Measuring the cyclicality of labor market flows using individual transitions

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We investigate whether the choice of a business cycle measure affects estimates of the cyclicality of labor market flows. We exploit precise administrative data on individual labor market transitions and study the association of alternative business cycle measures with individual transitions between employment and unemployment. We find indeed substantial heterogeneities across business cycle indicators that may have affected the results of prior studies on labor market transitions.

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1.   Introduction

In recent years, the literature on worker and job flows attracted increasing attention. It studies both, individual-level determinants of labor market transitions as well as the contribution of specific labor market flows such as job findings and separations to the characteristics of aggregate unemployment. Almost all studies of labor market flows consider the state of the business cycle in their analyses. However, there is no consensus on which measure to apply. We investigate whether the choice of a business cycle indicator affects conclusions on the cyclicality of labor market flows in studies conducted at the individual level.

The literature on individual labor market transitions, their patterns and heterogeneities derives its hypotheses from search theory (Mortensen and Pissarides 1999): labor market flows result from individual responses to the expected utility of alternative labor market states, which again may vary with the business cycle. The empirical analyses then apply various business cycle indicators: Gielen and van Ours (2006) and Tsou and Liu (2008) use national and sectoral annual employment growth rates, Frederiksen and Westergaard-Nielsen (2007) use annual GDP growth, Theodoussiou and Zangelides (2009) consider the level of the annual national unemployment rate. Schaffner (2011) relies on sets of year dummies while Ponomareva and Sheen (2013) consider monthly employment-to-population rates. Interestingly, the studies obtain rather heterogeneous results with respect to the cyclicality of the considered labor market flows: Gielen and van Ours (2006) find pro-cyclical separation behaviors, Frederiksen and Westergaard-Nielsen (2007) confirm counter-cyclical patterns. Theodoussiou and Zangelides (2009) find pro-cyclical separation behavior for males with little education and Ponomareva and Sheen (2013) find counter-cyclical separations. This heterogeneity in results may be due to data and methods but it may also relate to measurement issues. We investigate the relevance of applying heterogeneous measures of the business cycle.

This literature on individual transition patterns differs from the macroeconomic literature. First, it applies different dependent variables: where individual level studies focus on individual transitions macroeconomic studies are interested in *rates* of job finding and separation discussing average flows. Macro studies focus on the extent and cyclicality of

volatility as opposed to the patterns behind individual behaviors. Second, the macroeconomic literature treats business cycle indicators with more sophistication. For example, Fujita and Ramey (2009) use both, labor productivity and unemployment with leads and lags of up to 8 quarters; Nordmeier (2014) applies GDP, productivity, and unemployment, all with leads and lags of up to 8 quarters.

We estimate different worker flows based on highly reliable administrative data and determine whether the resulting cyclical patterns are robust to the choice of an indicator.

2. Data and Method

We apply German administrative data taken from the Sample of Integrated Labour Market Biographies (SIAB) 7510 (vom Berge et al. 2013). The SIAB data provide a two percent random sample of German unemployment insurance records. These unemployment insurance records cover about 80 percent of the German labor force excluding civil servants and the self-employed. The data provide daily information on employment and unemployment spells. Our sample considers East and West Germans aged between 21 and 65 years. Our data cover the period January 1993 through October 2010. The administrative data do not suffer from survey problems such as non-response and measurement error.[1]

We consider individuals' quarterly labor force status. An individual is coded as employed (state: E) if the person is in an employment relationship paying mandatory social security contributions.[2] The individual is coded as unemployed (state: U) if the person receives unemployment benefits.[3] We focus on, job separations, E-U, and job findings, U-E. We code a transition A-B in quarter t if an individual was in state A on day one of quarter t and in state B on day one of quarter t+1. **Figures 1.1** and **1.2** depict the seasonally adjusted development of job separation and job finding rates over time. The job separation rates vary between about

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[1]   We use a random sample of 40 percent of the overall data to keep sample sizes manageable. This allows us to use information on 430.472 different individuals with 13.8 and 2.4 Mio observations in our main regressions.

[2]   Excluded are individuals in training or early retirement, interns, disabled individuals in special employment situations, minor employment situations, and those in civil and military service.

[3]   This definition differs from the one applied in analyses on labor force transitions for the United States, where unemployment is associated with search rather than benefit receipt. For the years 2005 and 2006, we also considered registered job search in defining state U because the benefit payout was not coded completely.

1.5 and 2.8 percent per quarter. The rates are more volatile since 2004. The job finding rates from the state of unemployment vary between 7 and 14 percent per quarter over time. Starting in 2005, the rates dropped to lower levels. Nordmeier (2014) applies SIAB data through 2008 and obtains quarterly transition rates of similar magnitude.[4]

To determine the role of the business cycle we estimate linear models where the propensity of an individual transition is regressed on a set of covariates plus an indicator of the business cycle. Our covariates accounts for age, sex, education,[5] quarter, and East German residence (or missing information). In addition, we consider an indicator for the fourth quarter of 2004, when a major labor market reform took place (Burda and Hunt 2011). We consider three different indicators of the quarterly state of the business cycle: real GDP growth, the growth rate of the national unemployment rate, and the rate of change in aggregate employment, all in percent describing relative changes. As a robustness test we consider overall yearly average values instead. **Figure 2** depicts the co-movement of the three indicators based on quarterly data. The patterns show recession periods early in 1993, between 2002 and 2004 with a brief dip in the first quarter of 2005, and, finally, during the financial crisis in 2008/09. Generally, unemployment mirrors GDP growth. Interestingly, we observe some periods when employment and unemployment growth or GDP and unemployment growth rates are positive at the same time. The Appendix provides descriptive statistics.

3.   Results and Robustness

Tables 1.1 and 1.2 presents the coefficient estimates for the business cycle measures from regressions on job separation and job findings. We consider quarterly and annual business cycle indicators, respectively. We follow the literature and use heteroskedasticity-robust

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[4]   Following a referee suggestion, we additionally depicted the development of E-U and U-E flows after dividing each monthly figure by the number of observations in either state U or E every month instead of using only base state E for Figure 1.1. and base state U for Figure 1.2. This leaves the trends in Figure 1.1. basically unaffected whereas the development of U-E flows shifts in magnitude and development over time due to the new denominator.

[5]   The education information provided in SIAB is at times inconsistent and missing. To correct for this we chose an imputation method similar to Fitzenberger et al. (2006). Key idea is that educational degrees cannot be lost in the future. We also controlled for a missing information indicator.

standard errors.[6] The results for job separations in **Table 1.1** indicate that job separations are negatively associated with GDP and employment growth and positively with changes in the unemployment rate. All estimates are statically significant and suggest the expected counter-cyclical development. Job findings in row two of **Table 1.1** are significantly positively associated with GDP growth. The conditional correlation with employment growth is insignificant but also positive and thus pro-cyclical. Surprisingly, we observe a significantly positive coefficient of job finding with unemployment growth as well, which suggests a counter-cyclical association.

The estimations in **Table 1.2** show the same patterns: all three indicators in row one suggest that job separations are significantly counter-cyclical. In row two, only GDP growth yields the expected pro-cyclical job finding propensity. As in **Table 1.1**, unemployment growth is positively associated with job finding and the association of employment growth is not statistically significant. These results suggest that the findings on the cyclical nature of job finding probabilities vary depending on the business cycle indicator: the relationship may be insignificant, positive or negative.

We undertook two robustness tests of these results: first we added linear and quadratic time indicators to the specification. In both cases, the contradictory finding on the cyclicality of the business cycle indicators disappeared: once time trends are controlled for the job finding rate from unemployment is significantly pro-cyclical across all business cycle indicators (results available upon request). Second, we considered standard errors that are clustered at a temporal (i.e., quarter or year) level instead of at the person-period level. With clusters at the quarterly level the findings of Table 1.1 are robust. When we cluster standard errors in Table 1.2 at the annual level they increase such that the estimates are no longer statistically significant. Here, the small number of 18 years of observations may be insufficient to generate precise estimates.

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[6]   Our results are robust to applying robust standard errors at the individual level instead of at the individual-by-period level.

4.   Conclusions

This research yields two conclusions. First, we show that the cyclicality of labor market flows measured at the level of individual transitions may vary depending on the business cycle indicator considered. Second, in our data the heterogeneity in cyclical patterns disappears as soon as we add time trend indicators to the specification. As many prior studies on individual labor market transitions omitted such time trends, their findings on the cyclicality of labor market flows may not be reliable.

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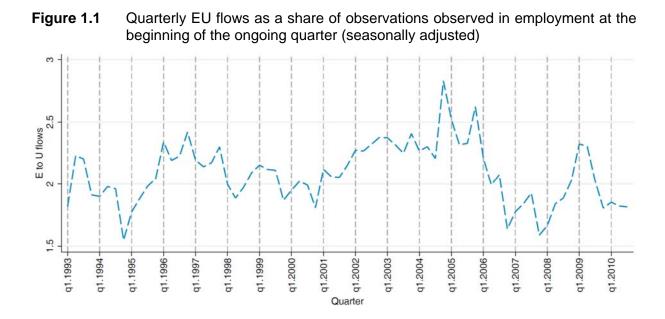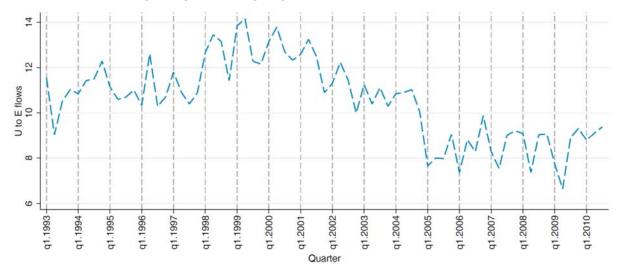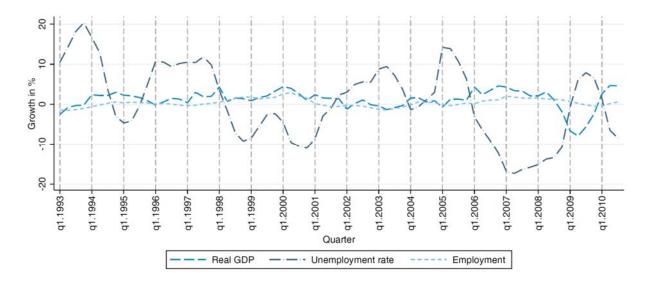
Figure 1.1   Quarterly EU flows as a share of observations observed in employment at the beginning of the ongoing quarter (seasonally adjusted)

Figure 1.2   Quarterly UE flows as a share of observations observed in unemployment at the beginning of the ongoing quarter

Note: Seasonally adjusted by deducting quarter-specific average deviations from the overall mean transition rate from the observed values.
Source: SIAB 7510 and own calculations.

Figure 2   Business cycle indicators over time (year-on-year change by quarter)

Source: GDP and employment: federal statistical office, unemployment: federal employment agency. The unemployment rate considers registered unemployment relative to the civil labor force.

Table 1.1 Conditional correlation of quarterly business cycle indicators with individual labor market flows

	Business Cycle Indicator: Annually					
Outcome	GDP		Unem. Rate		Employment	
E-U transition	-0.0429	***	0.0095	***	-0.0880	***
	(0.0018)		(0.0004)		(0.0041)	
U-E transition	0.1284	***	0.0357	***	-0.0372	*
	(0.0079)		(0.0021)		(0.0223)	
Controls:						
individual characteristics	yes		yes		yes	
season	yes		yes		yes	
outlier	yes		yes		yes	
east Germany	yes		yes		yes	

Table 1.2 Conditional correlation of annual business cycle indicators with individual labor market flows

	Business Cycle Indicator: Annually					
Outcome	GDP		Unem. Rate		Employment	
E-U transition	-0.0429	***	0.0095	***	-0.0880	***
	(0.0018)		(0.0004)		(0.0041)	
U-E transition	0.1284	***	0.0357	***	-0.0372	*
	(0.0079)		(0.0021)		(0.0223)	
Controls:						
individual characteristics	yes		yes		yes	
season	yes		yes		yes	
outlier	yes		yes		yes	
east Germany	yes		yes		yes	

Note: Standard errors are robust. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. The regression on E-U / U-E transitions use 13,770,306 / 2,360,121 observations. Both outcomes are regressed on identical control variables. The set of individual characteristics accounts for age, education, and sex.
Source: SIAB 7510 and own calculations.

Appendix: Descriptive Statistics

	Sample for E-U transitions		Sample for U-E transitions	
	Mean	Std. Dev.	Mean	Std. Dev.
Outcome Variables				
Transition E-U	0.0208	0.1428	-	-
Transition U-E	-	-	0.1031	0.3040
Explanatory Variables				
Women	0.4379	0.4961	0.4563	0.4981
East German residence				
East Germany	0.2109	0.4080	0.3801	0.4854
Residence inf. missing	1.67e-06	0.0013	0.0045	0.0672
Age groups				
31 to 40 years old	0.2985	0.4576	0.2351	0.4241
41 to 50 years old	0.2884	0.4530	0.2285	0.4199
51 to 65 years old	0.2140	0.4101	0.3290	0.4699
Education groups				
medium skilled	0.7623	0.4257	0.6430	0.4791
high skilled	0.1230	0.3284	0.0488	0.2154
Educ inf. missing	0.0269	0.1619	0.1617	0.3682
Quarter of flow				
quarter 2	0.2527	0.4346	0.2617	0.4396
quarter 3	0.2548	0.4358	0.2466	0.4310
quarter 4	0.2403	0.4273	0.2245	0.4172
Indicator Q4 2004	0.0138	0.1166	0.0131	0.1137
Cycle indicators				
GDP growth quarterly	0.0032	0.0090	0.0034	0.0095
Unempl.rate growth quarterly	0.0070	0.0948	0.0018	0.0978
Employment growth quarterly	0.0038	0.0099	0.0040	0.0096
GDP growth annually	0.0119	0.0213	0.0122	0.0230
Unempl.rate growth annually	0.0059	0.0885	0.0003	0.0916
Employment growth annually	0.0038	0.0094	0.0042	0.0089
Number of observations	13,770,306		2,360,121	

Note: Cycle indicators describe the relative change in percent of GDP, unemployment rate and employment divided by 100 thus generating scaled coefficient estimates.
Source: SIAB 7510 and own calculations.