Do Job Seekers Understand the UI Benefit System (and Does It Matter)?*

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Abstract

We study how job seekers' understanding of the unemployment insurance system affects their labor market performance. Combining data from a large-scale field experiment, detailed administrative records, and a survey of unemployed job seekers, we document three main results. First, job seekers exhibit pronounced knowledge gaps about the prevailing benefit rules and their personal entitlements. Second, we show that a low-cost information strategy using a personalized online tool increases job seekers' understanding of these aspects. Finally, we document heterogeneous labor market effects of the intervention based on its timing during the benefit spell and individuals' personal risk of long-term unemployment.

Keywords: Unemployment Benefits, Labor Supply, Field Experiments, Information Frictions, Labor Market Policy

JEL codes: J68, D83, C93

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1 Introduction

Unemployment insurance (UI) systems in modern labor markets are riddled with a multitude of rules and regulations that shape job seekers' incentives to work and search for employment. These rules include regulations governing benefit entitlements (Card and Levine, 2000; Schmieder et al., 2012, 2016), activity requirements (Lalive et al., 2005; Arni et al., 2013), and work allowances while receiving UI benefits (Caliendo et al., 2016; Benghalem et al., 2023). The regulations serve important objectives in providing financial means to job seekers, while trying to minimize moral hazard problems that commonly arise in social insurance systems (Hopenhayn and Nicolini, 1997; Krueger and Meyer, 2002; Acemoglu and Shimer, 2000; Chetty, 2008). However, the complexity of the rules may hinder job seekers' understanding of their situation, potentially distorting their decision-making.[1]

In this paper, we study the interplay between job seekers' understanding of the UI system and their labor market outcomes. Our analysis proceeds in three steps. Using a large-scale survey, we first document that UI recipients in Denmark exhibit significant knowledge gaps regarding their own benefit entitlements and the rules that govern them. We find that the lack of understanding is not limited to detailed regulations that apply to only a few job seekers. Rather, job seekers' knowledge gaps extend to two core dimensions of the UI system. First, over 40% of job seekers have beliefs about their remaining benefit entitlements that deviate from their actual entitlements by four weeks or more. On average, their estimates are off by over two months, with approximately equal shares of individuals overestimating and underestimating their entitlements. Second, the Danish UI system has intricate regulations that (1) allow unemployed workers to receive part-time benefits, enabling them to use their initial entitlements in a flexible way, and (2) permit them to extend their original entitlements by taking up work after registering for UI benefits. Specifically, each hour of work increases an individual's overall entitlements by an additional two hours. Through this mechanism, UI recipients can flexibly extend their benefit period from an initial two years to a maximum of three years. In our survey, however, we find that a large fraction of job seekers are either unaware of these extension possibilities, or systematically underestimate their generosity and the associated incentives to take up work opportunities.

In a second step, we conducted a randomized controlled trial among all UI recipients in Denmark (N$\sim$98,000) to examine whether a low-cost information strategy could enhance their understanding

[1] Complex rules are not necessarily inefficient; they can reduce moral hazard and act as a screening device, thereby potentially enhancing the targeting of social programs (Kleven and Kopczuk, 2011).

of the UI system. We encouraged treated job seekers to use an online information tool, which is embedded in the official online platform of the public employment service. This tool provides up-to-date, personalized information on two central elements of the UI system: (1) individuals' current entitlements, that is, the remaining period before their benefits expire, and (2) their options to extend these entitlements by working extra hours. By linking the data from the experiment to our online survey, we show that promoting the use of the information tool significantly enhances job seekers' understanding of these dimensions.

Finally, using detailed administrative records, we examine how job seekers' enhanced knowledge influences their labor market integration over up to two years following the intervention. Our empirical analysis accounts for the fact that Danish job seekers can exit UI not only by securing a new job but also by accessing other public transfer programs, allowing them to stop searching without transitioning to paid employment.[2] We document behavioral responses along both dimensions. While the average labor market effects of our intervention are relatively small and not statistically significant, we find substantial heterogeneity depending on two factors directly linked to job seekers' incentives within the UI system. Specifically, we focus on (1) individuals' elapsed benefit duration at the onset of the intervention, i.e., the entitlements they have already used, and (2) their overall risk of relying on UI for an extended period. We refer to this as the risk of long-term unemployment, which reflects job seekers' personal prospects of securing a new (full-time) job, as well as their ability to exit UI without starting new employment (e.g., due to the availability of other transfers or personal savings).

For long-term unemployed individuals who have been receiving UI benefits for over a year, the intervention decreases overall working hours and earnings by approximately 2.3% within 24 months compared to similar job seekers in the control group. While there are no significant treatment effects on the extensive margin of employment, the intervention encourages a shift from full-time employment to smaller work opportunities where individuals work only a few hours per week. This suggests that the treatment leads to a reduction in the intensive margin of employment (i.e., average weekly working hours) among those nearing benefit expiration, who typically face strong incentives to secure new employment.[3]

Conversely, we find positive labor market effects for individuals treated within the first six

[2]Depending on their situation, job seekers are often eligible for other public benefits, such as sickness or disability benefits, parental leave, and early retirement payments, which do not require active job search.

[3]It has been empirically documented in various settings that job seekers' effort (Marinescu and Skandalis, 2021) and job-finding rates (Katz and Meyer, 1990; Fallick, 1991; Van Ours and Vodopivec, 2006; Card et al., 2007; DellaVigna et al., 2017) tend to increase as UI benefits near expiration.

months of their benefit period, provided they have a low risk of long-term unemployment. In this group of unemployed workers, who are expected to have relatively strong labor market prospects or attractive alternatives to job search (such as eligibility for transfer programs with no search requirements), the treatment significantly increases employment by 1.3%, along with working hours and earnings, which both rise by 1.7%. Notably, these employment effects are accompanied by a reduced likelihood of exiting UI for other public transfer programs that do not require active job searching. This suggests that our intervention boosts the labor supply of individuals who are potentially in high demand, but would otherwise not participate in the labor market.

We illustrate how these effects can arise in a labor supply framework where individuals balance their trade-off between consumption and non-working time, while having the option to exit UI into non-employment and facing uncertainty about the availability and stability of job opportunities. When individuals become aware of the relatively generous extension possibilities, this theoretically influences their labor supply through two distinct mechanisms. On the one hand, workers who learn about the extension option perceive higher returns to work, as additional working hours are rewarded not only through wage payments but also by securing further benefit entitlements. This *substitution effect* incentivizes treated workers to increase their labor supply. Consistent with our empirical findings, this effect should be particularly pronounced for individuals with limited work incentives in the absence of an extension possibility, such as (1) those at the beginning of their benefit spell or (2) those having attractive alternatives or high utility costs of work. On the other hand, the additional benefits that individuals gain from working create an *income effect*, leading them to reduce their labor supply. Upon realizing that their work activities will extend (or have already extended) their entitlements, individuals may reduce their working time to take advantage of the additional benefits. This mechanism should be particularly relevant when strong work incentives exist in the absence of our intervention, such as for job seekers nearing benefit expiration.

This interpretation of the observed effects rests on the assumption that treated workers adjust their labor supply since they learn about the UI extension possibilities. However, it is also conceivable that the labor market effects stem from two additional features of our intervention. First, the online tool informs individuals not only about how to extend their benefit period but also about their current entitlements. Second, treated individuals might infer from our intervention that their work activities are being closely monitored by the public employment service. Both factors could influence the labor supply decisions of treated workers independently of their understanding of the benefit extension rules. To investigate this possibility, we examine additional survey responses on (1) beliefs

about current entitlements and (2) perceptions of being monitored. Our analysis indicates that these factors alone cannot explain the heterogeneous labor market effects of our intervention.

Our paper adds new insights to a growing literature showing that unemployed workers face substantial information frictions. Previous studies highlight that job seekers commonly lack information about the general labor market situation and potentially promising matches (see, e.g., Conlon et al., 2018; Altmann et al., 2018, 2022; Belot et al., 2019, 2022; Mueller et al., 2021; Hensvik et al., 2023).[4] We contribute to this literature by documenting substantial knowledge gaps about core features of the UI system itself. Moreover, our analysis suggests that digital tools offer a promising, low-cost solution to address these knowledge gaps (see also Fuentes et al., 2017; Belot et al., 2019).

Perhaps most closely related to our study is the contemporaneous work by Benghalem et al. (2023), who inform job seekers about the existence of a French part-time unemployment program and find that this increases individuals' propensity to work part-time while receiving UI benefits, but reduces their exit rate from unemployment.[5] While their study provides valuable insights on the effects of UI extension policies, our paper extends the literature along four key dimensions. First, Benghalem et al. (2023) focus on first-time unemployed workers who have been unemployed for a relatively short period; our data, by contrast, encompass the full population of UI recipients, enabling us to examine heterogeneous effects of benefit extension options across a much broader set of job seekers. Second, we analyze a system in which UI recipients can accrue *additional* benefit entitlements through part-time or short-term work. This feature creates work incentives that go beyond the part-time benefit provision studied in Benghalem et al. (2023). We find that these extension opportunities increase labor supply among individuals who might otherwise not participate in the labor market. At the same time, we document an increased take-up of part-time jobs among individuals already facing relatively strong work incentives, leading to lock-in effects that can delay full labor market reintegration.[6] Third, by combining the data from our RCT with rich administrative data, we provide detailed evidence on both extensive- and intensive-margin effects on

[4]Interventions addressing knowledge gaps in other, related domains focus on educational choices (see, e.g., Hastings and Weinstein, 2008; Jensen, 2010; Bettinger et al., 2012; Wiswall and Zafar, 2014), social security (Liebman and Luttmer, 2015; Finkelstein and Notowidigdo, 2019; Cairo and Mahlstedt, 2023), tax credits (Chetty and Saez, 2013; Bhargava and Manoli, 2015), or medicare (Kling et al., 2012).

[5]Complementing our exploratory analysis of treatment spillovers in Section 5.4, Benghalem et al. (2023) also convincingly show that their intervention induces no spillover effects among unemployed workers, using a clustered randomized design.

[6]These lock-in effects are consistent with Benghalem et al. (2023)'s findings and prior non-experimental studies that have examined the effects of "non-regular" jobs across several countries, including Austria (Böheim and Weber, 2011), Belgium (Cockx et al., 2013), Denmark (Kyyrä et al., 2013), Finland (Kyyrä, 2010), France (Auray and Lepage-Saucier, 2021), Germany (Caliendo et al., 2016), Norway (Godøy and Røed, 2016), Switzerland (Gerfin et al., 2005), the UK (Booth et al., 2002) and the US (Heinrich et al., 2005; Autor and Houseman, 2010). Such arrangements often induce short-run lock-in effects, though some have been associated with positive longer-term outcomes.

employment, earnings, and the take-up of other public transfers. Our results underscore that all of these margins are important for understanding job seekers' responses to the intervention. Furthermore, by integrating the RCT with a comprehensive follow-up survey, we are able to identify direct causal effects of the intervention on job seekers' knowledge and to explore alternative mechanisms through which the intervention may influence labor market outcomes.

Finally, our intervention differs from the aforementioned study and other information interventions by using a digital tool that delivers personalized information tailored to job seekers' specific situations, rather than providing abstract generic information about benefit rules.[7] This positions our paper within an emerging literature that studies the potential and limitations of digital tools in job search advice (e.g., Belot et al. 2019, Altmann et al. 2022, Bied et al. 2023, Hensvik et al. 2023, Behaghel et al. 2024). The possibility to tailor information policies to workers' specific situations appears particularly important in light of our result that an enhanced understanding can have unintended consequences if the underlying incentives promote short-sighted behavior, such as taking part-time jobs that may hinder or delay labor market integration. Against this backdrop, providing tailored information to job seekers who would genuinely benefit from a better understanding of the rules—such as those at the start of their benefit period in our setting—could improve overall welfare.

Our paper also contributes to the empirical literature on the effects of UI on search and labor market outcomes. More generous UI coverage encourages less intensive job search (Marinescu, 2017; Lichter and Schiprowski, 2021), increases time spent in unemployment (Katz and Meyer, 1990; Card and Levine, 2000; Lalive et al., 2006; Van Ours and Vodopivec, 2006; Chetty, 2008; Schmieder et al., 2012, 2016), and has ambiguous effects on the quality of job matches (Van Ours and Vodopivec, 2008; Centeno and Novo, 2009; Nekoei and Weber, 2017; Le Barbanchon et al., 2019). In this context, we provide new insights from a system with "flexible generosity", where benefit recipients can extend their entitlements by exerting additional effort after their initial UI registration. Since this prevents job seekers from accessing other public transfers, we also contribute to a small literature on the incentive effects of alternative programs, including sickness benefits (Larsson, 2006; Henningsen, 2008; Van Den Berg et al., 2019), disability benefits (Koning and Van Vuuren, 2007, 2010; Mueller et al., 2016), and early retirement schemes (Inderbitzin et al., 2016; Lammers et al., 2013) among

[7] In a parallel study, Cairo and Mahlstedt (2023) examine the labor market effects of personalized versus generic information on work requirements and punitive sanctions for social welfare recipients in Denmark—a more disadvantaged group with different incentives than the UI recipients in our setting. Their findings highlight the importance of the *type* of information in shaping workers' labor market responses.

UI recipients.

The remainder of the paper is organized as follows. Section 2 provides an overview of the Danish UI system and outlines existing knowledge gaps. Section 3 details the design of our randomized controlled trial, while Section 4 examines the knowledge effects of our intervention. In Section 5, we present the effects on labor market outcomes and discuss the underlying mechanisms. Finally, Section 6 concludes.

2 Benefit Rules and Knowledge Gaps

In this section, we provide a brief overview of Denmark's social protection system, with a focus on unemployment benefit regulations. We then examine job seekers' knowledge gaps regarding the prevailing benefit rules and their personal benefit entitlements.

2.1 Social protection in Denmark

Unemployment insurance: Unemployment insurance (UI) in Denmark is organized in a voluntary opt-in system, where unemployed workers are eligible to receive UI benefits for a guaranteed period of two years if they have paid contributions for at least 12 months within the last three years. The level of monthly benefits is fixed at 90% of a worker's prior wage earnings, up to a ceiling of DKK 18,866 per month before taxes (equivalent to approx. €2,500; values for 2019). Around 85% of Danish wage earners participate in the insurance system. Roughly 75% of UI benefit recipients receive the maximum amount of benefits, yielding an effective average replacement rate of approximately 60%. To maintain eligibility for UI, benefit recipients must actively seek employment and document their job search activities.

Extensions and sanctions: The guaranteed two-year benefit period corresponds to 3,848 hours of UI benefits ($= 104 \times 37$ hours—the full-time working hours of Denmark's official work week). UI recipients can consume these entitlements in a flexible manner. Specifically, individuals who work in part-time or short-term jobs after registering as unemployed receive UI benefits for all non-working hours, calculated as the difference between the full-time work week of 37 hours and their actual working hours in a given week. Moreover, workers accrue additional benefit entitlements by working during unemployment. Specifically, for each hour worked within the guaranteed two-year benefit period, a job seeker receives two hours of additional UI benefit entitlements. Hence, each hour worked (1) saves one hour of entitlements *and* (2) generates two additional hours of entitlements.

Appendix Figure A.1 illustrates the extensions resulting from short episodes of part-time (Case 1) or full-time (Case 2) employment after registering for UI benefits. Through this mechanism, individuals can extend the total duration of UI receipt by an additional 1,924 hours, which is equivalent to one extra year of benefit payments. Individuals qualify for the maximum extension if they have worked the equivalent of 6 months of full-time employment, and UI benefits expire no later than 42 months (=24 + 6 + 12 months) after the initial UI registration. During this period, the benefit level remains constant depending on the worker's wage prior to the initial UI registration.

In addition to the extension option, the UI system includes a small benefit sanction for job seekers who do not take up any employment while receiving UI benefits. Specifically, benefit payments are suspended for one day—a qualifying day—every four months if the UI recipient has not accumulated the equivalent of four full-time work weeks within the preceding four-month period.

Social assistance and other transfer programs: When UI benefits expire, unemployed workers can apply for social assistance, which provides substantially lower and means-tested benefits. For a single person, social assistance amounts to maximally DKK 11,423 per month—roughly 60% of the maximum UI benefit level (values for 2019).

Besides UI benefits and social assistance, job seekers in Denmark are commonly eligible for other public transfer programs, which enable them to exit UI without transitioning to paid employment (for overviews, see Andersen, 2019; European Commission, 2024). For eligible individuals, these programs typically provide benefit payments equal to UI, but they do not require recipients to actively seek employment. For instance, individuals who claim illness and present a medical certificate can receive sickness benefits for up to 22 weeks, or disability benefits if they are incapable of working for longer periods. Workers aged 62 and older are eligible for early retirement schemes, allowing them to rely on pension payments instead of UI. Parents of young children can (jointly) receive parental leave benefits for up to 48 weeks. Finally, individuals qualify for educational benefits when they enroll in a secondary, tertiary, or vocational education program. Switches between the different programs of the Danish social protection system are a relatively common phenomenon (Pedersen et al., 2012). In our sample, for instance, approximately 32% of UI recipients claim some other public transfer within the first 12 months after the beginning of our intervention.

Information for unemployed workers: As a result of the diverse rules governing benefit entitlements and extension possibilities, the Danish UI system is highly flexible but also intricate for

job seekers to navigate.[8] In the absence of our intervention, newly unemployed workers are informed that they are eligible for 3,848 hours of UI benefits. Moreover, they can access information about their entitlements and the rules for benefit extensions through the online platform of the public employment service (*jobnet.dk*), where the details are summarized in an online information tool. Most importantly, the tool provides personalized real-time information on (1) the worker's consumption of UI benefits (in hours), (2) their remaining benefit entitlements, including the current benefit expiration date (assuming no future employment periods), (3) the accumulated working hours that could be used to extend the benefit period, (4) how to avoid qualifying days, and (5) conditions to become eligible for a new two-year benefit period. The different elements of the online tool are depicted in Appendix Figure A.2. In the business-as-usual scenario before our intervention, the tool is accessible to all job seekers via the public employment service's online platform. As the tool is not prominently featured on the platform, however, its reach and impact among job seekers is limited (see Sections 2.2 and 3).

Besides the online tool, individuals can obtain information about the UI rules and their entitlements from caseworkers, who conduct regular meetings with benefit recipients. During the first six months of unemployment, job seekers are expected to have monthly meetings with their caseworker, while for those who remain unemployed for a longer period, meetings typically occur every three months. The primary objective of these meetings is to support job seekers in their job search, ensure compliance with search requirements, and discuss potential job opportunities or active labor market programs that may facilitate reemployment. Simultaneously, caseworkers have access to the same information regarding benefit entitlements that job seekers can access through the online tool.

2.2 Knowledge gaps

To examine job seekers' understanding of the rules and their benefit entitlements, we conducted an online survey among unemployed workers in March 2018—one week before the beginning of our intervention. We invited a random sample of all registered UI recipients ($N = 7,430$); 1,154 job seekers completed the survey, corresponding to a response rate of about 16%. Appendix Table A.1 summarizes socio-demographic characteristics of survey participants. Compared to the average UI recipient, survey respondents tend to be better educated, are more likely to be female and married,

[8] Similar regulations aimed at enhancing UI flexibility are present in many countries. For instance, in various US states benefit entitlements are tied to the business cycle (Farber and Valletta, 2015; Kroft and Notowidigdo, 2016), while various European countries, such as Germany (Caliendo et al., 2016), France (Fremigacci and Terracol, 2013; Benghalem et al., 2023), and Finland (Kyyrä, 2010), have provisions supporting part-time or temporary work (see also Cahuc, 2018, for an overview).

less likely to be migrants, and they have been unemployed for a somewhat longer time period.[9] Further details about the design and implementation of the survey can be found in Appendix B.

The survey included various questions to pinpoint job seekers' understanding of the UI system. First, to assess individuals' knowledge of their personal entitlements, we ask them to state the expiration date of their UI benefits if they do not take up any employment before that time. We compare participants' responses to their actual benefit expiration dates, calculated at the time of the survey, which we obtain from individual-level administrative records on public transfer payments. This enables us to explore whether job seekers accurately perceive their entitlements or if they either overestimate or underestimate their remaining benefit duration. Second, we elicit respondents' knowledge of the benefit extension rules described in Section 2.1. Specifically, we ask individuals four questions related to the possibilities to extend their entitlements beyond the guaranteed two-year benefit period, one question related to the income consequences of taking-up a small work opportunity, and one question related to the qualifying day. An English translation of the different survey items can be found in Appendix B. Based on participants' answers to the six knowledge questions, we construct a composite knowledge index, which captures a job seeker's overall understanding of the benefit rules. The index measures the share of correct answers on a scale from 0 (none of the six questions answered correctly) to 1 (all six questions answered correctly).

Knowledge about personal entitlements: The data from the pre-intervention survey, summarized in Table 1, reveal significant gaps in job seekers' understanding of the UI system. As shown in Panel A of Table 1, only about 35% of job seekers know their benefit expiration date to the exact week. Meanwhile, 19.2% of job seekers underestimate, and 20.5% overestimate, their remaining entitlements by four weeks or more. Notably, those who overestimate or underestimate their entitlements do so by a substantial margin. On average, the absolute difference between the expected and actual expiration dates is more than two months (8.95 weeks).[10]

[9]The characteristics that are over-represented among survey respondents tend to be positively associated with individuals' understanding of the UI benefit system. For example, job seekers with higher education, no migration background, and longer unemployment spells tend to have a better understanding of the UI benefit rules. This suggests that knowledge gaps in the overall population of unemployed workers may be even more pronounced than those measured in our survey.

[10]It is conceivable that misperceptions of the benefit expiration date are more pronounced among job seekers who experience a delay in receiving their first benefit payment. This may occur, for example, if they received severance pay at the end of their previous job or voluntarily left their position. However, as shown in Appendix Table A.2, the distribution of job seekers' knowledge about their personal benefit entitlements is very similar when focusing only on workers with non-delayed payments.

Table 1: Knowledge gaps

	Mean	SD
A. Understanding of personal benefit entitlements		
Absolute difference between expected and actual PBD in weeks[(a)]	8.953	15.137
Reporting correct PBD (within a week)[(b)]	0.354	0.478
Overestimating PBD[(b)]		
by one to three weeks	0.075	0.263
by four weeks or more	0.205	0.404
Underestimating PBD[(b)]		
by one to three weeks	0.175	0.380
by four weeks or more	0.192	0.394
B. Understanding of UI benefit rules		
Knowledge index (share of knowledge questions answered correctly)[(c)]	0.523	0.271
Fraction of correct answer to question:		
Existence of extension (Q26)	0.760	0.427
Extension gained (Q27)	0.331	0.471
Required period (Q31)	0.420	0.494
Maximum extension (Q32)	0.451	0.498
Income effect (Q28)	0.529	0.499
Qualifying day (Q30)	0.484	0.500
C. Primary information source[(d)]		
Online platform (*jobnet.dk*)	0.121	0.259
Job center	0.843	0.293
Other online sources (incl. social media)	0.023	0.126
Newspaper or TV	0.004	0.042
Family and friends	0.009	0.081
No. of observations	1,154	

Note: The table reports descriptive statistics based on the pre-intervention survey. The numbers in parentheses refer to the survey questions, with the English translation provided in Appendix B.
[(a)] Absolute difference between the subjectively expected remaining benefit duration (Q24) and the actual remaining benefit duration (observed in the administrative records) in weeks.
[(b)] Percentage share of survey respondents who report an expected remaining benefit duration that is (1) within the same week as the actual remaining benefit period, (2) one to three weeks longer/shorter than the actual remaining benefit period, (3) at least four weeks longer/shorter than the actual remaining benefit period.
[(c)] Share of correct answers to the six knowledge questions (Q1)–(Q6).
[(d)] Index summarizing responses (in percent) to the survey questions *(Q38) Where do you find information regarding your own unemployment benefit situation? and (Q39) Where do you find information about the rules regarding the job search process? [Check the most important answer.]*

Knowledge about benefit extensions and sanctions: Panel B of Table 1 shows that job seekers also exhibit significant knowledge gaps regarding the UI benefit rules. On average, respondents answer only 52.3% of the questions on potential benefit extensions and sanctions correctly. Analyzing individuals' responses to the different questions provides further insights into which aspects of the rules are well understood, and which are not. While about 76% of respondents are aware that their entitlements can generally be extended (Q26), only 30%-40% understand how extensions are calculated (Q27 and Q31). Moreover, only 45% know the maximum number of months by which the benefit duration can be extended (Q32). Similarly, only 48% of individuals understand

the determinants and consequences of the qualifying days (Q30), and just 53% are aware of the income consequences of accepting a short-term job (Q28). A detailed analysis of individuals' survey responses (see Appendix Figure A.3), reveals that most respondents who answer the knowledge questions incorrectly underestimate the overall generosity of the extension possibilities. For example, roughly 62% of respondents underestimate the length of the extension they receive for working two additional weeks, while only 5% overestimate it. Similarly, 42% of respondents underestimate the maximum possible extension of the benefit duration, whereas only 8% overestimate it.

Information acquisition: The survey data also sheds light on the sources job seekers rely on to gather information about the UI system, as documented in Panel C of Table 1. Notably, only a small fraction (12.1%) of respondents mention the public employment agency's online platform as their primary source of information, indicating that relatively few job seekers use the online tool in the pre-intervention period. 84% of the survey respondents primarily rely on their job center, which also organizes caseworker meetings, to obtain information about the benefit system. Other sources like social media, newspapers, television, or advice from family and friends play a minimal role in job seekers' information-seeking process.

Result 1. *UI recipients exhibit significant knowledge gaps regarding benefit rules and their personal entitlements. While the number of job seekers who overestimate their entitlements is roughly equal to those who underestimate them, a majority of job seekers underestimate the possibilities for extending their UI benefits.*

3 Randomized Controlled Trial

The aim of our field experiment is to exogenously enhance job seekers' understanding of the UI system by encouraging them to use the online information tool on the *jobnet.dk* platform. As described earlier, the tool outlines the general rules, offers personalized information about job seekers' specific benefit situation, and it is continuously updated throughout the unemployment spell. In the absence of our intervention, however, the usage of the online tool remains relatively modest as the public employment service does not actively promote the tool as part of its counseling process.[11]

To draw job seekers' attention to the online tool, individuals assigned to our main treatment (henceforth also denoted as *tool treatment*) received messages containing a short, non-personalized

[11] After logging into the *jobnet.dk* platform, reaching the subpage where the tool is located requires at least three clicks (assuming the user knows where to find it). On a typical pre-intervention day, the tool generates approximately 3,000 page visits among the roughly 100,000 UI benefit recipients (cp. Figure 2).

summary of the flexible benefit extension rules, information about the online tool and its features, and a direct link to access the tool. After a somewhat longer first message, individuals received up to four monthly reminders if they were still registered as UI recipients. All messages were sent to job seekers' personal mailbox on the *jobnet.dk* platform. The exact content of the messages can be found in Appendix B.

In addition to our main treatment group, we consider two other groups of job seekers. First, individuals assigned to the *control group* faced a "business-as-usual" environment. This means that they had access to the online information tool, but received no messages or reminders encouraging them to use the tool. A third group of job seekers (henceforth denoted as *message group*) received generic messages containing general information about job search and the *jobnet.dk* platform. These messages were sent at the same points in time as those for our main treatment group, but their content was unrelated to the information tool and the UI benefit rules. By comparing outcomes in the message treatment to the control group, we can identify potential effects of receiving messages or reminders by the labor market authorities *per se*, independent of the specific content of our main treatment.

3.1 Data and procedures

Our intervention was pre-registered at the The American Economic Association's registry for randomized controlled trials (AEARCTR-0002666). The participants in our trial comprise the full stock of UI recipients in Denmark at the beginning of March 2018. For our analysis, we focus on those individuals, who are full-time insured, which yields an estimation sample of 98,641 individuals. Participants were sampled one week before the beginning of the intervention and randomly assigned to three equally sized groups (tool, message, and control), with approximately 33,000 individuals in each treatment group. To investigate the causal effects of the intervention on labor market outcomes, we link the data from the experiment to comprehensive register data administered by Statistics Denmark. This provides us with detailed and accurate information on individuals' labor market outcomes and socio-demographic background characteristics.

In parallel to the randomized controlled trial, we conducted a post-intervention survey among a subset of participants in the experiment. The survey enables us to evaluate whether the intervention successfully improved job seekers' understanding of the UI system and increased their confidence in their ability to navigate its rules. The survey included the same knowledge questions as the pre-intervention survey described in Section 2.2. Moreover, we asked participants about their job

search and subjective beliefs of the UI system. For instance, we elicited job seekers' perceptions of being monitored by the labor market authorities, as a potential alternative channel through which the intervention may influence their job search activities (see Section 5.4). For the survey, which was conducted five weeks after the intervention began, we invited 22.5% of the total experimental sample ($N = 22,352$), with equally sized subsamples from each treatment arm. Appendix B provides a detailed summary of the survey design, implementation, and an overview of respondents' socio-demographic characteristics.

Figure 1: Timeline of the study (in weeks)

Pre-intervention survey	Main Message	Reminder 1	Post-intervention Survey	Reminder 2	Reminder 3	Reminder 4
$t = -1$	$t = 0$	$t = 4$	$t = 5$	$t = 8$	$t = 12$	$t = 16$

The timing of our intervention is illustrated in Figure 1. At the beginning of week $t = 0$ (March 05, 2018), the corresponding messages were sent to the tool and message groups, respectively. Subsequently, individuals in both groups received up to four treatment-specific reminder messages (in weeks $t = 4, 8, 12$, and 16). Only job seekers who were still registered as unemployed within the four-week period prior to the sending date received the reminder messages.[12] Individuals who exited and re-entered the UI system during the intervention returned to their originally assigned treatment group and received the subsequent reminders, if they continued their original benefit period. All treatment messages were sent out by the public employment service to individuals' personal mailbox on the *jobnet.dk* platform. Notably, all UI recipients are required to visit the platform at least once a week, ensuring that treatments are administered in a timely and comprehensive manner.

3.2 Sample characteristics and treatment take-up

Table 2 provides an overview of participants' background characteristics, separated by treatment status. The job seekers in our experiment are on average 40 years old, about 52% of them are female, 34% are married, and 34% have a university degree. On average, participants were unemployed for approximately 51 weeks over the past five years, had a gross monthly labor income of around DKK 18,000 (approx. €2,450), and worked an average of 22 hours per week during that period. While

[12]The proportion of individuals registered as unemployed decreased from about 87% in the first month to 56% in the fourth month after the beginning of the intervention. The frequency with which job seekers are exposed to the treatment messages thus depends on their post-intervention unemployment duration, as well as on other factors influencing treatment take-up (e.g., the job seekers' likelihood of checking their mailbox on the *jobnet.dk* platform). Throughout our empirical analysis in Sections 4 and 5, we therefore examine the effects of the intervention based on intention-to-treat analyses.

we observe only minor differences in background characteristics across treatments, a few of the balancing tests reported in the rightmost column of the table turn out to be statistically significant. To address these small differences between treatment arms, we condition on a rich set of covariates in our empirical analysis. Furthermore, it should be noted that the treatment does not affect survey participation (see Appendix Table A.3).

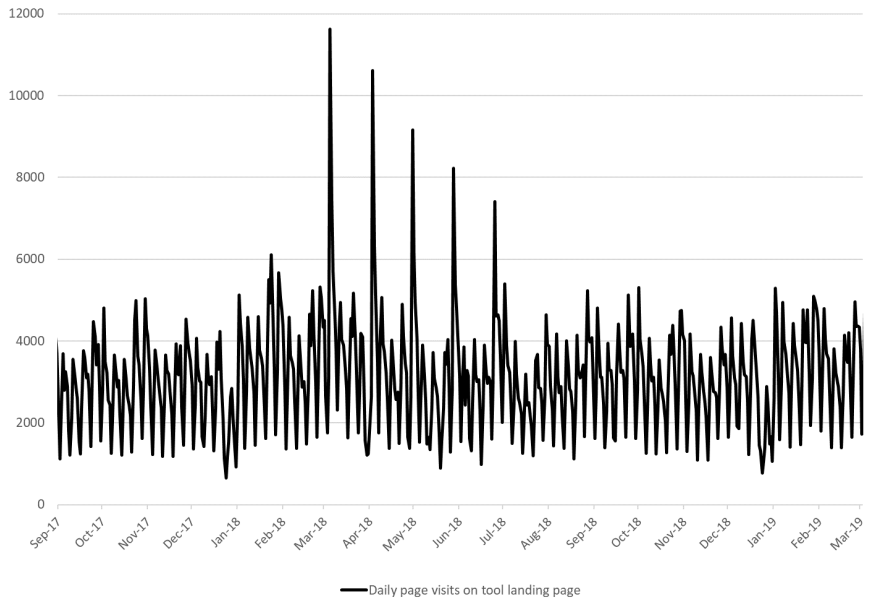
Table 2: Summary statistics and balancing tests

	Treatment			
	Control (C)	Message (M)	Tool (T)	$P-$value
No. of observations	32,905	32,876	32,860	
Educational level				
None (or missing)	0.082	0.082	0.087	0.038
Less than high school	0.176	0.176	0.181	0.264
High school	0.402	0.401	0.397	0.332
Bachelor degree (or equiv.)	0.241	0.241	0.241	0.978
Master degree (or equiv.)	0.098	0.100	0.095	0.094
Male	0.482	0.475	0.481	0.154
Age				
18-25 years	0.117	0.118	0.115	0.428
26-35 years	0.332	0.332	0.331	0.926
36-45 years	0.192	0.191	0.195	0.402
46-55 years	0.195	0.198	0.194	0.366
56-65 years	0.165	0.161	0.165	0.252
Household size				
One person	0.195	0.195	0.193	0.797
Two persons	0.344	0.342	0.345	0.652
Three persons	0.204	0.204	0.200	0.327
Four or more persons	0.258	0.259	0.262	0.492
Married	0.338	0.339	0.345	0.111
Children				
One child	0.164	0.164	0.162	0.650
Two or more children	0.172	0.171	0.173	0.730
Migration status				
1^{st} generation	0.193	0.191	0.198	0.065
2^{nd} generation	0.032	0.034	0.033	0.446
Weeks of UI benefits (current spell)	31.78	32.44	32.24	0.011
Weeks of UI benefits				
in last year	24.07	24.44	24.24	0.013
in last 5 years	50.23	50.80	50.72	0.128
Months employed				
in last year	6.049	5.994	6.032	0.261
in last 5 years	38.288	38.020	38.276	0.065
Average monthly earnings				
in last year	17,868	17,752	17,833	0.718
in last 5 years	18,399	18,281	18,389	0.461
Average weekly working hours				
in last year	19.20	19.13	19.06	0.425
in last 5 years	22.74	22.16	22.24	0.494

Note: Percentage shares unless indicated otherwise. $P-$values are based on F-tests for joint significance of treatment coefficients in separate regressions of each of the characteristics on dummies for the different treatment conditions.

To examine treatment take-up, Figure 2 plots the overall usage of the online tool based on data from Google Analytics. During our intervention, weekly visits to the tool increase by roughly 50% relative to the pre-intervention period. It can be seen that the increases in usage are concentrated to a few days following the dates of sending out the intervention messages, but the additional page visits do not crowd out usage of the tool in the periods between sending dates. The stark and concentrated spikes in page visits strongly suggest that the increase in usage of the tool is connected to our treatment (rather than additional traffic from non-treated users). At the same time, the pattern suggests that treated job seekers do not appear to use the online tool more frequently in the long run. As a second, more direct measure of treatment take-up, we also collected individual-level data on whether job seekers in the tool treatment opened their messages and clicked on the link to the online information tool (see Appendix Table A.4 for a detailed overview). We observe that 85-95% of job seekers assigned to the tool treatment open the main message and subsequent reminders. The figures for the message treatment also lie in this range. For each message sent to job seekers in the tool treatment, about 20% of participants click on the link to the online information tool. When considering all messages together, 45% of individuals in the tool treatment clicked on the link to the tool at least once.

Figure 2: Usage of the online information tool



Note: The figure depicts the number of page visits for the online information tool, based on data from Google Analytics.

4 Does the Intervention Increase Job Seekers' Knowledge?

In a first step, we examine whether our intervention improves job seekers' understanding of the UI system. Using data from the post-intervention survey, we estimate regressions of the following form:

$$Y_i = \alpha + D_i\delta + X_i\beta + \varepsilon_i. \tag{1}$$

As our main outcome variables, Y_i, we consider the two measures described in Section 2.2: (1) the accuracy of individuals' beliefs about their personal benefit entitlements and (2) their score on the index measuring knowledge of UI benefit rules. D_i indicates the treatment status (dummy variables for the tool and message group, respectively) and X_i is a vector of pre-intervention control variables, including socio-demographic characteristics and labor market histories, as presented in Table 2, plus dummies for the job seeker's place of residence (98 municipalities) and unemployment-fund membership (24 different funds). Throughout our analysis, we focus on intention-to-treat estimates (ITTs), ignoring whether treated individuals actually opened the treatment messages or clicked on the link to the information tool to avoid selection bias.[13]

The results, presented in Table 3, demonstrate that our intervention indeed enhances job seekers' understanding of their personal entitlements and the rules governing benefit extensions. The absolute difference between job seekers' subjectively expected benefit expiration date and the actual expiration date is approximately 1.7 weeks smaller for treated individuals compared to the control group ($p = 0.047$; see Column 1 of Table 3). With a baseline knowledge gap of 8.8 weeks among untreated job seekers (see bottom part of Table 3), the inaccuracy regarding personal benefit entitlements is thus reduced by about 20%. The results in Columns (2) and (3) further indicate that the higher accuracy in job seekers' beliefs is associated with, both, a reduction of over-optimism and pessimism among treated job seekers.[14] At the same time, we observe no systematic and statistically significant effect of the message treatment on job seekers' understanding of their entitlements.

In Column 4 of Table 3, we analyze treatment differences in job seekers' understanding of the UI benefit rules. The results show that job seekers in the tool treatment answer a significantly higher share of questions on potential benefit extensions and sanctions correctly compared to those in the control group. Specifically, the improvement on the knowledge index amounts to five percentage

[13]Note that deriving local average treatment effects is not straightforward in our setup, as exposure to the treatment may already commence when individuals open the treatment message, and not only when they use the online information tool.

[14]Specifically, we examine the absolute difference between the expected and actual PBD in weeks (as in Column 1), but we set the corresponding outcome variable to zero if the individual does not overestimate the PBD (see Column 2), or does not underestimate the PBD (see Column 3), respectively.

Table 3: Treatment effects on knowledge about the UI system

Dependent variable	Expected – actual remaining benefit duration[(a)]			Knowledge of UI benefit rules
	Absolute difference (in weeks)	Overestimation of entitlements (in weeks)	Underestimation of entitlements (in weeks)	Share of correct answers (0=low; 1=high)
	(1)	(2)	(3)	(4)
Tool treatment	-1.67**	-0.90	-0.77	0.050***
	(0.84)	(0.74)	(0.51)	(0.012)
Message treatment	-0.14	0.52	-0.65	0.025**
	(0.82)	(0.72)	(0.50)	(0.012)
No. of observations	2,000	2,000	2,000	2,805
Mean value control group	8.78	5.43	3.36	0.505
P-value tool v. message	0.068	0.055	0.816	0.045

Note: The table reports treatment differences in knowledge (intention-to-treat effects) among participants in the main survey. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. In all models, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total).
[(a)]Refers to the difference between the subjectively expected remaining benefit duration elicited through the online survey and the actual remaining benefit duration observed in the administrative records in weeks. In Column (1), we consider the absolute difference. In Column (2)-(3), we decompose the absolute difference into instances that over-, respectively underestimate their remaining benefit duration. Therefore, we set the corresponding outcome variable to zero if the individual does not overestimate (Column (2)), respectively if the individual does not underestimate (Column (3)) the PBD.

points ($p < 0.001$), corresponding to an increase of 10%, relative to the baseline knowledge level of job seekers in the control group. When estimating separate treatment effects on the six questions that comprise the knowledge index, we find that the tool treatment predominantly enhances individuals' understanding of the possibilities to extend their benefit entitlements (see Appendix Table A.5). Given that, in the absence of our intervention, most UI recipients underestimate the generosity of potential benefit extensions (see Section 2.2), the estimates suggest that treated workers (correctly) perceive their extension possibilities as more generous than their non-treated counterparts.

Finally, we also observe a modest positive effect of the message treatment relative to the control group ($p = 0.037$). Although the message treatment does not contain any information about the UI benefit rules, it is conceivable that the message treatment encourages job seekers to further explore the *jobnet.dk* platform.[15] One could speculate that doing so is beneficial for job seekers who are not yet familiar with the online portal and the UI system. When comparing knowledge differences between individuals in the tool treatment and the message treatment, we find significant positive effects of the tool treatment on both job seekers' knowledge of the benefit rules and their understanding of their own entitlements ($p = 0.045$ and $p = 0.068$ respectively; see post-estimation

[15]The message in this treatment arm started with the sentence "Use *jobnet.dk* regularly to know your possibilities and make the most out of them", cf. Appendix C.

test at the bottom of Table 3).

Result 2. *The intervention enhances job seekers' knowledge of their own entitlements and the UI benefit rules, particularly regarding the possibilities to extend their UI benefit period.*

5 Does the Intervention Alter Job Seekers' Labor Market Outcomes?

Thus far, we have documented that job seekers exhibit significant knowledge gaps about their entitlements and the benefit rules, with the majority of UI recipients underestimating the possibilities to extend their benefits. At the same time, we observed that our low-cost information intervention improves job seekers' knowledge in both dimensions. We next examine how the enhanced knowledge affects the realized labor market outcomes of treated job seekers. To do so, we link the data from our experiment to administrative records from Statistics Denmark, providing us with detailed information on labor market outcomes for the full population of treated and untreated job seekers.

5.1 Empirical strategy

It is natural to hypothesize that job seekers' responses to improved knowledge may vary based on their incentives within the UI system. Besides presenting the average treatment effects in our full sample, we therefore also consider two dimensions of heterogeneity that are related to these incentives: (i) the timing of the intervention during the benefit spell, that is, the amount of entitlements a job seeker has already used up, and (ii) a job seeker's overall risk of relying on UI for an extended period of time. In Section 5.3, we discuss the role of these features in a simple labor supply framework. In our empirical analysis, we examine both the average effects of the intervention and the treatment effects for different groups of UI recipients.

Specifically, we differentiate between three subgroups based on the elapsed benefit duration at the start of our intervention: (1) short-term benefit recipients with an elapsed benefit duration of less than six months (54% of individuals in our sample), (2) medium-term benefit recipients who received UI benefits for six to 12 months (24%), and (3) long-term benefit recipients with an elapsed benefit duration of more than 12 months (22%).[16] These groups differ in their incentives based on the time remaining until benefit expiration. Additionally, the composition of job seekers may vary across these groups as a result of dynamic selection. Specifically, individuals with strong labor market

[16]The six-month threshold is oriented towards the definition of long-term unemployment used by the Danish public employment service, while the one-year threshold corresponds to the more common international definition of long-term unemployment (e.g., OECD, 2019).

prospects and individuals eligible for other transfer programs are likely to be underrepresented among the long-term unemployed, as they have a higher likelihood of exiting UI over time.

Therefore, we additionally divide short-term benefit recipients by their predicted probability of staying in the UI system for 12 months or more, which we refer to as the risk of long-term unemployment. Using administrative data on unemployment entries from 2017, we estimate this risk with an out-of-sample prediction based on a LASSO-logit model that incorporates individual and regional characteristics (see Appendix Table A.6 for further details). The model's coefficients are then applied to the sample of our experiment to predict the risk of long-term unemployment, classifying individuals as low-risk (below median) or high-risk (above median).[17] This measure is expected to reflect job seekers' personal prospects of securing stable employment as well as their ability to exit UI without starting paid employment, for instance, due to eligibility for other public transfer programs (see Section 2.1).

5.2 Main results

Table 4 presents the treatment effects on our main outcome variables, cumulated over a two-year period following the intervention. As discussed in Section 2.1, individuals can exit the UI benefit system in Denmark either by securing a new job, or by transitioning to an alternative transfer program that does not require active job search. To approximate extensive-margin responses along these dimensions, we calculate the average monthly rate of (1) any employment and (2) receipt of other transfers, averaged over a 24-month period following our intervention. Additionally, we examine individuals' total working hours and labor earnings accumulated over the same period, which additionally capture the intensive margin of employment and potential changes in job quality, respectively. Appendix Figure A.4 complements Table 4 by illustrating the time profiles of treatment effects, based on monthly outcomes.

The first row of Table 4 documents that treatment effects on the average UI recipient in our sample are small and generally not statistically significant. The remaining estimates in the upper part of Table 4, however, demonstrate that the impact of the intervention varies significantly across different groups of UI recipients. For individuals with a low risk of staying in the UI system for an extended period, the tool treatment results in a significant increase in employment by approximately 0.9 percentage points ($p = 0.037$). This represents a relative employment increase of 1.3% compared to the baseline employment level for the corresponding job seekers in the control group (see bottom

[17] We also test the sensitivity of our results using a 2016 sample of unemployment entries (see Appendix Tables A.6 and A.7).

panel of Table 4). Meanwhile, the tool treatment significantly reduces the likelihood of receiving alternative transfers in the low-risk group by 0.9 percentage points per month ($p = 0.010$), corresponding to a relative decrease of almost 7% compared to low-risk job seekers in the control group. When examining the time profiles of these effects (depicted in Panel A. of Appendix Figure A.4), we find that the positive employment effects of the tool treatment gradually increase in the months following the intervention, while the likelihood of exiting UI for other transfer programs decreases immediately after the initial treatment.[18] Despite the time lag, the positive employment effects of the tool treatment translate into a 1.7% increase in individuals' total working hours ($p = 0.029$) and labor earnings ($p = 0.028$) over the two-year period.

While we observe no significant treatment differences for short-term unemployed high-risk job seekers and the medium-term unemployed, job seekers with an elapsed unemployment duration of more than one year experience negative labor market effects. For this group of long-term unemployed workers, the tool treatment reduces total working hours ($p = 0.046$) and earnings ($p = 0.068$) by 2.3% over the 24-month period compared to similar long-term unemployed individuals in the control group. As shown in the time profiles in Appendix Figure A.4 (Panel D.), the negative employment effects on the long-term unemployed appear immediately after the intervention begins. Notably, while working hours and earnings decrease significantly, the effect on the extensive margin is relatively small and statistically insignificant for this group.

Message treatment: Before further investigating the effects of the tool treatment, it should be noted that the message treatment has no significant employment and earnings effects in the overall sample and the different subgroups (see estimations in the middle part of Table 4). This indicates that the knowledge effect observed for this treatment arm in Table 3 does not translate into differences in labor market outcomes. Given that the knowledge effects of the message treatment are rather small and do not come along with a better understanding of the job seekers' personal entitlements, this finding is perhaps not too surprising. As we find no indications that the message treatment affects overall labor market outcomes or the nature of subsequent employment relationships, our following discussion will focus on the effects of the tool treatment.

[18] This differential speed in responses appears plausible. If eligible, job seekers can switch to alternative transfer programs (or decide not to do so) at any time, whereas searching for a job takes time. For instance, the average low-risk job seeker who finds a job requires about 3.5 months to do so. It seems likely that this delay could be even more pronounced for individuals who, without our intervention, would rely on other public transfers that do not require active job searching.

Table 4: Treatment effects on cumulated labor market outcomes

Dependent variable	**Cumulated outcomes within 24 months**							
	Avg. monthly employment rate (in %-points)		Avg. monthly rate of other transfers (in %-points)		Total working hours		Total labor earnings (in DKK)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tool treatment	-0.01		-0.36*		-3.68		-530	
	(0.24)		(0.21)		(8.57)		(1,705)	
× UI duration ≤ 26 weeks × low risk		0.92**		-0.89**		37.72**		8,086**
		(0.44)		(0.34)		(17.31)		(3,682)
× UI duration ≤ 26 weeks × high risk		-0.39		-0.60		-7.94		-1,525
		(0.40)		(0.41)		(16.81)		(3,278)
× UI duration 27-52 weeks		0.22		0.08		-6.27		-1,522
		(0.42)		(0.33)		(15.51)		(2,761)
× UI duration > 52 weeks		-0.66		0.06		-37.21**		-6,816*
		(0.54)		(0.43)		(18.65)		(3,640)
Message treatment	-0.06		-0.22		-0.49		-278	
	(0.26)		(0.21)		(9.43)		(1,943)	
× UI duration ≤ 26 weeks × low risk		0.59		-0.18		21.89		2,947
		(0.48)		(0.31)		(19.06)		(4,141)
× UI duration ≤ 26 weeks × high risk		-0.84*		-0.33		-15.29		-2,578
		(0.46)		(0.40)		(18.20)		(4,000)
× UI duration 27-52 weeks		0.15		-0.45		2.44		576
		(0.43)		(0.38)		(16.20)		(3,095)
× UI duration > 52 weeks		0.15		0.10		-4.90		-681
		(0.60)		(0.41)		(19.98)		(3,729)
No. of observations	98,641	98,641	98,641	98,641	98,641	98,641	98,641	98,641
P -value: tool v. message	0.850		0.362		0.678		0.874	
UI duration ≤ 26 weeks × low risk		0.461		0.055		0.371		0.217
UI duration ≤ 26 weeks × high risk		0.294		0.391		0.654		0.720
UI duration 27-52 weeks		0.892		0.104		0.650		0.522
UI duration > 52 weeks		0.164		0.926		0.108		0.078
Mean value control group	60.00		14.64		1,856		351,720	
UI duration ≤ 26 weeks × low risk		68.77		12.76		2,195		452,033
UI duration ≤ 26 weeks × high risk		59.64		15.63		1,856		340,660
UI duration 27-52 weeks		55.76		14.73		1,710		317,784
UI duration 27-52 weeks		54.56		15.48		1,608		283,272

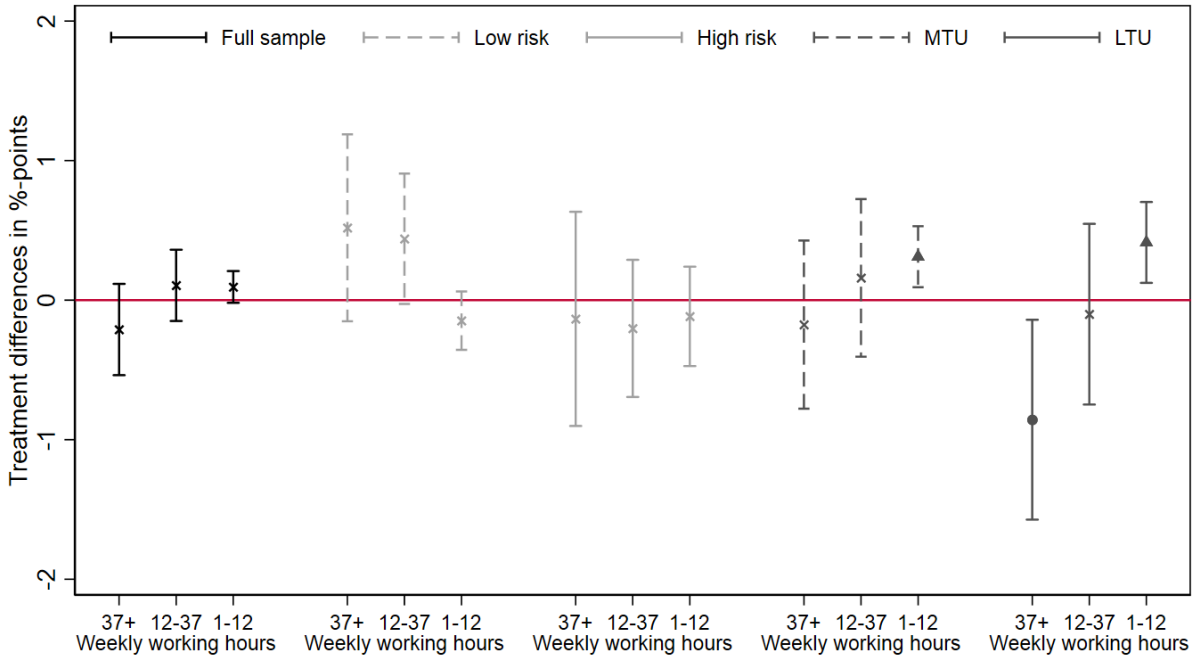
Note: The table reports treatment differences in labor market outcomes (intention-to-treat effects) among participants in the randomized controlled trial. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. In all models, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total).

Weekly working hours: To better understand the differential impact of the tool treatment on different worker groups, we now take a closer look at the nature of the resulting job matches. Given that benefit extensions depend on previously accumulated working hours, we differentiate jobs by weekly working hours. Specifically, we categorize them into small work opportunities (fewer than 12 hours per week), part-time jobs (12–37 hours per week), and full-time jobs (37 hours per week or more). The 12-hour threshold corresponds to the average weekly working time required to extend

the benefit period by exactly one month (cp. Section 2.1 and Appendix Figure A.1), while the 37-hour threshold represents the full-time work week in Denmark. Based on this categorization, we calculate the average monthly employment rates in the different job categories. Figure 3 presents the corresponding effects of the tool treatment for the overall sample and the different subgroups of job seekers. For the low-risk group (second panel from the left in Figure 3), the results indicate no significant change in weekly working hours, relative to low-risk individuals assigned to the control group. Among the long-term unemployed job seekers, however, we observe a shift from full-time employment to small work opportunities (see rightmost panel in Figure 3). Specifically, the tool treatment yields a reduction in the full-time employment rate of long-term unemployed workers by 0.86 percentage points ($p = 0.052$). At the same time, we observe a 0.41 percentage point increase ($p = 0.021$) in the uptake of jobs with a working time below 12 hours per week. These findings suggest that the adverse labor market effects of the intervention for long-term unemployed job seekers stem from adjustments along the intensive margin of employment. Treated job seekers work at a similar overall rate as untreated job seekers (cp. Table 4), but substitute away from full-time jobs towards smaller work opportunities. Conversely, the positive labor market effects for the low-risk group appear to result primarily from changes along the extensive margin of employment. That is, the additional employment observed in Table 4 for low-risk workers emerges primarily in jobs that are similar (in terms of working hours) to those held by the corresponding workers in the control group.

Benefit exhaustion: The negative labor markets effects of the intervention on long-term unemployed job seekers raises the concern that these individuals—who are already in their second year of the regular UI benefit period—face a higher risk of UI benefit expiration. In a last step, we therefore examine treatment effects on job seekers' likelihood of receiving UI benefits and lower, means-tested social assistance. The estimates, depicted in Appendix Figure A.5, indicate that treated long-term unemployed job seekers indeed exhibit a higher risk of benefit exhaustion compared to their untreated counterparts. 12 months after the beginning of the intervention, their likelihood of receiving social assistance is 0.8 percentage points higher ($p = 0.009$) than for comparable job seekers in the control group, corresponding to a relative increase of approximately 14% (see Panel D.1 of Figure A.5). The increased take-up of social assistance persists throughout the second year following the intervention and is accompanied by a reduced likelihood of receiving UI benefits (see Panel D.2 of Figure A.5). This pattern aligns with the notion that, by reducing their working hours,

Figure 3: Heterogeneous effects of tool treatment on weekly working hours



Note: The figure shows the effects of the tool treatment (including 90% confidence intervals) on the average monthly employment status (with varying weekly working hours) for different groups of UI benefit recipients during the first two years following the onset of the intervention. ●/▲/◆ indicate statistical significance at the 10%/5%/1%-level.
Low risk: Short-term unemployed individuals with an elapsed benefit duration of 26 weeks or less at the start of the intervention and a below-median predicted risk of receiving UI benefits for 12 months or more.
High risk: Short-term unemployed individuals with an elapsed benefit duration of 26 weeks or less at the start of the intervention and an above-median predicted risk of receiving UI benefits for 12 months or more.
MTU: Medium-term unemployed individuals with an elapsed benefit duration between 27 and 52 weeks at the start of the intervention.
LTU: Long-term unemployed individuals with an elapsed benefit duration exceeding 52 weeks at the start of the intervention.

treated long-term unemployed individuals eventually acquire shorter UI benefit extensions, thereby increasing the risk of benefit exhaustion.

Result 3. *While the intervention has no significant labor market effects for the average UI recipient, its impact varies depending on the elapsed benefit duration and the risk of long-term unemployment.*

(i) Short-term unemployed, low-risk job seekers: the intervention reduces exits from UI into other transfer programs and increases employment at the extensive margin, leading to higher overall working hours and earnings.

(ii) Long-term unemployed job seekers: the intervention causes a shift from full-time employment to small work opportunities, resulting in reduced overall working hours and earnings, as well as an increased risk of benefit exhaustion.

5.3 An illustrative framework

In the remainder of our study, we examine potential mechanisms underlying the heterogeneous labor market effects of our intervention. We do so by, first, discussing a stylized labor-supply framework in which unemployed workers learn about the possibility of extending their UI benefit entitlements by working additional hours. We then revisit our data to shed further light on potential alternative mechanisms and additional effects of the intervention.

5.3.1 Incentives within the UI system

Under the Danish UI benefit rules, individuals who are unemployed and actively seeking work receive UI benefits b for a guaranteed period denoted by T_0. If they remain unemployed beyond T_0, they are eligible for UI benefits only if they have worked for a sufficient amount of time since their initial registration up until T_0, as indicated by $\sum_{i=1}^{T_0} h_i$, where $h_i \in (0,1)$ represents the "degree" of employment in period i (measured as fraction of the monthly full-time working hours). Otherwise, they receive social assistance, which we normalize to 0. Given the rules described in Section 2.1, we can denote job seekers' remaining overall entitlements in period t as

$$B_t = \min \left\{ T, \max \{T_0 - t, 0\} + \delta \sum_{i=1}^{T_0} h_i \right\}. \tag{2}$$

During the initial two-year benefit period (until period T_0), benefit payments are guaranteed. After period T_0, benefit eligibility depends on the working hours accumulated in all periods up until T_0. Any hour worked is converted into additional UI entitlements at a rate of δ. The rule that each hour worked allows the individual to save one hour of entitlements and extends the initial entitlements by two additional hours implies $\delta = 3$.[19] However, the extension possibilities are capped at a maximum duration T, after which UI benefits expire with certainty. This means that an extra working hour creates additional entitlements as long as $\sum_{i=1}^{T_0} h_i < \frac{1}{\delta}(T - T_0)$, but hours worked beyond this threshold do not generate further entitlements. In our setting, the threshold corresponds to the

[19] For example, to be eligible for UI benefit payments in month $T_0 + 1$, an individual must have worked at least 49 hours since the initial registration, equivalent to approximately one month of employment with a weekly working time of around 12 hours.

equivalent of six months of full-time work.[20] UI eligibility in a given period t is represented by:[21]

$$\mu_t = \begin{cases} \min\{1, B_t\} & \text{if} \quad t \leq T \\ 0 & \text{if} \quad t > T \end{cases} \tag{3}$$

In each period, individuals are either unemployed or employed, with the possibility of flexibly combining employment and UI receipt through part-time work (see below). While unemployed and actively seeking work, individuals receive the instant value from UI benefits b, depending on their eligibility μ_t, incur a search effort cost k, and face a probability λ of finding a new job. Alternatively, individuals may stop searching and forfeit their eligibility for UI benefits. In this case, they receive a fixed reservation value $R \geq 0$, which may stem from alternative transfers that do not require job search or from personal savings. Hence, for a given discount rate β, the value of being unemployed in period t is given by:

$$U(t) = \max\{\mu_t b - k + \beta(\lambda V(t+1) + (1-\lambda)U(t+1)), R\}. \tag{4}$$

Individuals stop searching when the reservation value R exceeds the expected discounted utility from receiving UI benefits and continuing their job search.

The value of being employed in period t, denoted by $V(t)$, depends on the worker's labor supply, represented by their chosen working hours $h \leq 1$. We assume that, upon securing a new job, individuals can freely choose their working time, with $h = 1$ indicating full-time employment for the period.[22] An increase in working hours raises labor income, wh, where w represents the fixed wage of a worker who is full-time employed in a given period.[23] At the same time, longer working hours yield a utility cost described by the convex function $c(h) = \frac{1}{2}ch^2$, with c reflecting workers' utility costs, that is, their preferences for consumption relative to non-working time. When employed in a part-time job ($h < 1$) and eligible for UI, individuals receive benefits at the rate b for each non-working hour $(1-h)$. Individuals' consumption utility increases linearly in their per period income $I(h) = hw + \mu_t(1-h)b$ and jobs are destroyed at an exogenous rate κ. If workers retain their jobs with probability $(1-\kappa)$, they continue working the same number of hours as in the previous period.

[20] Individuals still have the possibility to earn "fresh" entitlements that allow them to receive UI benefits for a new two-year period. To do so, they need to accumulate working hours equivalent to 12 months of full-time work.

[21] This formulation accounts for the fact that benefit recipients cannot fully consume their remaining entitlements within a single period, and that their remaining entitlements may not add up to a full month.

[22] In contrast to directed job search models (Nekoei and Weber, 2017), we assume that the likelihood of securing a job, λ, is independent of job characteristics—specifically, the desired working hours. In this respect, our approach aligns with the literature on the labor supply effects of social security programs (see, e.g., Bitler et al., 2006; Kline and Tartari, 2016; Kostøl and Mogstad, 2014).

[23] We abstract from individuals' reservation wage choice—the minimum job offer they would accept. While job seekers might adjust their reservation wage after learning about the UI system, our results in Section 5.2 show similar relative treatment effects on total working hours and earnings, suggesting little impact on hourly wages.

Individuals choose their preferred working hours, h, to maximize the discounted value of employment:

$$V(t,h) = \max_h I(h) - \frac{1}{2}ch^2 + \beta\{\kappa U(t+1) + (1-\kappa)V(t+1)\}, \tag{5}$$

based on their preference for consumption relative to non-working time, while considering their eligibility for UI benefits. We assume that, while individuals know their UI eligibility in the current period, they do not have perfect information about future eligibility, μ_{t+1}. Instead, they hold a subjective belief $\widehat{\mu}_{t+1}$ and maximize their utility as if $\widehat{\mu}_{t+1}$ describes their actual future eligibility. As we will discuss below, this influences their labor-supply decisions through the value functions $U(t+1)$ and $V(t+1)$.

Optimal labor supply: To illustrate how workers determine their labor supply, it is useful to consider an agent who is eligible for UI in the current period ($t = 1$, i.e., $\mu_1 = 1$) but has not yet accumulated enough working hours to qualify for UI benefits in the next period ($t = 2$). By working additional hours in the current period, however, the agent can secure benefit entitlements to consume in $t = 2$. For an agent with eligibility belief $\widehat{\mu}_2$, the (subjectively perceived) optimal number of working hours, h^*, is determined by the first-order condition derived from Equation (5):

$$\underbrace{(1+\beta(1-\kappa))\,(w-ch)}_{\text{(1) change in net utility of work}} + \underbrace{\beta(\kappa+(1-\kappa)(1-h))\widehat{\mu}_2'(h)b}_{\text{(2) gained benefit entitlements}} - \underbrace{(1+\beta(1-\kappa)\widehat{\mu}_2(h))b}_{\text{(3) forgone benefit payments}} = 0, \tag{6}$$

where $\widehat{\mu}_2(h)$ represents the agent's belief about benefit eligibility in period $t = 2$ as a function of current working hours. Equation (6) shows that increasing labor supply has three implications: (1) it changes the agent's net utility from work, (2) it may generate additional future entitlements through the extension possibility, and (3) it limits the agent's ability to consume generated entitlements. Starting from the optimal labor supply in the final period, the decisions in all preceding periods can be derived through backward induction. Notably, workers earlier in their benefit spell generally have lower work incentives due to the lower risk of benefit exhaustion they face.[24]

5.3.2 Learning about extension possibilities

The intervention may influence individuals' labor supply by informing them about the possibility of extending their benefit period. Based on Equation (6), we first outline two key mechanisms through

[24]For example, an agent who is two periods away from benefit expiration (i.e., eligible in periods $t = 1$ and $t = 2$, and able to secure further entitlements for consumption in $t = 3$) determines the optimal labor supply, h^*, in period $t = 1$ by solving the following first-order condition:

$$(1+\beta(1-\kappa)+\beta^2(1-\kappa)^2)\,(w-ch) + \beta^2((1-(1-\kappa)^2)$$
$$+(1-\kappa)^2(1-h))\widehat{\mu}_3'(h)b - (1+\beta(1-\kappa)+\beta^2(1-\kappa)^2\widehat{\mu}_3(h))b = 0.$$

which this could affect individual behavior. We then discuss how the relative importance of these mechanisms may vary across different agents, potentially explaining the heterogeneous labor market effects documented above. Appendix Figure A.6 provides a graphical illustration of how the labor supply effects vary for agents with different costs of work (c) and at different stages of their benefit spell.

Substitution vs. income effects: When the agent is unaware of the possibilities to extend UI benefits, the second and third term in Equation (6) become zero, implying that the relationship between the agent's utility and their labor supply is represented by a simple hump-shaped function (as shown by the dashed lines in Appendix Figure A.6). Upon learning about the extension possibility, the agent's optimal labor supply is influenced by two countervailing mechanisms.

On the one hand, the returns to work increase, as working hours are rewarded not only through wage payments w, but also by securing additional benefit entitlements at a rate of $\widehat{\mu}_2'(h) = \delta$. This generates a *substitution effect* because an increase in $\widehat{\mu}_2'(h)$ incentivizes individuals to raise their labor supply and reduce their non-working time. This effect follows from the second term in Equation (6). Note that the true relationship between the agent's utility and their labor supply exhibits a kink, which occurs because only working hours accumulated up until a certain threshold $\bar{h}$ create extra entitlements, while this is not the case beyond that threshold (as shown by the solid lines in Figure A.6).[25] On the other hand, the additional entitlements gained through the extension possibility increase the value of non-working time for agents (i.e., $\widehat{\mu}_2$ rises). This *income effect* is represented by the third term in Equation (6) and it counteracts the substitution effect, as individuals seek to enjoy the entitlements they acquire, which requires reducing their working hours.

Low risk of long-term unemployment: For the low-risk group, we observed that the treatment reduces transitions from UI to non-employment while increasing employment at the extensive margin. This is consistent with the notion that our intervention primarily increases labor supply among individuals who would otherwise remain outside the labor market. Within our framework, such an effect is plausible assuming that these workers have relative strong preferences for non-working time, implying high utility costs of working additional hours (i.e., a large c). This limits their immediate incentives to work without the extensions. Consequently, the income effect of the extension remains

[25] Formally, the kink arises because $\widehat{\mu}_2'(h) = 0$ when $h > \bar{h}$, where $\bar{h}$ depends on the working hours accumulated in previous periods and is exogenous from the agent's perspective in period t.

relatively small, as it only becomes relevant once they have accumulated additional entitlements. Hence, the substitution effect is likely to dominate, motivating these workers to increase their labor supply in order to gain additional entitlements upon learning about the extension. Panel A.1 of Appendix Figure A.6 graphically illustrates that workers with high utility costs (c) increase their working hours when informed about the extension possibility (i.e., $h_{ext} > h_{base}$).

This pattern can be reinforced by the fact that these individuals learn about the extension possibility early in their benefit spell. In general, extensions are less relevant for agents' labor supply when benefit expiration is distant. However, the income effect diminishes relatively more than the substitution effect with a longer remaining benefit period. Note that the income effect occurs because increasing their labor supply limits agents' ability to take advantage of the gained entitlements. However, this only applies if they retain their current (part-time) job until their guaranteed benefit period expires—a scenario that is relatively unlikely at the beginning of the benefit spell. Conversely, the substitution effect remains relevant even if the current job is lost at some point, as every hour worked today generates additional entitlements for the future. We illustrate the role of the remaining benefit period in Panel A.1 and Panel B.1 in Appendix Figure A.6, where agents with fixed preferences show a stronger increase in their labor supply when they learn about the extension possibility earlier in the benefit spell.

Lastly, low-risk job seekers may have a high chance of securing a new job (high λ) if they choose to continue their job search. This may also contribute to the heterogeneous treatment effects because the increased work incentives from the extension possibility are more likely to result in actual employment compared to high-risk job seekers (low λ). This may amplify the positive employment effects for the low-risk group.[26]

Already long-term unemployed: For the group of long-term unemployed workers, we observed that the intervention causes a shift from full-time employment to small work opportunities, suggesting that the income effect is relatively more important for these job seekers. This may be the case as job seekers nearing the end of their benefit spell already face relatively strong work incentives in the absence of extensions. Hence, when learning about the possibility of an extension, the income effect becomes more pronounced as treated individuals realize that their (intended) labor supply

[26]On the other hand, additional entitlements may be more motivating for high-risk job seekers, as they are more likely to use them. Our finding that positive employment effects are concentrated among low-risk individuals suggests this mechanism is secondary. Instead, the value of benefit extensions seems sufficient to motivate workers, even when their likelihood of using them is low. Notably, the substitution and income effects outlined above only matter when job seekers perceive a nonzero risk of benefit expiration.

will generate significant additional entitlements they may want to enjoy.

At the same time, the possibility of extending entitlements is capped at the maximum benefit period, T. This means the substitution effect becomes less relevant for those who would have worked without the extension, resulting in limited additional work incentives when they learn about benefit extensions. Instead, they might reduce their labor supply in order to consume the entitlements they accumulate. This mechanism potentially explains the negative employment effects among job seekers who have already been unemployed for more than 12 months at the beginning of our intervention. Notably, the comparison of Panel A.2 and Panel B.2 in Appendix Figure A.6 illustrates that agents with identical preferences may reduce their labor supply if they learn about the extension possibility close to benefit expiration (see Panel A.2), but would increase their labor supply if they learn about it earlier in their benefit spell (see Panel B.2).

5.4 Additional empirical evidence

Before discussing broader implications of our findings, we present empirical evidence on four additional aspects that may be relevant for interpreting our results.

Learning about own entitlements: The tool used in our intervention not only informs UI recipients about how to extend their benefit period but also provides details about their current entitlements, which could influence their behavior as well. However, it is unlikely that merely learning about their remaining entitlements fully explains the heterogeneous labor market effects we observe. This conclusion is supported by the empirical results in Appendix Table A.8, which indicate that the tool treatment tends to reduce overly optimistic beliefs about the remaining benefit entitlements among the long-term unemployed ($p = 0.086$) and pessimistic beliefs among the low-risk group ($p = 0.133$). These changes in job seekers' beliefs about their remaining entitlements would, in contrast to our findings, be expected to directly increase work incentives among the long-term unemployed and reduce incentives to take up employment among the low-risk group.

Perception of the UI system: Thus far, our discussion has focused on job seekers' understanding of their entitlements and benefit rules. However, it is also possible that treated job seekers infer from the intervention (and the online tool) that their working hours are closely monitored by the public employment agency. This could increase their perceived pressure to search for jobs, potentially influencing their behavior independently of their understanding of the UI system. To further investigate this possibility, we examine responses to three questions from our post-intervention sur-

vey, measuring job seekers' perception of being monitored, as well as their perceived pressure to search for and accept jobs. Column (1) of Appendix Table A.9 shows the effects of the tool treatment on an index derived from these three questions, while Columns (2)–(4) of Table A.9 present separate treatment effects on each of the questions. Notably, we find no evidence that our intervention affects respondents' perceived sense of being monitored or their pressure to search for jobs. At the same time, we observe that the intervention affects other dimensions of respondents' perceptions that are related to their knowledge about the benefit rules and personal entitlements. In line with our main results, treated long-term unemployed job seekers perceive small work opportunities as more attractive compared to their counterparts in the control group (see Column (5) of Table A.9). Furthermore, all groups of benefit recipients become more certain about their current benefit expiration date as a result of the intervention (see Column (6) of Table A.9).

Other dimensions of heterogeneity: It is evident that the four groups of job seekers studied in our main analysis differ not only in terms of their elapsed benefit duration and their risk of long-term unemployment, but also in other dimensions, such as education levels and socio-demographic characteristics like gender, age, and migration background, which in turn could influence their response to our intervention.[27] To examine the sensitivity of our heterogeneous treatment effects with respect to the heterogeneity in these other dimensions, we re-estimate our main results, accounting for interaction terms of the treatment status with other background characteristics. The results, which are presented in Appendix Table A.11, suggest that the coefficients of interest remain relatively stable when controlling for other dimensions of heterogeneous treatment effects, such as education, gender, age, family status, and migration background.[28] This indicates that the elapsed benefit duration and the risk of staying in the UI system for an extended period are significant drivers of treatment effects, beyond heterogeneity in other covariates.

Treatment spillovers: Finally, one may expect our intervention to have, not only, a direct effect on treated job seekers, but also an indirect effect on the behavior or labor market outcomes of non-treated job seekers (see, e.g., Crépon et al. 2013, Ferracci et al. 2014, Gautier et al. 2018, Benghalem et al. 2023, Altmann et al. 2022). Such spillovers may occur (1) if treated individuals share their newly acquired knowledge with untreated peers ("information spillovers") or (2) if there

[27] Appendix Table A.10 shows summary statistics for the various subgroups of the experimental population.

[28] It is important to note that accounting for various heterogeneous effects simultaneously reduces statistical power. Nonetheless, we observe positive treatment effects on working hours and earnings among the low-risk group, and negative effects among long-term benefit recipients across all specifications.

is competition between treated and untreated individuals for the same vacancies ("displacement effects"). While our experiment is not designed to precisely pin down the existence and nature of treatment spillovers in our setting, we can shed some light on their relevance by exploiting variation in the share of treated individuals across different local labor markets. Our analysis—presented in more detail in Appendix D—yields little evidence of systematic positive or negative spillovers. While our analysis does, ultimately, not allow us to rule out all possible forms of treatment spillovers (e.g., the simultaneous presence of displacement effects and positive informational spillovers, which tend to offset each other), it appears unlikely that treatment spillovers have a large net effect on our results. This aligns with recent findings by Benghalem et al. (2023), who, using a clustered randomized design, found no evidence of treatment spillovers from an information intervention about part-time benefits.

6 Conclusion

In this paper, we studied the interplay between complex UI benefit rules, job seekers' understanding of these rules, and the resulting labor market outcomes. Relying on data from a randomized controlled trial with the universe of Danish UI benefit recipients, a large-scale online survey, and detailed administrative data, we demonstrate that job seekers exhibit substantial knowledge gaps regarding important aspects of the UI benefit system. Providing personalized information via an online tool significantly enhances job seekers' understanding of the UI benefit rules with respect to their personal entitlements and the possibilities to extend UI benefits through additional work hours.

We document that the improved knowledge induces heterogeneous labor market effects, depending on job seekers' personal situation. Our intervention enhances the labor integration of short-term unemployed job seekers with a low risk of receiving UI for an extended period of time. This group of workers becomes less likely to exit UI into non-employment and instead transitions into new employment in response to our intervention. Conversely, among long-term unemployed individuals who have been receiving benefits for over a year, our intervention encourages treated individuals to seek jobs with only a few hours of work per week instead of full-time positions. These patterns are consistent with a stylized framework in which learning about the opportunity to extend entitlements by working additional hours incentivizes some workers to increase their labor supply, while the gained extensions prompt others to reduce their working hours. The latter effect ultimately reduces the overall labor market integration of treated long-term unemployed individuals over a

24-month period following the start of the intervention, pointing to the relevance of lock-in effects associated with part-time work.

Our finding that a better understanding of the UI system translates into differential labor market effects for different "types" of job seekers highlights that policies, which aim to relax information constraints in tax and transfer systems, should take into account the built-in rules and incentives that they inform about. Digital tools seem to reduce information frictions effectively and have the potential to improve the welfare of some job seekers. At the same time, however, others may experience adverse effects when the underlying incentives promote short-sighted behavior, such as working in a part-time job in an environment where lock-in effects seem to be strong. Better targeting of information policies towards job seekers with lower chances of securing full-time positions could help mitigate these adverse labor market effects. Additionally, complementing the use of digital tools with more intensive caseworker counseling could enhance overall efficiency. In our context, it is possible that the less intensive counseling provided to long-term unemployed individuals contributes to the finding that increased knowledge is associated with poorer labor market outcomes.

When evaluating the overall usefulness of UI systems with part-time insurance or flexible extensions, it is important to note that our intervention was conducted during a period of low unemployment. Similar policies might be more effective in times of economic downturns, when there is a higher need for and potentially higher benefits from non-standard employment.

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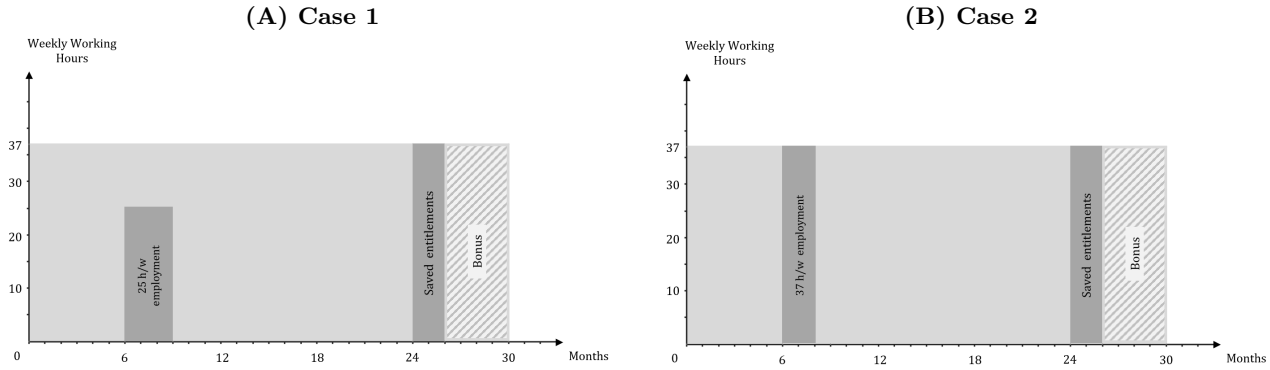
Online Appendix

A Additional Figures and Tables

Figure A.1: Illustration of UI benefit extension rules



Note: The figure illustrates the rules for extending UI benefits. The light grey area depicts periods in which the job seeker consumes UI benefits during the guaranteed two-year UI benefit period. In Case 1, the benefit recipient works approximately 25 hours per week (two-thirds of a full-time equivalent) for three months following their initial registration for UI benefits. In Case 2, the benefit recipient works 37 hours per week (full-time) for two months after registration. In both cases, the benefit recipient (1) saves benefit entitlements equivalent to two months (consumed in months 25 and 26; cp. dark grey areas) and (2) extends their overall UI entitlements by an additional four months (dashed grey areas in months 27–30), resulting in UI benefits expiring 30 months after the initial registration. Extensions are capped at an additional 12 months of UI benefits, with benefit receipt ending no later than 42 months after the initial registration.

Figure A.2: The Online Information Tool

(A) Benefit extension

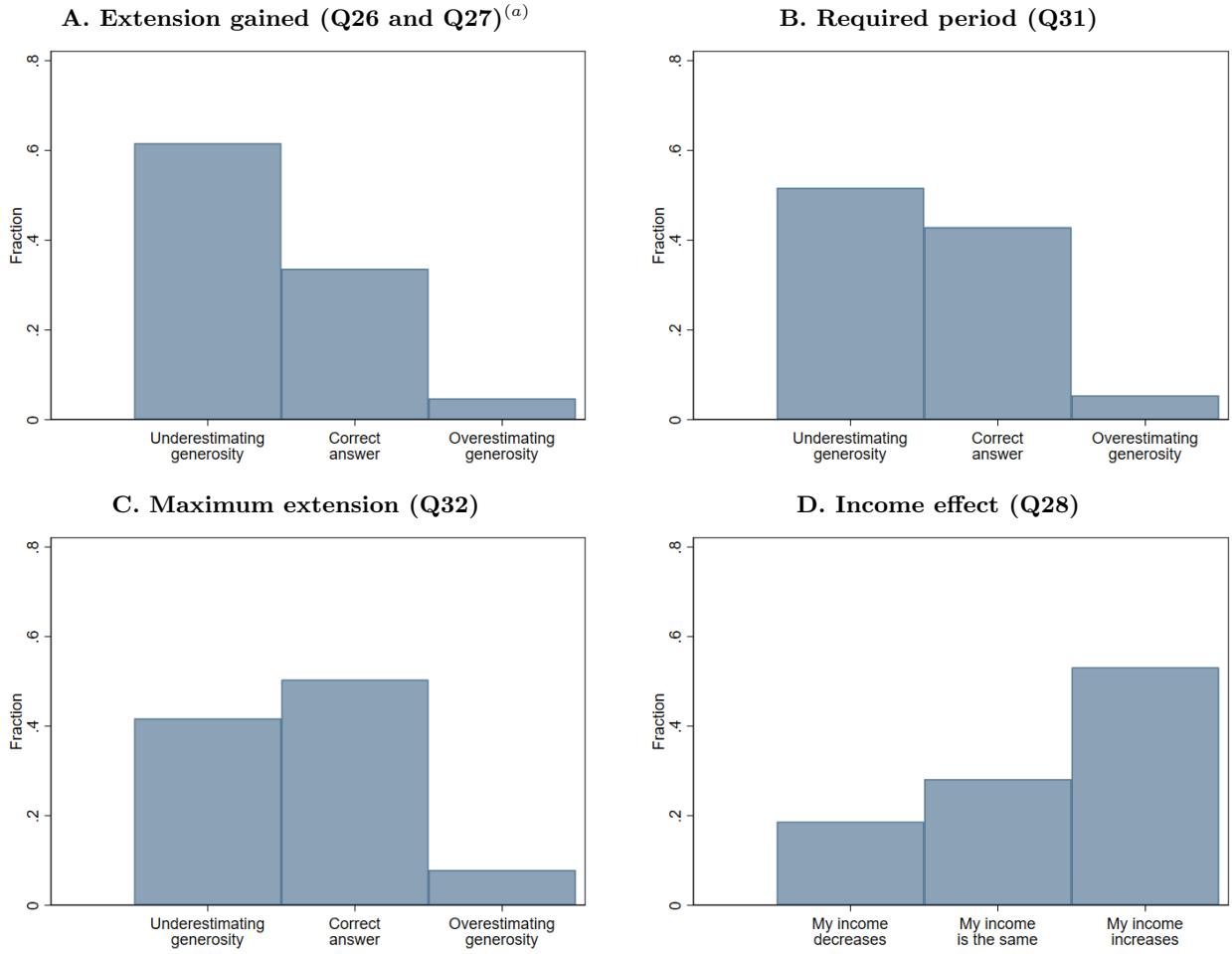
(B) Benefit consumption

(C) Renewing two-year benefit period

(D) Avoidance of benefit sanction

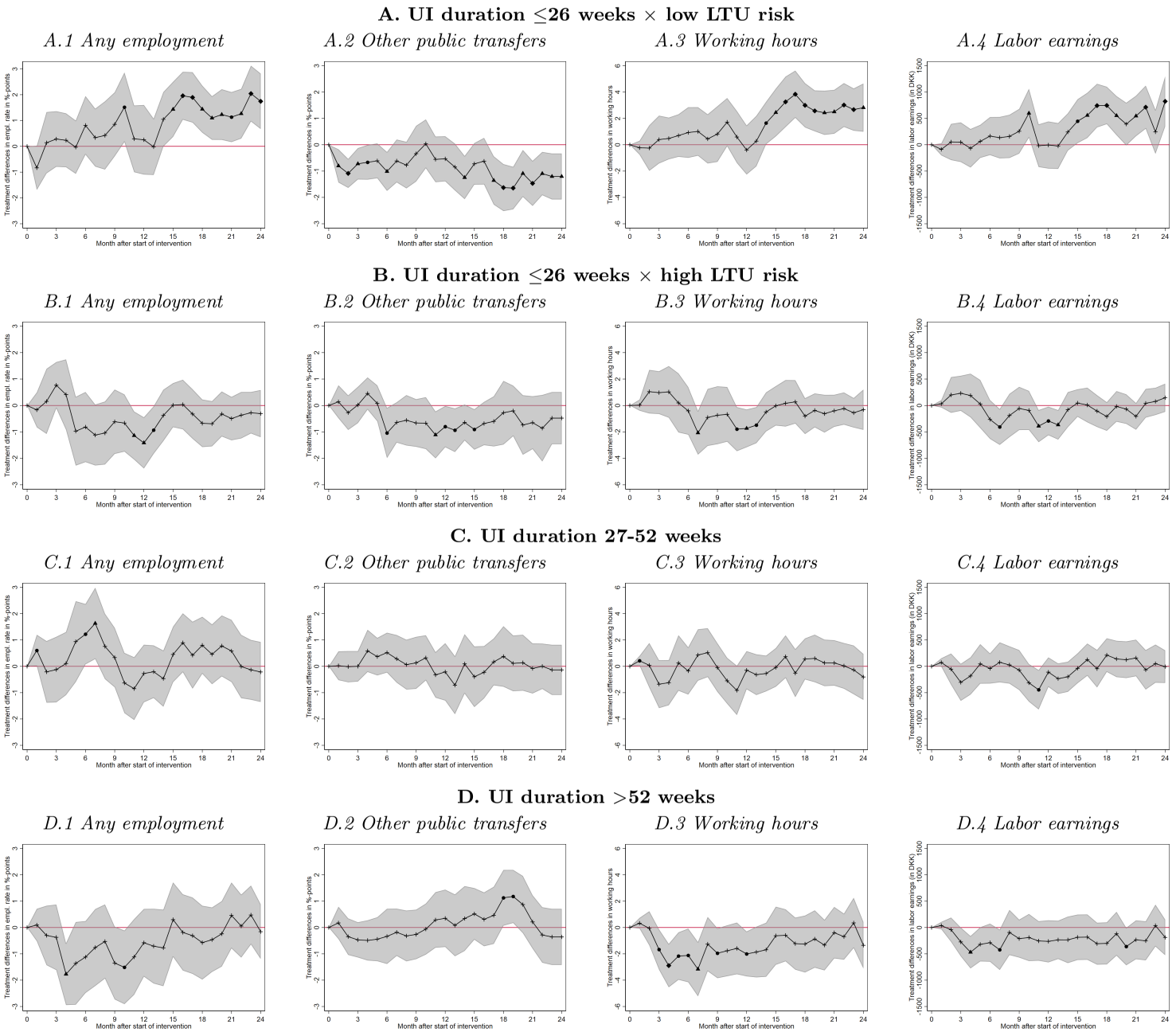
Note: The figure shows the different elements of the online tool, providing personalized information about the UI system. (A) displays the possibility of extending benefit entitlements based on accumulated working hours. (B) shows the consumption of benefit hours within the current benefit period and the current benefit expiration date. (C) shows the working hours saved for gaining a new 2-year benefit period. (C) shows how many working hours have been saved within the current 4-months window to reach the goal of 148 hours and avoid a benefit sanction.

Figure A.3: Distribution of survey answers



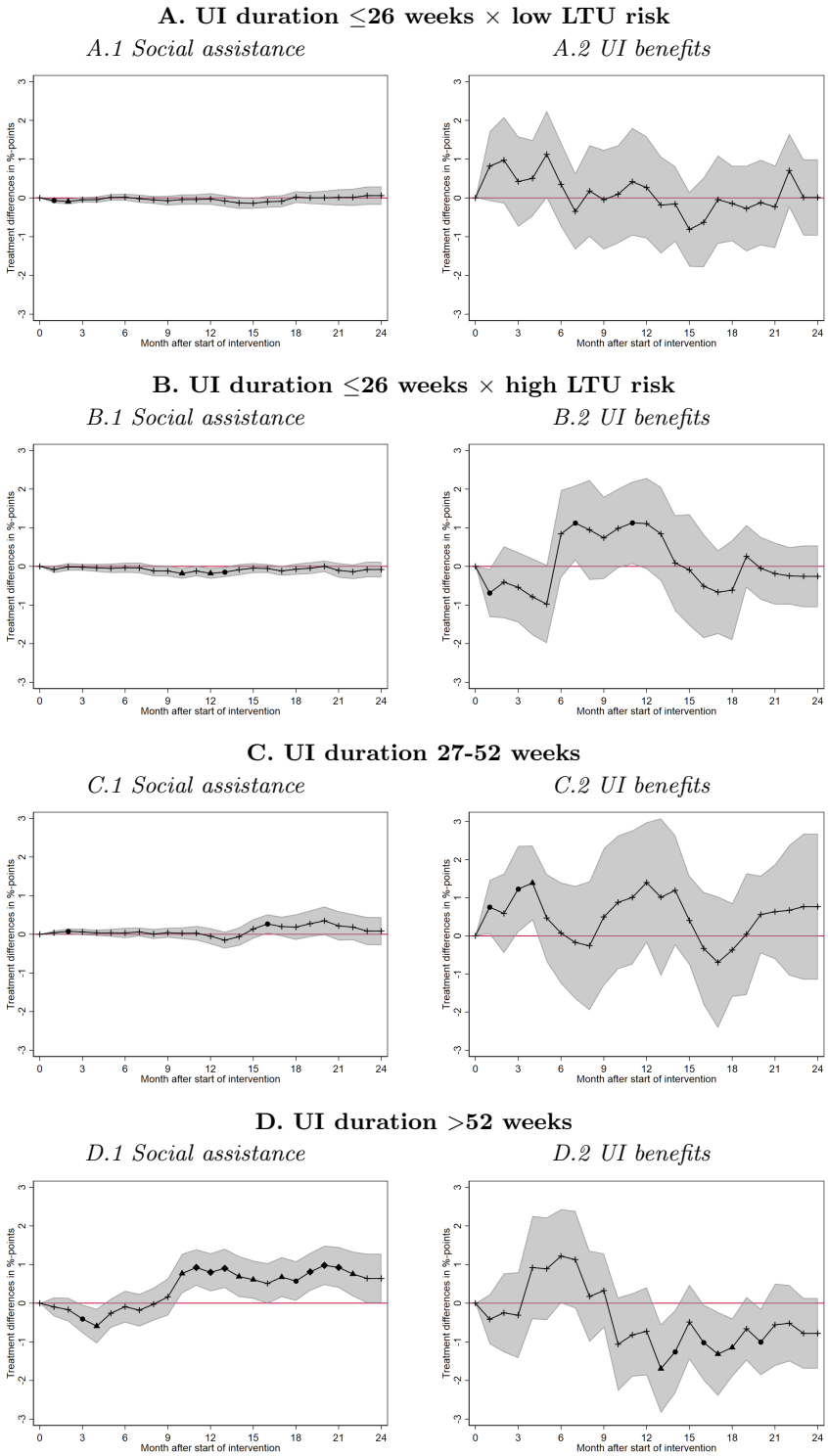
The figure shows the distribution of answers to the survey questions regarding individuals' knowledge about the UI benefit rules. If there are more than three response options (Panel A - C), incorrect answers are classified based on whether the respondent perceives the rules as less or more generous than they actually are.
(a) Depicted is the distribution of a variable that takes into account the respondents answers to question Q26 (i.e. the possibility of gaining a benefit extension) and Q27 (i.e. the length of the possible extension).

Figure A.4: Dynamic labor market effects of tool treatment



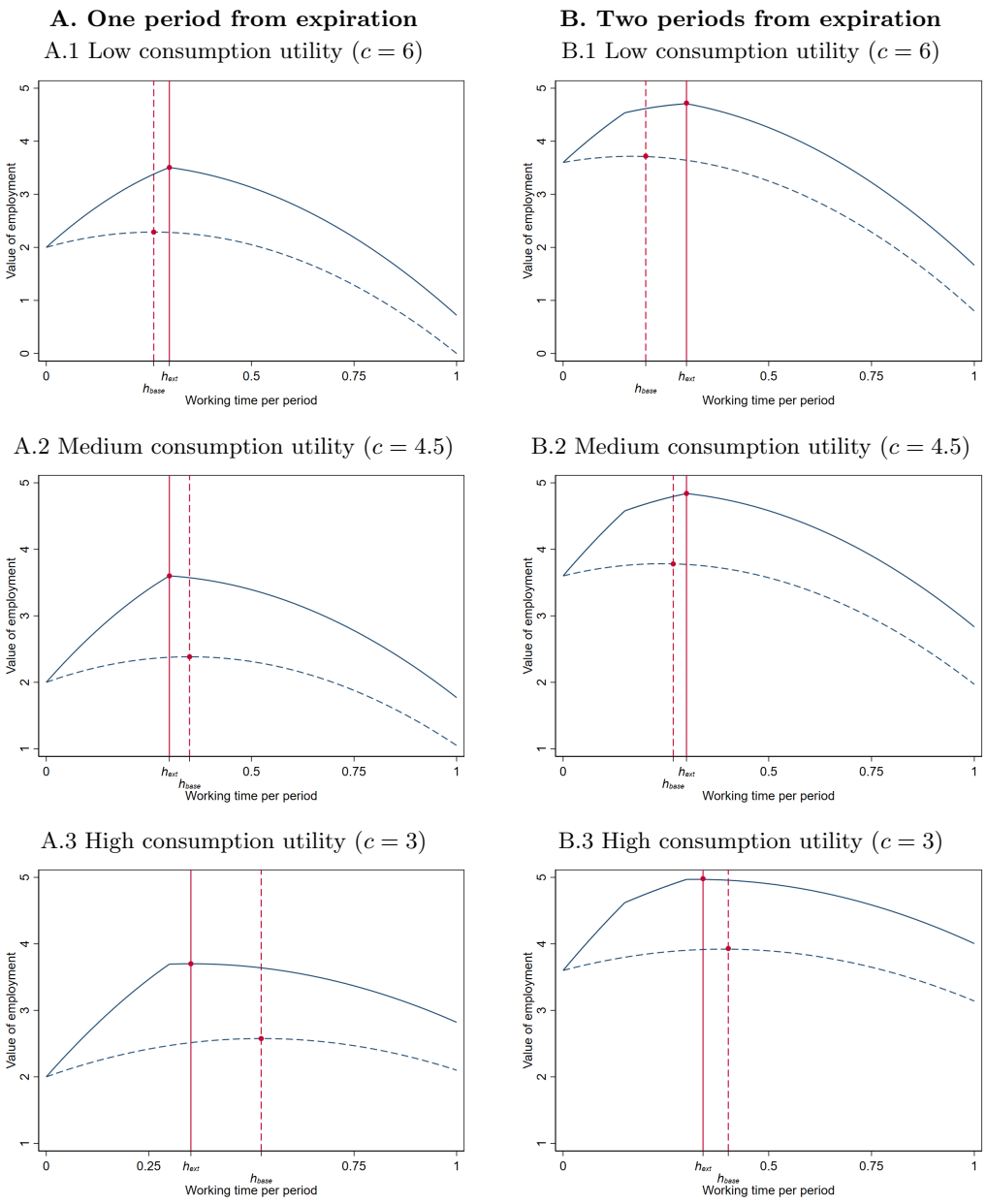
Note: The figure shows the effects of the tool treatment (including 90% confidence intervals) on the monthly employment rates, working hours and labor earnings within two years after the start of the intervention for different groups of UI benefit recipients. In all regressions, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total). ●/▲/◆ indicate statistical significance at the 10%/5%/1%-level.

Figure A.5: Effects of tool treatment on receipt of UI benefits and social assistance



Note: The figure shows monthly effects of the tool treatment (including 90% confidence intervals) on the likelihood of receiving (1) social assistance or (2) UI benefits within two years after the start of the intervention for different groups of UI benefit recipients. In all regressions, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total). ●/▲/◆ indicate statistical significance at the 10%/5%/1%-level.

Figure A.6: Illustration of potential treatment effects on working hours



Note: The figure illustrates job seekers' desired working hours based on the value of employment. When unaware of the extension possibilities, the relationship between the perceived value of employment and the desired number of working hours is represented by the dashed lines. In contrast, the solid lines depict this relationship when considering the potential to extend the UI benefit period by working additional hours. The kink in the value function at $\bar{h}$ reflects that up to this threshold, each additional hour worked generates extra entitlements at a rate of δ, whereas no additional entitlements accrue for hours worked beyond this point. We set the following parameters: $w = 3$, $b = 2$, $\kappa = 0.5$, $\beta = 0.8$, $\delta = 3$, and $\bar{h} = 0.3$.

Table A.1: Comparison of full sample and survey respondents

	Full sample	Respondents pre-intervention survey	Respondents post-intervention survey
No. of observations	98,641	1,154	2,805
Educational level			
None (or missing)	0.083	0.026	0.030
Less than high school	0.178	0.107	0.099
High school	0.400	0.395	0.353
Bachelor degree (or equiv.)	0.241	0.308	0.338
Master degree (or equiv.)	0.098	0.163	0.180
Male	0.479	0.432	0.435
Age			
18-25 years	0.116	0.049	0.040
26-35 years	0.332	0.232	0.230
36-45 years	0.193	0.159	0.175
46-55 years	0.196	0.261	0.272
56-65 years	0.163	0.299	0.282
Household size			
One person	0.194	0.221	0.229
Two persons	0.344	0.399	0.398
Three persons	0.203	0.189	0.185
Four or more persons	0.260	0.192	0.188
Married	0.341	0.406	0.411
Children			
One child	0.164	0.144	0.146
Two or more children	0.172	0.130	0.132
Migration status			
1^{st} generation	0.194	0.088	0.099
2^{nd} generation	0.033	0.011	0.010
Weeks of UI benefits (current spell)	32.15	36.63	34.57
Weeks of UI benefits			
in last year	24.25	27.10	26.47
in last 5 years	50.58	54.75	54.81
Months employed			
in last year	6.025	5.255	5.688
in last 5 years	38.194	38.95	39.49
Average monthly earnings			
in last year	17,818	21,299	22,445
in last 5 years	18,356	23,775	23,413
Average weekly working hours			
in last year	19.13	18.94	20.24
in last 5 years	22.24	24.12	24.46

Note: Depicted are summary statistics for the full experimental population and the samples of survey respondents who completed the pre-intervention survey (middle column) and post-intervention survey (rightmost column), respectively. Percentage shares unless indicated otherwise.

Table A.2: Descriptive statistics: understanding of UI benefit system among UI recipients with non-delayed payments

	Mean	SD
A. Understanding of personal benefit entitlements		
Absolute difference between expected and actual PBD in weeks[(a)]	9.303	15.312
Reporting correct PBD (within a week)[(b)]	0.341	0.474
Overestimating PBD[(b)]		
by one to three weeks	0.069	0.254
by four weeks or more	0.222	0.416
Underestimating PBD[(b)]		
by one to three weeks	0.173	0.379
by four weeks or more	0.195	0.397
B. Understanding of UI benefit rules		
Knowledge index (share of knowledge questions answered correctly)[(c)]	0.534	0.264
Fraction of correct answer to question:		
(Q1) Existence of extension	0.785	0.411
(Q2) Extension gained	0.349	0.477
(Q3) Required period	0.434	0.496
(Q4) Maximum extension	0.458	0.499
(Q5) Income effect	0.543	0.498
(Q6) Qualifying day	0.507	0.500
C. Information sources about UI benefit system[(d)]		
Online platform (*jobnet.dk*)	0.117	0.257
Job center	0.846	0.292
Other online sources (incl. social media)	0.024	0.126
Newspaper or TV	0.003	0.041
Family and friends	0.009	0.083
No. of observations	866	

Note: The table reports descriptive statistics based on the pre-intervention survey. We exclude individuals whose benefit payments are delayed, meaning they do not receive unemployment insurance (UI) payments within the first month following the end of their previous employment. An English translation of the corresponding survey questions can be found in Appendix B.

[(a)] Absolute difference between the subjectively expected remaining benefit duration and the actual remaining benefit duration (observed in the administrative records) in weeks.

[(b)] Percentage share of survey respondents who report an expected remaining benefit duration that is (1) within the same week as the actual remaining benefit period, (2) one to three weeks longer/shorter than the actual remaining benefit period, (3) at least four weeks longer/shorter than the actual remaining benefit period.

[(c)] Share of correct answers to the six knowledge questions (Q1)–(Q6).

[(d)] Index summarizing responses (in percent) to the survey questions *(i) Where do you find information regarding your own unemployment benefit situation?, (ii)Where do you find information about the rules regarding the job search process? [Check the most important answer.]*

Table A.3: Treatment differences in participation in post-intervention survey

Dependent variable	Invited to survey (1)	Survey for non-UI-recipients[(a)] (2)	Completed survey (3)
Tool treatment	0.000	0.000	-0.009
	(0.005)	(0.007)	(0.006)
Message treatment	-0.000	-0.004	-0.009
	(0.005)	(0.005)	(0.008)
No. of observations	98,641	22,327	22,327
Mean value control group	0.226	0.264	0.133
P-value tool v. message	0.893	0.620	0.971

Note: The table reports treatment differences regarding the participation in the post-intervention survey (intention-to-treat effects) among participants in the randomized controlled trial. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively.
[(a)]Refers to an indicator that the individual was invited to an adjusted version of the online survey, which excludes questions that explicitly address UI benefit recipients. All individuals who left unemployment by the time of the main survey in week t_5 were invited to the adjusted survey.

Table A.4: Treatment take-up: clicking behavior by treatment status

	Main message	Reminder 1	Reminder 2	Reminder 3	Reminder 4
Date sent	March 05, 2018	April 03, 2018	April 30, 2018	May 28, 2018	June 25, 2018
Tool treatment					
Messages sent[(a)]	32,857	30,460	26,905	22,839	19,968
Messages opened[(b)]					
total	30,717	26,806	22,904	19,366	16,777
share of sent	0.935	0.880	0.851	0.848	0.840
Click on link[(c)]					
total	6,539	6,311	4,747	3,949	3,711
share of sent	0.199	0.207	0.176	0.173	0.186
share of opened	0.213	0.235	0.207	0.204	0.221
Message treatment					
Messages sent[(a)]	32,874	30,552	26,927	22,801	19,941
Messages opened[(b)]					
total	30,946	27,420	23,761	20,082	17,663
share of sent	0.941	0.897	0.879	0.881	0.886

Note: The table depicts summary statistics on the take-up of the intervention, separately for the tool and message treatment.
[(a)]Refers to the total number of individuals receiving the corresponding message to their inbox on *jobnet.dk*. Reminders are only sent to individuals who have been registered as UI benefit recipients within the last four weeks before the date of the reminder.
[(b)]Refers to all individuals opening the corresponding message.
[(c)]Refers to all individuals clicking on the link to the online information tool.

Table A.5: Treatment effects on knowledge about UI benefit rules (separate questions)

Dependent variable	Existence of extension (Q26)	Extension gained (Q27)	Required period (Q31)	Maximum extension (Q32)	Income effect (Q28)	Qualifying day (Q30)
	(1)	(2)	(3)	(4)	(5)	(6)
Tool treatment	0.088***	0.130***	0.076***	0.049**	0.012	-0.020
	(0.018)	(0.021)	(0.023)	(0.023)	(0.023)	(0.023)
Message treatment	0.002	0.072***	0.061***	0.033	-0.008	0.022
	(0.018)	(0.021)	(0.023)	(0.023)	(0.023)	(0.023)
Observations	2,780	2,780	2,780	2,780	2,780	2,780
Mean value control group	0.771	0.271	0.349	0.432	0.521	0.482
P-value: tool v. message treatment	< 0.001	0.008	0.524	0.493	0.402	0.069

Note: The table reports treatment differences (intention-to-treat effects) with respect to the likelihood of answering the six questions measuring individuals' knowledge about the UI benefit rules correctly. The exact questions (Q26–Q32) are shown in Appendix B and the estimation sample includes all respondents of the main survey. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively.

Table A.6: Predicting the risk of long-term unemployment

Dependent variable:	**Realized unemployment duration > 52 weeks**			
	A. Logit model Sample 2017		B. LASSO-Logit model Sample 2017	Sample 2016
	Coef.	SE	Coef.	Coef.
Educational level (ref. none)				
Less than high school	-0.099*	(0.055)	-0.084	-0.0956
High school	-0.149***	(0.053)	-0.133	-0.206
BA degree (or equiv.)	0.058	(0.052)	0.074	0.0696
MA degree (or equiv.)	-0.018	(0.057)		
Male	-0.076***	(0.019)	-0.078	
Age (ref. 18-25 years)				
26 - 35 years	0.117***	(0.032)	0.093	0.0330
36 - 45 years	0.222***	(0.038)	0.195	0.299
46 - 55 years	0.333***	(0.039)	0.302	0.445
56 - 65 years	0.595***	(0.041)	0.559	0.789
Household size (ref. one person)				
Two persons	-0.129***	(0.0253)	-0.109	-0.124
Three persons	-0.307***	(0.056)	-0.226	-0.274
Four or more persons	-0.452***	(0.091)	-0.310	-0.137
Married	0.064***	(0.024)	0.049	
Children (ref. none)				
One child	0.168***	(0.046)	0.109	0.0241
Two or more children	0.292***	(0.083)	0.166	
Migration status				
1st generation	0.528***	(0.024)	0.528	0.541
2nd generation	0.326***	(0.045)	0.319	0.385
Average monthly earnings (in 10,000DKK)				
in last year	0.033*	(0.017)	0.016	0.074
in last 5 years	-0.118***	(0.021)	-0.094	-0.160
Average weekly working hours (×10)				
in last year	-0.044***	(0.015)	-0.029	-0.022
in last 5 years	0.018	(0.019)	0.012	
Weeks of UI benefits				
in last year	-0.013***	(0.001)	-0.013	-0.037
in last 5 years	-0.005***	(0.001)	-0.005	-0.007
Municipality FE	Yes		Yes	Yes
Unemployment fund FE	Yes		Yes	Yes
Pseudo-R^2	0.061			
No. of observations	69,230		69,230	42,251
Mean value dependent variable	0.300		0.300	0.227

Note: The table reports coefficients of a logit (Panel A) and a LASSO-logit (Panel B) model predicting the risk of long-term unemployment for a sample of entries into unemployment in 2017 (specification 1 and 2), respectively 2016 (specification 3). The dependent variable is a dummy indicating a realized unemployment duration of 52 weeks or more. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively.

Table A.7: Treatment effects by risk of long-term unemployment based on alternative prediction model[(a)]

	Sample: UI benefit duration ≤ 26 weeks	
	Total working hours within 24 months	Total labor earnings (in DKK) within 24 months
	(1)	(2)
Effect of tool treatment by risk og long-term unemployment (LTU)		
Low risk of LTU	45.94**	9,726**
	(22.52)	(4,790)
High risk of LTU	-4.22	-543
	(15.29)	(3,252)
P-value: low v. high risk of LTU	0.065	0.076
No. of observations	53,383	53,383
Mean value control group		
Low risk of LTU	1,851	363,185
High risk of LTU	1,861	340,621

Note: The table reports the effects of the tool treatment on labor market outcomes (intention-to-treat effects) among participants in the randomized controlled trial. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. All specifications account for the effect of the message treatment (coefficients are not shown).
[(a)]The risk of long-term unemployment (LTU) is estimated based on a sample of entries into unemployment in 2016 (rather than 2017) using a LASSO logit approach.

Table A.8: Heterogeneous knowledge effects of tool treatment

Dependent variable	Expected – actual current PBD[(a)]			Knowledge UI benefit rules
	Absolute difference (in weeks)	Overestimating entitlements (in weeks)	Underestimating entitlements (in weeks)	Share of correct answers (0=low; 1=high)
	(1)	(2)	(3)	(4)
Effect of tool treatment				
× UI duration ≤ 26 weeks × low risk	-1.50	0.05	-1.55	0.039*
	(1.72)	(1.50)	(1.03)	(0.024)
× UI duration ≤ 26 weeks × high risk	-2.79*	-1.26	-1.53	0.062**
	(1.68)	(1.47)	(1.01)	(0.025)
× UI duration 27-52 weeks	-0.71	0.01	-0.72	0.064***
	(1.53)	(1.34)	(0.92)	(0.023)
× UI duration > 52 weeks	-2.82*	-2.54*	-0.28	0.050*
	(1.69)	(1.48)	(1.02)	(0.026)
No. of observations	2,000	2,000	2,000	2,805
Mean value control group				
UI duration ≤ 26 weeks × low risk	7.66	3.96	3.70	0.469
UI duration ≤ 26 weeks × high risk	11.74	6.99	4.74	0.443
UI duration 27-52 weeks	7.25	3.39	3.85	0.522
UI duration 27-52 weeks	9.02	7.96	1.06	0.591

Note: The table reports heterogeneous effects of the tool treatment on individuals' knowledge about their current entitlements and the UI benefit rules (intention-to-treat effects) among participants in the main survey. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. In all models, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total).

[(a)]Refers to the difference between the expected and actual remaining PBD. In Column (1), we consider the absolute difference. In Column (2)-(3), we decompose the absolute difference into instances that over-, respectively underestimate their remaining benefit duration. Therefore, we set the corresponding outcome variable to zero if the individual does not overestimate (Column (2)), respectively if the individual does not underestimate (Column (3)) the PBD.

Table A.9: Heterogeneous treatment effects on individuals' perceptions of the UI system

Dependent variable	Perceived pressure & monitoring				Perceptions related to knowledge	
	Index of three items (10=high)	Feels monitored by authorities[a] (10=high)	Feels pressure to search [a] (10=high)	Feels pressure to accept job[a] (10=high)	Attractiveness small work opportunity[c] (10=high)	Certainty about PBD[d] (10=high)
	(1)	(2)	(3)	(4)	(5)	(6)
Effect of tool treatment						
× UI duration ≤ 26 weeks × low risk	0.050	0.216	0.177	0.012	0.530	0.936***
	(0.185)	(0.250)	(0.243)	(0.273)	(0.349)	(0.340)
× UI duration ≤ 26 weeks × high risk	0.246	0.023	0.383	0.422	0.385	0.633*
	(0.187)	(0.253)	(0.245)	(0.283)	(0.338)	(0.332)
× UI duration 27-52 weeks	-0.133	0.184	-0.307	-0.278	-0.422	0.623**
	(0.175)	(0.236)	(0.228)	(0.267)	(0.319)	(0.305)
× UI duration > 52 weeks	0.129	-0.004	0.238	0.442	0.804**	0.575*
	(0.211)	(0.287)	(0.261)	(0.303)	(0.332)	(0.299)
No. of observations	2,805	2,805	2,805	2,805	2,000	2,000
Mean value control group						
UI duration ≤ 26 weeks × low risk	7.361	7.604	7.908	6.262	4.970	6.503
UI duration ≤ 26 weeks × high risk	6.954	7.340	7.468	5.966	5.628	6.423
UI duration 27-52 weeks	7.367	7.482	8.143	6.309	6.059	6.490
UI duration 27-52 weeks	7.177	7.349	7.725	6.165	6.086	7.847

Note: The table reports treatment differences in the perception of the UI system among participants in the main survey. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. In all regressions, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total).

[a] The outcome in Column (1) refers to an index derived from the following three survey question: *Do you agree with the following statement? Please enter your assessment on a scale from 1 to 10, where 1="Do not agree at all" and 10="Completely agree": (Q11) My job search activities are regularly monitored by the authorities. (Q36) I constantly feel pressured to search for a job. (Q37) I constantly feel pressured to accept job offers.* Treatment effects on the three single items are depicted in Column (5)–(7).

[b] The outcome in Column (3) refers to the survey question: *(Q29) Suppose that you have an offer of working for one week (equivalent to 37 hours). The salary before tax is DKK5,500 and you receive unemployment benefits for the rest of the month. How attractive is such a job to you? Please enter your assessment on a scale from 1 to 10, where 1="Not attractive at all" and 10="Very attractive".*

[c] The outcome in Column (4) refers to the survey question: *(Q25) How sure are you about your answer to the question regarding your benefit expiration date? Please enter your assessment on a scale from 1 to 10, where 1="Not sure at all" and 10="Completely sure".*

The numbers in parentheses refer to the survey questions, with the English translation provided in Appendix B.

Table A.10: Summary statistics for subgroups of the experimental population

	Elapsed benefit duration			
	≤ 26 weeks		27-52 weeks	>52 weeks
	Low LTU risk[(a)]	High LTU risk[(a)]		
No. of observations	26,691	26,692	23,204	21,938
Treatment take-up[(b)]				
Clicked on link to online tool	0.344	0.388	0.495	0.571
Background characteristics				
Educational level				
None (or missing)	0.033	0.125	0.091	0.080
Less than high school	0.240	0.139	0.169	0.164
High school	0.524	0.343	0.375	0.360
Bachelor degree (or equiv.)	0.146	0.310	0.269	0.233
Master degree (or equiv.)	0.058	0.083	0.096	0.163
Male	0.613	0.395	0.463	0.449
Age				
18-25 years	0.085	0.202	0.098	0.062
26-35 years	0.228	0.424	0.341	0.323
36-45 years	0.222	0.155	0.195	0.204
46-55 years	0.278	0.116	0.196	0.202
56-65 years	0.187	0.102	0.169	0.209
Household size				
One person	0.195	0.179	0.191	0.215
Two persons	0.330	0.361	0.344	0.338
Three persons	0.207	0.205	0.206	0.191
Four or more persons	0.268	0.255	0.258	0.256
Married	0.385	0.290	0.345	0.351
Children				
One child	0.161	0.165	0.170	0.159
Two or more children	0.181	0.162	0.173	0.173
Migration status				
1st generation	0.062	0.271	0.205	0.235
2nd generation	0.013	0.046	0.034	0.037
Weeks of UI benefits	12.04	10.29	37.53	77.77
Labor market outcomes in last year				
Months employed	9.26	6.92	4.24	3.03
Average monthly earnings in DKK	29,932	14,451	16,658	7,620
Average weekly working hours	29.80	18.92	16.79	9.58

Note: The table reports summary statistics for different subgroups of the experimental population. Percentage shares unless indicated otherwise.

[(a)] The sample only includes individuals with an elapsed benefit duration of 26 weeks or less. The risk of long-term unemployment (LTU) is estimated based on a sample of entries into unemployment in 2017 using a LASSO logit approach.

[(b)] Refers to share of treated individuals who clicked on the link to the online tool provided in the treatment messages.

Table A.11: Coefficient stability: treatment effects on cumulated labor market outcomes

	Outcomes accumulated within 24 months							
Dependent variable	Working hours	Labor earnings in DKK	Working hours	Labor earnings in DKK	Working hours	Labor earnings in DKK	Working hours	Labor earnings in DKK
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of tool treatment								
× UI duration ≤ 26 weeks × low risk	37.72**	8,086**	34.06	5,959	46.71*	7,112	46.73*	6,948
	(17.31)	(3,682)	(21.33)	(4,524)	(25.85)	(5,424)	(28.10)	(5,900)
× UI duration ≤ 26 weeks × high risk	-7.94	-1,525	-13.51	-3,945	-3.94	-2,946	-8.37	-4,091
	(16.81)	(3,278)	(23.49)	(4,557)	(25.70)	(5,051)	(30.85)	(5,412)
× UI duration 27-52 weeks	-6.27	-1,522	-11.55	-3,905	-1.28	-2,985	-4.22	-3,810
	(15.51)	(2,761)	(18.88)	(3,151)	(22.35)	(3,947)	(25.21)	(4,554)
× UI duration > 52 weeks	-37.21**	-6,816*	-42.81**	-9,281**	-33.21	-8,519*	-36.99	-9,525*
	(18.65)	(3,640)	(21.52)	(4,154)	(24.32)	(4,627)	(27.00)	(5,240)
No. of observations	98,641	98,641	98,641	98,641	98,641	98,641	98,641	98,641
Mean value control group								
UI duration ≤ 26 weeks × low risk	2,195	452,033	2,195	452,033	2,195	452,033	2,195	452,033
UI duration ≤ 26 weeks × high risk	1,856	340,660	1,856	340,660	1,856	340,660	1,856	340,660
UI duration 27-52 weeks	1,710	317,784	1,710	317,784	1,710	317,784	1,710	317,784
UI duration 27-52 weeks	1,608	283,272	1,608	283,272	1,608	283,272	1,608	283,272
Controlling for treatment heterogeneity by[(a)]								
Education	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Gender	No	No	No	No	Yes	Yes	Yes	Yes
Age	No	No	No	No	Yes	Yes	Yes	Yes
Family status	No	No	No	No	No	No	Yes	Yes
Migration background	No	No	No	No	No	No	Yes	Yes

Note: The table reports treatment differences in labor market outcomes (intention-to-treat effects) among participants in the randomized controlled trial. Standard errors are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. In all models, we control for socio-demographic characteristics, labor market histories, place of residence (98 municipalities) and membership of unemployment funds (24 in total).

[(a)] We additionally control for interaction terms of the treatment indicator (tool treatment) with different background characteristics including indicators for (1) having a high school degree, (2) having a university degree, (3) being female, (4) being older than 45 years, (5) having kids, (6) being married or cohabiting and (7) having a migration background.

Table A.12: Summary statistics for participants in main survey

	Treatment status			
	Control (C)	Message (M)	Tool (T)	$P-$value
No. of observations	986	918	901	
Educational level				
None (or missing)	0.026	0.029	0.034	0.598
Less than high school	0.093	0.105	0.101	0.698
High school	0.345	0.365	0.349	0.628
Bachelor degree (or equiv.)	0.355	0.329	0.330	0.394
Master degree (or equiv.)	0.181	0.172	0.186	0.724
Male	0.438	0.408	0.457	0.106
Age				
18-25 years	0.040	0.037	0.044	0.726
26-35 years	0.234	0.227	0.230	0.923
36-45 years	0.174	0.174	0.176	0.991
46-55 years	0.259	0.281	0.279	0.476
56-65 years	0.293	0.281	0.271	0.560
Household size				
One person	0.220	0.220	0.246	0.311
Two persons	0.398	0.401	0.396	0.978
Three persons	0.205	0.178	0.171	0.137
Four or more persons	0.177	0.202	0.186	0.406
Married	0.421	0.412	0.401	0.672
Children				
One child	0.166	0.141	0.130	0.074
Two or more children	0.123	0.142	0.132	0.477
Migration status				
1^{st} generation	0.095	0.100	0.102	0.877
2^{nd} generation	0.013	0.011	0.007	0.318
Weeks of UI benefits (current spell)	33.227	36.960	33.615	0.008
Weeks of UI benefits				
in last year	26.12	27.91	25.37	0.002
in last 5 years	53.28	56.35	54.92	0.223
Months employed				
in last year	5.948	5.386	5.710	0.016
in last 5 years	40.072	39.210	39.133	0.378
Average monthly earnings				
in last year	23,016	21,285	23,003	0.195
in last 5 years	23,969	22,752	23,478	0.263
Average weekly working hours				
in last year	20.68	19.57	20.50	0.199
in last 5 years	24.64	24.31	24.46	0.810

Note: Percentage shares unless indicated otherwise. $P-$values are based on F-tests for joint significance of treatment coefficients in separate regressions of each of the characteristics on dummies for the different treatment conditions.

B Detailed Information about the Online Survey

The survey was implemented in two waves, involving a 30% subsample of our overall study population. A first survey wave was administered in the week immediately before the experiment started (week $t = -1$ in Figure 1). 7.5% of the total study population were invited to this pre-intervention survey (n=7,430; three equally-sized subsamples from each treatment arm). The main, post-intervention survey was administered in $t = 5$, roughly one month after treated individuals received the main treatment message. For the post-intervention survey, we invited 22.5% of the overall population from the RCT (n=22,352; equally-sized subsamples from the different treatments). Roughly 20% of the study population had already left unemployment at the time of the post-intervention survey. The invitation to the survey was independent of a participant's employment status at $t = 5$, but some survey questions, e.g., concerning individuals' personal benefit entitlements, were only included for respondents who were still unemployed at the time of the survey.

Individuals were incentivized to fill in the survey as they may participate in a lottery for 200 shopping vouchers of DKK 500 (approx. €65) each. Participants are invited by the public employment service on behalf of the University of Copenhagen, using their private e-mail addresses.[29] Using a different communication channel and a different sender for the survey and the information treatment reduces the risk that respondents connect the survey to the treatment messages.

The overall response rate in the online survey is about 14%, with a slightly lower value in the post-intervention survey (12.5%) than in the pre-intervention survey (15.5%). The difference primarily reflects a lower likelihood to respond among individuals who have already left unemployment. Table A.1 compares socio-demographic characteristics of participants in the pre- and post-intervention survey and the overall study population. Compared to the average UI benefit recipient, survey participants tend to be somewhat older and better educated, they are more likely to be female and married, less likely to be migrants, and they have been unemployed for a somewhat longer time period. While this indicates that survey respondents are not necessarily representative of the full experimental population, it is important to note that the treatment neither affects the likelihood of being employed by the time of the post-intervention survey, nor the likelihood of completing the survey (see Table A.3). Moreover, there are only minor differences regarding the composition of survey respondents across treatments arms (see Table A.12). Altogether, this suggests that the survey data are suitable to identify the causal effects of the intervention on job seekers' knowledge.

[29] Only participants who agreed to be contacted by the public employment service via e-mail are invited to the survey. This applies for about 50% of the overall population.

Survey questions about knowledge and perception of the UI system

(Q01) When did you register as unemployed either at jobnet.dk or at your unemployment fund?

- Day
- Month
- Year

(Q02) What type of job are you looking for? *You may mark multiple answers.*

- Full-time (37 or more working hours per week)
- Part-time (less than 37 working hours per week)

(Q03) What type of job are you looking for? *You may mark multiple answers.*

- Permanent job
- Temporary job

(Q04) How many jobs did you apply for during the last month? *Please state the exact total number of jobs.*

(Q05A) How many of your applications were for full-time and part-time jobs? *Please state the exact number of full-time and part-time jobs.*

- Full-time (37 or more working hours per week)
- Part-time (less than 37 working hours per week)

(Q05B) How many of your applications were for permanent and temporary jobs? *Please state the exact number of permanent and temporary jobs.*

- Permanent jobs
- Temporary jobs

(Q06) How often did you apply for jobs using the online platform jobnet.dk during the last month?

(Q07) How many hours did you spend on job search activities during the last week?

(Q08) Did you receive any invitations to job interviews during the last month?

- Yes
- No

(Q09) If yes: How many invitations to job interviews did you receive during the last month?

(Q10) When do you expect to deregister as unemployed at jobnet.dk or your unemployment fund? *Please indicate the point in time in which you expect to deregister.*

- Within 1 month
- Within 2 months
- Within 3 months
- Within 4 months
- Within 5 months
- Within 6 months
- Within 7 months
- Within 8 months

- Within 9 months
- Within 10 months
- Within 12 months
- Within 13 months
- Within 15 months
- Within 16 months
- Within 18 months
- Within 22 months
- Within 24 months
- In more than 24 months

(Q10) How sure are you about your answer above? *Please enter your assessment on a scale from 1 to 10, where 1="Not sure at all" and 10= "Completely sure".*

(Q11) Do you agree with the following statement? My job search activities are regularly monitored by the authorities. *Please enter your assessment on a scale from 1 to 10, where 1="Do not agree at all" and 10="Completely agree".*

(Q12) Overall, how easy/difficult is it for you to find a new job? *Please enter your answer on a scale from 1 to 10, where 1="Very easy" and 10="Very difficult".*

(Q13) Which of the following statements describes your usage of joblog best?

- I register a sufficient number of jobs to comply with the search requirements, but I have often searched for additional jobs that I do not register.
- I register a sufficient number of jobs to comply with the search requirements and I have rarely searched for further jobs.
- I always register all jobs I apply for regardless of the search requirements.
- Usually, I do not register my search activities in joblog.

(Q14) How many jobs did you apply for in the last month without registering them in joblog? *Please state the number of jobs.*

(Q15) How often should you check your suggested job ads on jobnet.dk?

- Every day
- Every week
- Every month
- Every second month

(Q16) Suppose you have forgotten to check your suggested job ads on time. What would be the consequence?

- You will receive a reminder
- You will be unsubscribed and no longer receive unemployment benefits
- Nothing

(Q17) What was your income in your last job? *Please indicate your monthly salary before tax.*

(Q18) What was your level of unemployment benefits (paid by your unemployment fund) in the last month? *Please indicate your monthly benefits before tax.*

(Q19) Did you work during the last month?

- Yes
- No

(Q20) How many hours did you work during the last month? *Please indicate the number of hours.*

(Q21) How much did you earn for these working hours? *Please indicate the total amount before tax.*

(Q22) Are you in job training or do you work in a subsidized job?

- Yes
- No

(Q23) Do you receive supplementary unemployment benefits?

- Yes
- No

(Q24) When will your unemployment benefits expire? Enter the date your unemployment benefit period ends if you include current extensions. Assume that you do not take any further work.

- Day
- Month
- Year

(Q25) How sure are you about your answer in the previous question? *Please enter your assessment on a scale from 1 to 10, where 1="Not sure at all" and 10="Completely sure".*

(Q26) Suppose you will work for two full weeks while being on unemployment benefits. How will this affect your situation at the end of the two-year unemployment benefit period? Can you use the two weeks to extend your benefit period?

- Yes
- No

(Q27) For how long can you extend your unemployment benefit period if you have been working for two weeks? Please indicate the number of weeks.

(Q28) Suppose that you have an offer of working for one week (equivalent to 37 hours). The salary before tax is 5.500 kr and you receive unemployment benefits for the rest of the month. How will it affect your total monthly income (working salary and unemployment benefits) in comparison to a month where you receive unemployment benefits only, if you accept the job?

- My income decreases
- My income is the same
- My income increases

(Q29) How attractive is such a job to you? *Please enter your assessment on a scale from 1 to 10, where 1="Not attractive at all" and 10="Very attractive".*

(Q30) Suppose you have received unemployment benefits for a period of 4 months and you are not working during the period, how will it affect your unemployment benefit in the fourth month compared to the first 3 months of the period? My benefits in the 4th month are:

- Lower

- Unchanged
- Higher

How large do you expect that the benefit reduction in the fourth month will be? *Give it your best shot.*

- Amount before tax:

(Q31) The unemployment benefit period is two years with the possibility of an extension. How many hours do you have to work to extend the benefit period by 12 weeks? *(This could be by working in a small job during the benefit period.)*

- 111 hours (3 weeks)
- 222 hours (6 weeks)
- 444 hours (12 weeks)
- 666 hours (18 weeks)
- 888 hours (24 weeks)

(Q32) In general, by how much can the two-year unemployment benefit period be extended by working while you receive unemployment benefits?

- 481 hours (3 months)
- 962 hours (6 months)
- 1443 hours (9 months)
- 1924 hours (12 months)
- 2405 hours (15 months)
- 2886 hours (18 months)

With the following questions, we are interested in your perception of the job search process. You will be confronted with several statements. Please indicate on a scale from 1 to 10 whether your agree with the statement, where 1="completely disagree" and 10="completely agree".

(Q33) I generally feel well informed about the rules, rights, and regulations that are relevant for me.

(Q34) It is easy for me to find the information that I need.

(Q35) The rules are hard to understand.

(Q36) I constantly feel pressured to search for a job.

(Q37) I constantly feel pressured to accept job offers.

(Q38) Where do you find information regarding your own unemployment benefit situation? *Check the most important answer.*

- Job center or unemployment fund
- Jobnet.dk
- Other online sources, incl. social media
- Newspaper or TV
- Family and friends

(Q39) Where do you find information about the rules regarding the job search process? *Check the most important answer.*

- Job center or unemployment fund
- Jobnet.dk
- Other online sources, incl. social media
- Newspaper or TV
- Family and friends

(Q40) The following question is about your feelings in the last four weeks. Below you can see a list of words describing different emotions and conditions:

1. Attentive	6. Upset	11. Excited	16. Scared
2. Strong	7. Irritable	12. Hostile	17. Enthusiastic
3. Inspired	8. Active	13. Proud	18. Distressed
4. Afraid	9. Guilty	14. Unhappy	19. Determined
5. Alert	10. Nervous	15. Ashamed	20. Interested

Please mark the answer that describes in the best way your feelings in the last four weeks. *Mark one answer for each feeling.*

- Not at all
- Slightly
- Somewhat
- Pretty much
- To a great extent

C Text of Treatment Messages

Main message to treatment group:

Dear X,

Your unemployment benefits will expire at some point, but did you know that you can influence the duration of your unemployment benefit period yourself? Every hour you work translates into up to two extra hours of unemployment benefits, which you can use to extend your unemployment benefit period. At the same time, every hour you work helps you avoid a qualification day, at which you receive no unemployment benefits.

A new tool on *jobnet.dk* makes it easy for you to keep an eye on your accumulated working hours and get an overview of the most relevant benefit rules. The dynamic and personalized tool is called "Dagpengetæller" ["benefit meter"]. It is continuously updated with your unemployment benefit hours and your working hours; and you can calculate how extra working hours will affect your unemployment benefit period.

Your benefit meter gives you an overview of:

1. The hours you have worked
2. Your consumption of unemployment benefits and your remaining benefit hours
3. Rules that are important for you. Check the information boxes by clicking on the "i"-button

Learn more about your unemployment benefits now. [LINK]

Use your benefit meter regularly to know your possibilities and make the most out of them. You may, for instance, check your benefit meter when you log on to jobnet.dk to check your suggested job ads or register your job applications.

Did you know that there are about 20,000 vacancies available at jobnet.dk right now? There are more possibilities than you may think.

Good luck with your job search.

Reminder message to treatment group:

Dear X,

Your unemployment benefits will expire at some point in time, but did you know that you can influence the duration of your unemployment benefit period yourself?

A new tool on *jobnet.dk* makes it easy for you to keep an eye on your accumulated working hours and get an overview of the most relevant benefit rules.

Learn more about your unemployment benefits now. [LINK]

Use your benefit meter regularly to know your possibilities and make the most out of them.

Did you know that there are about 20,000 vacancies available at jobnet.dk right now? There are more possibilities than you may think.

Good luck with your job search.

Message to message group:

Dear X,

Use *jobnet.dk* regularly to know your possibilities and make the most out of them.

Did you know that there are about 20,000 vacancies available at jobnet.dk right now? There are more possibilities than you may think.

Good luck with your job search.

D The Role of Treatment Spillovers

The large-scale nature of our experiment potentially raises concerns about the presence of spillovers from treated individuals on other, untreated job seekers. For instance, there could be information spillovers such that treated individuals inform their untreated peers about their newly acquired knowledge of the UI benefit system (Duflo and Saez, 2003). Spillovers could also arise as a result from labor-market competition between treated and untreated job seekers (Crépon et al., 2013; Gautier et al., 2018) and there could be crowding out among job seekers applying for the same vacancies (Ferracci et al., 2014), e.g., marginal jobs. While our experimental design does not explicitly account for the analysis of spillover effects, e.g., through a clustered randomization procedure with varying treatment intensity across different regions (see, e.g., Crépon et al. 2013, Altmann et al. 2022), our randomization procedure gives rise to natural exogenous variation in the share of treated individuals in subgroups of job seekers, who are likely to interact with each other. Specifically, to examine the relevance of treatment spillovers in our setting, we calculate the share of individuals being assigned to the tool treatment within clusters of job seekers, taking into account their place of residence (98 municipalities), their last occupation before becoming unemployed (173 occupations), and their age (five cohorts given by 10-year age bins). Assuming that individuals within a cluster are, on average, more likely to interact with each other than individuals from different clusters (either by informing each other or by competing for similar vacancies), we can use variation in this measure of local treatment intensity to shed light on treatment spillovers. As shown in Figure D.1, we observe substantial variation with respect to treatment intensities across the different clusters. Moreover, Table D.1 shows that individual characteristics have very little predictive power for our measure of local treatment intensity, suggesting there are no systematic differences across clusters with different treatment intensities.

To empirically identify treatment spillovers, we estimate regression models of the following form (similar to Crépon et al., 2013):

$$Y_{ij} = \delta D_i + \gamma TI_j + \theta(D_i \times TI_j) + \eta X_i + \zeta_{ij} \tag{D.1}$$

where TI_j, refers to the local treatment intensity within cluster j (at the region-occupation-age level) and D_i is a dummy variable indicating whether individual i is assigned to the tool treatment. Equation (D.1) allows us to estimate different parameters of interest. First, δ identifies the direct treatment effect in the absence of spillovers. Second, γ show possible spillovers on individuals who are assigned to the control group (or the message treatment). For instance, a negative coefficient would imply that a larger share of treated individuals has a negative impact on the labor market outcomes

of non-treated job seekers. Finally, the interaction effects of the actual treatment assignment D_i and the local treatment intensity TI_j, given by θ, inform us about differential spillovers between treated and non-treated individuals. This means that the overall spillover effect on the treatment group is given by $(\gamma + \theta)$. We employ two-way clustered standard errors at the level of municipalities and previous occupations. Table D.2 shows the results for cumulated working hours and earnings over 24 months for two different specifications. First of all, we consider the continuous treatment intensity as depicted in Figure D.1 (see Specification 1). Alternatively, we also consider indicator variables accounting for the top and bottom quintile of the distribution of local treatment intensities (see Specification 2). Overall, we find little evidence for systematic positive or negative treatment spillovers. For instance, the estimates from Specification 2 suggest that higher treatment intensities have a non-linear effect on untreated job seekers, with working hours and earnings in both the top and bottom quintile of the treatment-intensity distribution being both somewhat higher than for intermediate treatment intensities (though both effects are rather imprecisely estimated). While our analysis does, ultimately, not allow us to rule out all possible forms of treatment spillovers (e.g., the simultaneous presence of displacement effects and positive informational spillovers, which tend to cancel each other out), it appears unlikely that treatment spillovers have a large net effect on the results presented in Section 5.

Table D.1: Predictability of local treatment intensity

Dependent variable	**Local treatment intensity**	
	Coef.	SE
Educational level (ref. none or missing)		
Less than high school	-0.0023	(0.0037)
High school	-0.0032	(0.0033)
Bachelor degree (or equiv.)	-0.0027	(0.0032)
Master degree (or equiv.)	-0.0049	(0.0034)
Male	-0.0012	(0.0020)
Age (ref.18-25 years)		
26-35 years	0.0054	(0.0053)
36-45 years	0.0102*	(0.0060)
46-55 years	0.0059	(0.0047)
56-65 years	0.0056	(0.0047)
Household size (ref. one person)		
Two persons	0.0002	(0.0023)
Three persons	-0.0026	(0.0027)
Four or more persons	-0.0001	(0.0032)
Married	-0.0009	(0.0018)
Children (ref. none)		
One child	-0.0007	(0.0024)
Two or more children	-0.0023	(0.0036)
Migration status (ref. Danish)		
1^{st} generation	0.0035	(0.0025)
2^{nd} generation	-0.0012	(0.0045)
Actual nr of joblog at pre-survey	0.0001	(0.0001)
Average monthly earnings in 10,000DKK		
in last year	0.0004	(0.0006)
in last 5 years	0.0001	(0.0003)
Average weekly working hours (×100)		
in last year	-0.0013	(0.0009)
in last 5 years	-0.0001	(0.0003)
Weeks of UI benefits		
in last year	-0.0001	(0.0001)
in last 5 years	0.0000	(0.0000)
Weeks of UI benefit receipt (ref. 26 weeks or less)		
27-52 weeks	0.0037*	(0.0021)
more than 52 weeks	0.0013	(0.0026)
P -value joint sig. UI fund FE		0.162
No. of observations	98,641	
Adjusted R^2	0.0003	

Note: OLS estimation. Two-way clustered standard errors at the municipality-occupational level are shown in parenthesis. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively.

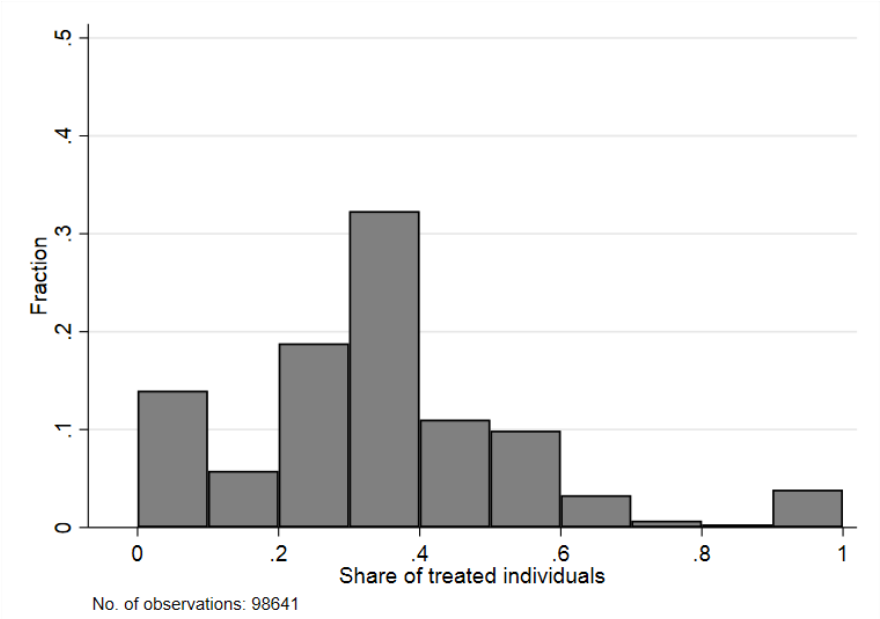
Table D.2: Treatment Effects and spillovers on labor market outcomes

	Cumulated outcomes within 24 months			
	Working hours		Labor earnings in DKK	
	(1)	(2)	(3)	(4)
Specification 1				
Tool treatment	-30.92		-6,583	
	(42.12)		(8,392)	
Local treatment intensity (cont.)	-16.22		-4,635	
	(57.84)		(11,910)	
Tool × local treatment intensity	71.84		16,676	
	(111.7)		(22,126)	
Specification 2$^{(a)}$				
Tool treatment		-11.31		-2,113
		(8.32)		(1,883)
Local treatment intensity (cat.)				
Bottom quintile		18.31		3,011
		(29.32)		(5,376)
Top quintile		42.15		6,383
		(29.51)		(5,442)
Tool treatment				
× bottom quintile		22.42		3,069
		(35.33)		(6,072)
× top quintile		8.95		3,171
		(19.12)		(4,466)
P -value joint significance				
Local treatment intensity (cat.)		0.281		0.476
Tool × treatment intensity (cat.)		0.703		0.649
No. of observations	98,641	98,641	98,641	98,641
Mean value outcome	1,852	1,852	350,582	350,582

Note: The table reports treatment differences and spillover effects on labor market outcomes for different subgroups of participants in the randomized controlled trial. Local treatment intensity refers to the share of treated job seekers (tool treatment) across combinations of 98 municipalities and 173 previous occupations (3-digit DISCO level) and five age cohorts (10-year age bins). Two-way clustered standard errors at the level of municipalities and previous occupations are reported in parentheses. ***/**/* indicates statistical significance at the 1%/5%/10%-level, respectively. All models account for the effect of the message treatment (coefficients are not shown).

$^{(a)}$Top/bottom quintile refer to dummy variables indicating local treatment intensities in the top/bottom quintile of the distribution. The bottom (top) quintile includes all clusters with treatment intensities up to 0.2 (above 0.45).

Figure D.1: Distribution of local treatment intensities



Note: Depicted is the distribution of the local treatment intensity referring to the share of treated job seekers (tool treatment) across combinations of 98 municipalities and 173 previous occupations (3-digit DISCO level) and five age cohorts (10-year age bins).