Effects of a Higher Replacement Rate on Unemployment Durations, Employment, and Earnings

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1. Introduction

Unemployment insurance is one of the most important safety net programs in developed countries. Institutional details such as the generosity of unemployment benefits and potential unemployment benefit duration vary strongly between countries. In 2009, for OECD countries, replacement rates were between 36 % (New Zealand) and 86 % (Portugal) and potential unemployment benefit duration between 6 months (i.e. US) and unlimited (Belgium) for unemployed individuals who are single and earned an average wage. This raises the question of how to design an optimal unemployment insurance balancing between effective poverty prevention and adverse incentive effects.[1] From an efficiency point of view, it is imperative to know how unemployed individuals adjust their job search effort to changes in the parameters of unemployment insurance. But we also want to know how post-unemployment work prospects change when the unemployment insurance design changes.

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1   For contributions inferring the optimal unemployment insurance design from estimated labour supply elasticity w.r.t. unemployment benefits (substitution effect) and assets or cash-on-hand (liquidity effect) see Chetty (2008) and Kroft and Notowidigdo (2011).

This paper sheds light on the effect of the replacement rate, one of the key parameters in unemployment insurance design, on unemployment durations, employment probabilities and earnings in Switzerland. Importantly, the research design adopted allows to focus on low and medium income individuals. They are of special interest as the poverty prevention aspect of unemployment insurance is more important for them than for high income individuals. Furthermore, these individuals might be credit constrained and cannot save enough to smooth consumption over an unemployment spell.[2] Thus, an increase in unemployment benefits might increase unemployment durations through the liquidity effect and through moral hazard, where the first is welfare enhancing while the second is welfare deteriorating (see, e.g. Chetty, 2008).

Switzerland, a country with 7.8 million inhabitants and an unemployment rate as low as 3.6 % (August 2010), spent more than 5.4 billion Swiss Francs (5.9 billion dollars) on unemployment benefits in the year 2010. Before July 2003, the Swiss unemployment insurance provided benefits for up to two years with a benefit replacement rate of 70 % or 80 %, depending on pre-unemployment income and on the presence of dependent persons. In July 2003, the unemployment insurance underwent a large reform where the potential benefit duration was reduced from 24 to 18 months. A special feature of this reform was that benefits increased by up to 5.88 ppt for a small group of unemployed individuals who earned between 3,536 and 4,340 Swiss Francs before entering unemployment and who had no children. Exploiting this reform, the causal effect of a change in the replacement rate on unemployment durations, employment and earnings can be identified adopting a difference-in-differences approach. The difference-in-differences estimates contrast the changes in the outcomes for treated and control groups. The treated group consists of individuals who earned between 3,536 and 4,340 Swiss Francs before entering unemployment. As a control group, individuals with lower (3,000–3,535 Swiss Francs) or higher (4,341–4,800 Swiss Francs) incomes will be used. The assumptions that have to hold to identify the treatment effect on the treated in independent repeated cross sections are – in short – no endogenous entry into unemployment because of the increase in the replacement rate, and equal time trends of the outcome for treatment and control groups in absence of the treatment. This paper provides evidence in favour of both assumptions.

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2   See Browning and Crossley (2001) for a paper on unemployment spells and consumption
    smoothing.

Having estimated the effect of changes in the replacement rate on unemployment durations, this paper completes the picture by providing evidence on employment probabilities and earnings using data from a 25 % sample of the social security system database. I estimate the effects on employment probabilities, expected earnings, and earnings of the employed, respectively, a quarter of a year, half a year, one, two and five years after the start of the unemployment spell.

The literature on the effects of unemployment benefit levels on unemployment durations is extensive and the question has repeatedly been a subject of research since the early eighties. Mortensen (1977) and Pissarides (1994) developed the now standard job search model with on-the-job search and variable job search effort. They conclude that the effect of an increase in unemployment benefits on unemployment durations is in general ambiguous since job search effort decreases in the early stages of the unemployment spell but increases as potential benefit duration is exhausted. Many empirical papers investigate the link between unemployment insurance design – specifically benefit levels and potential unemployment benefit durations – and unemployment duration. Nickell (1979) and Meyer (1990) use survival analysis to investigate the effect of benefit levels and potential unemployment benefit duration on unemployment exits. They find that exits fall strongly when benefit levels increase. However, these estimates cannot properly control for unobserved heterogeneity among the unemployed. Carling, Holmlund, and Vejsiu (2001) study a policy change in Sweden and find that a cut of 5 % in the benefit level increased job finding rates by 10 %. Roed and Zhang (2003) combine survival analysis with quasi-experimental variation in unemployment benefits in Norway and find an elasticity of unemployment duration with respect to benefits of around 0.95 for men and 0.35 for women. Lalive, van Ours, and Zweimüller (2006) find, that a 6 ppt increase in unemployment benefits in Austria increases unemployment durations by 0.38 weeks, which implies an elasticity of 0.15. They also show, that unemployed individuals react much less to changes in the benefit level than to changes in potential unemployment benefit duration and that the combination of the two policy changes leads to stronger reactions than each change alone. Meyer and Mok (2007) shows that a large change of 36 % in the benefit level in New York State strongly increases unemployment durations. Holmlund (1998) surveys the literature and finds ambiguous results concerning the effect of benefit levels on unemployment duration.[3]

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3   See also Atkinson and Micklewright (1991) for a critical survey over the theoretical and empirical literature studying the effect of unemployment insurance on unemployment duration and Fredriksson and Holmlund (2006) for a more recent survey focusing on incentive schemes in unemployment insurance.

Even though an efficient unemployment insurance should not only aim at reducing unemployment durations but should also allow the unemployed to search for a suitable job, empirical papers studying the effects of unemployment insurance on post-unemployment outcomes are considerably less frequent. Addison and Blackburn (2000) use a displaced worker survey in the US and compare unemployment benefit recipients with non-recipients, which corresponds to a difference in the replacement rate of 44 %. They find a slight positive effect of unemployment benefits on earnings. Card, Chetty, and Weber (2007) use Austrian data to evaluate two discontinuities in the eligibility criteria for severance pay and extended benefit duration, respectively. They find that both increase unemployment durations significantly but have no effect on subsequent job-match quality. Lalive (2007) investigates a change in potential benefit duration of 13 quarters in Austria and finds no effects on wages. van Ours and Vodopivec (2008) study a reform in Slovenia that decreased potential benefit duration from 9–12 months to six months. They find no effect on job quality, measured as wages paid and durations of jobs. Centeno and Novo (2009) look at the effect of potential benefit duration on post-unemployment wages for different income quartiles. They find that low-wage individuals who are likely to be liquidity constrained do benefit from longer benefit duration in terms of higher post-unemployment wages. This is not the case for high-wage individuals, however. Barbanchon (2012) applies a regression discontinuity approach to French data to study the effects of strongly prolonged potential benefit duration on workers with low employability. He finds large effects on the unemployment hazard rates but no significant effects on job-match quality. Finally, the study most related to this paper is Degen and Lalive (2014) who analyze another feature of the same unemployment insurance reform in Switzerland in July 2003. They find that expected earnings and employment for individuals aged 50 to 54 increase as a consequence of a cut in potential benefit duration from 24 to 18 months.[4]

This paper contributes to the existing literature in two aspects. *First,* it provides estimates on the semi-elasticity of unemployment durations on the replacement rate using quasi-experimental variation in the Swiss unemployment insurance replacement rate that has not yet been exploited, namely a policy change that increased the replacement rate for some unemployed individuals by up to

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4   Schmieder, von Wachter, and Bender (2012) take a different approach to study the longterm effects of potential benefit duration. They look at recurrent unemployment spells and find that the effect on the initial spell is much larger then the effect when taking into account all recurrent spells within five years.

5.88 ppt, while the replacement rate stayed constant for all other individuals. *Second,* the paper is one of the first to provide evidence on the effect of the replacement rate, as opposed to potential benefit duration, on post-unemployment earnings and employment probabilities.

The results suggest that the replacement rate increase led to a 3.1 % increase in unemployment duration, which translates to an elasticity of 0.075. Consistent with earlier literature, the analysis shows no statistically significant effects of the replacement rate on post-unemployment outcomes.

The paper is structured as follows. The next section provides background on the Swiss unemployment insurance system and on how the reform in July 2003 influenced the replacement rate. Section 3 shows a description of the data as well as summary statistics. Section 4 estimates the effect of the replacement rate on unemployment durations. Section 5 shows results on employment probabilities and earnings. Finally, Section 6 concludes.

2. Background

In the Swiss unemployment insurance system, individuals qualify for benefits if they (a) are full- or part-time unemployed;[5] (b) were in paid employment before getting unemployed and therefore have an accountable work loss; (c) live in Switzerland; (d) have completed obligatory schooling and are not yet retired; (e) have contributed to unemployment insurance for at least 6 months (before July 2003) or 12 months (after July 2003) within the last two years; (f) are placeable; and (g) comply to the local labor offices regulations.

If an unemployed individual qualifies for benefits, he receives between 70 % and 80 % of his insured pre-unemployment earnings, where the exact replacement rate depends on the presence of dependent persons and on the level of insured earnings. Insured earnings correspond to the realised earnings through employment in the last six months before unemployment and are top coded at 8,900 Swiss Francs. Benefits can be claimed for up to two years, depending on the unemployment insurance contribution time before getting unemployed.[6] Those who register at a local labor office do not only receive monetary compensation but also job search assistance. Job search is monitored and non-compliance with

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5   Part-time unemployed means that a person either works part-time but looks for a full-time position, or that the person doesn't work and looks for a part-time position.

6   360 work days when contributed 12 months, 400 work days when contributed 18 months, and 520 days when contributed 24 months and older than 55 years or handicapped.

job search requirements or the non-acceptance of a reasonable job offer lead to complete withdrawal of benefits for up to 30 days.[7]

In July 2003, the Swiss unemployment insurance underwent a large reform. This reform was first announced by the Federal council in February 2001 and decided over by the parliament in March 2002. The referendum was announced in August 2002 and the Swiss population voted over the reform in November 2002. The political discussion was dominated by two major issues: *first,* after the reform, the unemployed have to pay contributions for at least 12 months to be eligible for benefits, while before the reform, they were allowed benefits after six months of unemployment insurance contributions. *Second,* potential unemployment benefit duration was decreased from 24 to 18 months.

This paper exploits a less-known feature of the unemployment insurance benefit schedule and how it altered with the reform in July 2003. Figure 1 shows the benefit replacement rate against insured pre-unemployment earnings. Specifically, it shows the replacement rate schedule for insured earnings between 3,000 and 5,000 Swiss Francs (CHF) and for individuals who do not have any children. The solid line shows the replacement rate schedule before the reform in July 2003, and the dashed line after the reform.

Before July 2003, low-income unemployed individuals get 80 % of their insured earnings up to a maximum amount of 130 CHF per day. This maximum amount corresponds to monthly insured earnings of 3,536 CHF, as a month is defined to have 21.7 work days. Once 130 CHF of daily compensation are reached, the benefits no longer increase with income as long as the replacement rate is higher than 70 %, which is equivalent to say that benefits stay constant at 130 CHF for unemployed who earned between 3,536 and 4,030 CHF. For higher incomes, the replacement rate amounts to 70 % of previous earnings and thus, benefits do again increase with insured earnings (solid line in Figure 1). After the unemployment insurance reform, the maximum daily benefits that an unemployed individual can receive with a replacement rate higher than 70 % increased to 140 CHF (dashed line in Figure 1). That is, benefits stay constant at 140 CHF per day for individuals who earned between 3,797 and 4,340 CHF before getting unemployed, and are 80 % of insured earnings for those that earned less than 3,797 CHF, and 70 % of earnings for those that earned more than 4,340 CHF.[8] All other features of the replacement rate schedule remained unchanged. The

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7   See ARNI, LALIVE, and VAN OURS (2013) for details on the Swiss benefit sanction system.
8   Before and after July 2003, insured earnings are top coded at 8,900 Swiss Francs, and therefore unemployment benefits are top coded at 287 Swiss Francs per day.

Figure 1: Replacement Rate before and after July 2003
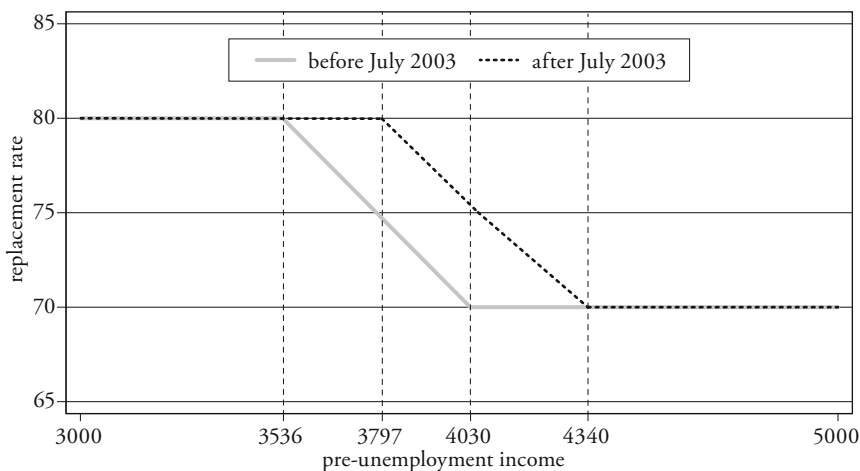
changes in the replacement rate schedule were applied to in-progress spells. That is, from July 1, 2003 on, every unemployed got the benefit amount that corresponded to the new replacement rate after the reform.

The replacement rate changed by a maximum of 5.88 ppt for individuals with previous insured earnings between 3,536 and 4,340 CHF, while it didn't change for individuals with lower or higher incomes. We can therefore identify effects of changes in the replacement rate adopting a difference-in-differences approach.

3. Data

The data for this study stems from two different sources. *First,* the Swiss unemployment insurance register, and *second,* the Swiss social security system. This section describes the data sources and the sample selection and provides first descriptive statistics for the variables of interest.

3.1 Description

The main data source is the Swiss unemployment insurance register. The data base contains all individuals who registered at an office of the public employment service in the years 1998 to 2007. Apart of registration and de-registration

dates (daily precision), the data mainly contains personal characteristics that are important to determine unemployment benefits, but also other information that help the caseworker to assign suitable jobs. Most importantly, we know insured pre-unemployment earnings and the exact unemployment duration.

Only non-married individuals who have no dependent persons are kept in the sample as only those are affected by the replacement rate change in July 2003.[9] The sample is further restricted to contain only full-time unemployed individuals who are registered for at least 2 days at a local labor office (this is also the minimal work loss to be eligible for unemployment benefits), who are eligible for unemployment benefits and do actually get them. Note that the sample includes only individuals who contributed to unemployment insurance at least 12 months before getting unemployed. This, to make sure that individuals who enter unemployment insurance before and after the reform in July 2003 are indeed comparable. Also, only individuals of age between 25 and 50 are considered. This corresponds to the prime-age labor market participants and ensures that most of the unemployed have finished their education. Moreover, individuals older than 55 were differently affected by the reform of the unemployment insurance in July 2003 as their potential benefit duration was not reduced to 18 months. Keeping these older individuals in the sample could therefore confound the analysis if interaction effects between the benefit replacement rate and potential benefit duration are present and treatment and control groups do not balance with respect to the age composition.

Data from the Swiss social security system is used to analyse employment and earnings. The data is a 25 %-sample of all individuals who have ever contributed to social security between 1982 and 2008 and provides information on monthly employment status and real earnings. The data can be merged with the unemployment register data through a unique identifier. I then keep information on employment status and earnings three, six, twelve, 24, and 60 months after the start of the unemployment spell.[10]

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9   The replacement rate does not depend on marital status but depends on the presence of children. However, the data does not inform us about the presence of children but about the presence of dependent persons. When married, it is not clear if the dependent person is the spouse or a child. Therefore only non-married individuals without any dependent persons are kept in the sample.

10 Note that these are not truly post-unemployment outcomes, but may arise during an unemployment spell. However, the indicators two and five years after the beginning of unemployment are necessarily after registered unemployment.

Table 1: Summary Statistics

Variable	(1) All incomes Mean	(2) Std. Dev.	(3) Treated & Control Mean	(4) Std. Dev.	(5) Treated Mean	(6) Std. Dev.
A. Before July 2003						
Insured earnings	4,767.84	1,612.10	3,969.78	499.23	3,960.69	234.97
Replacement rate	72.85	4.25	73.86	4.34	73.01	3.32
UE duration (weeks)	29.34	28.01	28.09	27.39	28.03	27.50
Employed after 3 months	0.50	0.50	0.53	0.50	0.53	0.50
after 6 months	0.65	0.48	0.68	0.47	0.68	0.47
after 1 year	0.72	0.45	0.72	0.45	0.73	0.45
after 2 years	0.76	0.43	0.74	0.44	0.74	0.44
after 5 years	0.75	0.43	0.72	0.45	0.73	0.45
Earnings (CHF) after 3 months	1,856.20	2,794.30	1,629.34	2,075.61	1,652.44	2,118.28
after 6 months	2,850.00	3,000.46	2,466.38	2,337.14	2,468.18	2,296.54
after 1 year	3,450.37	3,163.13	2,819.18	2,352.30	2,830.40	2,335.96
after 2 years	3,825.47	3,237.38	3,065.53	2,424.73	3,022.99	2,394.29
after 5 years	4,078.21	3,754.20	3,167.96	2,672.34	3,140.59	2,632.16
Observations	115,326		54,744		26,357	
B. After July 2003						
Insured earnings	4,926.10	1,630.02	4,017.61	486.40	3,962.52	233.13
Replacement rate	73.03	4.32	74.92	4.40	75.90	3.57
UE duration (weeks)	29.16	25.94	28.46	25.89	28.72	26.31
Employed after 3 months	0.50	0.50	0.52	0.50	0.53	0.50
after 6 months	0.65	0.48	0.66	0.47	0.66	0.47
after 1 year	0.75	0.43	0.75	0.43	0.75	0.43
after 2 years	0.81	0.39	0.80	0.40	0.80	0.40
after 5 years	0.81	0.40	0.79	0.41	0.78	0.41
Earnings (CHF) after 3 months	1,798.48	2,835.41	1,562.76	2,143.57	1,529.67	2,019.24
after 6 months	2,719.07	2,842.60	2,332.12	2,281.43	2,272.85	2,202.65
after 1 year	3,519.52	3,029.90	2,886.92	2,325.57	2,814.67	2,308.51
after 2 years	4,105.81	3,163.30	3,328.32	2,483.88	3,253.14	2,505.96
after 5 years	4,518.04	3,803.38	3,576.20	3,067.48	3,481.72	2,726.24
Observations	120,326		52,694		25,833	

Notes: Unemployment durations are right censored at 730 days. Insured earnings are censored at 8,900 CHF. Post-unemployment outcomes (employment and earnings) are for 25% of the whole population. Post-unemployment outcomes are 3 / 6 / 12 / 24 / 60 months after the begin of the unemployment spell. Earnings are real earnings and set to 0 CHF for non-employed individuals. *Source:* Unemployment register 1998–2007 (SECO).

3.2 Summary Statistics

Table 1 provides summary statistics of insured earnings, replacement rates, and the outcome variables before and after July 2003. Columns (1) and (2) show summary statistics for all incomes (0 to 8,900 CHF), Columns (3) and (4) for the sample under consideration (3,000 to 4,800 CHF), and Columns (5) and (6) for the treated only (3,536 to 4,340 CHF). Roughly half of the observations fall within the earnings bandwidth under study. Clearly, the sample is not representative, as insured pre-unemployment earnings are restricted to be lower than the mean of the overall population. However, low-to-medium income earners are of special interest as the poverty prevention aspect of unemployment insurance is more important for them than for high income individuals. Furthermore, these individuals might be credit constrained and cannot save enough to smooth consumption over an unemployment spell.

The replacement rate is slightly higher in our sample than in the overall population because insured pre-unemployment earnings are lower. The mean replacement rate of the treated increases by 2.89 ppt after the reform, while it raises only very lightly in the overall population. Mean unemployment durations in our sample are 28 weeks (more than six months) before July 2003, and half a week longer after the reform. Looking at the probability of being employed shows that after three months already 50 % of the unemployed have found a job. This increases to 65 % after half a year and 72 % after a year and from then on it stays fairly constant. It also shows that five years after the start of an unemployment spell, about 25 % of the individuals either left the labor force or became again unemployed. Expected earnings reflect the upward trend in employment probability.

4. Unemployment Durations

This section presents the effect of an increase in the replacement rate on unemployment durations adopting a difference-in-differences approach. Figure 1 presented the change in the benefit replacement rate due to the unemployment insurance reform in July 2003. Individuals who had insured earnings between 3,536 and 4,340 CHF were positively affected by the reform. Those who profited the most – with respect to the change in the replacement rate – were individuals with insured earnings between 3,797 and 4,030 CHF. For them, the replacement rate increased by 5.88 percentage points. As the replacement rate stayed constant for individuals with monthly earnings lower than 3,536 CHF or monthly earnings

higher than 4,340 CHF, these individuals build a natural control group for the difference-in-differences analysis.

4.1 Identification and Underlying Assumptions

This section shows the assumptions that have to hold for the difference-in-differences estimator to identify the average treatment effect on the treated when applied to independent cross sections and discusses their plausibility in the current context. Let's adopt the following notation: Y_{0B} is the potential non-treatment outcome before the reform, Y_{0A} is the potential non-treatment outcome after the reform, and Y_{1A} is the potential treatment outcome after the reform. In a repeated cross section, each individual is observed in only one of the three states. Let $D \in \{0,1\}$ be a treatment indicator that is 1 if an individual belongs to the treatment group (insured earnings between 3,536 and 4,340 CHF). If the individual enters unemployment before the reform, its observed outcome is $Y_B = Y_{0B}$, because nobody receives treatment. If the individual enters unemployment after the reform, its observed outcome is $Y_A = DY_{1A} + (1 - D)Y_{0A}$. The difference-in-differences estimator is then

$$DiD = [E(Y_A \mid D=1) - E(Y_A \mid D=0)] - [E(Y_B \mid D=1) - E(Y_B \mid D=0)] \quad (1)$$

Two key assumptions have to hold for the difference-in-differences estimator to identify the average treatment effect on the treated.[11] *First,* the treated and the control groups should exhibit parallel time trends. *Second,* the treatment should not itself change the composition of the unemployed individuals, and therefore should not change the expected outcome in absence of the treatment.[12]

Assumption 1: Parallel time trends of Y_0 for the treated and the control groups: $E(Y_{0A} - Y_{0B}|D=1) = E(Y_{0A} - Y_{0B}|D=0)$.

This is the main identifying assumption. In the current setting this is a rather restrictive assumption as it requests that unemployment durations of individuals with lower/higher income would evolve in the same way over time than unemployment durations of the treatment group. An indication for the validity of the

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11 See also LEE and KANG (2006) for a more extensive discussion of the assumptions that have to hold in a repeated cross section setting.

12 Note that the two assumptions are presented without conditioning on the covariates. The first assumption has to hold when conditioning on the set of pre-reform covariates. The second assumption has to hold when conditioning on the set of post-reform covariates.

assumption can be given by implementing a placebo analysis.[13] Table 2 shows the results of a difference-in-differences analysis, assuming a virtual unemployment insurance reform in July 2000 and using only data on individuals entering unemployment before January 2003. The same specification as for the main analysis in Section 4.2 is estimated:

$$y_i = \alpha + \beta_1 T_i + \beta_2 A_i + \beta_3 T_i \cdot A_i + \gamma X_i + \varepsilon_i \qquad (2)$$

Column (1) contains the whole sample of unemployed individuals entering unemployment before January 2003. Columns (2) to (5) sequentially exclude observations before the placebo reform to address anticipation effects. This might be important for the main analysis where individuals can switch the benefit regime, it should however have no effect in the placebo analysis. If the estimates for the coefficients on the interaction effect "Treatment·After" were significant, even though there is no treatment in this case, this is strong evidence for unequal time trends for treatment and control groups. None of the estimated placebo treatment effects turns out to be statistically significant. Therefore, the assumption of equal time trends is not violated in July 2000.[14]

Assumption 2: The treatment does not change the composition of the treated and the control groups, and therefore does not change the expected outcome in absence of the treatment.

This assumption is important when applying difference-in-differences in repeated cross sections. If there is endogenous entry to unemployment, that is if individuals do enter unemployment more frequently because they expect to get higher benefits, then the assumption is violated. Figure 2 shows the unemployment inflow of the control groups as a ratio of the unemployment inflow of the treated group. Inflow is calculated as the number of persons entering unemployment in a given quarter, weighted by the earnings bandwidth of the group. In the

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13 Note that the placebo analysis is also a first implicit test for the existence of anticipation effects. If strong anticipation effects before the reform led unemployed individuals in the treatment group to search less intensively for a job, this would lead to a positive difference-in-differences estimate in the placebo analysis.

14 Note that there is still the possibility that asymmetrically adverse labor market conditions occur during the reform period in July 2003, which would lead to a violation of assumption 1. Note also that the reform in July 2003 has not only changed the replacement rate, but also potential unemployment benefit duration. Even though the change in potential benefit duration was the same for treatment and control groups, it could arise that individuals react differently to this change depending on unobserved heterogeneity correlated with income.

Table 2: Difference-in-Differences Estimates for Placebo Reform in July 2000

Dependent variable: Log unemployment duration

Excluded pre-reform time	(1) 0 months	(2) 3 months	(3) 6 months	(4) 9 months	(5) 12 months
Treatment	–0.014	–0.009	–0.002	0.012	0.024
	(0.015)	(0.016)	(0.017)	(0.018)	(0.019)
After	0.075***	0.065***	0.044***	0.029**	0.027**
	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)
Treatment · After	0.010	0.006	–0.002	–0.016	–0.028
	(0.023)	(0.023)	(0.023)	(0.024)	(0.025)
R-squared	0.083	0.082	0.081	0.081	0.079
Observations	48,715	46,985	44,586	41,819	39,761

Notes: Robust standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Controls include age, gender, Swiss citizenship, mother tongue, mobility, qualification, function in previous job, sector of previous employment, caseworkers assessment of placement possibilities, type of residence community. Only individuals in the data that enter into unemployment before January 2003.
*Source:* Unemployment register 1998–2007 (SECO).

case of endogenous entry into the treatment group, we would expect the relative inflow for both of the two control groups to decrease around the reform. Even though the evidence is mixed, the fact that the relative inflow of the high earnings control group increases is evidence against endogenous entry. The decreasing relative inflow of the low earnings group is likely to be driven by increasing trends in nominal earnings, which make low earnings relatively rare compared to the higher earnings group. The overall pattern seems also more compatible with asymmetrically adverse labor market conditions for some earning groups than with strategic behaviour of the unemployed individuals.

A second piece of evidence against endogenous entry is presented in Table 3. One channel through which endogenous entry could arise is that individuals decide to enter unemployment because of a higher replacement rate, and therefore voluntarily quit their job.[15] The data contains information on how a job seeker lost his job. If the unemployed quit the job or if he behaved such that

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15   Note that also employers could be more reluctant to lay their workers off when unemployment replacement rates are higher. This would, however, lead to an increase in the relative inflow to unemployment of the treatment group, which was not confirmed in Figure 2.

Figure 2: Inflow Ratio between Controls and Treated
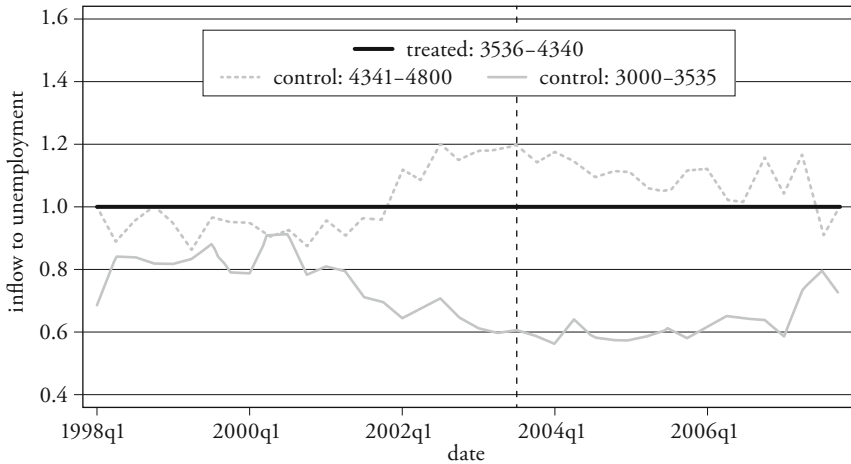
Notes: Inflow ratio of the control groups in comparison to the treatment group. Inflow is calculated as the number of persons entering unemployment in a given quarter, weighted by the earnings bandwidth of the group. The dashed vertical line marks July 2003.
Source: Unemployment register 1998–2007 (SECO).

Table 3: Difference-in-Differences Estimates: Endogenous Entry

Dependent variable	(1) fraction quit job
Treatment	−0.002
	(0.004)
After	−0.019***
	(0.003)
Treatment · After	0.010*
	(0.006)
R-squared	0.019
Observations	107,437

Notes: Robust standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Controls include age, gender, Swiss citizenship, mother tongue, mobility, qualification, function in previous job, sector of previous employment, caseworkers assessment of placement possibilities, type of residence community.
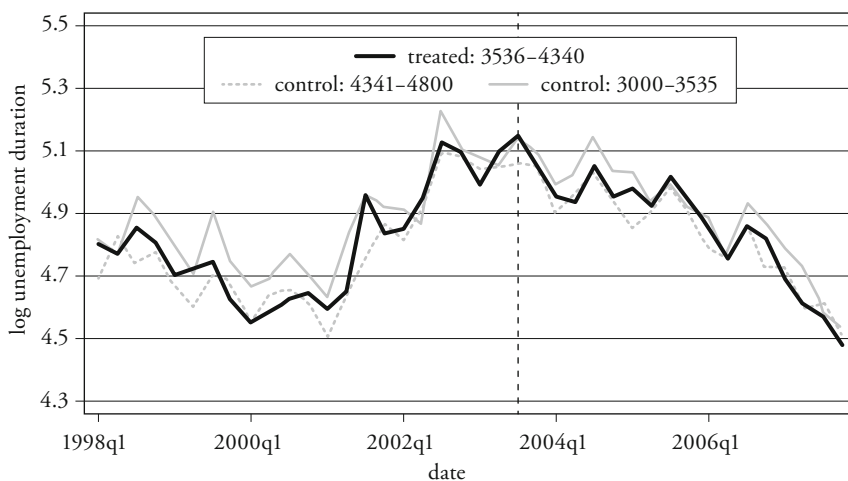*Source:* Unemployment register 1998–2007 (SECO).

the employer laid him off for good reason, this is classified in the data as being himself responsible for his job loss.[16] Table 3 adopts a difference-in-differences approach to investigate if the reform in July 2003 had an influence on the percentage of unemployed individuals who quit their job. The reform increased job quits by 1 ppt for the treatment group, but the estimate is only weakly statistically significant. Moreover, after the reform, quitting a job is by 1.9 ppts less likely. Together, Figure 2 and Table 3 provide evidence that assumption 2 is satisfied in this study.

If both assumptions hold, the difference-in-differences estimator can be rewritten as

$$DiD = E(Y_{1A} - Y_{0A} \mid D = 1) \tag{3}$$

and therefore it identifies the average treatment effect on the treated.

Figure 3: Log Unemployment Duration for Treated and Controls

Notes: Log unemployment durations for control groups and the treatment group. The dashed vertical line marks July 2003.
Source: Unemployment register 1998–2007 (SECO).

16 The data contains the first reason for a sanction of an unemployment spell. That is, if an unemployed individual was sanctioned twice, i.e. first for quitting his job voluntarily and a second time for non-compliance with job search requirements, the data contains the information that the individual has quit his job. The sanction has not necessarily been enforced in the first month of unemployment as the evaluation of the responsibility of the unemployed individual can take some time.

4.2 Results

Figure 3 shows the evolution of log unemployment durations for treated and control groups over time. The vertical line marks July 2003, when the reform of the unemployment insurance took place. Unemployment durations increase before the reform because of an ongoing recession, and decrease after July 2003 when the economy recovers. In general, unemployment durations of the three groups evolve very similarly. Unemployment durations of the low income control group are slightly higher than those of the treatment and the high income control groups. From Figure 3 there is no clear evidence for an effect of the increased replacement rate on unemployment durations.

   Table 4 shows the results, when investigating the effect of a higher replacement rate on unemployment durations, applying the difference-in-differences estimator. The following econometric specification is estimated by OLS:

$$y_i = \alpha + \beta_1 T_i + \beta_2 A_i + \beta_3 T_i \cdot A_i + \gamma X_i + \varepsilon_i \qquad (4)$$

where y_i is log unemployment duration. T_i is the treatment indicator that takes values between 0 and 1, depending on the intensity of the treatment. If the indicator is 0, the individual belongs to the control group. If it takes the value 1, the reform increased the replacement rate for the concerned individual by 5.88 ppt. Values between 0 and 1 mean a treatment intensity between 0 and 5.88 ppt, where the values are obtained by linear interpolation. A_i is a dummy for entering unemployment after July 2003. $T_i \cdot A_i$ is the interaction term between T_i and A_i, and its coefficient β_3 identifies the treatment effect on the treated. Finally, X_i is a vector of control characteristics and includes age, gender, Swiss citizenship, mother tongue, a mobility indicator (five categories), qualification (three categories), function in the previous job (seven categories), sector of previous employment (ten categories), caseworkers assessment of placement possibilities (five categories), and the type of the residence community (number of inhabitants, agglomeration). The sample used in the estimations of Table 4 consists of unemployed individuals who have insured pre-unemployment earnings between 3,000 and 4,800 CHF. The treatment group consists of those individuals who have insured earnings between 3,536 and 4,340 CHF before entering unemployment.[17]

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17 The control group could reasonably be split into a low-earnings control group and a high-earnings control group. CAMPBELL (1969, p. 365) (cited in ROSENBAUM, 1987) notes that "the ideal control groups would bracket the treated group" in terms of unobservable characteristics and could thus be used to estimate lower and upper bounds of the treatment effect.

Table 4: Difference-in-Differences Estimates (3,000–4,800 CHF)

Dependent variable: Log unemployment duration

Excluded pre-reform time	(1) 0 months	(2) 3 months	(3) 6 months	(4) 9 months	(5) 12 months
Treatment	–0.007 (0.011)	–0.011 (0.011)	–0.009 (0.011)	–0.010 (0.012)	–0.012 (0.012)
After	0.020*** (0.008)	0.033*** (0.008)	0.048*** (0.008)	0.072*** (0.008)	0.091*** (0.008)
Treatment·After	0.031** (0.015)	0.035** (0.015)	0.033** (0.015)	0.035** (0.016)	0.036** (0.016)
R-squared	0.077	0.077	0.077	0.079	0.080
Observations	107,437	104,589	101,408	97,856	95,467

Notes: Robust standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Controls include age, gender, Swiss citizenship, mother tongue, mobility, qualification, function in previous job, sector of previous employment, caseworkers assessment of placement possibilities, type of residence community.
Source: Unemployment register 1998–2007 (SECO).

Column (1) in Table 4 shows the baseline estimates. The coefficient on "Treatment·After" is an estimate of the effect of an increase in the replacement rate by 5.88 ppt on log unemployment durations. The point estimate indicates that the reform increased unemployment durations of the treatment group by 3.1 %, or roughly one week if evaluated at the sample mean. Note that these estimates have to be interpreted as the treatment effect on the treated after the reform in July 2003. That is, with maximum potential benefit duration of 400 days and minimum contribution requirement of 12 months. Is this effect relevant at all, given that the same unemployment insurance reform reduced potential benefit duration by 120 days? DEGEN and LALIVE (2014) show that the potential benefit duration cut decreased unemployment durations by approximately 0.5 months in their sample of interest. However, their sample consists of older job seekers with a longer average unemployment duration of 16.5 months. In relative terms, the effect of the two parts of the reform in the two different samples are therefore exactly equal to 3.1 %.

The estimated treatment effect in Table 4, Column (1) can be bounded between 0.028 and 0.031* using this methodology. Note that there is some loss in statistical significance due to the reduced number of observations.

    One feature of the reform of the Swiss unemployment insurance was that
unemployment spells which were in progress changed their replacement rate
immediately at the date when the new benefit regime was introduced. Neglect-
ing this could bias our results downwards in two distinct ways. *First,* there is a
mechanic reaction of individuals that switch the benefit regime in the middle of
their unemployment spell. Once they receive higher benefits, they might lower
their search effort as incentives have changed. *Second,* individuals who anticipate
the benefit regime switch when staying unemployed might lower their search
effort already from the beginning of their spell in anticipation of the future
increase in unemployment benefits. Both reactions will lead to an underestima-
tion of the estimated coefficients by increasing the unemployment durations of
the treatment group prior to the reform. To check if these anticipation effects do
influence the estimations, I exclude in columns (2) to (5) of Table 4 progressively
more individuals entering unemployment just before July 2003. Even though
individuals entering unemployment after the reform stay significantly longer
unemployed, the estimated effect of the reform on the treatment group remains
very robust and amounts to 0.036 in Column (5). The longer unemployment
durations after the reform, when cutting some quarters of unemployment inflow
before July 2003, are in line with our expectations as unemployment rates started
to increase in the year 2001 because of a recession and reached a peak in the year
2004. Individuals entering unemployment after the reform therefore faced unfa-
vourable labor market conditions compared to individuals entering before 2003.
    Table 5 disentangles the effect of the reform for different background charac-
teristics of the unemployed by introducing interaction terms to the regression.
Specifically, it checks if unemployed individuals react more or less to changes
in the replacement rate depending on age, mother tongue, mobility, qualifica-
tion, and ease of placement. This is implemented using the following economet-
ric specification:

$$y_i = \alpha + \beta_1 T_i + \beta_2 A_i + \beta_3 T_i \cdot A_i + \beta_4 T_i \cdot \tilde{X}_i \qquad (5)$$
$$+ \beta_5 A_i \cdot \tilde{X}_i + \beta_6 T_i \cdot A_i \cdot \tilde{X}_i + \gamma X_i + \varepsilon_i$$

where $\tilde{X}_i$ is a restricted set of background characteristics, containing age, gender,
Swiss citizenship and dummies for being German speaking, mobile, qualified,
and for being easy to place. These background characteristics are included as
deviations from their mean. Therefore, the coefficient on the interaction term
$T_i \cdot A_i$ in columns (2) to (6) still shows the same effect of an increase in the benefit
replacement rate on unemployment durations as Table 4. For ease of exposition,

**Table 5: Difference-in-Differences Estimates with Interaction Terms
(3,000–4,800 CHF)**

Dependent variable: Log unemployment duration

Excluded pre-reform time	(1) 0 months	(2) 3 months	(3) 6 months	(4) 9 months	(5) 12 months
Treatment	−0.008	−0.012	−0.011	−0.012	−0.014
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
After	0.019**	0.032***	0.047***	0.071***	0.090***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Treatment·After	0.031**	0.035**	0.034**	0.035**	0.037**
	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
T·A·Male	−0.097***	−0.105***	−0.114***	−0.101***	−0.095***
	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)
T·A·Swiss	−0.036	−0.040	−0.039	−0.039	−0.028
	(0.039)	(0.040)	(0.040)	(0.041)	(0.042)
T·A·German speaking	−0.040	−0.050	−0.049	−0.063*	−0.062*
	(0.033)	(0.033)	(0.034)	(0.034)	(0.035)
T·A·age	0.001	0.001	0.001	0.001	0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
T·A·mobile	−0.076	−0.071	−0.085	−0.085	−0.089
	(0.062)	(0.063)	(0.063)	(0.064)	(0.065)
T·A·qualified	0.053	0.049	0.030	0.026	0.008
	(0.034)	(0.034)	(0.035)	(0.036)	(0.037)
T·A·easy to place	−0.032	−0.031	−0.035	−0.036	−0.036
	(0.042)	(0.042)	(0.043)	(0.043)	(0.043)
R-squared	0.077	0.077	0.078	0.080	0.080
Observations	107,437	104,589	101,408	97,856	95,467

Notes: Robust standard errors in parentheses. $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Regressions also include interaction terms of German speaking, age, gender, Swiss citizenship, mobile, qualified, and easy to place with treatment dummy and after dummy. Age, gender, Swiss citizenship, mobile, qualified, and easy to place are in mean deviation. Controls include age, mother tongue, mobility, qualification, function in previous job, sector of previous employment, caseworkers assessment of placement possibilities, type of residence community.
Source: Unemployment register 1998–2007 (SECO).

Table 5 only presents the coefficients β_1 to β_3 and the vector of coefficients β_6 that identifies differences in the treatment effects of the replacement rate on unemployment durations, by background characteristics. The results suggest that the positive effect of an increase in the replacement rate on unemployment durations is mainly driven by women. The effect for men is negative and strongly statistically significant. With respect to the other background characteristics, there is no notable treatment effect heterogeneity.[18]

The increase of the replacement rate was only a minor feature of the unemployment insurance reform in July 2003. Importantly, the reform also changed potential unemployment duration for some of the unemployed. Lalive, van Ours, and Zweimüller (2006) show for Austria, that different policy changes can significantly interact with each other. Specifically, individuals who were affected simultaneously by an increase of the replacement rate and an extension of potential benefit duration reacted stronger than the sum of the two separate effects would have suggested. As the two policy changes of the reform in July 2003 are expected to have inverse effects on unemployment durations, the estimate shows a lower bound of the effect of the replacement rate on unemployment durations if interaction effects are important.

5. Post-Unemployment Outcomes

This section complements the evidence providing estimates of the effect of the replacement rate on post-unemployment outcomes. For a policy maker in charge of designing an unemployment insurance system it is, from a welfare perspective, imperative to know not only how changes in the incentives from the replacement rate change unemployment durations but also how labor market prospects after unemployment are affected. I investigate three different measures for labor market success, each three months, six months, one year, two years, and five years after the start of the unemployment spell. *First,* I investigate employment probability after unemployment. *Second,* expected earnings, measured in Swiss Francs, are analysed. *Finally,* log earnings provide evidence on the effect on earning levels for those who found a job.

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18   German speakers do react somewhat less to the change in incentives in Columns (4) and (5) of Table 5. This result is very much in line with Eugster, Lalive, and Zweimüller (2009), Eugster et al. (2011), and Eugster and Parchet (2011), who show that French- and Italian-speaking Swiss have longer unemployment durations, stronger demand for social insurance, and higher tax levels.

Table 6 contains difference-in-differences estimates for the three post-unemployment outcomes. Panel A. shows the effects of an increase in the replacement rate on the probability of being employed three months, six months, one year, two years, and five years after the start of the unemployment spell. Note that the data on employment and earnings are from a 25 % sample of everybody that contributed at least once to social security between 1982 and 2008. Because of the restricted time frame, employment and earnings five years after the start of the unemployment spell cannot be observed for many individuals who enter unemployment after July 2003. This explains the strongly decreasing number of observations from Columns (1) to (5). Column (1) shows that increasing the replacement rate has no statistically significant effect on employment probabilities after the unemployment spell. Panel B. in Table 6 shows estimates on real earnings. These estimates are directly influenced by the results in Panel A. If there was no effect of the reform on earnings for those who work, but a negative effect on unemployment durations, then the estimated effect on earnings in Panel B. would be negative. All the estimated coefficients are statistically insignificant. Finally, Panel C. investigates log earnings. The advantage of taking log earnings is that the estimated effects are only for those individuals who actually work. The disadvantage is that sample selection will influence the results. The point estimates on log earnings are always statistically insignificant except six months after unemployment. It seems that, at least during the unemployment spell, individuals who were affected by the reform increased their wage expectations and accepted more frequently better paid jobs. After the unemployment spell, the picture is not clear. To conclude, Table 6 does not provide evidence for an effect of the level of the replacement rate on employment probabilities and earnings. The only statistically significant estimates suggest that employment along with earnings increased in general after the reform in July 2003.

6. Conclusions

This paper analyzes the effects of the level of the replacement rate on unemployment durations, employment, and earnings taking advantage of a reform in the Swiss unemployment insurance system in July 2003. Adopting a difference-in-differences approach, I find point estimates that indicate an increase in the unemployment duration by 3.1 % with women reacting stronger than men. The estimated effects on post-unemployment outcomes are statistically insignificant and lead to the conclusion that there is no effect of the level of the replacement rate on employment probabilities or earnings after the unemployment spell is finished.

Table 6: Difference-in-Differences estimates for Post-Unemployment Outcomes

	(1) 3 months	(2) 6 months	(3) 1 year	(4) 2 years	(5) 5 years
A. Employment					
Treatment	−0.001	0.010	0.004	−0.000	0.003
	(0.013)	(0.012)	(0.012)	(0.011)	(0.012)
After	−0.007	−0.008	0.028***	0.049***	0.057***
	(0.009)	(0.008)	(0.008)	(0.008)	(0.013)
Treatment·After	0.010	−0.014	0.002	0.011	−0.006
	(0.017)	(0.016)	(0.015)	(0.015)	(0.027)
R-squared	0.026	0.038	0.039	0.037	0.038
Observations	21,604	21,604	21,604	19,938	11,349
B. Earnings					
Treatment	26.1	−31.8	−34.7	−114.5*	−90.2
	(54.9)	(59.9)	(60.4)	(62.1)	(67.9)
After	−25.0	−85.9**	123.1***	249.5***	397.1***
	(39.1)	(42.4)	(41.7)	(45.0)	(99.7)
Treatment·After	−92.7	−56.0	−115.7	−3.7	−145.7
	(72.4)	(78.4)	(79.5)	(87.4)	(175.7)
R-squared	0.027	0.048	0.053	0.054	0.065
Observations	21,604	21,604	21,604	19,938	11,349
C. Log earnings conditional on employment					
Treatment	−0.008	−0.071**	−0.007	−0.044	−0.042
	(0.042)	(0.034)	(0.029)	(0.027)	(0.026)
After	−0.055*	−0.048**	0.023	0.057***	0.025
	(0.029)	(0.022)	(0.020)	(0.018)	(0.031)
Treatment·After	0.016	0.078*	−0.044	−0.010	0.046
	(0.056)	(0.044)	(0.038)	(0.035)	(0.060)
R-squared	0.023	0.026	0.029	0.030	0.044
Observations	11,369	14,472	15,925	15,386	8,347

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. No observations excluded before reform. Effects are robust to anticipation effects. Controls include age, mother tongue, mobility, qualification, function in previous job, sector of previous employment, caseworkers assessment of placement possibilities, type of residence community.
Source: Unemployment register 1998–2007 (SECO).

In light of the design of unemployment insurance, increasing the replacement rate does cause disincentive effects which translate themselves to longer unemployment durations without leading to any positive effects on post-unemployment outcomes. It has to be kept in mind, however, that the background of this paper is a very generous unemployment insurance system with high replacement rates and relatively long potential unemployment durations, and that effects could potentially differ in other systems.

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SUMMARY

This paper discusses the effects of a higher unemployment benefit replacement rate on unemployment durations, employment, and earnings. A reform of the Swiss unemployment insurance in July 2003 increased the replacement rate by up to 5.88 ppt for individuals who earned between 3,536 and 4,340 CHF and have no children, while it did not change the replacement rate for all other unemployed persons. This allows to study the effects of a higher replacement rate adopting a difference-in-differences (DiD) approach. The change in the replacement rate increased unemployment durations by 3.1 % – or roughly one week – for the treatment group. Women tend to react stronger than men. There is no effect of the level of the replacement rate on employment probabilities or earnings after the unemployment spell is finished.