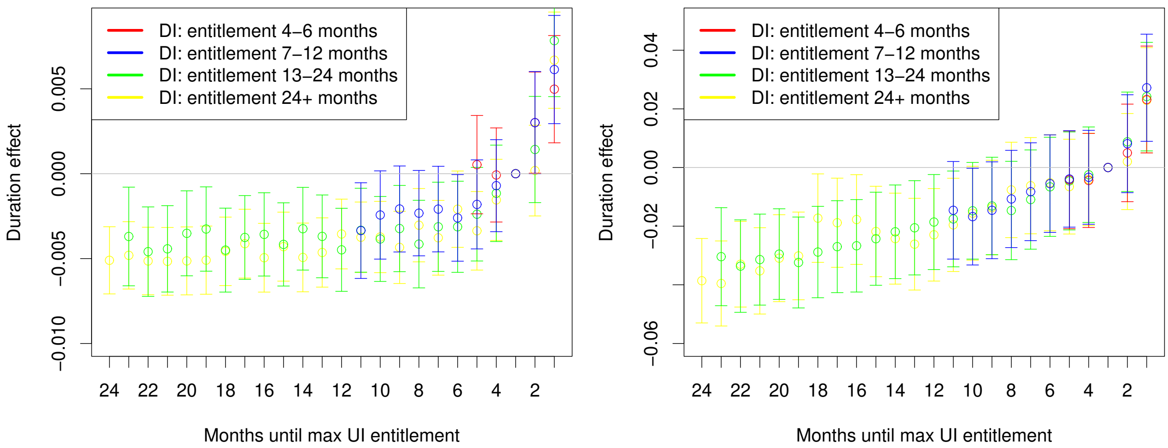


Figure A.6: Differences in the evolution of the incidence of mental health treatments of unconditional pre-spike and spike cohorts entering SI

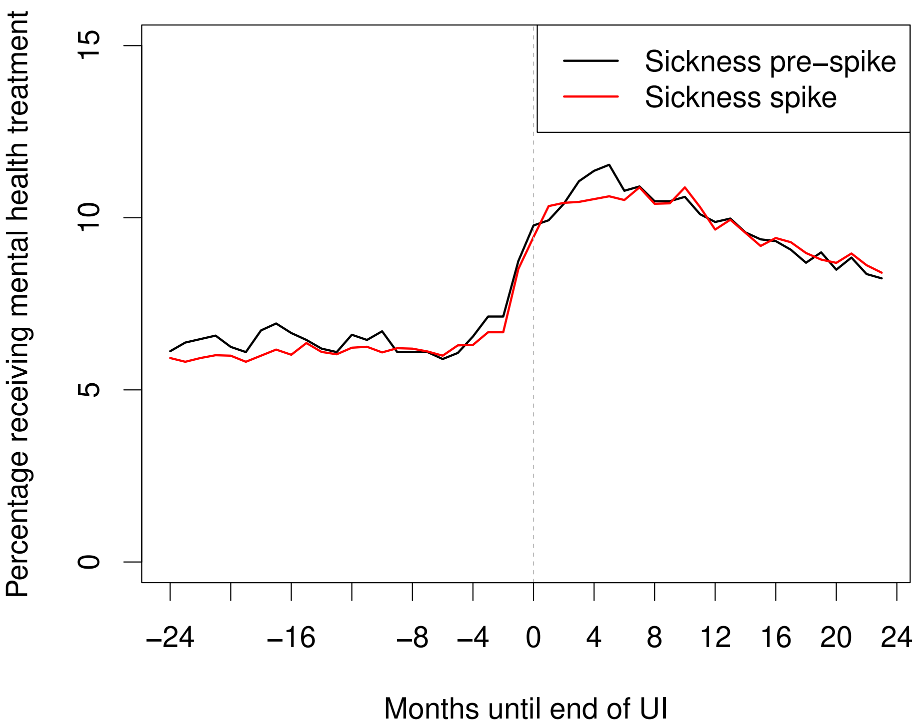
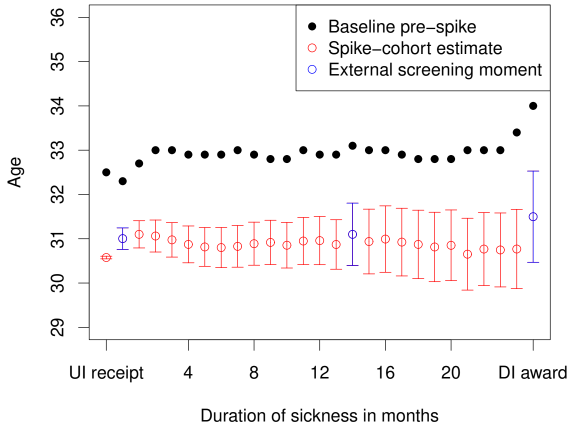
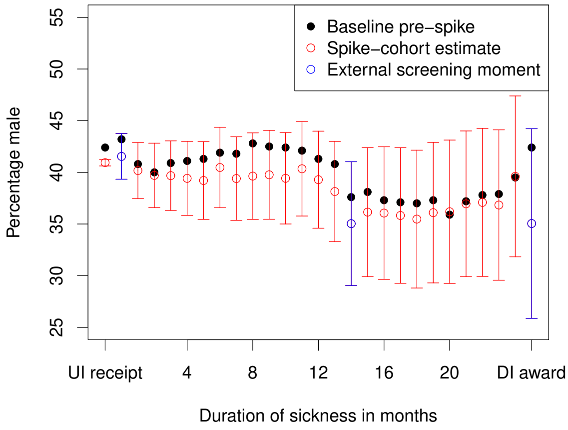


Figure A.7: Estimated differences in demographics of pre-spike and spike cohorts (95% confidence intervals)

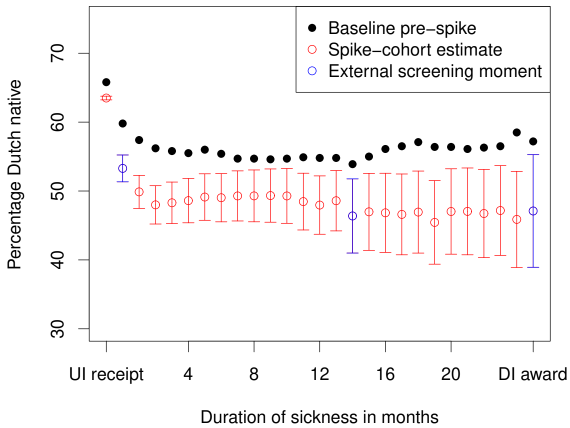
(a) Age



(b) Gender (% Male)



(c) Native (%)



(d) Years of education

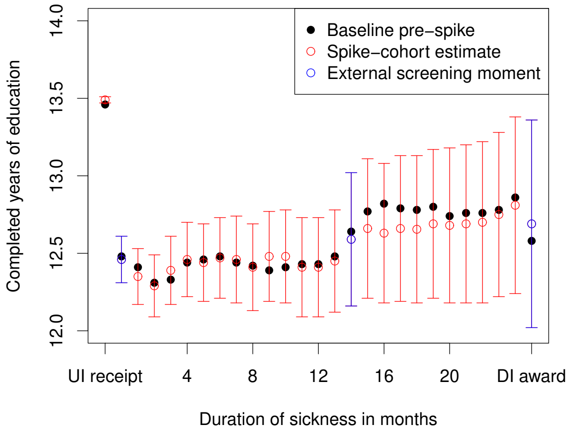
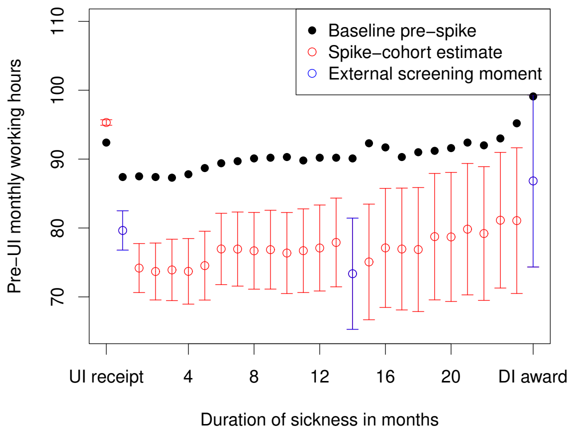
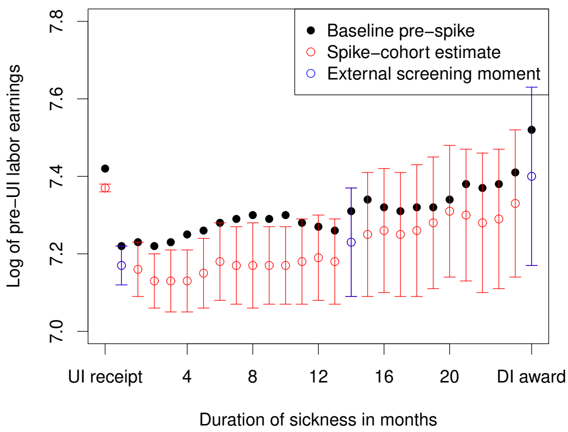


Figure A.8: Estimated differences in pre-UI job characteristics of pre-spike and spike cohorts (95% confidence intervals)

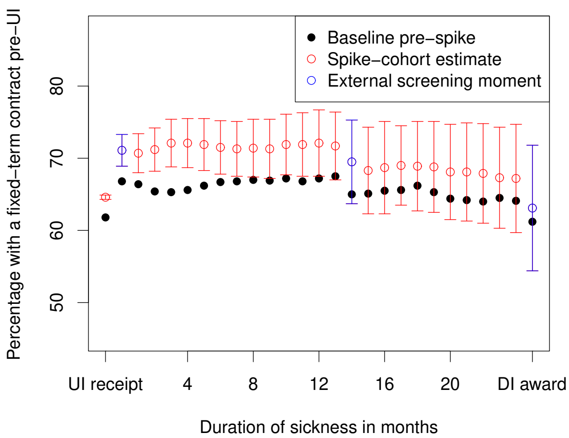
(a) Monthly working hours



(b) Log labor earnings



(c) Fixed-term contract



B Online Appendix

B.1 The impact of external screening

Our findings suggest that the health status of those entering SI before and at the end of UI entitlement is similar. Lower exit rates out of SI result in differences in the health status between the surviving cohorts. The figures on the persistence of the spike and the compositional differences suggest that these differences between the cohorts are partly offset during the first-year sickness assessment, as more individuals in the spike cohort are screened out.

We now formally test whether the observed differences are indeed counteracted by the first-year assessment and the DI assessment that takes place after two years of SI receipt. A natural way to do so is by comparing the award rates of pre-spike and spike workers before and after the first- and second-year assessments. Table B.1 therefore presents the average award probabilities of pre-spike and spike cohorts for the first-year assessments in columns (1) and (2) and for the final DI assessment in columns (4) and (5), respectively. In addition, it shows the corresponding relative probabilities in columns (3) and (6). The first line shows the observed (unconditional) award rates. Knowing that there are differences in the composition of both cohorts, we subsequently derive award rates based on the observed characteristics of the full sample of SI recipients. As such, we increasingly control for differences in observables that may change the implied conditional pre-spike and spike award rates.

For the first-year sickness assessment, workers in the spike cohort have a significantly lower probability of having an assessed degree of disability exceeding 35% and therefore are more likely to be screened out. Their award rate is 58.4%, as compared to 63.5% for the pre-spike cohort. Recall that this difference is mirrored by the drop in the relative risk of SI receipt for at least 12 months in Figure 4. Most notably, adding demographic controls results in conditional award rates of both cohorts that are markedly higher. When including both demographic and pre-UI job controls, the conditional relative award rate of the spike cohort increases from 0.92 to 0.95, indicating that part of the lower award rate stems from these variables. As expected, the inclusion of health controls does not significantly affect the difference in the probability of passing the first-year assessment. As an additional check, we interact the spike dummy with the health controls to test whether the impact of health differs for both cohorts. The estimated interaction terms are however insignificantly different from zero, implying that health has a similar effect on the probability of passing the first-year sickness assessment for both cohorts.

Table B.1: Decomposition of difference in probability of having an assessed degree of disability above 35% in the first year assessment or the final DI assessment

Specification	First-year assessment award rate			DI assessment award rate		
	Pre-spike cohort	Spike cohort	Ratio	Pre-spike cohort	Spike cohort	Ratio
Unconditional	63.5%	58.4%	0.92*	67.4%	66.6%	0.99
Cumulative controls[a]:						
Elapsed time in UI	59.6%	53.6%	0.90**	62.3%	59.2%	0.95
+ Demographics	70.5%	66.0%	0.94*	70.7%	69.2%	0.98
+ Pre-UI job characteristics	71.5%	67.6%	0.95	72.6%	71.5%	0.98
+ Health utilization	70.0%	67.1%	0.96	71.8%	71.0%	0.99
+ Interaction terms	69.9%	67.1%	0.96	72.8%	70.3%	0.97

*/** Difference between award rates is significant at a 5%/1% significance level.
[a]: With the estimation of models with subsequently added controls, we derive conditional award rates that are based on the full sample of SI recipients. As such, we control for compositional differences of the pre-spike and spike cohort, as compared to the full sample.

We conclude that the impact of the one-year-assessment is more substantial for workers in the spike cohort.

For the final DI assessment, we find that the observed award rates are comparable between the cohorts. The inclusion of control variables does not affect the remaining difference in the award probabilities. These results suggest that the first-year sickness assessment screens out more workers in the spike cohort, while the final DI assessment affects both groups similarly. In terms of the assessed degree of disability, both groups are therefore comparable. This again renders it unlikely that the spike in sickness reports is fully driven by rational maximizing behavior of relatively healthy workers.

B.2 Theoretical framework

To better understand the various potential mechanismsdriving the increased inflow into SI at the end of UI entitlement, we propose a simple theoretical framework in which an unemployed worker can choose to apply for SI during the UI benefit period. The following subsections discuss the setup of the framework and its predictions.

B.2.1 Model setup

Each period (month), unemployed workers decide whether to apply for sickness insurance (SI) or whether to stay on UI. These workers differ in their level of health h. Workers remain on

SI and (potentially) subsequently on DI for a combined total of N months.[27] If they are still eligible for UI after these N months, the choice problem is repeated. Once the elapsed time on UI, t, exceeds the total UI entitlement, T, workers can no longer choose to be on UI or SI but receive social assistance (SA). The benefit income from SA is lower than that from UI and SI (and may be equal to zero with partner income or with assets). The subsequent period's utility, U_{t+1}, is discounted by factor γ. Note that we do not model exits into employment directly, but incorporate these implicitly into the discount rate γ. A high probability of exiting into employment implies a lower net present value of social benefits, which is reflected by a lower value of γ. In this setting, the money utility in period t of respective valuation options can be written as:

$$U_t = \begin{cases} \sum_{j=1}^{N} \gamma^{j-1} \, b^{SI}(h) \, + \, \gamma^N \, U_{t+N} & \text{if on SI and } t \leq T \\ b^{UI}(h) \, + \, \gamma \, U_{t+1} & \text{if not on SI and } t \leq T \\ b^{SA}(h) + \gamma \, U_{t+1} & \text{if } t > T, \end{cases}$$

with b^{SI}, b^{UI} and b^{SA} as the money utility value of SI and potential subsequent DI benefit receipt, UI benefit receipt and SA receipt respectively. The value of SI benefits, b^{SI}, depends on the level of health h. Better health implies higher DI benefits resulting in a higher valuation of SI/DI receipt ($\frac{\delta b^{SI}}{\delta h} > 0$).[28]

If a worker decides to remain on UI, he/she has to adhere to ongoing UI job search requirements and meetings with caseworkers. The money utility value of UI benefits in one period, $b^{UI}(h)$, therefore consists of both the monetary benefits and the money disutility of the ongoing job search requirements. Adherence to these benefit conditions is more difficult for workers who are in poor health. Hence, the instantaneous money utility value of UI decreases as health worsens: $\frac{\partial b^{UI}}{\partial h} > 0$. There are similar job search requirements when on social assistance and hence the value of SA depends on the level of health as well ($\frac{\partial b^{SA}}{\partial h} > 0$).

For ease of exposition, we assume that both γ and N do not depend on the level of health h. If better health implies higher exit rates into employment, this could be modelled as a higher discount rate ($\frac{\delta \gamma}{\delta h} < 0$). Better health could also imply a shorter period of SI/DI receipt N, since healthier individuals are more likely to self-report recovery or to be screened out during the two-year SI period ($\frac{\delta N}{\delta h} < 0$). Additionally, we assume that the total duration of

[27]Note that benefits equal 70% of last earned wages for both SI and DI.

[28]Note that SI benefit levels are independent of health, while DI benefit levels are dependent on assessed health.

SI benefit receipt N is unaffected by delaying the SI application. As shown below, relaxing these three assumptions changes the incentives to delay, but not the general predictions.

B.2.2 Model predictions

To explain the implications of our model, we first analyze whether or not a worker would apply for SI at a given moment in the UI spell. Next, we analyze the decision to delay the SI application as a potential explanation for bunching at the moment of UI benefit exhaustion.

The decision to apply for SI

A worker chooses to apply for SI if the net present money utility value of doing so exceeds the net present money utility value of continued receipt of UI and SA benefits for the same duration. This tradeoff is shown in the following expression:

$$\underbrace{\sum_{j=1}^{N} \gamma^{j-1}\, b^{SI}(h)}_{\text{Net present utility value of SI}} \quad > \quad \underbrace{\sum_{j=1}^{T} \gamma^{j-1}\, b^{UI}(h) + \sum_{j=T+1}^{N} \gamma^{j-1}\, b^{SA}(h)}_{\text{Net present utility value of UI and SA}} \tag{B.1}$$

Worse health potentially increases the left-hand side of Equation (B.1) through higher expected DI benefit payments, and it decreases the right-hand side due to the increased cost of adhering to the UI and SA job search requirements. Unhealthy individuals are therefore more likely to apply for SI than healthy individuals at any moment during UI entitlement.

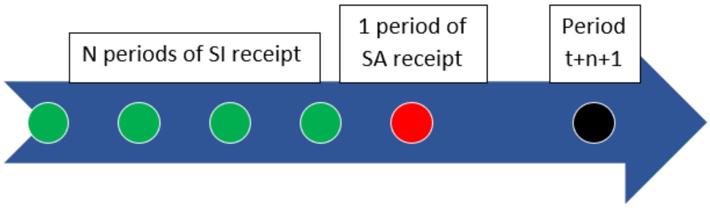
The decision to delay the SI application

Given that a worker decides to apply for SI, we now relax the assumption that the decision should be made at a given moment and instead allow the worker to delay the application. Figure B.1 illustrates this decision problem, showing how a one-month delay affects the outcome for a worker who has less than 13 weeks of remaining UI entitlement. Delaying the SI application by one month implies one month of extra UI benefit receipt, but this comes at the cost of receiving SI benefits one month later and losing one month of SA receipt. Algebraically, this comparison of option values simplifies to:

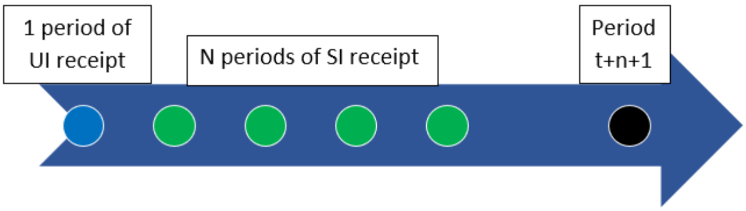
$$\underbrace{b^{UI}(h)}_{\text{Gained UI utility}} \quad > \quad \underbrace{(1-\gamma^{N})\, b^{SI}(h)}_{\text{Increased discounting of SI}} \quad + \quad \underbrace{\gamma^{N}\, b^{SA}(h)}_{\text{Lost SA receipt}} \tag{B.2}$$

Figure B.1: Choice problem for delaying SI application by one month

(a) Outcome without delay



(b) Outcome with a one-month-delay



The above equation shows that the worker will choose to delay the UI application if the money utility value of an additional month of UI receipt exceeds the loss incurred through discounting by receiving SI benefits one month later and one month less of SA receipt after SI benefits are terminated. This comparison is independent of the remaining UI entitlement. If a worker decides to delay by one month, it is thus optimal to delay as long as possible and apply in the last month of UI entitlement.[29]

The health conditions of a worker plays an important role in the trade-off between gained UI and lost SI/SA valuation. For unhealthy workers, adherence to the job search requirements is costly, resulting in limited gains from the extra month of UI receipt. A lower valuation of SA receipt potentially offsets this to some extent, but the SA receipt is discounted by N periods while the UI receipt is not discounted at all. The impact of bad health through gained UI receipt will therefore dominate. On top of this, the potentially higher level of DI benefits due to bad health results in a high valuation of SI receipt and hence high cost of receiving these SI benefits later. The gains from delaying the application for SI are limited, while the costs to do so are substantial. Unhealthy workers are therefore unlikely to delay their SI application.

Factors not related to health may also explain the worker's decision (when) to apply for SI/DI benefits. An important one concerns the level of stigma a worker experiences when receiving various types of social benefits. To simplify the illustration of the various incentives

[29]Workers who are not yet within the last 13 weeks of their UI entitlement have smaller incentives to delay SI applications. The maximum amount of benefits they can gain remains the same (13 weeks), but to attain this they need to delay for more months and hence incur the costs of delay for more periods. At the end of this section we illustrate the incentives to delay when the remaining UI entitlement period exceeds 13 weeks.

faced by workers, and the role of health in this process, our baseline model does not incorporate these other factors. In the Online Appendix Section B.2.3, we show that the results of this simplified model also extend to a more elaborate model that incorporates stigma effects.

In summary, our framework predicts that among those that choose to apply for SI/DI benefits, incentives to delay applications until the end of their UI entitlement period are strongest for relatively healthy workers. Given their stronger incentives to delay, they will be over-represented in SI applicant cohorts at the end of UI entitlement. This optimizing behavior of workers with relatively good health conditions also may explain bunching – and corresponding spike effects – at the end of UI entitlement.

Behavioral explanations

While our model framework provides a benefit maximization explanation for bunching where workers act rationally, we can think of extensions that incorporate behavioral failures. First, workers might be prone to status-quo bias, where high (perceived) switching costs to SI prevent workers from immediate applications. At the moment of UI benefit exhaustion, however, switching is unavoidable, either to SI or to SA. In effect, this also drives increased inflow into SI in the last month of UI benefit entitlement. As a second explanation, present bias may have an ambiguous impact. For workers with a high valuation of UI relative to SI, the gains of delay are in the present and costs lie in the future. For workers with a relatively high valuation of SI, however, delay translates to costs in the present as well as costs in the future. Present bias might therefore incentivize workers to delay their SI application, but also deter them from doing so. Finally, workers may have a lack of information on their eligibility to SI. Workers may therefore re-optimize when they become aware of their eligibility as they receive the letter just before the end of UI entitlement, and then decide to apply. As argued earlier, it is likely that many UI recipients are not aware of their SI entitlement at the start of their UI benefit receipt. The letter from UWV informs them that their SI eligibility ends together with UI eligibility, and that in case of sickness, they should apply for SI immediately.

The above-mentioned behavioral failures lead to application delays for all types of workers, regardless of their health status. This therefore allows us to compare the health outcomes of workers applying for SI at the end of their UI entitlement with those applying in the months prior to the end of their UI entitlement. When the health conditions of SI applicants at the end of their UI entitlement are less severe than those of applicants in earlier months, this can be interpreted as evidence of benefit-maximizing behavior.

B.2.3 Model extensions

In the theoretical framework discussed above, we make several simplifying assumptions in the theoretical framework for ease of exposition. First, we assume workers are within the last 13 weeks of their UI eligibility. Second, we assume that the discount rate γ and the duration of SI receipt N are independent of the level of health h. Third, we assume that N is fixed and not affected by the delay of the SI application. Lastly, we do not incorporate the role of additional factors such as stigma in the decision to apply for SI. In this section, we discuss the implications of relaxing some of these assumptions.

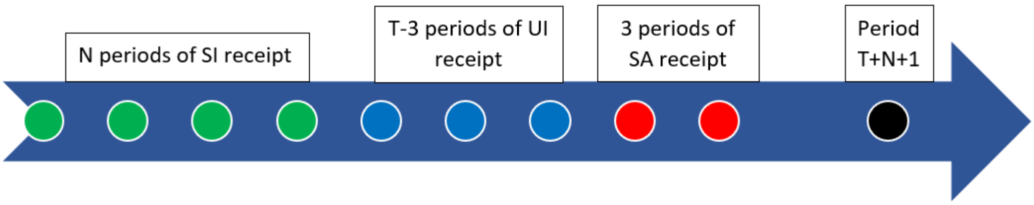
Length of UI entitlement

If workers have not yet reached the last 13 weeks of their UI entitlement, they only gain in terms of UI benefit receipt if their remaining UI entitlement after delay is less than 13 weeks. Only SI applications within the last 13 weeks of UI entitlement result in a "phase-in period" which is shorter than 13 weeks and thereby an increased duration of potential UI benefit receipt. For simplicity, we assume that if this worker decides to delay, he/she will do so as long as it is possible in order to gain as many additional months of UI receipt as possible. This worker thus has to delay their application for T months, to gain three months (13 weeks) of UI entitlement. This choice is illustrated in Figure B.2.

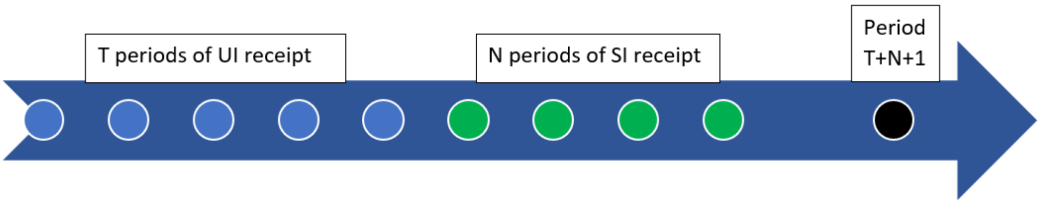
Delaying the SI application by T months implies that workers gain 13 weeks (three months) of UI benefit receipt, receive their SI benefits T month later, and lose three months of SA

Figure B.2: Choice problem for delaying SI application by T month

(a) Outcome without delay



(b) Outcome with a T months delay



receipt. The comparison of option values is as follows :

$$\sum_{j=1}^{T}\gamma^{j-1}b^{UI}(h)+\sum_{T+1}^{N+T}\gamma^{j-1}b^{SI}(h)+\gamma^{N+T}U_{N+T+1} \quad >$$
$$\sum_{j=1}^{N}\gamma^{j-1}b^{SI}(h)+\sum_{j=N+1}^{N+T-3}\gamma^{j-1}b^{UI}(h)+\sum_{j=N+T-2}^{N+T}\gamma^{j-1}b^{SA}+\gamma^{N+T}U_{N+T+1}$$

$$\underbrace{\sum_{j=1}^{T-3}\gamma^{j-1}b^{UI}(h)-\sum_{j=N+1}^{N+T-3}\gamma^{j-1}b^{UI}(h)+}_{\text{Earlier UI receipt}}\underbrace{\sum_{j=T-2}^{T}\gamma^{j}b^{UI}(h)}_{\text{three extra months of UI receipt}} \quad >$$
$$\underbrace{(1-\gamma^{T})\sum_{j=1}^{N}\gamma^{j-1}b^{SI}(h)+}_{\text{Lost valuation of SI}}\underbrace{\sum_{j=N+T-2}^{N+T}\gamma^{j}b^{SA}}_{\text{Lost SA receipt}}$$

In this case, the worker will delay the SI application if the increased valuation of receiving their UI benefit immediately, plus the valuation of the three additional months of UI benefit receipt, exceeds the sum of the loss of discounting the SI benefit receipt by T months and the loss of three months of SA benefit receipt. If the remaining UI entitlement exceeds 13 weeks, the maximum attainable benefits of delay are the same as when the remaining UI entitlement is less than 13 weeks. However, SI benefit receipt has to be delayed by a longer period, implying a larger loss through discounting. Incentives to delay are therefore smaller if the remaining

UI entitlement exceeds 13 weeks.

Discount rate dependent on health

In the baseline model, we assume that the discount rate γ is independent of the level of health h. This assumption can be violated for two reasons. First, time preferences could be directly impacted by negative health shocks (Rice & Robone, 2022). Second, exits into employment are modelled in the theoretical framework through the discount rate. A higher job-finding rate corresponds to a higher discount rate as future benefits payments become less likely. Individuals in better health could have higher job-finding rates, and hence a higher discount factor ($\frac{\delta\gamma}{\delta h} > 0$).

Modelling the discount rate as a function of health impacts the decision to apply for SI. As Equation (B.1) shows, SI, UI and SA are discounted by the same discount factor. But while subsequent SI benefit levels are constant, the r.h.s. of the equation is a weighted average of UI and SA benefits with different levels. Healthier individuals having a higher a higher discount factor place more weight on benefits received early (UI), and less weight on benefits received late (SA). If $b^{UI} > b^{SA}$, increased discounting because of better health decreases the likelihood of applying for SI. However, if $b^{UI} < b^{SA}$, the opposite holds. Given that benefits received on UI always exceed or are equal to benefits received on SA and that both benefit types include job search requirements, the value of receiving UI will exceed the value of receiving SA. As a result, increased discounting because of better health amplifies the general health effect on the decision to apply: healthier individuals are less likely to apply for SI.

We next consider the impact of the discount rate on the decision to delay. Equation (B.2) shows that the gain of delay does not depend on γ, while the cost of delay does. In particular, the derivative of the costs with respect to γ is equal to $N\gamma^{N-1} \cdot \big(b^{SA}(h) - b^{SI}(h)\big)$. The impact of (increased) discounting on the delay decision thus depends on the relative valuation of SA and SI. With better health, the value of SA will be higher and the value of SI will be lower. This renders it more likely that increased discounting increases the cost of delaying. This thus counteracts the direct impact of improved health. It should however be noted that the change in the cost of delay is relatively small, and second-order effect relative to the changes in the valuations of SI, SA, and UI benefit receipt.

Total duration of SI receipt N dependent on health

Our theoretical framework assumes that N, the total duration N of SI (and potentially subsequent DI) benefit receipt, is independent of the level of health. If healthier individuals are more likely to self-report recovery, or if they are more likely to be screened out during the sickness period, N would negatively depend on h.

When deciding whether to apply for SI, individuals compare the present discounted money utility values of receiving N months of SI with that of receiving N months of UI followed by SA once UI eligibility ends. A one-month increase in N implies that makes it more costly not to apply for SI: this results in the loss of one month of SI benefits, and the gains are one extra month of SA receipt with a lower benefit level.[30]. Hence, a longer total duration of SI benefit receipt due to worse health increases the probability of applying for SI, amplifying the results of the baseline model.

Examining the decision to delay the application, increased N due to worse health impacts the cost of discounting SI, and the cost of losing SA benefit receipt. Delay of SI application shifts one month of SI benefit receipt from the current period to month $N+1$. As N increases, SI receipt in month $N+1$ is discounted stronger, increasing the cost of delay. Reversely, delay results in one month of SA receipt lost in month $N+1$. As N increases, the potential net present value of this month of SA receipt decreases, reducing the cost of delay. However, for unhealthy individuals B^{SI} most likely exceeds B^{SA}, and the discounting effect of SI thus dominates. This implies that increased total SI benefit receipt N due to worse health makes unhealthy individuals less likely to delay their SI application, strengthening the impact of health on the decision to delay as discussed in the baseline model.

Total duration of SI receipt N affected by delay

We have assumed that the duration of SI benefit receipt is unaffected by the delay of the application. One could argue that this is unlikely to hold, as workers need to exit SI once they recover. In the most extreme case, this would imply that the duration of SI benefit receipt decreases one-to-one with the duration of the delay. Delaying an SI application would then imply a re-labelling of SI benefit receipt to UI benefit receipt, without affecting the total combined duration of the benefit receipt. The amount of benefits received under UI is equal to the amount received under SI while the search requirements are arguably a costly aspect of

[30]This assumes that the total duration of SI benefit receipt N exceeds the remaining UI eligibility T.

UI. Under this scenario, delaying an SI application would therefore be highly unlikely. In other scenarios in which the duration of SI benefits reduces less than one-to-one with the duration of the delay, the same reasoning as illustrated above still holds as the cost of delay is unaffected while the gain of delay is reduced. As a result of this, the requirements for the delay to be beneficial become more stringent. Conditional on these more stringent requirements on delay, the impact of health on the decision to delay remains the same.

The role of stigma

Lastly, our framework models the impact of health on the decision to apply for and potentially delay an SI application, but does not incorporate alternative factors that might affect this decision, such as stigma experienced when receiving SI benefits. Extending the framework to incorporate such stigma, as done below, does, however, lead to similar conclusions.

To incorporate stigma, we allow workers to differ in two dimensions: their level of health h, and the stigma s they experience when receiving SI benefits.[31] There might be a stigma attached to the receipt of SI (and DI) benefits and hence its valuation depends negatively on s ($\frac{\delta b^{SI}}{\delta s} < 0$). The level of stigma is assumed to be negatively correlated with the level of health, as wrongful use by healthy individuals is more likely to result in non-pecuniary costs.

To explain the implications of this extended model, we classify four types of workers. These workers differ in two dimensions, their level of health (h) and the stigma (s) they experience when receiving SI benefits. Table B.2 shows how the relative valuations of UI, SI and SA differ between these four types (and the corresponding model predictions which we discuss below). Healthy workers experiencing a high level of stigma when receiving SI benefits have a relatively low valuation of SI compared to both UI and SA. If the level of stigma experienced by these healthy workers decreases, their valuation of SI receipt increases and surpasses the value of SA (and potentially UI) receipt. For unhealthy workers the cost of adhering to the job search requirements of UI and SA is high, resulting in a relatively low b^{UI} and b^{SA}. The value of receiving SI is likely to be higher than that of UI, even among individuals experiencing high stigma when on SI. In what follows, we first analyse whether or not these four types of workers would apply for SI at a given moment in the UI spell. Next, we analyse the decision to delay the SI application as a potential explanation for bunching at the moment of UI benefit exhaustion.

[31] Sigma (s) can also be interpreted as a measure of the relative valuation of leisure. Low stigma and a high valuation of leisure have similar implications in the model.

Table B.2: Classification of worker types based on their relative valuation (b) of UI, SI and SA benefits and the model predictions for these worker types

	Healthy workers	**Unhealthy workers**
High stigma of SI benefit	$b^{SI} < b^{SA} < b^{UI}$ Do not apply for SI benefits	$b^{SA} < b^{UI} \lesseqgtr b^{SI}$ Do apply for SI benefits Limited incentives to delay application[a]
Low stigma of SI benefit	$b^{SA} < b^{UI} \lesseqgtr b^{SI}$ Do apply for SI benefits Incentives to delay application	$b^{SA} < b^{UI} < b^{SI}$ Do apply for SI benefits No incentives to delay application

[a]: Most unlikely scenario: stigma is likely to decrease as health deteriorates

The decision to apply for SI

A worker chooses to apply for SI if the net present money utility value of doing so exceeds the net present money utility value of continued receipt of UI and SA benefits for the same duration. This dilemma is shown in the following expression:

$$\underbrace{\sum_{j=1}^{N} \gamma^{j-1}\, b^{SI}(h,s)}_{\text{Net present utility value of SI}} \quad > \quad \underbrace{\sum_{j=1}^{T} \gamma^{j-1}\, b^{UI}(h) + \sum_{j=T+1}^{N} \gamma^{j-1}\, b^{SA}(h)}_{\text{Net present utility value of UI and SA}} \tag{B.3}$$

Similar to in our standard model, unhealthy individuals are more likely to apply for SI than healthy individuals, for a given level of stigma. The level of stigma individuals experience when on SI only affects the left-hand side of Equation (B.3). Higher levels of stigma result in a lower valuation of SI, and hence a higher level of stigma reduces the likelihood to apply for SI. The model thus predicts that healthy individuals experiencing a sufficiently high level of stigma do not apply for SI. If the stigma experienced by healthy workers decreases to a sufficiently low level, they will apply for SI benefits. Reversely, unhealthy workers will apply for SI benefits. For unhealthy workers experiencing a high level of stigma to apply for SI, the health issues have to be large enough to offset the experienced stigma (see Table A.1).[32]

[32]The threshold for being classified as healthy or unhealthy could be different depending on the experienced level of stigma.

The decision to delay the SI application

For the decision to delay the SI application, the same comparison between gained UI utility and lost utility though the discounting of SI and the loss of SA receipt still holds:

$$\underbrace{b^{UI}(h)}_{\text{Gained UI utility}} > \underbrace{(1-\gamma^N)\, b^{SI}(h,s)}_{\text{Increased discounting of SI}} + \underbrace{\gamma^N\, b^{SA}(h)}_{\text{Lost SA receipt}} \tag{B.4}$$

Both the level of health and the stigma workers experience when on SI benefits play an important role in the trade-off between gained UI and lost SI/SA valuation as shown in Table A.1. For unhealthy workers, adhering to the job search requirements is relatively costly, resulting in limited gains from the extra month of UI receipt. A lower valuation of SA receipt potentially offsets this to some extent, but the SA receipt is discounted by N periods while the UI receipt is not discounted at all. The impact of bad health through gained UI receipt will therefore dominate. On top of this, the potentially higher level of DI benefits due to bad health results in a high valuation of SI receipt and hence high cost of receiving these SI benefits later. The gains from delaying the application for SI are therefore limited, while the costs to do so are substantial. Unhealthy workers are therefore unlikely to delay their SI application. For these unhealthy workers, higher experienced stigma would lower the lost valuation of SI and make it more beneficial to delay the application. The stigma would however have to be sufficiently large to offset the low gains of delay. This is unlikely to be the case, as stigma tends to decrease as health deteriorates.

For healthy workers experiencing low stigma from SI, the reverse story holds: the cost of ongoing search requirements in UI is relatively low, resulting in large gains from delay. These lower costs of ongoing search requirements also result in larger costs of lost SA receipts and the low stigma results in larger costs from increased discounting of SI partly offsetting the incentives to delay. However, the impact of health on the decision to delay implies that the incentives for healthy workers with low stigma are always larger than the incentives for unhealthy workers with low stigma. When comparing healthy workers with low stigma to unhealthy workers with high stigma, stigma and health have opposing impacts on the incentives to delay. The incentives to delay are likely still stronger for these healthy workers, given that improved health directly impacts the gains of delay while the impact of a decrease in stigma on the valuation of SI is discounted by a factor $1-\gamma^N$.

Summing up, our framework predicts that three types of individuals apply for SI: healthy workers with low stigma, and unhealthy workers with either high or low stigma. Among these three worker types, the unhealthy workers with low stigma will not delay their SI application implying that the health of workers who do delay will on average be better than the health of workers applying before the end of their UI entitlement, even in the unlikely case where the incentives to delay for healthy workers with low stigma are as large as those for unhealthy workers with a high level of stigma (see Table A.1).[33] If the incentives to delay for healthy workers with low stigma are larger than those of unhealthy workers with high stigma, the health differences are amplified. The theoretical framework thus shows that if the rational decision to delay SI applications in order to maximize the total duration of benefit receipt drives potential bunching behavior at the end of UI entitlement, workers applying at the end of their UI entitlement will on average be healthier than those applying before the end of their UI entitlement.

[33] The average health of SI applicants is a weighted average of healthy low stigma, unhealthy low stigma and unhealthy high stigma. Given the incentives to delay, healthy workers with low stigma (and potentially unhealthy workers with high stigma) will be over-represented when looking at the population applying for SI at the end of UI entitlement resulting in on average better health.