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Emotional Well-Being and Unemployment: a Replication Study with the American Time-Use Survey

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Abstract

We use data from the well-being module of the American Time-Use Survey (ATUS) 2010-2013 to reexamine the relationship between unemployment and emotional well-being. We replicate two previous studies (Krueger and Mueller 2012; Dolan et al. 2017) which have produced differing findings on this relationship, and analyze what factors cause the differences in their outcomes. We find that the results critically depend on the definition of employment statuses and the choice of well-being measure. The unemployed appear sadder and more in pain than the employed, but no other emotion queried in the ATUS has worse values for the unemployed than for the employed. Aggregate emotional well-being measures suggest that unemployment is not negatively related to emotional well-being. Applying a wider instead of narrow definition of unemployment tends to result in better emotional well-being scores for the unemployed, mainly because job leavers and new or re-entrants into the labor market report better emotions than the group of people who are unemployed due to an involuntary job loss.

JEL Classification: I31, D91, J60, J22

Keywords: replication, unemployment, happiness, affective well-being, time use

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1. Introduction

The literature on the economic determinants of subjective well-being has produced overwhelming evidence that unemployment is detrimental to cognitive well-being, measured by, e.g., the life satisfaction of affected persons. There are, however, only few studies that examine the relationship between a person's employment status and their daily emotional experiences, which is typically referred to as affective or emotional well-being.[1] These studies suggest that unemployment affects emotional well-being through two channels. On the one hand, the unemployed experience lower levels of affective well-being than the employed when engaged in the same kind of activities (Knabe et al. 2010; Krueger and Mueller 2012). On the other hand, employed persons rate working among the worst activities during their days (Kahneman et al. 2004; White and Dolan 2009; Bryson and MacKerron 2017). Since, by definition, the employed have to spend more time working than the unemployed, this worsens their average emotional experience over the entire day. The first channel has been referred to as a *saddening effect* of unemployment and the second as a *time-composition effect* (Knabe et al. 2010). The two effects work in opposite directions, such that it is not clear, *a priori*, which of the two groups feels better over the entire day. Krueger and Mueller (2012), using data from the well-being module of the American Time-Use Survey (ATUS) collected in 2010, have shown that unemployed persons report significantly more sadness and pain than the employed over the course of the day. This suggests that the saddening effect dominates the time-composition effect. Dolan et al. (2017) use later waves of the ATUS (2010-2013) and partially aggregate negative emotions into a composite negative affect score. They do not find differences in the day-averages of experienced happiness, meaningfulness and negative affect between the employed and the unemployed. Supportive evidence for the claim that unemployment is not negatively related to emotional well-being has also been found in Germany (Knabe et al. 2010, Wolf et al. 2019), France (Fleché and Smith 2017) and the UK (Hoang and Knabe 2019).

In this replication study, we reexamine the studies by Krueger and Mueller (2012), henceforth KM, and Dolan et al. (2017), henceforth DKS. Our aim is to replicate both studies, identify the factors that drive the differences in the results between these two studies and provide a

[1] The conceptual differences between cognitive and affective well-being are reviewed by Lucas (2016). Berlin and Fors Conolly (2019) provide empirical evidence on the relationship between the two components of subjective well-being.

more differentiated analysis of the relationship between unemployment and emotional well-being.

2. Data and Method

The ATUS is an annual nationally representative survey of how US residents allocate their time to a wide range of activities.[2] ATUS respondents are drawn from the US Current Population Survey (CPS). They are interviewed again between two to five months after their CPS interview and are asked to provide a detailed diary of what they did during the day preceding the interview. In the waves 2010, 2012 and 2013, ATUS includes a well-being module where respondents also report the strength of their emotional experiences for three random episodes of their time-use diary. They have to rate, on a scale from 0 to 6, how happy, meaningful, sad, stressed, in pain and tired they felt during these activities. The ATUS well-being module includes 34,565 individuals who report on 102,776 activities in the three waves 2010-2013.

KM and DKS both use the ATUS well-being module, but differ in how they treat the data. First, KM use the 2010 ATUS wave, whereas DKS use the 2012-2013 waves. Second, after the publication of KM's study, ATUS discovered that late-night episodes were erroneously under-represented in the 2010 wave and provided adjusted sample weights that DKS were able to use. Third, the two papers differ in how employment status is defined, which age groups are considered and how weekends, early mornings and late nights are taken into account. Finally, while DKS aggregate negative emotions to an average negative affect score, KM only examine disaggregated data.

We will replicate the studies by KM and DKS and examine, through stepwise adjustments of sample specifications, which factors are responsible for the differences in their results. We start by replicating the findings by KM. We then apply the new corrected weights and relax the restrictions concerning age, time and day of the week. Next, we use the employment classification by KM on the later ATUS waves 2012-2013. Finally, we alter the employment classification using the status provided by ATUS which replicates DKS's results.

We extend the analysis by jointly considering all three waves of the ATUS well-being module and by classifying the employment status using the internationally standardized ILO definition. Like KM, we analyze each of the six emotions queried in ATUS separately.

[2] ATUS data and further information are available from the US Bureau of Labor Statistics (www.bls.gov/tus/).

Extending their analysis, we also calculate various aggregate well-being measures: the negative affect (duration-weighted average strength of all negative emotions), the net affect (the duration-weighted difference between the average positive affect and average negative affect) and the U-Index (the proportion of time during which the strongest reported emotion is a negative one).

KM only consider those unemployed who are eligible for unemployment insurance (UI) benefits. Thus, their sample only includes short-term unemployed who lost their jobs, who were temporarily on lay-off or recently became unemployed. DKS examine all unemployed persons regardless of their eligibility status. Hence, they cover long-term unemployed persons and different reasons for being unemployed. To explore how these differences affect the results, we conduct subgroup analyses, where we differentiate the unemployed according to the reason for and duration of their unemployment.

3. Results

We first replicate the results by KM, i.e. we use the ATUS 2010 with the original, uncorrected weights, we only consider episodes on weekdays between 7am and 11pm, respondents have to be between 20 to 65 years old, are either full-time employed or unemployed and eligible for UI benefits. The ATUS does not contain data on actual UI receipt. To construct their sample of unemployed persons with UI eligibility, KM narrow the sample of ATUS respondents classified as unemployed using additional information from the CPS interviews. They only consider unemployed respondents who were on layoff at their ATUS interview, who lost their job involuntarily before their CPS interview due to layoff or expiration of a temporary job, or who lost their job between their CPS and ATUS interviews (for which no information on the reason for the job loss is available). The unemployed who previously held a part-time job in states where UI requires a full-time working history are excluded from KM's sample (cf. Krueger and Mueller 2010). With these sample restrictions, we are able to replicate KM's results exactly for the employed. For the unemployed, we obtain the same results as KM for happiness, sadness, pain and tiredness. Our results for perceived meaningfulness and stress of the unemployed are close to, but slightly higher than those of KM. The slight differences could stem from how the sample of unemployed persons in KM's study is constructed. KM investigate only unemployed persons who are eligible for UI benefits. However, such information is not directly available in ATUS. UI eligibility laws vary across US states and over time. Even though we tried to reconstruct KM's operationalization of UI eligibility as closely as possible, slight differences remain between

their findings and our replication. Our results are shown in Panel A of Table 1, Specification 1. On average over the day, the unemployed are more in pain, but less tired than the employed. We also find a relatively large difference in sadness, which is, however, not statistically significant ($p=0.093$).[3] The gaps between the employed and the unemployed in experienced happiness, stress and meaningfulness are small and not statistically significant. When we calculate aggregate emotion measures (which KM do not), we obtain mixed results. While the negative affect and net affect scores suggest that the employed feel better than the unemployed, the U-index points in the other direction. None of these differences is statistically significant.

After KM had published their study, ATUS discovered that late-night episodes were under-sampled in the 2010 wave and released adjusted sampling weights.[4] In Specification 2, we maintain KM's research design, but apply the adjusted weights. With more weight given to late-night episodes, the employed appear slightly less stressed and more tired than in Specification 1. We find that the unemployed report weaker emotions, i.e. they feel less sad, stressed and in pain, and experience less meaningfulness and less happiness than in Specification 1. The gap in pain becomes smaller and loses statistical significance.

In the third specification, we still use only the 2010 wave and maintain KM's definition of employment status, but relax all sample restrictions. Specifically, we take all ages (15+), all hours of the day and weekends into account. In this larger sample, both groups appear to feel happier, less sad, less stressed and less tired. This result is mainly driven by the inclusion of all hours of the day and weekend diaries. The gaps in affect ratings between the employed and the unemployed are mostly similar to those in Specification 2 and slightly smaller than those in Specification 1. Negative affect, net affect, and the U-index show no significant differences between the employed and the unemployed. However, we find that the unemployed report significantly more sadness and pain, but less tiredness than the employed.

In the fourth specification, we switch from the data wave used by KM (2010) to the waves used by DKS (2012-2013) and maintain all other settings. The unemployed show better affect ratings in all queried emotions (except tiredness) compared to the third specification, while the results for employed change only little. As a result, while the unemployed still appear to be sadder, their well-being gap to the employed for pain and tiredness becomes smaller and

[3] We follow the Journal of Economic Psychology's convention and set the threshold for statistical significance at 5%. Since KM apply a 10% threshold, we also report $p<.1$ in Tables 1 and 2.
[4] Further information on this issue can be found in Appendix C of the ATUS Data Dictionary (ATUS 2014).

loses its significance. Interestingly, the unemployed have a significantly lower U-index than the employed in the waves 2012- 2013.

In the final specification of Panel A, we alter the employment status classification. Using the labor force status variable generated by ATUS, we are able to exactly replicate the findings by DKS. DKS only examine happiness, meaningfulness and the negative affect. For these measures, there are no statistically significant differences between the employed and the unemployed.[5] When we look at the other aggregate well-being measures, we do not see a difference in the net affect between the two groups, whereas the U-index suggests that the unemployed feel significantly better than the employed in their daily life. With the less restrictive classification of employment and unemployment (which includes, e.g., part-time employed persons and unemployed persons who left their jobs or have re-entered or newly entered the labor market), affect ratings of both the employed and the unemployed become better compared to KM's classification. When we look at each emotion separately (which DKS do not), we observe significantly more sadness and less tiredness for the unemployed than the employed. The magnitudes of these differences are smaller than in KM's original specification.

The five specifications in Panel A show that the differences in the findings by KM and DKS are mainly driven by the choice of well-being measures (separate emotions or aggregate measures) and the definition of labor force status. Whether or not the unemployed are significantly worse-off compared to the employed in their emotional well-being depends on which emotion or well-being measure is being considered, while the magnitude and statistical significance of the well-being gaps critically depend on who is classified as employed or unemployed.[6]

[5] Following DKS, we also regress the emotion scores on employment status and various sets of controls of socio-demographic characteristics. The outcome validates DKS's results and indicates that, when controlling for more confounding factors, the unemployed tend to report lower affect than the employed. The differences remain statistically insignificant.

[6] As a robustness check, we verified that our results are independent of the order in which the different changes between Specifications 1 to 5 are applied.

Table 1: Affective well-being of the employed and the unemployed with respect to definitions of employment status and settings of weight and sample

Panel A

Data Waves	ATUS 2010									ATUS 2012 - 2013					
Weights	uncorrected ATUS weights			corrected ATUS weights											
Employment status definition	KM's classification: fulltime employment; unemployment with UI eligibility (involuntary job loss, unemployed for at most 26 weeks)												ATUS classification		
Sample restrictions	weekdays, 7am - 11pm, ages 20 - 65						weekdays and weekends, all hours, ages 15+								
Specification	(1)			(2)			(3)			(4)			(5)		
	E	UE	E-UE	E	UE	E-UE	E	UE	E-UE	E	UE	E-UE	E	UE	E-UE
Happy	4.06	3.99	0.07	4.09	3.90	0.19	4.21	4.08	0.13	4.27	4.24	0.03	4.30	4.37	-0.07
Sad	0.63	1.11	-0.48^{+}	0.63	1.00	-0.37	0.59	0.99	-0.40*	0.55	0.87	-0.32*	0.54	0.69	-0.15**
Stressed	1.94	2.05	-0.11	1.87	2.00	-0.13	1.64	1.74	-0.10	1.62	1.64	-0.02	1.55	1.54	0.01
In pain	0.76	1.36	-0.60*	0.78	1.23	-0.45	0.78	1.27	-0.49*	0.76	1.05	-0.29^{+}	0.77	0.89	-0.12^{+}
Tired	2.45	1.98	0.47*	2.50	2.01	0.49*	2.39	1.97	0.42**	2.35	2.11	0.24^{+}	2.33	2.15	0.18*
Meaningful	4.37	4.39	-0.02	4.37	4.18	0.19	4.36	4.24	0.12	4.33	4.53	-0.20	4.31	4.27	0.04
Negative Affects	1.45	1.62	-0.17	1.45	1.56	-0.11	1.35	1.49	-0.14	1.32	1.42	-0.10	1.30	1.32	-0.02
Net Affect	2.77	2.56	0.21	2.78	2.48	0.30	2.93	2.66	0.27	2.98	2.96	0.02	3.01	3.00	0.01
U-Index	0.17	0.13	0.04	0.16	0.13	0.03	0.15	0.12	0.03	0.13	0.08	0.05**	0.13	0.11	0.02*
No. of respondents	2934	111		2934	111		6102	240		10217	286		13101	1159	
No. of episodes	7947	317		7947	317		18161	708		30390	849		38957	3440	

Panel B

Data Waves	ATUS 2010 - 2013								
Weights	corrected ATUS weights								
Employment status definition	KM's classification			ATUS classification			ILO Definition		
Sample restrictions	weekdays and weekends, all hours, ages 15+								
Specification	(6)			(7)			(8)		
	E	UE	E-UE	E	UE	E-UE	E	UE	E-UE
Happy	4.27	4.19	0.08	4.29	4.31	-0.02	4.30	4.30	0.00
Sad	0.55	0.95	-0.40**	0.56	0.74	-0.18**	0.56	0.77	-0.21**
Stressed	1.60	1.69	-0.09	1.55	1.51	0.04	1.55	1.58	-0.03
In pain	0.76	1.10	-0.34**	0.77	0.91	-0.14*	0.78	0.89	-0.11
Tired	2.42	2.08	0.34**	2.40	2.17	0.23**	2.39	2.06	0.33**
Meaningful	4.35	4.50	-0.15	4.33	4.25	0.08	4.36	4.34	0.02
Negative Affects	1.33	1.45	-0.12	1.32	1.33	-0.01	1.32	1.33	-0.01
Net Affect	2.98	2.89	0.09	2.99	2.94	0.05	3.01	2.99	0.02
U-Index	0.14	0.11	0.03*	0.14	0.12	0.02^{+}	0.13	0.11	0.02*
No. of respondents	16319	526		20904	2037		19830	1450	
No. of episodes	48551	1557		62166	6044		58982	4307	

Notes: We apply annual replicate weights when using the 2010 or 2012-2013 waves separately, and pooled replicate weights when pooling all waves. Significance level: $^{+}$ p<0.10, * p<0.05, ** p<0.01

Table 2: Affective well-being of the unemployed by reasons and duration of unemployment using ATUS labor force status classification

Reason for unemployment	Job losers		Job leavers, re- and new entrants		Differences			
Unemployment duration	Up to 26 weeks	Over 26 weeks	Up to 26 weeks	Over 26 weeks				
	(1)	(2)	(3)	(4)	(1) - (2)	(3) - (4)	(1) - (3)	(2) - (4)
Happy	4.05	4.10	4.34	4.54	-0.05	-0.20	-0.29	-0.44*
Sad	1.01	0.87	0.64	0.64	0.14	0.00	0.37	0.23
Stressed	1.64	1.84	1.39	1.47	-0.20	-0.08	0.25	0.37
In pain	1.19	1.33	0.79	0.56	-0.14	0.23	0.40	0.77**
Tired	2.42	2.03	2.33	2.06	0.39	0.27	0.09	-0.03
Meaningful	4.33	4.30	4.08	4.07	0.03	0.01	0.25	0.23
Negative Affects	1.57	1.52	1.29	1.18	0.05	0.11	0.28	0.34*
Net Affect	2.63	2.68	2.93	3.13	-0.05	-0.20	-0.30	-0.45^{+}
U-Index	0.10	0.16	0.13	0.08	-0.06^{+}	0.05*	-0.03	0.08*
No. of respondents	158	334	852	191				
No. of episodes	469	994	2524	568				

Notes: Job losers - all unemployed persons classified as job losers at time of CPS, including being laid off, termination of temporary jobs and other job loss reasons.
Significance level: $^{+}$ p<0.10, * p<0.05, ** p<0.01

The classification of the labor force status appears to critically affect the results. In Panel B of Table 1, we thus extend the analysis by using all three waves of the ATUS well-being module and comparing results for three different employment status definitions: KM's classification (Specification 6), the labor force status generated by ATUS (Specification 7) and the ILO definition (Specification 8). The ILO definition considers persons to be unemployed if they did not work for pay in the last seven days, but have been actively looking for jobs in the last four weeks and would have been able to start working in the last four weeks if a job had been offered.

When KM's classification is used on ATUS 2010 – 2013 (Specification 6), we find that the unemployed are significantly sadder and more in pain, but less tired and have a lower U-index than the employed. This result also holds when we apply the ATUS classification (Specification 7), but the gaps between the employed and the unemployed are smaller and the gap in the U-index is not statistically significant. When we use the ILO definition, the unemployed are also significantly sadder and less tired than the employed. The difference in experiences of pain between the two groups, which is negative and highly significant in favor of the employed in Specifications 6 and 7, becomes smaller and loses statistical significance in Specification 8. The results in Panel B suggest that when a wider definition of unemployment is applied (Specifications 7 and 8), the well-being gaps between the employed and the unemployed are smaller and have less statistical significance (despite the larger number of observations) than when only unemployed persons who recently lost their job are considered (Specification 6).

To better understand to what extent the differences between the specifications using KM's or the ATUS employment classifications arise from combining short- and long-term as well as voluntarily and involuntarily unemployed persons, we also investigate affective well-being of

unemployed persons, differentiated by the reasons for and duration of unemployment (Table 2). We distinguish between persons who became unemployed because they lost their job and those who became unemployed after leaving their job voluntarily or who newly entered or reentered the labor market. Furthermore, we differentiate between short- and long-term unemployment (up to or more than 26 weeks). KM use only observations of unemployed persons who are job losers due to lay-off or the expiration of a temporary contract. This narrow specification leaves a rather small sample. We consider all types of job losers, i.e. we take into account all unemployed persons classified as job losers in the CPS, including those who lost their jobs due to reasons other than layoffs or expired temporary contracts. The results in Table 2 do not provide a clear-cut picture of the differences in emotional well-being between short- und long-run unemployed persons. The job losers who are unemployed for more than 26 weeks tend to feel happier, less sad and less tired than the short-term unemployed who lost their job. However, they also feel more stressed and in pain. Overall, they have a slightly higher net affect and a lower negative affect. Except for pain, the same findings hold for the subgroup of job leavers and new or re-entrants. However, neither of these differences is statistically significant. The only statistically significant differences are found for the U-index. According to this measure, the long-term unemployed job leavers and re-/new entrants are feeling worse than their short-term unemployed counterparts. When comparing job leavers and new or re-entrants to job losers, our estimates suggest that the former group experiences more happiness, less sadness, less stress and less pain, but also less meaningfulness. The aggregate measures indicate that the job leavers and re-/new entrants have a higher net affect and lower negative affect than the job losers. All statistically significant differences (which are only found when comparing the long-term unemployed among both groups) suggest that the job leavers and re-/new entrants feel better than the job losers. Taken together, this suggests that the main reason for the differences observed in Table 1 is not that KM's definition excludes long-term unemployed job losers, but that the ILO and ATUS definitions of unemployment also include job leavers and new or re-entrants, who report, on average, relatively high emotional well-being scores.

4. Conclusion

We are able to replicate the findings by KM for the ATUS 2010 data and by DKS for the ATUS 2012-2013. On the one hand, the unemployed appear to suffer from more feelings of sadness and pain than the employed. These results support KM's conclusion that "unemployment takes an emotional toll" (KM 2010, p. 599). On the other hand, the employed feel more tired than the unemployed and average levels of happiness, stress and experienced meaningfulness do not differ substantially between the two groups. When calculating aggregate measures of emotional well-being, the differences in single emotions balance each other, such that we do not find significant differences between the employed and the unemployed. This supports the findings by DKS that there is "no relationship between unemployment and experiential SWB [subjective wellbeing]" (DKS 2017, p. 69). These findings are quite robust to modifications in sampling weights, age and time restrictions and the addition of further waves.

In this dual replication study, we show that the results critically depend on the choice of labor force classifications and whether specific emotions or aggregate well-being measures are analyzed. KM only consider single emotions and use a relatively restrictive definition of unemployment, which focuses mainly on the short-term unemployed who lost their job involuntarily. With wider definitions of unemployment, e.g. the ILO definition or that used by ATUS, we find more favorable values for the average emotional well-being of the unemployed. While the unemployed – widely defined – still appear sadder than the employed, we do not find that the emotional well-being is lower for the unemployed than for the employed for the other queried emotions. The aggregate emotional well-being measures also suggest that unemployment is not negatively, or in some cases even positively, related to emotional well-being. This is in line with the study by DKS and also corresponds to findings obtained with similar data from Germany, France or the UK. Our results show that applying a wider instead of narrow definition of unemployment tends to result in better emotional well-being scores for the unemployed mainly because job leavers and new or re-entrants into the labor market report better emotions than the group of people who are unemployed because they lost their previous job. If possible, future research on the subjective well-being of the unemployed should thus pay closer attention to the distinction between these groups.

References

ATUS (2014): American Time Use Survey (ATUS) Data Dictionary: 2010, 2012, and 2013 Well-being Module of the US Bureau of Labor Statistics, https://www.bls.gov/tus/wbmintcodebk.pdf.

Berlin, M., and F. Fors Connolly (2019). The association between life satisfaction and affective well-being, Journal of Economic Psychology, 73, 34-51.

Bryson, A., and MacKerron, G. (2017). Are You Happy While You Work? Economic Journal, 127(599), 106–125.

Dolan, P., Kudrna, L., and Stone, A. (2017). The Measure Matters: An Investigation of Evaluative and Experience-Based Measures of Wellbeing in Time Use Data. Social Indicators Research, 134(1), 57–73.

Flèche, S., and Smith, C. (2017). Time use surveys and experienced well-being in France and the United States. OECD Statistics Working Papers, 2017/07.

Hoang, T. T. A., and Knabe, A. (2019). Time use, unemployment, and well-being: an empirical analysis using Britsh time-use data, CESifo Working Paper No. 7581, Munich.

Kahneman, D., Krueger, A. B., Schkade, D. A., Schwarz, N., and Stone, A. A. (2004). A survey method for characterizing daily life experience: The day reconstruction method. Science, 306(5702), 1776–1780.

Knabe, A., Rätzel, S., Schöb, R., and Weimann, J. (2010). Dissatisfied with Life but Having a Good Day: Time-use and Well-being of the Unemployed. Economic Journal, 120(547), 867–889.

Krueger, A. B., and Mueller, A. I. (2010). Job search and unemployment insurance: New evidence from time use data, Journal of Public Economics 94(3-4), 298-307.

Krueger, A. B., and Mueller, A. I. (2012). Time Use, Emotional Well-Being, and Unemployment: Evidence from Longitudinal Data. American Economic Review, 102(3), 594–599.

Lucas, R. (2016). Subjective well-being in psychology. In M. D. Adler and M. Fleurbaey (Eds.), The Oxford Handbook of Well-Being and Public Policy, Oxford: Oxford University Press, 403-423.

Wolf, T., Metzing, M., and Lucas, R. (2019): Experienced Well-Being and Labor Market Status: The Role of Pleasure and Meaning, SOEPpapers 1043, DIW, Berlin.