Kristine von Simon[1,*] *and Inés Hardoy*[2]

Tackling disabilities in young age—Policies that work

Abstract

Work impairment is an increasing concern in advanced economies, particularly among young people. Activation, rather than passively providing economic support, is often regarded as the preferred strategy for addressing this issue. However, little is known about which measures are effective for improving youth work impairment. A hazard rate competing risk model with unobserved heterogeneity applied to rich Norwegian panel data provides some insights. *Wage subsidies*, and to some extent *education/training* programs, have the intended effect. In other words, work-impaired youths who participate in these measures have a higher probability of obtaining work/starting an education and a lower probability of experiencing a transition to social security than those youths who do not participate in any measure. The impacts of *follow-up* initiatives and *work practice* programs are more mixed.

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Corresponding author: Kristine von Simson
k.von.simson@samfunnsforskning.no

1 Institute for Social Research, Oslo

2 Institute for Social Research, Oslo, E-mail: iha@samfunnsforskning.no

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1 Introduction

Young people with health problems face several challenges in the labor market. They have a disadvantage in completing upper secondary school (Champaloux and Young, 2015) and getting a job (Maslow et al., 2011), and health problems might also affect their pay (Smith, 2009). In addition, there are indications that poor health in adolescence has negative long-term consequences for employment, especially among people with low education (Holland et al., 2011). Vocational rehabilitation programs (VRPs) have the purpose of facilitating labor market inclusion and counteracting the likelihood of labor market exclusion of people with reduced work capabilities. Moreover, the design and efficiency of public policies and the way program gatekeepers interpret the numerous policies available to them, affect the flows in and out of disability pensions (Burkhauser et al., 2016).

This article investigates the impact of VRPs targeting work-impaired youths in Norway. Norway serves an interesting case. The proportion of young people aged 18–29 years receiving health-related benefits in Norway increased from 1.9% in 1994, when unemployment reached its highest peak of the last decades, to 3.4% in 2000, and then further to 5.1% in 2017 (NOU, 2019:7). The majority of these youths are diagnosed with mental health problems. Combined with a low exit rate from long-term sickness/disability to work, this trend is worrying. In addition, Norway, together with the other Scandinavian countries, has a long tradition of publicly supplied welfare services and activation measures. Existing evidence points to a shift in sickness and disability policies in recent decades in most Organization for Economic Co-operation and Development (OECD) countries from passive income support to stronger employment support and benefit conditionality (Böheim and Leoni, 2018). In Norway, individuals must attempt a VRP before they can be awarded a permanent disability claim. VRPs are much more comprehensive than ordinary active labor market programs (ALMP) for the unemployed, both in terms of their cost per capita and the number of participants.

There is a vast amount of literature on the impact of ordinary ALMPs. Fewer studies focus on VRPs (ALMPs for individuals with work impairment), and surprisingly few concentrate specifically on the impact of VRPs for young people. Existing evidence on ALMPs indicates that policies need to be targeted to be effective; there is a need to understand better what works for whom (Crépon and Berg, 2016). From the literature on ALMPs for ordinary unemployed individuals, it is clear that the effectiveness of programs differs substantially by age group, where young people seem to gain less from participation in ALMPs than adults do (Card et al., 2017; Hardoy et al., 2018; Kluve et al., 2019).

The empirical literature on the impact of programs targeting people with reduced work capability using well-established identification strategies is scant and inconclusive. Some studies using more recent data deserve special mention. Angelov and Eliason (2018) study the effect of wage subsidies targeting job seekers with disabilities in Sweden and find both positive and negative impacts. Any positive employment effects seem to be outweighed by considerable lock-in effects. However, the participants are less likely to have a transition out of the labor force to the disability insurance program. Rehwald et al. (2018)'s Danish evidence from a randomized experiment indicates that neither vocational programs nor counseling help sick-listed workers return to work, and they might even have adverse effects. These results are in contrast to those of Holm et al. (2017), who find positive employment effects of ordinary education and

wage subsidies for the same group of workers in Denmark. Campolieti et al. (2014) study the effects of a vocational rehabilitation program implemented in the late 90s in Canada. Their matching estimators suggest relatively small and imprecise effects for men and larger and significant effects for women. Dean et al. (2017) apply a structural model to a rich U.S. sample from 2000 and find positive long-term effects on employment and earnings for individuals with mental health problems, particularly for employment-related services. Adamecz-Völgyi et al. (2018) in Hungary and Bewley et al. (2007) in the United Kingdom are examples of studies of comprehensive programs involving counseling, training, rehabilitation, and employment subsidies, which show positive employment effects.[1] A randomized control trial (Burns et al., 2007) carried out in six European countries among people with severe mental illness compares traditional vocational rehabilitation with individual placement and support, concluding that the latter is more effective. None of the abovementioned studies focus on youth.

A recent study focusing on work-impaired individuals in Norway with reduced work capabilities deserves closer mention. Markussen and Røed (2014) use local/geographical variation in labor market offices to identify the causal effects of VRPs on labor market outcomes. They conclude that strategies focusing on early intervention and participation in measures in the ordinary labor market are better than alternative strategies that give priority to vocational education or organized work in the sheltered sector. While older individuals benefit more from work-related measures, ordinary education seems to be the most successful measure for younger work-impaired individuals.[2]

In this study, we compare the impact of activation to that of passively receiving welfare support. We investigate how the duration of work impairment and eventual participation in the different VRPs affect transitions to one of two outcome states: job/education and social security. To identify the impact of VRPs, we use a mixed proportional competing risk hazard model (Abbring and van den Berg, 2003), which is described in detail in Gaure et al. (2007). A special feature of the model is that it captures unobserved heterogeneity, which is crucial for separating selection effects from causal effects.

Caliendo and Schmidl (2016) show that there is still no consensus regarding the effectiveness of different active labor market policies for youth in Europe. They emphasize that more evidence is required and that there is a particular need for studies including education as an outcome of success as well as studies with a long observation period. Our study adds to the literature by providing causal evidence of the effect of such policies for a particularly vulnerable group—work-impaired youth—using comprehensive administrative data covering 12 birth cohorts over a period of 13 years and including several dimensions of outcome measures.

Our analyses indicate that *wage subsidies* primarily, but also to some extent *education/training* programs, increase the probability of obtaining work/starting an education and reduce the probability of experiencing a transition to social security. The impacts of *follow-up* initiatives and *work practice* programs are more mixed. During participation, these measures are

1 Positive results of VRPs are also found for Finland (Leinonen et al., 2019) and Switzerland (Hagen, 2019).

2 Salvanes et al. (2018) study the effects of ordinary education for young people with work impairment in Norway. They use a reform aimed at depriving work-impaired youths aged 22–25 years of the right to participate in ordinary education as a VRP. The analysis shows that the reform led to young people having more difficulties returning to work compared with young people who were not affected by the reform. However, the effect does not seem to be long-lasting.

associated with an increased probability of having a transition to job/education. After program completion, the positive effect on job/education transitions persists. However, now the youths also have a higher probability of experiencing a transition to social security. We interpret this as an indication that follow-up and work practice measures are used as a screening device and function as springboards to working life.

The article proceeds as follows: first, we present the data, provide some descriptive statistics, and describe the empirical model. Next, we look into the results on the impact of different VRPs on job/education on the one hand and social security on the other. We conclude the article with a discussion of our results and a brief summary.

2 Data and sampling

We have access to rich Norwegian administrative data from several individual registers covering information on employment, unemployment, income, education, social welfare, demographics, administered and merged by Statistics Norway. Our sample consists of all residents in Norway born between 1976 and 1994 registering as work impaired for at least 1 month during the period from January 2002 through December 2012, and who are between 18 and 29 years old at the time of registration. Notice that the eldest we observe were 26 years old in 2002, and it is only in 2005 that we first observe youths up to age 29. The data has a panel structure, making it possible to follow individuals over time and monitor their transitions in and out of the labor market.

There are two possible ways to obtain the status of work impaired in the administrative registers. One is after a period of employment and sick leave and requires a certificate of ill health issued by a general practitioner (GP). The other is to be given the status of work impaired by a supervisor at the Labour and Welfare Service (NAV) office[3] through a work capacity assessment. There is no lower limit on the degree of reduced working capacity. The work capacity assessment is the basis for further follow-up and labor market measures. VRPs consist of measures targeting individuals with work impairment (e.g., vocational education and work in sheltered firms[4]) as well as ordinary active labor market programs (e.g., training and work practice). While being registered as having work impairment, youths may receive different kinds of benefits, depending on their health status. Youths who have their work capacity reduced by at least 50% due to a GP-certified illness are entitled to a health-related benefit.[5] Those who do not fulfill the health requirements may be eligible for unemployment benefits, activity support, or means-tested social assistance.

The unit of analysis is spells rather than individuals. A fresh spell of work impairment is defined as a period with no occurrence of registered work impairment during the previous 6 months. The final sample consists of 130,634 unique spells beginning in the period 2002–2012, comprising 108,134 youths aged 18–29 years. We follow these youths on a monthly basis until

3 NAV is all-encompassing in the sense that it provides all welfare services: social-, health- and labor market-related services.

4 Sheltered firms produce goods and/or services and are established to provide clarification, job training, or qualification to persons who have reduced their ability to work. They are financed with public resources

5 Before 2010, the temporary health-related benefits consisted of rehabilitation benefits, vocational benefits, and time-limited disability benefits. In 2010, these three benefits were merged into one benefit: the work assessment allowance. If work capacity is reduced permanently, permanent disability benefits may be granted. We remove youths who receive permanent disability benefits from our sample, as they are not likely to return to the labor market.

December 2014, which means that we observe all youth for a minimum of 2 years and some youths up to 13 years.

While youths are registered with reduced working capacity, they can participate in VRPs. Transitions to VRPs are referred to as temporary transitions. It is not uncommon to have several spells of program participation within the same spell of work impairment. However, it is problematic to model such repeated spells because previous participation in a labor market program can affect both the likelihood of future program participation and the impact of these programs. Therefore, in this study, we focus on the effect of the first VRP and censor subsequent transitions to VRPs.

VRPs vary throughout analysis based on economic fluctuations and labor demand.[6] Programs are grouped in such a way that they resemble the categories typically used in international studies (Kluve, 2010; Card et al., 2017). We focus on four major categories. Education/training (EDU) refers to off-the-job classroom courses/education. Wage subsidies (WS) entail subsidized ordinary employment in the public or private sectors. Work practice (WP) is mostly on-the-job training expected to provide work experience in both the ordinary and sheltered sectors. Follow-up (FU) is supported by employment and follow-up assistance to obtain or retain work. The remaining small-scale programs are placed in a residual category, and transitions to these programs are censored. A more detailed description of the different programs is found in Appendix B.

We distinguish between the effects of VRPs while participating in a program and the effects after completion of the program. A large body of research literature points to so-called lock-in effects, where the unemployed get locked into the program and spend less time searching for jobs during their participation (van Ours, 2004; Røed and Raaum, 2006). After program completion, the likelihood of getting a job may increase again, for example, due to higher job search activity, increased formal or job-specific human capital, better information or larger networks. The work-impairment spell ends when the person is no longer registered with reduced working capacity for three consecutive months. We identify two exit states: exit to social security, which includes a permanent disability or social assistance, and exit to an ordinary job or a formal education. Appendix B describes of the definition and priority of different labor market states. Transitions to states other than social security or job/education are censored.[7] In addition, we censor spells that are still on-going at the end of the observation period.[8] This makes it possible to include all young people who register as work impaired without having to assume when the spell will end.

2.1 **Descriptive statistics**

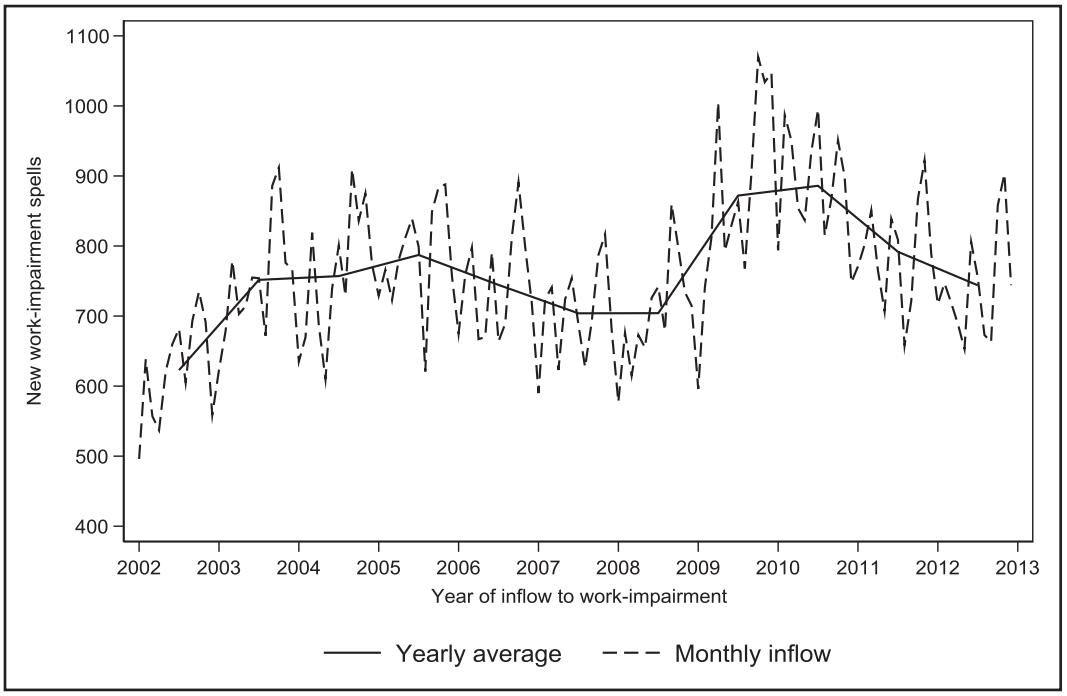
Figure 1 shows the inflow into new spells of work impairment in our data by the month of entry. There was an increase in new work-impairment spells from 2002 to 2012, particularly in the periods 2002–2004 and 2009–2010. After 2010, the inflow into work impairment

6 The target group has also been redefined in 2009/2010, and there have been changes in regulations, both of which have affected the composition of the target group and the way they are distributed in the different programs. The changes are discussed in depth in Sections 2.1 and 4.2.

7 Appendix B describes the definition and priority of different labor market states.

8 We also censor durations over 60 months, as transitions after this time are rare and complicate statistical inference.

Figure 1 Inflow into work impairment by the month of entry. Young people 18-26 years of age in the period 2002–2012.



Note: The figure includes only youths aged 26 or under, as older youths are not equally represented over the evaluation period in our data.

decreased. The observed pattern is mainly due to changing business cycles, with recessions in 2001–2003 and 2008–2009 causing increased inflows into nonemployment. However, changes in regulations related to the follow-up of individuals with work impairment may also have affected the inflows. First, the time-limited disability benefit was introduced in 2004. This was a temporary disability benefit targeted at young people with favorable labor market prospects, to decrease inflows into permanent disability pension. Then, a new follow-up work-impaired regime was introduced during 2009–2010. It involved a work-capability assessment, along with an expansion of the eligibility criterion for receiving temporary health-related benefits to include individuals without previous sickness or labor market history.

Figure 2 shows survival curves by VRP status. We see that youths spend a relatively long time in work impairment. After 36 months, 23% of the youth who do not participate in any programs is still registered as work impaired. The corresponding shares among program participants are 36% for WS, and around 60% for FU, WP, and EDU. The longer durations for VRPs partly reflects the lock-in effects of participation.

Figure 3 shows monthly transition rates into different VRPs. Overall, young work-impaired individuals are more likely to participate in EDU and WP and less likely to participate in FU measures and WS. We also see that EDU and WP are more frequently used early in the work-impairment spell, stabilizing around 10 months, whereas the flow into the other programs is rather stable over the 5–6-year period.

Figure 4 shows monthly transition rates into the outcome states work/education and social security, by VRP status. For youth who do not participate in any VRP during work impairment, the probability of having a transition to work/education decreases rapidly during

Figure 2 Survival curves by vocational rehabilitation program (VRP) status. Young people 18-29 years of age in the period 2002–2012.

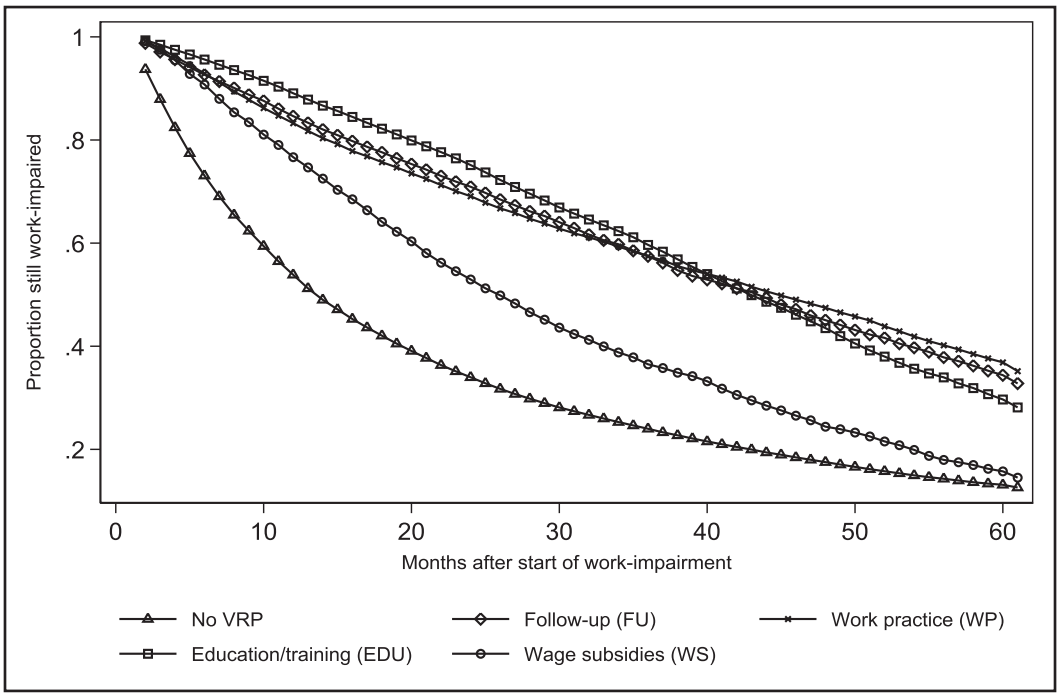
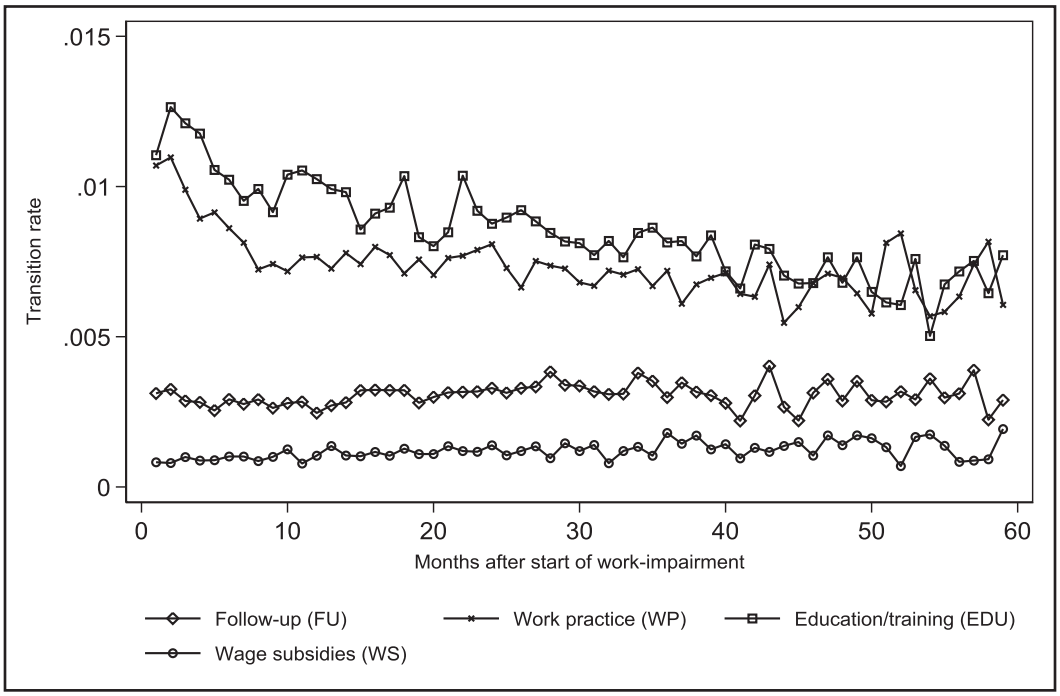
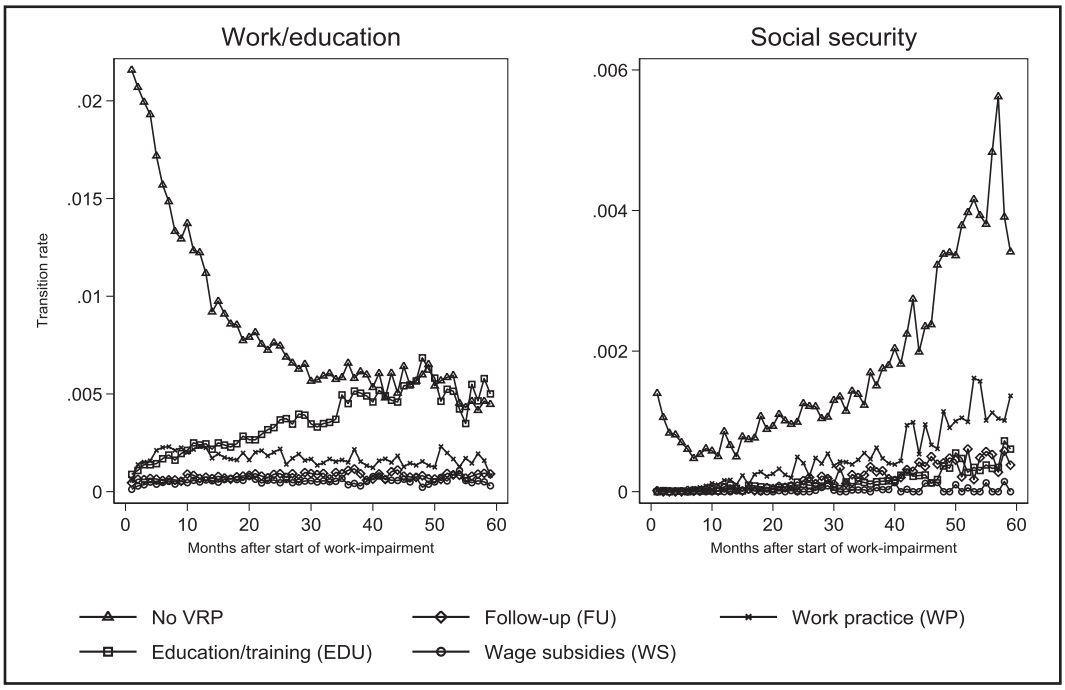


Figure 3 Monthly transition rates into vocational rehabilitation programs (VRPs). Young people 18-29 years of age in the period 2002–2012.



the first 2 years and stabilizes at a low level thereafter. Again, we see indications of lock-in effects for the VRPs, with low probabilities and slightly increasing transition rates to work/education during the first months of the spell. The pattern is quite different when it comes to social security, where the likelihood of experiencing a transition to social security drops the first year, but we also see a steep increase in the transition rate after around 40 months. This partly reflects the dynamic selection problem: individuals who are still work impaired after

Figure 4 Monthly transition into work/education and social security, by vocational rehabilitation program (VRP) status. Young people 18-29 years of age during the period 2002–2012.



40 months constitute a highly selected group with a high probability of entering social security and a low probability of entering employment or education.

Descriptive statistics of the observed characteristics of work-impaired youths are presented in Table 1. Only 46% of work-impairment spells contain VRP participation; the remaining 54% comprise the comparison group. Many young people spend considerable time in work impairment, with an average of 20 months for spells of no participation and slightly longer for VRP participation spells.[9] On an average, youths spend around 8 months in VRPs, with educational measures lasting the longest.

There are signs of considerable selection into different VRPs. Women participate more often in EDU, whereas they are strongly underrepresented among participants in WS. There is also a relatively low proportion of non-European youths in WS compared with participants in other programs. Participants in EDU tend to be positively selected in that they are more educated, have more recent labor market experience and also have parents with higher education and income. Participants in WP, on the other hand, seem to be negatively selected. Moreover, while nearly 44% of participants in EDU receive health-related benefits[10] at the start of the work-impairment spell, only 25% of participants in WS do.[11]

There are also notable differences in outcomes states, depending on VRP participation. WS and EDU seem to be more successful in terms of outcome states than WP and FU. The

9 Duration is measured including time spent in VRP.

10 Health-related benefits include all benefits requiring a doctor-certificated medical condition: rehabilitation benefits, vocational benefits, time-limited disability benefits (before 2010), and work assessment allowance (after 2010). The first month is chosen for practical reasons.

11 We, unfortunately, do not have information about other kinds of transfers the youth receive during work impairment. Bragstad and Sørbø (2014) find in their study of young work impaired that 23% of the youth receive social assistance during the first month of work impairment, while 32% receive no benefit at all. Their sample is, however, not directly comparable to our sample, as they focus only on youth entering work impairment in 2011.

Table 1 Sample means by VRP status

	No program	Follow-up (FU)	Work practice (WP)	Education/ training (EDU)	Wage subsidies (WS)
	(1)	(2)	(3)	(4)	(5)
Individual characteristics					
Age group (years)					
18–20	0.209	0.259	0.330	0.180	0.173
21–24	0.365	0.375	0.348	0.341	0.388
25–29	0.426	0.366	0.322	0.479	0.439
Female	0.481	0.429	0.460	0.501	0.229
Immigrant	0.067	0.064	0.065	0.072	0.054
Completed upper secondary education	0.336	0.249	0.216	0.421	0.324
Activity before entering work impairment					
In education	0.405	0.466	0.496	0.447	0.393
In employment	0.536	0.431	0.379	0.599	0.596
Mean income 3 years before entering work impairment					
Labor income, BA	1.485	1.061	0.935	1.767	1.620
Nontaxable transfers, BA	0.395	0.388	0.403	0.356	0.309
Taxable transfers, BA	0.248	0.268	0.232	0.241	0.282
Parental background					
Higher-educated parents	0.221	0.206	0.199	0.257	0.175
Parents' labor income, BA	7.723	7.569	7.415	7.992	7.695
Parents' transfers, BA	2.303	2.486	2.445	2.169	2.195
Region of residence					
Eastern Norway	0.496	0.473	0.446	0.499	0.388
Southern Norway	0.072	0.094	0.081	0.074	0.110
Western Norway	0.242	0.249	0.234	0.235	0.276
Middle Norway	0.087	0.100	0.125	0.078	0.115
Northern Norway	0.103	0.084	0.113	0.113	0.113
Receiving health-related benefits	0.521	0.373	0.387	0.440	0.255
Spell characteristics					
Duration of work impairment, months	20.524	29.767	27.221	31.275	26.585
Duration of VRP, months	0.000	8.827	7.909	13.016	8.090
Transition to work	0.381	0.238	0.185	0.251	0.494
Transition to education	0.114	0.050	0.059	0.106	0.041
Transition to permanent disability	0.064	0.053	0.048	0.020	0.018
Transition to social assistance	0.086	0.038	0.041	0.018	0.026
Transition to unemployment	0.141	0.070	0.065	0.086	0.124
Transition to unknown state	0.063	0.036	0.037	0.112	0.047
Censored due to time	0.151	0.209	0.176	0.026	0.128
Censored due to transition new VRP	0.000	0.306	0.389	0.327	0.122
Observations	70,590	8,305	23,189	25,512	3,038

VRP, vocational rehabilitation program; BA, basic amounts.

Notes: Column 1 shows means for spells without VR participation, and columns 2–5 show means for spells with VR participation. All variables are measured at the start of the work-impairment spell. The income variables are all measured in BA. In 2018, one BA was equivalent to NOK 96883 (approx. 10,000 euros). Health-related benefits include rehabilitation benefits, vocational benefits, time-limited disability benefits (before 2010), and work-assessment allowance (after 2010). Taxable transfers include pensions from the National Insurance scheme, occupational pensions, sickness benefits (before 2006), and unemployment benefits, whereas nontaxable transfers include among others child benefit, housing benefit, social assistance, and student scholarship.

differences underscore the importance of modeling transitions to each VRP as well as the outcomes states separately, with controls for observable individual characteristics and previous labor market history. The large observed differences also emphasize the need to control for selection on unobserved characteristics as well.

The data do not contain information on medical diagnoses or reasons for work impairment. However, other studies provide a good indication of the types of problems that are most prevalent among youths. According to Sutterud (2017), mental health disorders are by far the most common diagnosis for recipients of temporary disability benefits; for work-impaired young people, social and psychological mental health disorders comprise between 50% and 60% of the cases of work impairment during the period of analysis (Brage and Bragstad, 2011).

3 Econometric method

The main purpose of active labor market measures is to stimulate and facilitate the employability of participants. However, it is challenging to identify a causal link between program participation and the outcomes. Unobserved factors that affect both the decision to participate in measures and the labor market results can give rise to biased estimates of impact effects. Of particular concern in the context of VRPs is the health status of the individual, which tends to be self-reported or even unobserved. As we do not have access to health information in our data, this underlines the importance of controlling for unobserved confounders.

We use the Timing-of-Events (ToE) approach formalized by Abbring and van den Berg (2003) to identify the causal effects of VRPs on subsequent transitions. This framework exploits information on the timing of events to distinguish causal effects from selection effects. For instance, if a VR participant gets a job immediately after exiting the program, it is more likely that the participation has affected the job probability than if it takes a long time after VRP completion to get a job. In addition, treatment assignment is modeled jointly with the outcome of treatment as a competing risk hazard rate. Selection effects are then explicitly controlled for by allowing the unobserved determinants associated with each hazard rate to be correlated.

Recent applications of the ToE model include Clausen et al. (2009), Heinesen et al. (2013)002C and Kyyrä et al. (2019). Particularly relevant in our context is Holm et al. (2017), who use the method to investigate the impact of ALMP for sick-listed workers in Denmark. Lombardi et al. (2019) and Gaure et al. (2007) show, using Monte Carlo simulations, that the ToE model is well suited for separating causal treatment effects from sorting effects. The method has been also shown to perform well relative to other non-experimental methods (Muller et al., 2020).

3.1 Empirical specification

Our econometric approach is a multivariate mixed proportional hazard rate model. Time is measured from the moment the individual enters work impairment (initial state) and is normalized to zero. We use spells rather than individuals as our analytical unit. Let T^p and T^o be stochastic variables denoting duration until treatment ($p = \{FU, WP, EDU, WS\}$) and duration until outcome ($o = \{$job/education; social security$\}$), respectively, with realizations t^p and t^o. If t

$\leq t^p$, there are two possible transitions: to VRP or one of the outcomes. If $t > t^p$, a transition to VRP has occurred, and the only transition possible is to one of the outcome states. As explained above, we only consider the effect of the first VRP of each work-impairment spell.

All durations are measured in months, and thus we use a discrete version of the underlying continuous hazard rate. Let θ_{kit} denote the hazard rate from the initial state into state $k = p, o$ for spell i during month t:

$$\theta_{pit} = \exp\left(\alpha_p d_{it} + \beta_p x_i + \gamma_p c_t + v_{pi}\right),\ p = \text{FU, WP, EDU, WS}$$

$$\theta_{oit} = \exp\left(\alpha_o d_{it} + \beta_o x_i + \gamma_o c_t + \Delta_{oit} + v_{oi}\right),\ o = \text{job/education, social security}$$

Equation (1) is called the selection equation and models the transition rate from work impairment into one of the VRPs. The transition rate from work impairment to one of the outcomes is explained by Eq. (2), the outcome equation. The effect of spell duration d_{it} is assumed to be piecewise constant. Two-month intervals are included for the first 6 months, 4-month intervals for durations of 7–18 months, 6-month intervals for durations of 19–36 months, one 12-month interval for durations of 37–48 months, and an open-ended interval for durations over 48 months.

As for observed covariates x_i, we include the individual characteristics presented in Table 1. All characteristics are measured at the start of the work-impairment spell. In addition, to capture national trends and seasonal fluctuations, we include annual and quarterly dummies as well as the local youth unemployment rate in the municipality (c_t). All variables are included as flexibly as possible, preferably using dummies for each value.

The effect of program participation is defined by the indicator function Δ_{oit}, taking the value of one if the treatment has been imposed before month t. This treatment effect is further divided into two effects: an on-treatment effect and an after-treatment effect. We shall provide an interpretation of the program effects in the empirical analysis when presenting the results. For the sake of simplicity, we assume that the treatment effect of one particular program is the same for all individuals; therefore, Δ_{oit} enters the hazard rate model just like the other explanatory variables.

3.2 Identification

The timing-of-events results of Abbring and van den Berg (2003) ensure that the abovementioned model is nonparametrically identified. With single spell data, identification hinges strongly on the proportional hazard assumption, which may be a difficult assumption to satisfy (see, e.g., van den Berg (2001) for a discussion of the proportionality assumption in a job-search setting). However, flexible modeling with a large number of time-varying calendar variables introduces exogeneity into the hazard rates and makes the proportionality assumption less important while strengthening identification (Brinch, 2007; Gaure et al., 2007; Lombardi et al., 2019).

Both the selection and the outcome equation include a set of time-invariant individual unobserved characteristics v. The unobserved characteristics enter the model as random effects and are thus assumed to be uncorrelated with the observed covariates. This

may not hold in our setting. For instance, health is not observable to us and is often considered to be correlated with parental background and/or educational attainment. However, Lombardi et al. (2019) show that the ToE model is relatively robust to correlations between observed and unobserved covariates, as long as the distribution of unobserved heterogeneity is flexibly specified, the sample size is large and there is some exogenous variation in the hazard rate.

We use the modeling framework described in Gaure et al. (2007); namely, we impose a nonparametric probability distribution for v, assuming that the distribution can be characterized by an a priori unknown number of discrete points (mass points), with their associated probabilities. Further, we assume that v between different transitions may be correlated. For instance, motivated individuals are likely to profit more from program participation and are more likely to receive job offers as well. If we ignore the correlations between the unobserved heterogeneities (e.g., between job and program participation), the estimated treatment effect will be biased.

A necessary condition to interpret the treatment effects as causal is the no-anticipation assumption. This assumption states that individuals should not have private information about the exact timing of treatment ex-ante. Such information may influence their behavior; for instance, they may slow (intensify) their job search activity because they are certain that they will participate in a VRP in the future. It may be that program participation is perceived as a threat or punishment, so more effort is put into getting a job before the program starts (Maibom Pedersen et al., 2014). If this is the case, the estimated treatment effects will be biased. We do not have access to information about notification of VRP participation in our data. However, the supply of VRPs is constrained, leading to long waiting times; in about a third of cases it took more than a year from the time the user's ability to work was assessed until a program was initiated (Lande and Selnes, 2017). Reasons for the delay were many: a program considered to be suitable was not available, or the person was too sick or negligence on the part of the public employment services (Lande and Selnes, 2017). Furthermore, around half of registered work-impaired individuals lack activity plans, and follow-up is sporadic (Riksrevisjonen, 2018). Such findings are indicative that assignment to programs is based on availability, often on short notice, and with local variations. Furthermore, the no-anticipation assumption does not rule out the possibility that some individuals know that they have a larger probability of participating in VRPs and act on this knowledge.

3.3 **Estimation**

The probability that spells i has a transition to state k during month t can be expressed as follows:

$$p_{kit} = \left(1 - exp\left(-\sum_{k \in K_{it}} \theta_{kit}\right)\right) \frac{\theta_{kit}}{\sum_{k \in K_{it}} \theta_{kit}}$$

K_{it} denotes the set of feasible transitions for spell i during month t. Before entering treatment, $K_{it} = \{p, o\}$. During and after treatment, $K_{it} = \{o\}$. θ_{kit} is the hazard rate defined in

Eqs (1) and (2) above. Let y_{kit} be an outcome indicator variable equal to 1 if spell i has a transition to state k in month t and 0 otherwise, and let Y_i denote the complete set of outcome indicators for spell i. The conditional likelihood contribution by spell i can then be formulated as follows:

$$L_i\left(v_i\right)=\prod_{y_{kit}\in Y_i}\left(\prod_{k\in K_{it}}\left(p_{kit}\right)^{y_{kit}}\times exp\left(-\sum_{k\in K_{it}}\theta_{kit}\right)^{1-\sum_{k\in K_{it}}y_{kit}}\right)$$

The distribution of the unobserved heterogeneity v_i is approximated in a nonparametric way by means of a discrete distribution (Heckman and Singer, 1984). As the unobserved heterogeneity terms are unknown by the researcher, they must be integrated from the likelihood function. We follow Gaure et al. (2007) and let the number of mass points be determined endogenously in the estimation process together with the other parameters. The estimation procedure starts with one mass point (no unobserved heterogeneity), and then more points are added until the likelihood can no longer be improved.[12] To avoid over- or under-correction for unobserved heterogeneity, we use the Akaike Information Criterion (AIC) to select the optimal number of mass points (Lombardi et al., 2019). The sensitivity of our results regarding the choice of the information criterion is investigated in Section 4.2.

4 Results

4.1 Lock-in and post-program effects

In this section, we show the main results from the estimated multivariate mixed proportional hazard rate model with unobserved heterogeneity outlined above. The preferred model has eight mass points in the heterogeneity distribution. The number of mass points is selected using the AIC (Lombardi et al., 2019). We start by showing the effect of participating in the different VRPs on transitions to job/education and social security.

As mentioned above, the model consists of six transitions that are estimated simultaneously: transitions from reduced working capacity to one of the four labor market programs and transitions to one of the two outcome states: job/education or social security. The first is definitely a measure of success of VRPs. A transition to social security may indicate that the program did not have the intended effect—but not necessarily. If participation in a VRP helps to realize that the person is incapable of taking up work at all, then a transition to social security may be interpreted as a positive outcome.

Table 2 presents the main results.[13] Program effects are measured relative to not participating in any VRPs. By exponentiating the estimated value and subtracting 1, we can interpret estimates as percentage changes in the likelihood of a transition occurring over a very short time interval (hazard rate), given that no such transition has yet occurred. Thus, the positive effect of participating in training with respect to a transition to work/education after the program is completed can be interpreted as a percentage increase in the hazard rate of 63.4% ((exp (0.491) − 1) * 100). However, when considering effects over larger time spans such as 1 month, it

12 This is considered to be the case when the log-likelihood increases by <0.01.

13 Complete estimation results are presented in Table A1 and Table A2, both in the Appendix.

Table 2 Effect of vocational rehabilitation programs (VRPs) during and after program participation on the transition to social security and job/education

	Transition to social security		Transition to job/education	
	Under VRP	**After VRP**	**Under VRP**	**After VRP**
Follow-up (FU)	0.034 (0.067)	0.237*** (0.074)	0.470*** (0.034)	0.367*** (0.043)
Work practice (WP)	−0.061 (0.040)	0.136*** (0.045)	0.251*** (0.024)	0.273*** (0.028)
Training/education (EDU)	−0.736*** (0.054)	−0.083 (0.057)	0.088*** (0.021)	0.491*** (0.027)
Wage subsidies (WS)	−0.598*** (0.117)	−0.242 (0.169)	0.691*** (0.043)	0.918*** (0.069)

Notes: * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. In addition to the treatment effects, the estimations include controls for age, gender, immigrant background, education level, activity before work impairment, previous income, parental background, region of residence, indicator for health-related benefit receipt, local unemployment rate, duration dependence, and calendar variables. Complete estimation results are included in the appendix. The preferred model has eight mass points in the unobserved heterogeneity distribution.

is necessary to also take into account the *level* of the transition rate as well as the level of competing transition rates (to other program categories as well as to social security).[14]

In order to facilitate the interpretation of the estimates, we have calculated the probability that a reference person who has been registered with reduced working capacity for a period of 6–10 months exits to one of the outcomes states. The reference person is a male native Norwegian, 22–25 years old, who lives in the east of Norway and has only completed compulsory school. His parents have low education and average income. The dashed line in Figure 5 (6) shows the probability of having a transition to social security (job/education), provided that such a transition has not yet occurred, for a reference person who has not participated in any program. The bars show how participation in a VRP changes this probability, during participation in the VRP (left) and after completion of VRP (right), ceteris paribus. The gray bars show significant effects, while the white bars show effects that are not significantly different from zero.

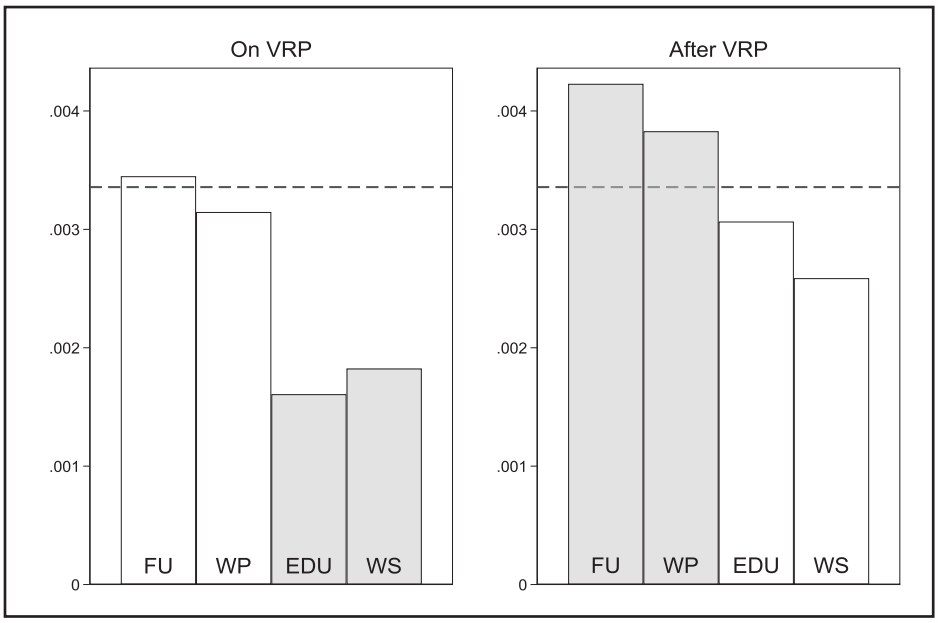
Figure 5 (left) shows that both EDU and WS are associated with lock-in effects; that is, during program participation the likelihood of having a transition to social security is about 50% lower for a reference participant in training and 45% lower for reference participants in WS relative to not participating in any program. However, the likelihood of experiencing a transition to social security is very small: slightly over 0.3% for a reference person and nearly 0.2 for a participant in WS or EDU.[15] After VRP completion, we find small positive effects of program participation for FU and WP on the probability of transitions to social security.

Figure 6 illustrates the effect of VRP participation on the transition to job/education. Somewhat surprising, as the figure on the left shows, we do not find any lock-in effects related to program participation. On the contrary, all programs show positive on-program effects on the transition to job/education of roughly between 0.5 and 4% points relative to the nonparticipation alternative. This could reflect that caseworkers more actively use VRPs as a springboard to working life than is the case with ordinary ALMP.

14 We have also done a regression where we investigate the impact of the different programs on employment and education separately. The estimates behave as expected. The impact on employability is stable for model specification. However, when we investigate the effect on education separately we observe that training has a positive significant impact on education, and wage subsidies have a negative impact on education.

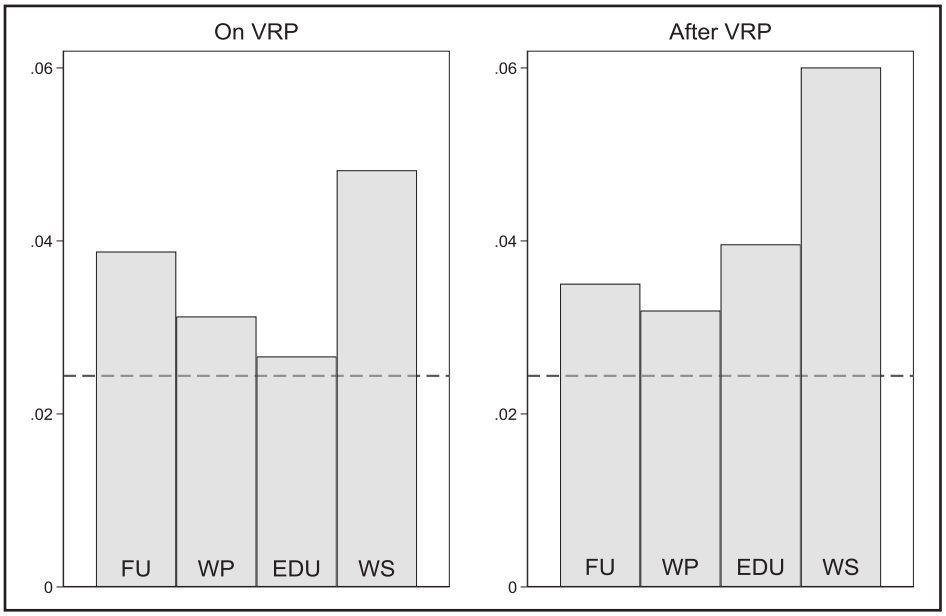
15 It is important to note that this is a conditional probability, conditional on *not yet* having experienced a transition.

Figure 5 The effect of vocational rehabilitation program (VRP) on the transition to social security.



Notes: FU, follow-up; WP, work practice; EDU, education/training; WS, wages subsidies. The dashed line shows the transition probability for a reference person who did not participate in any VRP, and who has been registered as work impaired for 6–10 months. The reference person is a male, aged 22–25 years, living in Eastern Norway, native-born, with no completed upper secondary education, with average parental background, by average youth unemployment.

Figure 6 The effect of the vocational rehabilitation program (VRP) on the transition to job/education. FU, follow-up; WP, work practice; EDU, education/training; WS, Wages Subsidies.



Notes: The dashed line shows the transition probability for a reference person who does not participate in any VRP, and who has been registered as work impaired for 6–10 months. The reference person is a male, aged 22–25, living in Eastern Norway, native-born, with no completed upper secondary education, with average parental background, by average youth unemployment.

The figure on the right shows the positive effects of all programs after participation. WS is associated with the largest positive effects, in line with most studies of both ordinary ALMPs and VRPs, also in an international context. The impact is an increase of about 4% points, from 2% to 6%. Meanwhile, EDU shows an increase of nearly 2% points compared with the nonparticipation alternative. The likelihood of getting an ordinary job or starting an education is nearly three times as high after participation in WS relative to not participating in any program. The objective of WS is that participants continue to work for the firm that receives the subsidy after the subsidy is removed, which can partly explain the positive effect. However, for those participants who return to work impairment after the subsidy period, there is still a significantly increased likelihood of a transition to work or education. This indicates that the impact of wage subsidies is not exclusively a deadweight effect (i.e., it is not the case that employers only hire people they would have employed anyway).[16]

4.2 **Robustness tests**

As mentioned earlier, the ToE model makes some assumptions that are difficult to test. In order to investigate the sensitivity of our results, we run three robustness tests. The first two concern unobserved heterogeneity, while the last test concerns the sample composition.

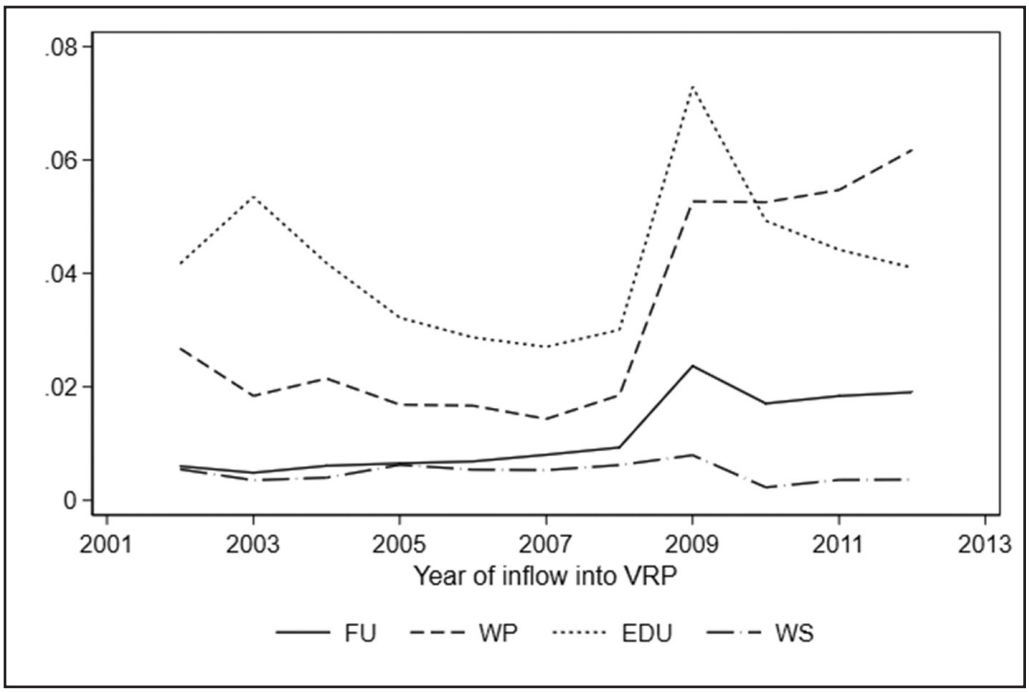
The ToE model assumes that unobserved heterogeneity is time invariant. However, during the spell of work impairment, health may change. If changes in health status influence the probability of treatment as well as the probability of having a transition to one of the outcomes, our effect estimates may be biased. For instance, youths with deteriorating health statuses may be less likely to participate in VRPs because they need to get better in order to benefit from participation. At the same time, deteriorating health may be associated with an increased probability of having a transition to social security and a decreased probability of having a transition to job/education. Although our data do not contain any direct information about individual health status, we observe whether the youths receive health-related benefits during the spell of work impairment. A medical-certified reduced work capacity of at least 50% is required in order to be eligible for a health-related benefit. Receipt of a health-related benefit may thus serve as a signal of the gravity of the health condition. We include a time-varying indicator equal to 1 with the receipt of health-related benefits and 0 otherwise as a proxy to changes in health status.[17]

The second robustness test investigates the sensitivity of our results to the choice of information criterion used to select the number of mass points in the distribution of unobserved heterogeneity. Lombardi et al. (2019) show that selecting too few or too many mass points for the distribution of unobserved heterogeneity may seriously bias the treatment effects. They compare the performance of the Maximum Likelihood (ML) criterion (i.e., choose the number of mass points where there is no further improvement in the log likelihood) to information criteria penalizing parameter abundance: the AIC, the Bayesian Information Criterion (BIC), and

16 The literature often argues that WS has greater deadweight and displacement effects than the other types of measures. Caliendo et al. (2017) point out that the selection to WS might be more complex than for other programs because it involves more active participation on the part of the employed during the hiring. Attempts to fully control for positive selection might not be altogether successful.

17 Holm et al. (2017) conduct a similar robustness test in their evaluation of active labor market programs for sick-listed workers in Denmark.

Figure 7 Yearly inflow into vocational rehabilitation program (VRP), as share of all ongoing work-impairment spells. Young people 18-29 years of age old.



Note: FU, Follow-up; WP, work practice; EDU, education/training; WS wage subsidies.

the Hannan–Quinn Information Criterion (HQIC) in a ToE framework. They conclude that all information criteria perform better than the ML criterion, but no single criterion performs better in all settings. They thus recommend using all three criteria and report the results from the different criteria as a robustness check. However, they also show that the risk of overcorrection is larger in small samples than in large samples, which implies using a less restrictive criterion, such as the AIC, in our case.

The last robustness test concerns changes to the composition of our sample related to the introduction of the new work-impairment regime in 2009–2010. Importantly, the regime introduced obligatory work capability assessments and expanded the target group to include individuals without previous labor market or sickness histories. This change is particularly relevant for our target group, as young people often lack labor market experience. In addition, the regime emphasized intensified follow-up and early activation. As shown in Figure 7, the reform led to a steep rise in VRP participation. We investigate whether the implementation of the WAA reform affects our results by estimating the model solely on work-impairment spells starting before 2009.[18]

Results from the robustness tests are presented in Table 3. The first column shows results from the original model of Table 2, where health is assumed to be time invariant, the number of mass points is chosen according to the AIC and the whole sample is used. The next column then introduces time-varying health, as explained above. The third and fourth column presents results using the two other information criteria, whereas the last column shows results for spells starting before the work-impairment reform in 2009. As shown in Table 3, the results seem to be largely robust to the inclusion of time-varying health. However, some of the positive

18 Ideally, we would also like to estimate the model on spells starting after 2009. However, the time span is too short for many to experience a permanent transition. Hence, a large portion of the observations is censored.

Table 3 Effect of vocational rehabilitation programs (VRPs) during and after program participation on the transition to social security and job/education: Robustness tests

	To social security					To job/education				
	Original model	**Time-varying health**	**BIC**	**HQIC**	**Before 2009**	**Original model**	**Time-varying health**	**BIC**	**HQIC**	**Before 2009**
Under treatment										
FU	0.034	−0.030	0.070	0.082	0.354***	0.470***	0.330***	0.480***	0.469***	0.559***
	(0.067)	(0.064)	(0.063)	(0.064)	(0.074)	(0.034)	(0.036)	(0.033)	(0.034)	(0.042)
WP	−0.061	−0.098**	−0.071*	−0.063	0.333***	0.251***	0.119***	0.264***	0.258***	0.546***
	(0.040)	(0.040)	(0.040)	(0.040)	(0.046)	(0.024)	(0.025)	(0.024)	(0.024)	(0.029)
EDU	−0.736***	−0.895***	−0.660***	−0.722***	−0.534***	0.088***	−0.107***	0.072***	0.089***	0.220***
	(0.054)	(0.053)	(0.052)	(0.054)	(0.061)	(0.021)	(0.021)	(0.020)	(0.021)	(0.024)
WS	−0.598***	−0.684***	−0.523***	−0.575***	−0.528***	0.691***	0.808***	0.683***	0.693***	0.797***
	(0.117)	(0.115)	(0.113)	(0.115)	(0.123)	(0.043)	(0.046)	(0.042)	(0.043)	(0.046)
After treatment										
FU	0.237***	0.212***	0.246***	0.263***	0.301***	0.367***	0.443***	0.377***	0.366***	0.018
	(0.074)	(0.071)	(0.064)	(0.071)	(0.095)	(0.043)	(0.045)	(0.043)	(0.043)	(0.070)
WP	0.136***	0.119***	0.115***	0.127***	0.162***	0.273***	0.307***	0.281***	0.277***	0.031
	(0.045)	(0.045)	(0.040)	(0.045)	(0.060)	(0.028)	(0.029)	(0.028)	(0.028)	(0.044)
EDU	−0.083	−0.182***	0.005	−0.072	−0.066	0.491***	0.574***	0.474***	0.493***	0.455***
	(0.057)	(0.056)	(0.054)	(0.057)	(0.074)	(0.027)	(0.028)	(0.027)	(0.027)	(0.035)
WS	−0.242	−0.297*	−0.146	−0.217	−0.284	0.918***	1.129***	0.900***	0.913***	0.554***
	(0.169)	(0.169)	(0.115)	(0.170)	(0.195)	(0.069)	(0.073)	(0.069)	(0.069)	(0.096)

BIC, Bayesian information criterion; HQIC, Hannan–Quinn information criterion; FU, follow-up; WP, work practice; EDU, education/training; WS, wage subsidies.

Notes: * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. In addition to the treatment effects, the estimations include controls for age, gender, immigrant background, education level, activity before work impairment, previous income, parental background, region of residence, indicator for health-related benefit receipt, local unemployment rate, duration dependence, and calendar variables. The original model has eight mass points in the heterogeneity distribution, whereas the model with time-varying health has nine mass points. The BIC and HQIQ models have five and six mass points, respectively, while the model with spells starting before 2009 has nine mass points.

impacts become more prevalent, and EDU and WS now significantly reduce the likelihood of a transition to social security. We also see that the results are robust to the information criterion used; both the BIC and the HQIC give very similar results as the original model using the AIC.

When estimating the model using only spells starting before 2009, two interesting differences appear regarding FU and WP. The results indicate that participants in FU and WP are more likely to have a transition to social security while on the program when we disregard the period after 2009. This may be associated with the use of VRPs as a screening device. Rules are such that activation (work-oriented measures) is compulsory before permanent disability benefits can be granted. As the eligibility criteria for receiving health-related benefits became less strict after the WAA reform, it is likely that the sample was comprised of relatively more youths with serious health conditions before the implementation of WAA than after it. FU and WP are more likely than EDU and WS to have been more frequently offered to youth with unclear work capability prospects in the period before 2010. The other noticeable change is that the positive job/education effect of having participated in WP and FU disappears. This suggests that the positive effects of the period after 2009 are driving the positive results in the original model. Recall that inflow into VRPs increased dramatically with WAA, with VRP participants likely to have better employment prospects since the rules for entitlement became less strict. The observed pattern seems to reflect this change in the composition of the target group.

5 Discussion and conclusion

Results from OECD's Better Life Index show that Norway ranks very high on most measures of well-being, with short working hours, low-income inequality and high life satisfaction.[19] This suggests that workers in Norway should, in principle, enjoy just as good health as workers in comparable countries. Nevertheless, Norway has high sickness absence rates and is among the countries with the greatest proportion of temporary or permanent health-related benefits.[20] Of particular concern is the large number of youths receiving health-related benefits, of which mental disorders are the primary cause. This trend has evolved over the last 30 years despite recent reforms and has proven to be difficult to mitigate. While in the early 1990s there were twice as many recipients of unemployment benefits as recipients of temporary health-related benefits, the relation today is three to one in favor of recipients of temporary health-related benefits (Fevang et al., 2017). The most recent figures from Statistics Norway indicate that these numbers are continuing to rise.

Public expenditure in Norway on social security benefits amounted to 20% of GDP in 2018, over a third of which covers health-related benefits. Activation of work-impaired individuals through VRPs is a major goal of the labor market authorities. Despite this, we know little about how VRPs function, particularly when it comes to work-impaired youths. There are clear indications that youths react differently to activation than adults, and they face quite different challenges. Many young people with reduced work capabilities have little or no work experience. This means that VRPs are highly important as a means to gain the skills and labor market experience necessary to improve and facilitate their labor market attachment. Economic

19 http://www.oecdbetterlifeindex.org/countries/norway.

20 From an international perspective, Norway has very low unemployment rates, and there are indications that some of the disability claims may be "unemployment in disguise" (Bratsberg et al., 2013).

fluctuations clearly affect labor market attachment, more so for young people than for adults and disadvantaged youths than for ordinary unemployed (Barth and von Simson, 2012). Moreover, the distinction between unemployment and disability is rather blurry (Røed, 2012). The heterogeneity of the target group is further exacerbated by the extra uncertainty related to their health, both with respect to the type of diagnosis and the degree of reasonable disability/work capability. When it comes to youth, mental health problems are by far the most important factor related to work impairment, the causes of which can be rather indistinct.

WP is the program with the greatest scope in Norway, both today and in the past 30 years. Earlier Norwegian studies suggest that educational and training measures work relatively better for people with physical disorders, while those with mental health problems benefit more from participating in work-oriented measures (Børing, 2002; Møller, 2005). Markussen and Røed (2014) study of work-impaired individuals is in line with the above. They recommend early intervention and participation in measures in the ordinary labor market. The exception is youths, who seem to benefit more from ordinary education.

We can draw several interesting policy-relevant findings from our analysis. The results show that WS, and to some extent EDU, have the intended effect: work-impaired youths who participate in these measures have a higher probability of obtaining work or starting an education and a lower probability of experiencing a transition to social security than youths who do not participate in any measure. For FU and WP, the results are more mixed. During participation, these two measures are associated with an increased probability of having a transition to work or education and a decreased probability of having a transition to social security. After completion of FU or WP, the increased likelihood of getting a job or starting an education persists. However, the participants are also more likely to have a transition to social security. Recall that activation is a prerequisite for being considered for permanent disability benefits. Our results indicate that these measures work primarily as a screening device to sort work-impaired individuals into those in need of thorough assistance and those in need of a 'nudge'. The counseling/motivation/mapping on the part of the social worker as well as the experience from the program might be motivating factors driving the youth to search more actively for an ordinary job. Employers may also use the opportunity to sort the people they may eventually want to keep. Hence, push and pull factors may be at play, initiated by the youths, the social worker, and/or the employer. For some work-impaired youths, activation seems to help clarify the need for prolonged rehabilitation or work incapacity. For others, it can effectively counteract the moral hazard problem inherent in social insurance.

Mental health problems are the most prevalent condition of the work impaired. The apparent rise of mental health problems among youth in Norway (Bakken, 2019) can also be seen across most OECD countries (OECD, 2018). It is widely documented that mental health problems early in life are detrimental for overall well-being, health, and education, both in the short and long runs (Collishaw, 2015). For instance, estimates show that the Danish state could save ca. 2.8 billion Euros annually (NOK 29.5 billion) if vulnerable children and young people are quickly helped back to a normal life course (Rambøll, 2012). School interventions targeted at preventing and alleviating mental health problems could spare considerable economic and societal resources of youth who are at risk of not completing school and experiencing social and economic exclusion.

Abbreviations

AIC, Akaike information criterion; ALMP, Active labor market programs; BA, Basic amount; BIC, Bayesian information criterion; GP, General practitioner; HQIC, Hannan-Quinn information criterion; ML, Maximum likelihood; NAV, Labor and Welfare Service; OECD, Organization of Economic Co-operation and Development; ToE, Timing-of-Events; VRP, Vocational rehabilitation programs; EDU, Education/training; WS, Wage subsidies; WP, Work practice; FU, Follow-up; WAA, Work assessment allowance.

Declarations

Availability of data and materials

Restrictions apply to the availability of the data used under license from Statistics Norway for this study. Data are available from the authors upon reasonable request and with permission of Statistics Norway only.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

The authors have shared responsibility and work equally. KS has estimated the models.

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Appendix A

Table A1 Complete estimation results: Transitions to vocational rehabilitation programs (VRP)

	FU	WP	EDU	WS
	Coefficient (SE)	**Coefficient (SE)**	**Coefficient (SE)**	**Coefficient (SE)**
Completed upper section education	−0.048 (0.034)	−0.159 (0.022)	0.443 (0.018)	0.142 (0.052)
Receiving health-related benefits	−0.576 (0.037)	−0.461 (0.023)	−0.096 (0.023)	−2.273 (0.061)
Non-European immigrant	−0.184 (0.062)	−0.210 (0.038)	0.293 (0.035)	−0.501 (0.110)
Female	−0.350 (0.028)	−0.168 (0.017)	−0.065 (0.016)	−1.102 (0.053)
Income last 3 years prior to work impairment				
Nontaxable transfers	−0.180 (0.033)	−0.059 (0.019)	0.075 (0.018)	−0.212 (0.059)
Taxable transfers	0.095 (0.029)	0.014 (0.019)	0.002 (0.018)	0.232 (0.047)
Labor income	−0.075 (0.015)	−0.049 (0.009)	0.143 (0.007)	0.058 (0.020)
Parents' income average (7–17 years)				
Transfers	0.004 (0.007)	−0.027 (0.005)	−0.016 (0.004)	−0.032 (0.012)
Labor income	−0.004 (0.004)	−0.015 (0.002)	0.003 (0.002)	0.010 (0.006)
Higher-educated parents	−0.219 (0.036)	−0.200 (0.022)	0.098 (0.019)	−0.330 (0.060)
Local youth unemployment rate	0.009 (0.011)	0.022 (0.006)	0.015 (0.006)	−0.021 (0.017)
Activity year prior to work impairment				
In education	0.189 (0.032)	0.115 (0.020)	0.273 (0.018)	0.100 (0.053)
Employed	0.007 (0.037)	−0.103 (0.024)	0.133 (0.021)	0.402 (0.059)
Year dummies (2002 reference)				
Year 2003	−0.372 (0.190)	−0.431 (0.092)	0.179 (0.067)	−0.693 (0.211)
Year 2004	−0.129 (0.174)	−0.194 (0.084)	0.051 (0.066)	−0.629 (0.192)
Year 2005	−0.005 (0.167)	−0.359 (0.084)	−0.061 (0.066)	−0.109 (0.177)
Year 2006	0.028 (0.166)	−0.252 (0.083)	−0.105 (0.066)	−0.282 (0.178)
Year 2007	0.259 (0.165)	−0.355 (0.085)	−0.056 (0.068)	−0.197 (0.179)
Year 2008	0.517 (0.164)	−0.126 (0.084)	0.077 (0.067)	0.026 (0.178)
Year 2009	1.571 (0.158)	1.073 (0.077)	1.063 (0.062)	0.557 (0.174)
Year 2010	1.625 (0.158)	1.326 (0.076)	0.892 (0.063)	−0.208 (0.186)
Year 2011	1.794 (0.158)	1.464 (0.077)	0.817 (0.063)	0.290 (0.180)
Year 2012	1.824 (0.159)	1.586 (0.077)	0.738 (0.064)	0.428 (0.180)
Year 2013	1.916 (0.162)	1.609 (0.080)	0.553 (0.069)	0.656 (0.186)
Year 2014	2.175 (0.168)	1.690 (0.087)	0.562 (0.078)	0.655 (0.207)
Age category (21–24 reference)				
Age 18–20	−0.177 (0.039)	0.108 (0.024)	−0.001 (0.025)	−0.273 (0.070)
Age 25–29	−0.184 (0.034)	−0.204 (0.022)	−0.033 (0.019)	−0.119 (0.053)
Duration of work-impairment spell (1–2 months reference)				
3–4 months	−0.062 (0.057)	−0.100 (0.031)	0.036 (0.028)	0.277 (0.104)
5–6 months	−0.081 (0.060)	−0.145 (0.033)	−0.087 (0.030)	0.397 (0.108)
7–10 months	−0.036 (0.053)	−0.301 (0.031)	−0.148 (0.027)	0.598 (0.096)
11–14 months	−0.038 (0.058)	−0.286 (0.033)	−0.080 (0.029)	0.773 (0.102)
15–18 months	0.160 (0.059)	−0.273 (0.036)	−0.116 (0.032)	0.966 (0.107)
19–24 months	0.140 (0.059)	−0.256 (0.036)	−0.149 (0.032)	1.159 (0.106)
25–30 months	0.262 (0.064)	−0.303 (0.040)	−0.126 (0.036)	1.261 (0.115)

(*Continued*)

Table A1 Continued

	FU	WP	EDU	WS
	Coefficient (SE)	**Coefficient (SE)**	**Coefficient (SE)**	**Coefficient (SE)**
31–36 months	0.278 (0.070)	−0.290 (0.045)	−0.167 (0.040)	1.413 (0.123)
37–48 months	0.221 (0.070)	−0.340 (0.045)	−0.226 (0.041)	1.640 (0.123)
49+ months	0.219 2 (0.083)	−0.339 (0.054)	−0.350 (0.051)	1.776 (0.140)
Quarter (first-quarter reference)				
Quarter 2	0.004 (0.036)	0.045 (0.022)	0.443 (0.024)	0.070 (0.062)
Quarter 3	0.114 (0.036)	0.210 (0.022)	0.954 (0.021)	0.265 (0.060)
Quarter 4	0.327 (0.036)	0.289 (0.022)	0.339 (0.024)	0.295 (0.061)
Region of residence (Eastern Norway reference)				
Southern Norway	0.244 (0.048)	0.191 (0.032)	−0.013 (0.030)	0.570 (0.076)
Western Norway	0.081 (0.035)	0.085 (0.022)	0.035 (0.019)	0.273 (0.055)
Middle Norway	−0.012 (0.048)	0.382 (0.028)	−0.158 (0.029)	0.363 (0.074)
Northern Norway	−0.202 (0.050)	0.181 (0.028)	0.161 (0.026)	0.241 (0.075)

FU, follow–up; WP, work practice; EDU, education/training; WS, wage subsidies.

Table A2 Complete estimation results: Transitions to outcome states

	Social security	Job/education
	Coefficient SE	**Coefficient SE**
Completed upper secondary education	−0.398 (0.027)	0.350 (0.012)
Receiving health-related benefits	−1.088 (0.024)	−1.438 (0.013)
Non-European immigrant	−0.114 (0.040)	0.121 (0.023)
Female	−0.391 (0.020)	0.050 (0.011)
Income last 3 years prior to work impairment	0.392 (0.019)	−0.120 (0.013)
Nontaxable transfers		
Taxable transfers	0.040 (0.019)	0.027 (0.012)
Labor income	−0.109 (0.011)	0.118 (0.005)
Parents' income average, 7–17 years		
Transfers	0.025 (0.005)	−0.010 (0.003)
Labor income	0.001 (0.003)	0.006 (0.001)
Higher educated parents	−0.037 (0.026)	−0.001 (0.013)
Local youth unemployment rate	0.000 (0.007)	−0.020 (0.004)
Activity year prior to work impairment		
In education	−0.231 (0.022)	0.133 (0.012)
Employed	−0.232 (0.027)	0.428 (0.014)
Year dummies (2002 reference)		
Year 2003	0.081 (0.076)	−0.114 (0.040)
Year 2004	0.130 (0.074)	0.001 (0.038)
Year 2005	0.159 (0.072)	0.166 (0.037)
Year 2006	0.050 (0.071)	0.244 (0.037)

(*Continued*)

Table A2 Continued

	Social security	Job/education
	Coefficient SE	**Coefficient SE**
Year 2007	−0.150 (0.074)	0.270 (0.038)
Year 2008	−0.611 (0.077)	0.038 (0.038)
Year 2009	−0.861 (0.077)	−0.109 (0.037)
Year 2010	−0.585 (0.073)	−0.596 (0.038)
Year 2011	−0.325 (0.073)	−0.384 (0.038)
Year 2012	−0.480 (0.074)	−0.379 (0.039)
Year 2013	−0.559 (0.077)	−0.347 (0.041)
Year 2014	−0.046 (0.079)	−0.331 (0.045)
Age (21–24 reference)		
Age 18–20 years	0.152 (0.027)	0.035 (0.016)
Age 25–29 years	0.006 (0.024)	−0.178 (0.013)
Duration of work-impairment spell (1–2 months reference)		
3–4 months	−0.008 (0.038)	0.077 (0.019)
5–6 months	−0.034 (0.041)	0.045 (0.020)
7–10 months	−0.065 (0.037)	0.006 (0.019)
11–14 months	−0.065 (0.039)	−0.006 (0.021)
15–18 months	−0.043 (0.042)	−0.093 (0.023)
19–24 months	0.032 (0.041)	−0.070 (0.023)
25–30 months	0.118 (0.044)	−0.033 (0.025)
31–36 months	0.206 (0.048)	−0.020 (0.028)
37–48 months	0.567 (0.044)	0.171 (0.027)
49+ months	1.138 (0.048)	0.300 (0.032)
Quarter (first quarter reference)		
Quarter 2	−0.024 (0.025)	0.124 (0.013)
Quarter 3	0.107 (0.024)	0.415 (0.012)
Quarter 4	0.040 (0.025)	−0.031 (0.014)
Region of residence (Eastern Norway reference)		
Southern Norway	0.042 (0.035)	−0.048 (0.020)
Western Norway	0.062 (0.024)	−0.025 (0.013)
Middle Norway	−0.017 (0.033)	−0.051 (0.018)
Northern Norway	−0.114 (0.033)	0.023 (0.017)

Appendix B

Vocational rehabilitation programs:

i) *Education/Training (EDU)*: qualifying formal training in a classroom both in the form of shorter labor market training courses (normally up to 10 months) or in the ordinary education system (maximum 3 years).
ii) *Wage subsidies (WS)*: subsidy to employer to hire persons who encounter difficulties in acquiring a job on an ordinary basis. *Wage subsidies* exist for firms both in the private and public sectors, and the participant is supposed to perform regular tasks. The maximum duration is 1 year, but it can be extended to up to 3 years.
iii) *Work practice (WP)*: mostly on-the-job training expected to provide work experience. The duration is normally 1 year, but it can be extended to 2 years. *Work practice* is offered both in the ordinary and sheltered sectors.
iv) *Follow-up (FU)*: supported employment and *follow-up* assistance with the goal of obtaining or retaining work. The duration is up to 6 months, but it may be extended for another 6 months and for special needs for up to 3 years. It also includes job search courses and assistance at work.

Outcomes states

If a person is registered in multiple states at the same time, the following order of priorities apply:

1) *Disability insurance*: persons registered with permanent disability insurance.
2) *Job*: persons registered with a working relationship in the employment registers or registered as partially employed in the Employers Register. We also include persons receiving parental benefits or sick pay, as these states require an on-going employment relationship. Wage income in the job relationship is required to be above 5,000 NOK (approx. 650 EUR). If we do not observe a job relationship in the employment register, we use the income register to investigate whether the person has had wage income and if it is reasonable to believe that the person might have had a job after leaving work impairment. We divide annual income by the months left in the year after leaving work impairment. If the figure is higher than 5,000 NOK, we define it as a job transition.
3) *Education*: persons registered with current education in the National Education Database.
4) *Unemployed*: persons registered as unemployed in the unemployment register, regardless of receipt of unemployment allowance.
5) *Social assistance*: persons registered as recipients of social assistance.
6) *Unknown*: persons not found in any of the above states.