Worker flows in Germany: Inspecting the time aggregation bias ☆

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HIGHLIGHTS

- The paper studies the effects of time aggregation in the measurement of worker flows.
- Daily information on worker flows is provided by German administrative data.
- Monthly time aggregation leads to an underestimation by 10%.
- The bias in the job-finding rate shows procyclical behavior.
- The bias in the separation rate appears to be rather acyclic.

ARTICLE INFO

ABSTRACT

Employing daily information from German administrative data, this paper analyzes the effects of time aggregation in the measurement of worker flows. Time aggregation that is based on a comparison of monthly labor market states leads to an underestimation of total worker flows by approximately 10%, which is larger than the prediction of a standard correction approach. Multiple labor market transitions within a month induce a procyclical bias in the job-finding rate but not in the separation rate. Rather, during upswings, workers are more likely to change jobs with short intervening transition periods. Relative to previous findings, this reconsideration of German worker flows reveals that the job-finding rate plays a larger role in explaining unemployment fluctuations, although the additional dynamics of the time aggregation bias are shown to be less significant.

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1. Introduction

Worker flows play a crucial role in understanding labor market dynamics. Modern labor market theory explicitly accounts for the continuous process of job finding and separations and thereby aims to match stylized facts regarding labor market data. Data on worker flows are typically observed by comparing individual labor market states at a monthly or quarterly frequency. This measurement frequency, however, induces a downward bias when individuals have multiple labor market transitions during the period between two measurement points.

The objective of this paper is to analyze the so-called time aggregation bias by employing German administrative labor market data. In addition to the absence of sample rotation and sample attrition,[1] administrative data from Germany have the advantage of daily information. Because every daily change in an individual's labor market status can be considered, worker flows based on this information do not encounter a time aggregation bias. Nevertheless, German administrative data allow a time aggregation bias to be derived by computing labor market transitions at a lower measurement frequency.

By accounting for a time aggregation bias in his monthly measured worker flows, Shimer (2005) notes that the U.S. job separation rate is nearly acyclic. Shimer (2012) reinforces a procyclical time aggregation bias in the separation rate by formulating a correction approach for neglected worker flows. Since a draft of his paper was circulated, Shimer's correction approach has evolved into the standard approach

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[1] In a survey data set, sample rotation and sample attrition involve a margin error as workers fail to be matched (see, e.g., Fujita and Ramey, 2006).

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to adjust for time aggregation (see, e.g., Fujita and Ramey, 2006, 2009; Petrongolo and Pissarides, 2008; Gomes, 2012). Moreover, Shimer's conclusion of a nearly acyclical separation rate has led many studies to assume an exogenous separation rate when employing search and matching models. This development has given rise to reconsideration of the cyclicality of the job-finding and separation rates. In particular Fujita and Ramey (2009) and Elsby et al. (2009) caution against the assumption of an exogenous separation rate by demonstrating that the U.S. separation rate is strongly countercyclical and contributes substantially to unemployment fluctuations.

Following a comprehensive body of literature addressing U.S. labor market dynamics, similar studies have emerged for European countries. For example, Petrongolo and Pissarides (2008) focus on France, Spain and the U.K. and find different contributions of the job-finding and separation rates to variations in unemployment, as explained by different institutional settings. Elsby et al. (2013) investigate unemployment dynamics in the OECD; regarding the Nordic and Continental European countries, the authors conclude that each transition rate explains nearly half of the unemployment fluctuations. Smith (2011) and Elsby et al. (2011) provide more detailed analyses of unemployment flows in the U.K. and demonstrate that the separation rate drives increased unemployment levels during recessions, whereas the job-finding rate dominates unemployment variations during periods of moderation. For Germany, however, evidence with respect to the driving forces of unemployment dynamics is rather scarce, and consensus has not yet been reached.

Whereas studies examining worker flows in the U.S. and other countries use survey data, studies on German labor market transitions are primarily based on administrative data (see, e.g., Bachmann, 2005; Gartner et al., 2012; Jung and Kuhn, in press). Bachmann and Schaffner (2009) address this issue and compare worker flows derived from German administrative data with those derived from a German household survey; the authors do not find substantial differences in the transition rates, but they argue that the dynamics are better captured by the administrative data. Nevertheless, there is no existing study that exploits daily information from German administrative data to investigate the time aggregation bias.[2]

This study derives a monthly measure of the time aggregation bias as suggested by related studies of U.S. labor market transitions. For this purpose, I rely on a definition of unemployment that includes unemployment periods without receipt of benefits. Such periods most likely result from the expiration of entitlements and lead to information gaps in the administrative data set, but they may be relevant for measuring labor market transitions. Using this comprehensive measurement for German worker flows, I complement the analysis of the time aggregation bias by reconsidering the relative importance of the job-finding and separation rates over the business cycle.

The results indicate that monthly point-in-time comparisons of labor market states lead to an underestimation of total worker flows by approximately 10%, whereas the theoretical correction approach of Shimer (2012) predicts an underestimation of only 3%. The time aggregation bias in the job-finding rate (i.e., the probability of finding and losing a job within a month) exhibits procyclical behavior. By contrast, the time aggregation bias in the separation rate (i.e., the monthly reemployment probability of a separated worker) appears to be less affected by the business cycle. To bridge the gap with U.S. analyses, I discuss the relevance of indirect job-to-job transitions. The reconsideration of the total job-finding and separation rates reveals strongly cyclical German worker flows, and the job-finding rate is shown to play a dominant role in explaining unemployment fluctuations.

The remainder of this paper is structured as follows. Section 2 describes the data set and the measurement of worker flows. The time

aggregation bias is investigated in Section 3. Section 4 reconsiders cyclical facts regarding the job-finding and separation rates, and Section 5 concludes the paper.

2. Data description

I use the Sample of Integrated Labor Market Biographies (SIAB) 1975–2008 provided by the Institute for Employment Research (*Institut für Arbeitsmarkt- und Berufsforschung, IAB*). The SIAB is a 2% random sample of German residents who have a job that is subject to the social security system or who receive unemployment benefits (see Dorner et al., 2010).[3] The main advantage of the administrative data set is the availability of daily information. However, regardless of the data source, most studies rely on monthly point-in-time comparisons.

I follow the literature and calculate the number of monthly worker flows, but I rely on a daily measurement. The continuous procedure prevents underestimation of labor market transitions and avoids possible bias over the business cycle.[4] Although the administrative data consists of actual labor market processes, it can become difficult to reconstruct a worker's labor market biography if he or she loses the entitlement to unemployment benefits. This loss of benefits may result from a regular exhaustion of unemployment benefits or from an irregular break accompanied by a sanction. Therefore, I apply the nonemployment proxy introduced by Fitzenberger and Wilke (2010), which consists of all nonemployment periods after an employment period, when at least one benefit receipt notification is available.[5] Because the nonemployment proxy includes both unemployment periods with benefit receipt and unemployment periods without benefit receipt, it ensures that the continuous measurement of worker flows does not fail to capture relevant labor market transitions.

Table 1 presents the implications of the unemployment definition for unemployment durations. The first column indicates that nearly 30% of all benefit receipt periods have been contracted. As a consequence, the mean unemployment duration increases from nearly eight months (228 days) to more than one year (371 days). The standard deviation of both measures indicates that the distribution of unemployment durations is highly right-skewed. Moreover, the second column from the right demonstrates that unemployment benefits may even be received for only one day. The maximum unemployment duration increases from 17.5 years to approximately 33 years. Thus, there is at least one worker who is discovered to have been unemployed for more than half of his or her working life.

Given the two-state environment, a worker may leave the unemployment pool and enter the employment state (*UE* flow or job finding) or leave the employment state and enter the unemployment pool (*EU* flow or separation). Worker flows are defined by their underlying transition rates (i.e., all transitions within a month t are referred to the initial labor market state in month t_1). Hence, the job-finding rate (f) and the separation rate (s) satisfy the following:

$$f_t = \frac{\left(\sum_{s=1}^{S} UE_s\right)_t}{U_{t-1}} \qquad \text{and} \qquad s_t = \frac{\left(\sum_{s=1}^{S} EU_s\right)_t}{E_{t-1}}, \qquad (1)$$

where t denotes the 10th day of a month and S denotes the number of days since the 10th day of the previous month.

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[2] To my knowledge, only Bachmann (2005) computes worker flows on a daily basis, but he does not compare these flows with labor market transitions that are computed at a lower measurement frequency.

[3] In Germany, unemployment benefits include benefits from the unemployment insurance system (*Arbeitslosengeld*), means-tested benefits (*Arbeitslosenhilfe* until 2004/ *Arbeitslosengeld II* since 2005) and income maintenance during training (*Unterhaltsgeld*). The social security system excludes, for example, so-called *Minijobs*. Information on data selection is provided in Appendix A.

[4] Strictly speaking, a daily measurement is discrete, but this study considers such measurements as a continuous framework.

[5] The unemployment measure is referred to as a *non*employment proxy because it cannot eliminate the possibility that it includes persons who are out of the labor force, such as workers who are temporarily discouraged in their job search. More details regarding the nonemployment proxy are provided in Appendix B.