The Effect of Unemployment Benefits and Nonemployment Durations on Wages

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Introduction

The provision of unemployment insurance (UI) is one of the most important policy instruments governments can use to influence the labor market. For example about 750,000 individuals received primary UI benefits in Germany in spring 2017. The total expenses were about 14.7 billion Euros, which is nearly 50 percent of the total budget reserved for the German employment agency. At the same time, the fact that a substantial amount of people are unemployment does have a substantial effect not only on individual level but also for the whole economy of a country. Exploring channels of which (UI) affects individuals job market outcomes such as unemployment as well as the general effect of unemployment on individuals is therefore very important task. While there is a substantial micro and macro (and psychology) literature on the effects of unemployment, causal channels are rarely cleanly identified. Similarly, the effects of UI are largely explored using survey, and not administrative data.

The paper from Schmieder et al. (2016) (from now on SWB) contributes a profound treatment of the problems. They are looking at the effects of (1) UI on general job market outcomes and (2) the causal channel of being nonemployed[1] on the reemployment wage. In particular, they exploit a special feature of the old German social security system. The length of being entitled for UI depends on the age, as will discussed in greater detail later. This allows for a regression discontinuity (RD) design, using the age thresholds as cutoffs. Building on this design and with guidance from a formal model, SWB then use UI as instrument to pin down (2). When looking at the causal channel of nonemployment on reemployment wages, two possible candidates are standing to reason. On the one hand, the longer individuals are unemployment, the lower their standards, i.e. their reservation wage might be. This could be for example because of a lower outside option. They thus accept lower wages. On the other hand, the offers unemployed workers get might depend on the length of nonemployment. Possible reasons discussed in the literature are human capital depreciation or stigma.

SWB provide evidence that in fact the latter channel is dominating. They do so by showing that an increase in the outside option (being eligible for a longer UI duration) does not change the reemployment wage. This leaves only the other channel to explain the observed negative relationship between nonemployment and reemployment wage.

[1]As discussed later, due to data limitations the authors can only infer about non- and not unemployment.

The rest of this paper is organized as following: In section , informations of the German unemployment assistantship system is given as well as a detailed description of the data used by SWB. After that in I present their RD approach and the results to answer (1). This is followed by section , in which their approach to estimate causal channel (2) is provided. In section , I discuss the papers assumptions and contributions and conclude.

Background Information and Data

Background Information

The paper focuses on the time period between 1987 and 1999, since during this time the UI system was stable. Contrary to after 1999, there were no major changes or reforms, which makes it easier to investigate underlying relationships. Individuals are eligible for receiving UI benefits if they have been working for at least 12 months in the previous three years. As mentioned before, the maximal potential UI duration depends on the age of the individual. In particular, if one is younger than 42, the maximum is 12 month, if one is older than 42 and younger than 43, the maximum is 18 month. If one is older than 44, the maximum potential UI duration is 22 month, which is a considerable increase in a relatively small age window. The benefits of receiving UI are substantial, since it offers a fixed replacement rate of 63 percent of the old wage. If an individual receives the full duration of UI benefits, one can claim unemployment assistance benefits, which are nominally 53 percent replacement, but are heavily reduced by other income (such as spousal income). This means that for many unemployed, exhausting the UI benefits come in hand with a significantly lower income.

Data

The data, which SWB are using comes from the social security records in Germany. Being administrative data, it is very detailed both in coverage and variety of variables. More specifically, they are able to track about 800,000 individual job characteristics and UI benefits on a day-to-day basis. These job characteristics include variables such as wage, occupation or industry. Furthermore, they have demographic variables such as gender, education etc. Surely, using these administrative data has many benefits, the only minor disadvantage compared to survey data is that they have no information if an individual is actively searching for a job or not, thus can only measure nonemployment.

The Effect of UI on Job Market Outcomes

Estimation Strategy and Validity

Using the age thresholds on UI maximum duration edibility, the authors employ a RD approach to identity the causal effect of UI benefit duration on job market outcomes. Their method is pretty standard, with the following formula as estimation equation:

$$y_i = \beta + \gamma \cdot \Delta P \cdot D_{a_i \geq a^*} + f(a_i) + \epsilon_i. \tag{1}$$

As usual, y_i denotes the outcome variable, which will be multiple job market outcomes for individuals. $D_{a_i \geq a^*}$ is the dummy variable indicating if individual $i's$ age a_i is above the threshold of age 42, which

will be the main examined threshold. ΔP represents the influence of a change in UI maximum duration edibility from 12 to 18 months, which will be the effect of interest. The authors also use the 44 age cutoff and in a third variant pool both thresholds together as robustness checks[2]. $f(a_i)$ is then a linear function, where the slope depends on the side of the cutoff. While this identifies the effect of an 6 month increase in potential UI duration, for some results also calculate the marginal effect $\frac{dy}{dP}$ of a one month increase using linear interpolation.

The key assumption of a sharp RD approach is that around the threshold, the only discontinuous jump is the change in the treatment variable. Possible treats are endogenous sorting and bunching around the threshold. Indeed, employees might have a incentive to delay their dismissal (or wait with their claim to receive UI), if they are very close to the threshold. Similar, firms might selectively fire employees who are eligibile for a higher UI duration. The authors address this issue by referring to a previous paper (Schmieder et al., 2012a) where they discuss this in length. There, SWB provide evidence that the incentives of waiting are small and that firms do not systematically lay workers of depending on UI characteristics. Most important, observed discontinuity around the threshold appear to be very small, with a few hundred spells. For a graphical illustration, consider figure 1. Apart from the address bunching directly on the thresholds, there seems not to be jumps. Similarly, there are no visible jumps in figure 2, where the pre-unemployment wage is plotting conditional on age. This means that at least for wages, there is no difference in the jobs before the nonemployment spell before and after the thresholds.

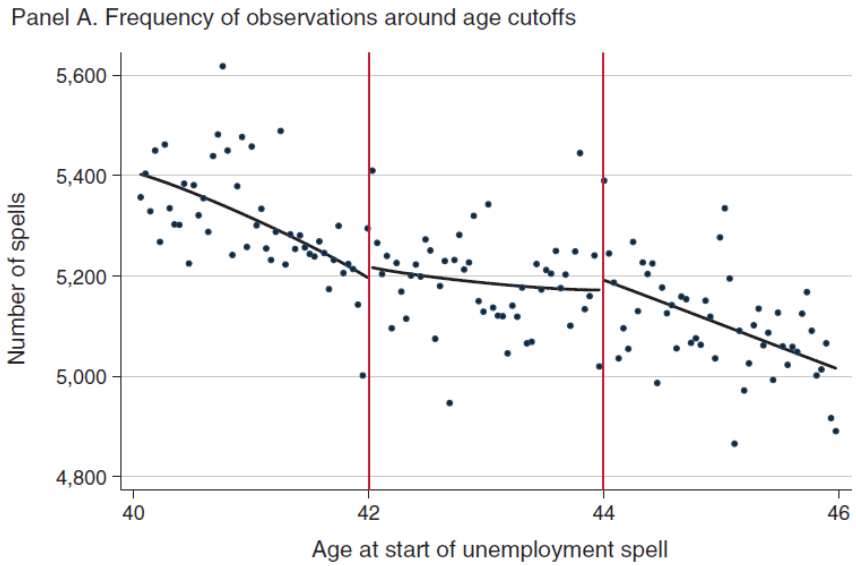

Figure 1: .

Results

Table 1 displays the results of applying equation 1 with numerous job market outcomes as dependent variable. In particular, the first column displays the effect of an increase in potential UI duration on the actual UI duration. The effect is substantial, since a one month increasing in potential duration leads to nearly a third

[2]In the pooled regression, ΔP represents the average effect of changing potential UI duration about 6 and 4 months.

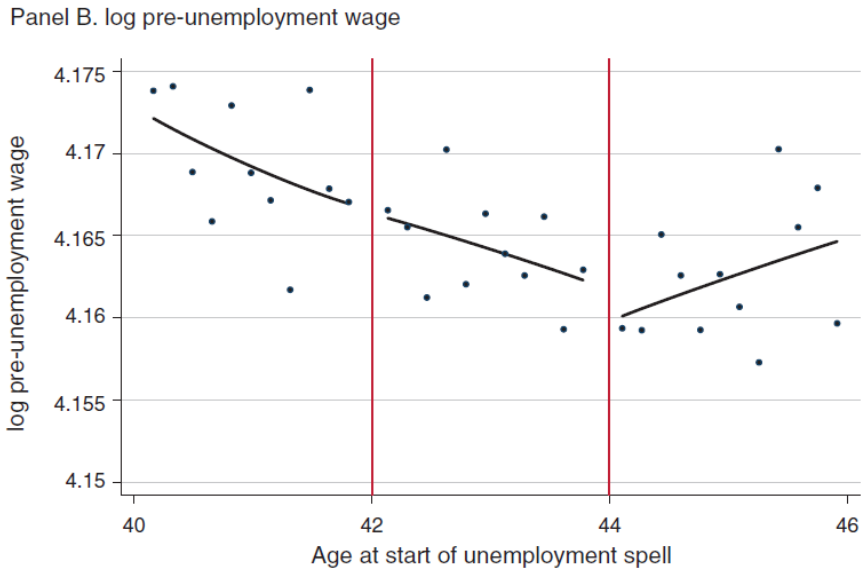

Figure 2: .

increase in actual duration. Partly, this effect is expected since individuals are mechanically longer covered, but one can easily find behavioral explanations for the increase. For example unemployed might reduce their search effort and thus stay longer on UI benefits. The second column supports this idea, since the actual duration of nonemployment is also significantly increased by an increasing in potential UI duration. Results from columns (3)-(5) confirm the negative effects of a higher potential UI duration on other characteristics. Namely, the probability of ever being employed again is slightly smaller as well as the reemployment wage and the difference between pre- and post-unemployment wage. The later one is interesting, because it removes individual fixed effects[3].

Table 1: Main Results of the RD Estimation using the UI Duration Threshold

	Increase in potential UI duration from 12 to 18 months				
	UI benefit duration (1)	Nonemp duration (2)	Ever emp again (3)	log post wage (4)	log wage difference (5)
RD estimate (Age $\geq$ cutoff)	1.77 (0.048)**	0.95 (0.19)**	-0.0094 (0.0033)**	-0.0078 (0.0036)*	-0.0070 (0.0034)*
Marginal effect $\frac{dy}{dP}$	0.29 (0.0080)**	0.16 (0.032)**	-0.0016 (0.00046)**	-0.0013 (0.00060)*	-0.0012 (0.00058)*
Mean of dependent variable	7.57	14.7	0.86	4.01	-0.14

** and * indicate significance at the 1% and 5 % level. See table 1 in Schmieder et all. (2016) for more details on standard error calculation and estimation.

In Table 2, the authors look at additional dependent variables to investigate whether individuals with longer edibility might trade reemployment wages with other job characteristics. The results suggest that the answer

[3]This would be a problem if there are interaction effects between the age of certain individuals and the characteristics of the job they choose depending on their potential UI duration.

is negativity, meaning that an increase in in potential UI duration leads to worse job quality, measured by the fraction of part time employment or a change in industry or occupation (columns (6)-(8)). Albeit small in magnitude, the effects are significant on the 5 % level. Another interesting depended variable is the development of the wage once an individual is reemployed, given a change in past UI duration edibility. As one might suspect, neither is the wage growth nor the wage level after 5 years economically or statistically different from zero.

Table 2: Additional Results of the RD Estimation using the UI Duration Threshold

	Increase in potential UI duration from 12 to 18 months			
	log wage growth 5 years (1)	log wage 1 year after reemployment (2)	log wage 3 year after reemployment (3)	log wage 5 year after reemployment (4)
Marginal effect $\frac{dy}{dP}$	0.00026	-0.0014	-0.00093	-0.0008
	(0.00085)	$(0.00069)^{*}$	(0.00077)	(0.00091)
Observations	311,568	382,089	345,073	311,833
Mean of dependent variable	-0.084	3.95	3.95	3.97
	Duration of post-unemployment job in years (5)	Post-unemployment job is full time (6)	Post-unemployment job is different industry (7)	Post-unemployment job is different occupation (8)
Marginal effect $\frac{dy}{dP}$	-0.0081	-0.0011	0.0012	0.0018
	(0.0067)	$(0.00045)^{*}$	$(0.00057)^{*}$	$(0.00071)^{**}$
Observations	437,899	437,182	425,131	437,899
Mean of dependent variable	4.10	0.89	0.69	0.61

** and * indicate significance at the 1% and 5 % level. See table 2 in Schmieder et all. (2016) for more details on standard error calculation and estimation.

The Effect of Nonemployment on Reemployment Wages

Model and Estimation

The authors develop a labor market search model, which is based on canonical partial-equilibrium search models. See McCall (1970) for the seminal paper and Lippman and McCall (1976) for an early survey. For early econometric theory regarding these models, see Flinn and Heckman (1982). Ljungqvist and Sargent (2012) offers a overview over the theoretic literature. SWB use the model to fix ideas about the relationship between nonemployment and reemployment wages as well as gain predictions guided by the model[4].

I will outline the important aspects of their model, omitting derivations and intermediate steps. Workers start initially unemployed and each period choose their search intensity λ_t (with a cost function $\psi(\lambda_t)$) and whether to accept a given wage offer w_t^*. Those are drawn from a distribution with c.d.f. $F(w^*, \mu_t)$.

[4]The authors state that using a bargaining (see Pissarides (2000)) approach (or directed search models) would yield similar theoretic results.

Importantly, these distribution might depend on individual worker characteristics such as length of nonemployment. An optimal strategy of a worker is to set a reservation wage path ϕ_t and search intensity λ_t, such that the worker accepts a wage offer if $w_t^* \geq \phi_t$. While staying unemployed, a worker receives UI benefits b for potentially P periods and after exhausting these benefits $\underline{b}$.

Denoting the expected wage of an worker leaving unemployment by $w^e(t, P)$, we are now interested in a change of this wage when altering UI benefits P. Assuming that the wage offer distribution is defined by the mean μ_t, we have:

$$\frac{dw^e(t,P)}{dt} = \frac{\partial w^e(\phi_t, \mu_t)}{\partial \phi_t}\frac{\partial \phi_t}{\partial_t} + \frac{\partial w^e(\phi_T, \mu_t)}{\partial \mu_t}\frac{\partial \mu_t}{\partial t}. \tag{2}$$

One can immediately see that the effect of an increase in potential UI duration is the mixture of two effects. The first term refers to a change in the reemployment wage due to changes in the reservation wage ϕ_t. The second term represents the change in the reemployment wage due to changes in wage offers. This highlights the first issue of a simple OLS regression of reemployment wage on nonemployment duration. Since the effect is a mixture of both channels, it is not possible to distinguish between the two. The second issue arises from the model structure. Both search intensity and reservation wage are choice variables in the model, which causes a endogeneity problem. Consider for example an ceteris paribus increase in nonemployment duration. This will lower the outside option of the worker and while directly affecting the wage offers also alter his search behavior, leading to a different reemployment wage. Similarity, consider a´n increase in the reemployment wage. A worker will respond to this for example with a higher search intensity. Also, for a fixed reservation wage (if the outside option is not altered), workers will accept more jobs, leading to lower nonemployment duration.

Assuming that workers are homogeneous[5], an interesting variable to look at is the expected reemployment wage $E[w^e(t, P)]$ at the start of nonemployment. If we again shift unemployment benefits, the variable is again the sum of two effects:

$$\frac{dE[w^e(t,P)]}{dP} = \sum_{t=0}^{\infty}\left[\frac{\partial w^e(t,P)}{\partial P}g(t)\right] + \sum_{t=0}^{\infty}\left[w^e(t,P)\frac{\partial g(t)}{\partial P}\right], \tag{3}$$

where $g(t)$ is the p.d.f of the nonemployment distribution. The first term displays the effect of the shift in P on the reemployment wage path, while the second term along the reemployment wage path. Meaning that the later changes the wage partially in every period, while the first shifts the entire path. Defining D as the expected nonemployment duration and assuming that expected reemployment wage is a linear function of nonemployment duration, we have $\sum_{t=0}^{\infty}\left[w^e(t,P)\frac{\partial g(t)}{\partial P}\right] = \frac{dw^e(t,P)}{dt}\frac{dD}{dP}$. Here $\frac{dD}{dP}$ is the marginal effect of an increase in maximum potential duration of receiving UI benefits P on the expected nonemployment duration D. Using this result and combing equations (2) and (3), the following equation is obtained:

$$\frac{E[w^e(t;P)]}{dP} = E\left[\frac{\partial w^e(\phi_t,\mu_t)}{\partial \phi_t}\frac{\partial \phi_t}{\partial_t}\right] + \left[\frac{\partial w^e(\phi_t,\mu_t)}{\partial \phi_t}\frac{\partial \phi_t}{\partial t} + \frac{\partial w^e(\phi_t,\mu_t)}{\partial \mu_t}\frac{\partial \mu_t}{\partial t}\right]\frac{dD}{dP}. \tag{4}$$

[5]The authors show that for the following results, this is not an necessary assumption, i.e. the IV estimator does also has a LATE interpretation in the case of heterogeneous workers.

The critical take away is the fact that if reservation wages are not binding, i.e. $\frac{\partial w^e(\phi_t,\mu_t)}{\partial \phi_t} = 0$, equation (4) reduces to

$$\frac{E[w^e(t;P)]}{dP} = \left[\frac{\partial w^e(\phi_t,\mu_t)}{\partial \mu_t}\frac{\partial \mu_t}{\partial t}\right]\frac{dD}{dP}. \tag{5}$$

This equation reflects the challenge when trying to identify the causal effect of maximum potential duration of receiving UI benefits duration on reemployment wages. The resulting term is a mixture of two effects. The first component refers to the positive effect of having a higher outside option, while the second refers to the negative effect of getting wage offers drawn from a different distribution.

Suppose we can empirically validate that only the second channel is actual driving the effect. Then (4) reduces even further to

$$\frac{E[w^e(t;P)]}{dP} = \frac{\partial \mu_t}{\partial t}\frac{dD}{dP} \Leftrightarrow \tag{6}$$

$$\frac{\frac{E[w^e(t;P)]}{dP}}{\frac{dD}{dP}} = \frac{\partial \mu_t}{\partial t} := \pi \tag{7}$$

We can interpret π as the causal effect of nonemployment duration on reemployment wages through changing wage offers.

Validity

The goal is now to estimate π via instrumental variables. The denominator $\frac{dD}{dP}$ correspond to column (2) of table 1 and serves as first stage[6]. To make sure our IV estimate $\hat{\pi}$ is a consistent estimator of π, apart from the usual IV assumptions[7] we need to check that the statements made previously from the model are indeed backed by empirical evidence. For this, the authors use the increase in potential UI benefit duration as exogenous shock to the reservation wage. Thus two statements need to be validated:

(1) *The increase in potential UI benefit duration does indeed affect the reservation wage.* The authors check this by comparing the exit hazard rates of individuals depending on the maximum UI benefit eligibility. A significant difference is evidence for a change in reservation wage. This is because in the model a higher potential UI benefit duration does increase the reservation wage and lowers search intensity, thus less people will leave the nonemployment spell.

(2) *No effect of UI duration on conditional reemployment wage.* Once (1) is validated, one can directly test this claim by looking at the post-unemployment wages of individuals conditional on being nonemployed for some time. If there is no significant difference, a change in UI duration does not seem to have an effect on conditional reemployment wages.

Figures 3 and 4 address the two statements. The first one plots the unemployment exit hazard rate of individuals conditional on their nonemployment duration. It can be clearly seen that the blue line lies above the red one, meaning that being eligibile for only 12 month of UI benefits compared to 18 months leads to a higher exit rate each month. The difference is in every period, even in the first one significant. So individuals seem in fact to respond to changes in the outside offer (and thus in the reservation wage) in different search and job acceptance behavior.

[6] Thus easily satisfies the relevance condition of IV.

[7] Conditional on observable characteristics there is no change in the distribution of unobserved characteristics over the nonemployment spell.

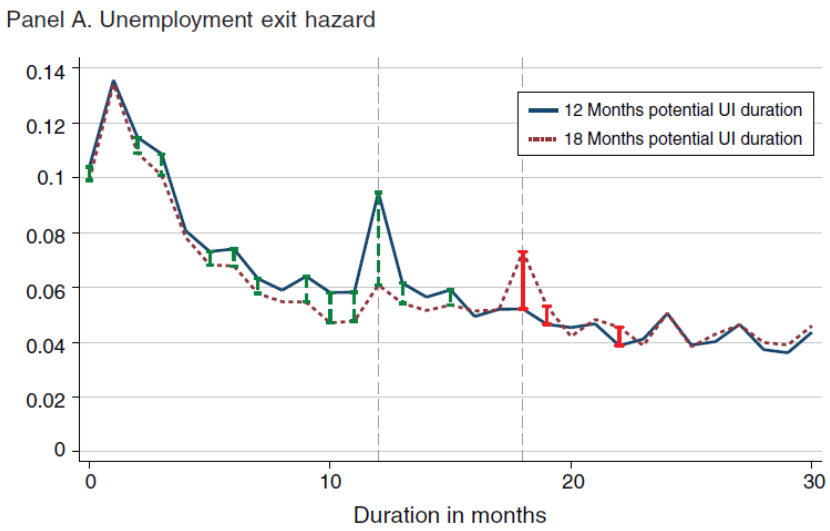

Figure 3: Change in Exit Hazard

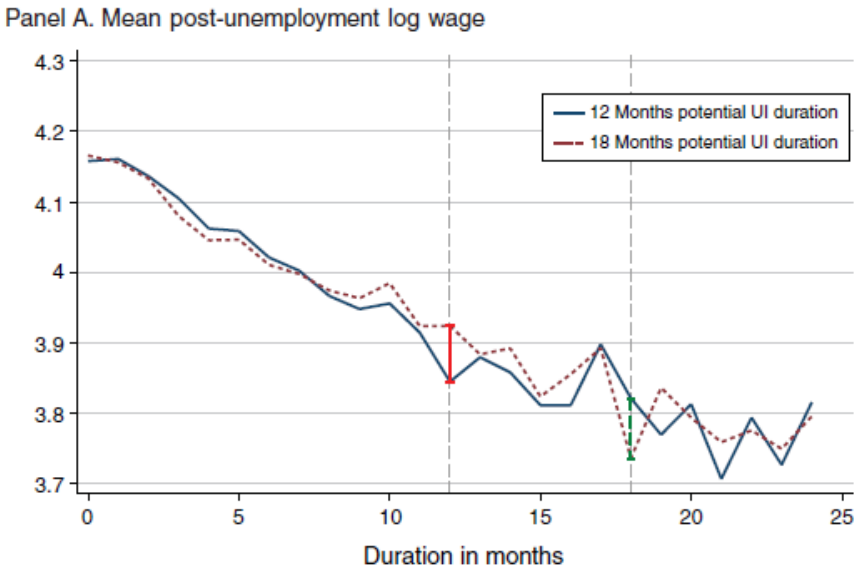

Figure 4: Change in Conditional Reemployment Wage

The second figure shows the difference in the post-unemployment wages conditional on the timing of the nonemployment. This means that for example at month five, the wage of an individual who just accepted a job after five month of nonemployment and 12 months of potential UI duration is compared to the wage of an individual who also found a job after five months, but with 18 months of potential UI duration. Judging from the picture, apart from the 12 and 18 months mark there are no visible differences. The authors further confirm that except for the two months there is no significant difference between the two lines, and the two differences happen to cancel each other out.[8]

[8]The authors further show that this is also the case when splitting the wage distribution in deciles and comparing different

Thus event hough the increase in UI benefit duration does have an effect on behavior, it does not alter the post-unemplyoment wage through the channel of a different reservation wage. It seems that people do not just accept lower wages because they have a lower outside option.

Results

Having validated that the only channel of how nonemployment duration affects reemployment wages is trough changes in the wage offer distribution, we can now estimate π. Table 3 displays $\hat{\pi}$, i.e. the results of the IV estimation. The effect is significantly negative and in magnitude even larger than the naive OLS estimate. Thus it seems that indeed individuals get lower wage offers the longer they stay nonemployed. In fact, an additional month of nonemployment reduces average reemployment wage by about 0.8 percent. This may seem small, but aggregates implies a daily wage loss of 4.8 percent (9.6 percent) for 6 (12) additional months of nonemployment, which is quite substantial. In total, this represents about a third of the average wage loss at 6 (12) months.

Table 3: Results of the IV Estimation using the UI Duration as Instrument

	Increase in potential UI duration from 12 to 18 months	
	2SLS	OLS
	log reemployment wage (1)	log reemployment wage (2)
Nonemployment duration	-0.0080	-0.0067
	(0.0033)*	(0.000053)**
Observations	437,182	437,182
Mean of dependent variable	4.01	4.01

** and * indicate significance at the 1% and 5 % level.

Discussion and Conclusion

Overall, SWB proved a thorough analysis of the influences of UI and nonemployment. The results are important for policy makers and help weigh the costs and benefits when implementing changes to the UI system. In particular, they offer a better understanding of the decline in reemployment wages along the nonemployment path. Previous studies (for example (Addison and Portugal, 1989) or (Keane et al., 1997)) cannot causally identify the estimate, for example because they use a OLS specification.

(critical points)

Due to the excellent data quality, their sample covers nearly all kinds of jobs and individuals[9]. This is in contrast to many previous papers in the literature such as (Katz, 1986) and Katz and Meyer (1990) or more recently DellaVigna and Paserman (2005) and Krueger and Mueller (2011). However, one shortcoming is the focus on the age window of 40 to 46 imposed by the thresholds. There might be substantial differences

eligibility within wage deciles.

[9]The only subgroups missing are self-employed, students and governmental employees.

in the search behavior as well as on the importance of the reservation wage if individuals are for example just starting their professional career. Similarly, interaction effects with retirement might be important as well. However, workers age 40-46 are usually seen as the core of the working population. If one is willing to generalize the effects to say the window of 35-50, one can use the results of SWB to address influences on the majority of workers. Hence external validity problems are from subordinate concern here, but one needs to keep the age window in mind.

The authors further show that not only does the change in potential UI benefit duration affects behavior in all periods along the nonemployment spell, but also along the whole wage distribution. This implies that the decline in wage offers is not driven by a particular subgroup of workers, which would belittle the importance of the results.

While there is a substantial literature on the effects of UI in general (on wages see Card et al. (2007) and Centeno and Novo (2009)), there are few other papers who address the German UI system. Examples are Fitzenberger and Wilke (2010) or Dlugosz et al. (2014). However, SWB are major contributors to this area. Utilizing their dataset, the authors have produces a series of papers addressing for example the effects of German UI extension in the long run (Schmieder et al., 2012b), over the business cycle (Schmieder et al., 2012a) or in the great recession (Schmieder and Von Wachter, 2016).

Albeit published in 2016, the paper has already received visible attention in the literature. For example, DellaVigna et al. (2017) investigate the relationship between reference dependence and job search. They assume that reservation wages are not binding, building on the results from SWB. Marinescu (2017) develops a general equilibrium model and finds similar effects as SWB concerning the effects of UI benefits. Lastly, Huang and Yang (2016) use a very similar approach to investigate the influence of UI benefits in Taiwan, where there is an age threshold as well.

(conclusion)

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