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Regional Decomposition in Age Group Unemployment Dynamics in Germany

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Abstract

This article analyzes age group-related differences in the risk of losing a job and the chance to find new employment using regional administrative data for Germany. I also consider flows between inactivity (out of the labor force) and unemployment to examine the relative contributions of labor market flows to different age group unemployment dynamics. Inactivity and activity flows account for about 23% (and 83% for the youth) of unemployment dynamics, and contributions of separation (11%-50%) and job finding (5%-30%) vary with age groups. Counties with a larger share of the labor force youth have high dynamics and very low unemployment rates. In contrast, regions with a smaller percentage of youth experience twice as large unemployment rates. Overall, the results provide strong evidence for decreasing regional labor market dynamics when the share of older workers increases.

Keywords: regional labour markets, age groups, separation rate, job finding rate, unemployment dynamics

JEL classification: R23, J21, J63, J64

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1 Introduction

In all OECD countries, the unemployment rates for younger workers are over those for older ones. For example, on an OECD average over the last decade, the youth (15 to 24 years) unemployment rate is about three times larger than the unemployment rate of workers aged 55 to 64. In addition, compared to prime-age workers (25 to 54 years), the youth unemployment rate is about twice as large, and the rate of older workers is only three-fourths of the prime-age worker's rate. Simultaneously, based on data on unemployment duration, it will be argued that older unemployed need more time to find a new job. On the other hand, considering job tenure statistics, the risk of losing a job is lower for older workers.[1]

This raises the question about age group-related differences in the risk of losing a job and the chance to find new employment in a labor market with unequal unemployment risk across age groups and has implications for regional labor market dynamics when group sizes shift. Due to the German labor force's aging, it is essential to understand the differences between younger, prime-age, and older workers.

In this article, I study the relative contributions of unemployment inflows and outflows to the dynamics of different age group unemployment rates at the regional level in Germany. I can show that younger, prime-age, and older workers differ in labor market flow rates and relative contributions to unemployment dynamics using regional administrative data from the German Federal Employment Agency. While recent studies focus on the national level and mainly on the relative contribution of separation and job finding, this study also considers the flows from/to the non-labor market to/from unemployment.

Concerning the literature on the relative importance of separation and job

[1] During the first three months of unemployment in the OECD, 50% of the youth and about 30% of older workers exit unemployment. Long-term unemployment is an issue for 20% of the youth and 40% of older workers in the OECD. For up to 12-month job tenure, the youth share is 50%, and the percentage of older workers is 9%. Also, 26% of the youth and 7% of older workers work for the same employer between one and three years.

finding rates for the dynamics of the unemployment rate, Hall (2005) and Shimer (2005, 2012), Petrongolo and Pissarides (2008), and Elsby et al. (2013) conclude that the job finding rate is more relevant for the US labor market, while Darby et al. (1986) and Fujita and Ramey (2009) come to the opposite conclusion and find evidence for a relatively more important contribution of job separation. Elsby et al. (2009) "find that everyone is a winner". Smith (2011) finds evidence that increases in the unemployment rate come along with rising separations in the UK. Petrongolo and Pissarides (2008) conclude that both flow rates are equally important for the UK labor market, while job finding rates contribute relatively more to the French and Spanish unemployment fluctuations. In their analysis of different OECD countries, Elsby et al. (2013) find, on average, an inflow-outflow contribution of 15:85 for Anglo-Saxon economies and a relative ratio of 45:55 for continental European and Nordic countries.

Three studies have analyzed Germany in more detail. Nordmeier (2014) used a 2% labor force sample and analyzed the time aggregation bias for separation and job finding in monthly data between 1981 and 2007. She concludes that the job finding rate is more critical in explaining unemployment fluctuations using a two-state model. Hertweck and Sigrist (2015) used SOEP data for West Germany and the period 1984 to 2009 to analyze labor market flows disaggregated by gender, age, and educational background using a three-state model. They find that inflow fluctuation contributes more to unemployment fluctuations (60:40). Jung and Kuhn (2014) also conclude that inflow contributes more to unemployment rate volatility (60:40) using a 2% sample of the West-German labor force (1980 to 2004) and two-state and three-state models. All studies have in common that only macroeconomic conclusions can be drawn. The present article considers regional (county-level) panel data to cover within country local labor market heterogeneity.

When older and younger workers are not perfect substitutes, the literature's findings are related to a specific demographic composition. Shimer (2001) argues that a high proportion of young workers incentivize firms to create new jobs because younger workers undertake more search activities, which reduces the firms' recruitment costs. In this case, young workers could have a relatively higher job finding rate. In addition, Burgess (1993) and Pissarides and Wadsworth (1994) find evidence in Great Britain that job separation rates are higher for young workers because a higher proportion of such workers engage in on-the-job search activities.

Older workers' lower job finding rates can result from age discrimination (Charness and Villeval 2009, Langot and Moreno-Galbis 2013) and assumed or actual productivity differentials (Haltiwanger et al., 1999, Hellerstein et al., 1999, Daniel and Heywood, 2007). Productivity may increase with age if job experience is essential (Autor et al. 2003, Nordström Skans 2008) or decline if human capital depreciates over time, mainly due to technological change or a loss of manual abilities (Börsch-Supan 2003, Autor and Dorn 2009). Concerning cognitive abilities, the age effect is more complex. Engaging in information processing is lower among senior workers (Baltes and Lindenberger, 1997), making it difficult to employ older workers in challenging jobs, such as flight control.

Considering these findings, I argue that it is not evident which implications the increasing relative appearance of older job seekers and job candidates may have relative to job-worker matching in the labor market and, ultimately, unemployment dynamics. Concerning the existing literature, only Hertweck and Sigrist (2015) analyze three age groups using the West German sample of the Socio-Economic Panel. This study adds to the literature by analyzing the contributions of five age groups to unemployment fluctuations at the regional level using administrative data. In contrast to most literature on relative flow contributions to unemployment dynamics, I consider regional panel data instead of aggregated time series. In contrast to other studies, I use administrative data that precisely cover the flows of the official unemployment rates at the county level.

Considering a three-state model (flows between employment and unemployment and between unemployment and inactivity) and monthly flow data, I find that the contributions of inflow and outflow rates to overall unemployment fluctuations are almost 50:50 using the non-steady-state approach. For all unemployed, the dynamics that arise from the inactivity and activity flow account for about 23% of unemployment dynamics. For the youth (15 to 24 years), this relative contribution accounts for 83%. The remaining unemployment fluctuations for all unemployed are explained by separation (49%) and job finding (27%), respectively. Separations are more significant for all age groups than job finding contributions. Regions with a larger share of the labor force youth have high dynamics and very low unemployment rates. In contrast, regions with a smaller share of the youth experience twice as large unemployment rates. Agglomeration areas experience a more considerable turnover between active and passive labor markets than rural areas. The relative contributions of separation and job finding are more relevant for older workers' unemployment, while the relative activity/non-activity flows most contribute to younger workers' unemployment rate. In general, inflow and outflow rates decline with age. Compared to prime-age workers, I find lower inflow and exit rates for older workers. Hence, aging of the labor force lowers the dynamics of the German labor market, particularly in regions that suffer from fast aging.

The remainder of the paper is organized as follows. Section 2 provides a steady-state and a non-steady-state model to analyze relative flow contributions to unemployment dynamics. Section 3 describes the data, and section 4 provides an empirical analysis of the German labor market using different models and discusses some policy implications. Finally, I summarize the main findings in section 5.

2 The Dynamics of Unemployment

Following Petrongolo and Pissarides (2008), Smith (2011), and Elsby et al. (2013), I use transition rates related to unemployment inflows and outflows to measure relative flow contributions to unemployment fluctuations. However, the three-state model should be compatible with the administrative data used in the next section and differs slightly from the standard approach.

In a two-state model, only the flows between unemployment U and employment E are considered, and workers neither enter nor exit the labor force. The three-state model considers flows out of and into the labor force from/to the stock inactivity I (see Figure 1). I consider the following flows: from unemployment to employment UE, from employment to unemployment EU, from unemployment to inactivity UI, and from inactivity to unemployment IU. Flows between employment and inactivity are not considered. From a statistical perspective, they are not necessary to measure the unemployment rate - the focus in the empirical section. It takes only the four flows considered to explain the complete fluctuation of the official number of unemployed. However, flows between employment and inactivity affect the unemployment rate indirectly, but in this case, the focus is on the stock of employed and inactive people.[2]

FIGURE 1 ABOUT HERE

During period t; the following transition rates according to a Poisson process are considered: job finding rate $f_t = UE_t/U_{t-1}$, non-activity rate $n_t = UI_t/U_{t-1}$, separation rate $s_t = EU_t/E_{t-1}$, and activity rate $a_t = IU_t/E_{t-1}$. The latter arrival rate should be ideally related to I. However, the stock of inactive people is difficult to measure and would include a potential measurement error that is difficult to interpret. Consequently, the considered definition differs from the activity rate in

[2] Large flows from employment to inactivity positively affect the unemployment rate because they reduce the labor force. The opposite happens for large flows from inactivity to employment.

the literature. However, the advantage of this measure is that it is more comparable to flows due to separation (e.g., size and dynamics). For all transition rates we have $0 \leq f_t, n_t, s_t, a_t \leq 1$.

2.1 Steady-State

We start with the steady-state unemployment rate to calculate the relative contributions of the transition rates to unemployment dynamics. The actual unemployment rate (based on the stock approach) $u_t = U_t / (U_t + E_t)$ will be approximated using the equilibrium unemployment rate u_t^*. In this case, the stock of the unemployed is $U_t = U_{t-1} + s_t E_t - f_t U_t$. Adding the flows from and to inactivity, $a_t E_t$ and $n_t U_t$, and dividing by the labor force yield:[3]

$$u_t = u_{t-1} + s_t (1 - u_t) - f_t u_t + a_t (1 - u_t) - n_t u_t \tag{1}$$

In steady-state, inflow equals outflow, $\dot{u}_t = 0$. Rearranging (1) yields the steady-state unemployment rate

$$u_t^* = \frac{s_t + a_t}{s_t + a_t + f_t + n_t} = \frac{i_t}{i_t + e_t}. \tag{2}$$

The flow rates s_t and a_t can be added to the inflow rate $i_t = s_t + a_t$ and the rates f_t and n_t add up to the exit rate $e_t = f_t + n_t$, with $0 \leq i_t, e_t \leq 1$.

To measure the relative flow contributions, some rearrangements are necessary. The calculations are provided in the Appendix. I follow the literature and measure the individual flow-related relative contribution to the fluctuations in u_t^* using the

[3] In contrast to Petrongolo and Pissarides (2008) and Smith (2011), I use a_t instead of using the flow rate from employment to inactivity weighted by the proportion of flows from inactivity to unemployment to all outflows from I. Similarly, Smith (2011) uses instead n_t the flow rate from unemployment to inactivity weighted by the proportion of flows from inactivity to employment to all outflows from I. Both weights sum up to 1.

concept of "beta values":

$$\beta^k = \frac{cov\left(\Delta u^*_{t-1}, u^{*k}_t\right)}{var\left(\Delta u^*_{t-1}\right)}, \tag{3}$$

with $k = s, a, f, n$ and $\beta^s + \beta^a + \beta^f + \beta^n = \beta^i + \beta^e = 1$. The beta values measure the individual flow-related percentage contributions to the variance of the equilibrium unemployment rate in the three-state model.

2.2 Non-Steady-State

The relative contributions of the flow rates to u^*_t are restricted to the assumption of equilibrium unemployment. Given that the labor market is not in equilibrium, the relative contributions to actual unemployment are of major interest because they differ from the contributions to u^*_t. Therefore, we are interested in the relative flow contributions to changes in the actual unemployment rate u_t. With respect to such a non-steady-state decomposition I follow Smith (2011) and use (1) and (2) to calculate the actual unemployment rate

$$u_t = \frac{i_t}{i_t + e_t} - \frac{\dot{u}_t}{i_t + e_t} = \frac{i_t}{i_t + e_t} - \frac{du_t}{dt}\frac{1}{i_t + e_t}. \tag{4}$$

This equation allows us to calculate the relative contribution of s_t, a_t, f_t, and n_t on u_t. Again, the individual flow-related variance contribution to the dynamics in u_t will be measured with beta values (details are provided in the Appendix):

$$\beta^k = \frac{cov\left(\Delta u_t, u^k_t\right)}{var\left(\Delta u_t\right)}, \tag{5}$$

with $k = s, a, f, n$ and $\beta^s + \beta^a + \beta^f + \beta^n = \beta^i + \beta^e \leq 1$. These beta values are the individual flow-related percentage contributions to the three-state model's unemployment rate variance. They sum up to one if past shocks do not affect current unemployment.

2.3 Time Aggregation Bias

To account for the time aggregation bias (Shimer 2012), I will use the arrival rate to calculate their corresponding probabilities. Although the time aggregation bias is "a logical extreme"[4], I substitute the flow rates for flow probabilities in the empirical section to account for continuous time transitions and to compare the two approaches. This is necessary when an individual will lose and find (or find and lose) a job within the considered period. Discrete data and corresponding arrival rates will yield biased measures of the instantaneous transitions. However, according to the literature, this measurement bias appears small.[5]

I follow Shimer (2012) and calculate the probability $X_t \in [0,1]$ as a function of the corresponding arrival rate x_t using $X_t = 1 - e^{-x_t}$. Here, $x_t = s_t, a_t, f_t, n_t, i_t, e_t$ and $X_t = S_t, A_t, F_t, N_t, I_t, \check{E}_t$. However, while in case of the arrival rates $i_t = s_t + a_t$ and $e_t = f_t + n_t$ is true, we have for the corresponding probabilities $I_t = 1 - e^{-i_t} > S_t + A_t$ (with $S_t = 1 - e^{-s_t}$ and $A_t = 1 - e^{-a_t}$) and $\check{E}_t = 1 - e^{-e_t} > F_t + N_t$ (with $F_t = 1 - e^{-f_t}$ and $N_t = 1 - e^{-n_t}$). In the empirical section I use the definitions $I_t \equiv S_t + A_t$ and $\check{E}_t \equiv F_t + N_t$.

3 Data

The period considered in this article is 2007-2014, which is covered by a reduction of the overall unemployment rate from 9.0% in 2007 to 6.7% in 2014. I use administrative data provided by the German Federal Employment Agency from January

[4] Shimer (2012), p. 131.

[5] See, for example, Shimer (2012), Elsby et al. (2009), Fujita and Ramey (2009), and Petrongolo and Pissarides (2008).

2007 to December 2014.[6] Concerning the unemployed, I analyze all unemployed and the j age groups 15-24 years, 25-34 years, 35-44 years, 45-54 years, and 55-64 years old to point out age-related differences in unemployment dynamics. The unbalanced panel for 402 regions (counties) provides for each month a distribution over all counties in Germany (with up to 38,592 observations for each variable). The data are not seasonally adjusted. While seasonal adjustment is common for national data, the fluctuations are important for understanding individual county dynamics.

Monthly regional data provide exact information on the stocks of employment E and unemployment U and flows between these two stocks and unemployment and inactivity I. Employment cover employees subject to social insurance contribution (not the informal labor market). Unemployment means that the individual is actively searching for employment (subject to social insurance contribution) and registered as unemployed[7].

The flows are used to calculate the arrival rates according to section 2:

- job finding rate: $f_t = UE_t/U_{t-1}$. The flow from unemployment to employment covers registered unemployed who find new employment.
- non-activity rate: $n_t = UI_t/U_{t-1}$. The flow from unemployment to inactivity cover registered unemployed who leave due to discouragement, medical leave, or retirement but also due to an apprenticeship or a job creation scheme (training). From a statistical point of view, in the latter two cases, people are moving back into unemployment via a_t, not before they finished the apprenticeship or job creation scheme.
- separation rate: $s_t = EU_t/E_{t-1}$. The flow from employment to unemploy-

[6] Unfortunately, before January 2007, the data are not available.

[7] According to the Social Security Code, an individual is (registered) unemployed if the person is currently not employed, is living in Germany, is seeking for a job with at least 15 hours a week, is available to the employment agency, and at least 15 years old but not older than the statutory retirement age.

ment covers people who lose their job (independent of the causes) and become registered unemployed.

- activity rate: $a_t = IU_t/E_{t-1}$. The flow from inactivity to unemployment covers those who come from the non-labor market, including graduates from schools or universities, and become registered unemployed. This group also covers those who finish an apprenticeship or a job creation scheme.

The inflow rate is $i_t = s_t + a_t$ and the exit rate is $e_t = f_t + n_t$. For all transition rates we have $0 \leq i_t, e_t, f_t, n_t, s_t, a_t \leq 1$. Following section 2.3, the calculated arrival rates are used to compute the corresponding arrival probabilities S_t, A_t, F_t, N_t, I_t, and $\check{E}_t$. For each group, regional monthly values are calculated. With regional index r, the local equilibrium unemployment rate (2) is equal to

$$u_{rt}^* = \frac{i_{rt}}{i_{rt} + e_{rt}}. \tag{6}$$

To illustrate the direct relationship between age group-related unemployment rates and the unemployment rate for all unemployed, I rearrange the equilibrium unemployment rate (6) using age-specific rates weighted at the relevant population share p_j, with $j = 1, 2, 3, \ldots, J$, and $\sum p_j = 1$

$$u_{rt}^* = \sum_{j=1}^{J} p_j u_{jrt}^* = \sum_{j=1}^{J} p_j \frac{i_{jrt}}{i_{jrt} + e_{jrt}}. \tag{7}$$

For comparison, the same approach can be applied to the actual unemployment rate:

$$u_{rt} = \sum_{j=1}^{J} p_j u_{jrt} = \sum_{j=1}^{J} p_j \frac{U_{jrt}}{U_{jrt} + E_{jrt}}. \tag{8}$$

From equations (7) and (8), it follows that equal inflow and exit rates across age groups would make weighting by population shares unnecessary. However, since age-specific unemployment rates differ, their flow rates will also differ.

4 Empirical Analysis

In this section, I focus on transition rates and the non-steady-state approach. Additional results for transition probabilities and steady-state contributions are provided in the Appendix. In general, the time aggregation bias is very small. Hence the results do not change much when I use transition probabilities instead of transition rates. The steady-state's flow contributions are somewhat different from the non-steady-state case results. This means that the steady-state is helpful for calculating average values but less appropriate for assessing the contributions to dynamics.

Table 1 provides average values for the arrival rates, equilibrium unemployment rates, and actual unemployment rates for each age group and all unemployed from January 2007 to December 2014. All variables are weighted with age group-specific labor force size. Several findings are striking. The arrival rates decline with increasing age of the groups.[8] This applies to all measures. For exit transitions, non-activity transitions are always higher than job finding transitions. From this, it follows that an unemployed person is more likely to move to inactivity than (back) into employment for all age groups. For inflow transitions, I find that activity transitions are always higher than transitions of separation. Since activity flows are related to the same denominator as separation flows, we can conclude for all age groups that a person is more likely to move from inactivity to unemployment than from employment to unemployment. Hence, the stock of the unemployed is more affected by activity/non-activity flows than by separation/job finding flows. On average, the proportion of non-activity flows in all exit flows and the proportion

[8] Kluve et al. (2009) also find that older workers' re-employment rates are the lowest.

of activity flows in all inflows are roughly 60%.

TABLE 1 ABOUT HERE

Considering age groups seems important since transitions are more than two times larger for the youth than the group 55-64. Concerning extreme values, the unemployed aged 15-24 have about four times higher probability of finding a job within the next month than those aged 55-64. In contrast, the youth's probability of losing a job within the next month is only 2.2 times larger.

The last two columns of Table 1 show average values for the equilibrium unemployment rate and the actual unemployment rate. In most cases, particularly for prime-age groups, the equilibrium rate is near the actual one. From this, we can conclude that age group differences in transition rates greatly approximate the unemployment rate differences.

Table 2 provides further information for different regional subgroups on all unemployed and groups 15 to 24 and 55 to 64. On the left of Table 2, we compare regions with a labor force share of the youth with at least one standard deviation above the mean and at least one standard deviation below the mean. The same procedure is done for older workers. For regions with a larger youth share (first column), we find higher numbers for the age groups and all unemployment for exit and lower numbers for inflow. As a consequence, unemployment rates are below average. The pattern is precisely the reverse when the regional youth's share is below the average (second column). These findings align with Shimer's (2001) assumption that the youth's share positively affects job creation. When regions with a larger and smaller share of older workers are considered, we find values near the average rates. For the youth and all unemployed, more adverse conditions are present. In contrast, the labor market conditions worsen for the older group when the 55-64 group share is large. We can conclude that older workers compete more with other older workers than with the youth. Interesting is the finding that inflow transitions are lower in regions with a large youth share than in areas with a large percentage of older workers. In the latter case, the flow rates are similar to the group averages in Table 1.

TABLE 2 ABOUT HERE

The right side of Table 2 provides results for East and West German counties and three different types of regions: metropolitan areas (type I), urban areas (type II), and rural areas (type III). For counties in East Germany, inflow into unemployment is higher, while exiting is below the average. Hence, the adverse labor market conditions in the East can be explained by inflow and exit. The results for the West German regions go in the opposite direction, and average unemployment rates are about one percentage point below the average for all counties. Unemployment is lower in urban regions, with above-average exits and below-average inflows. However, the dynamics are higher in rural counties, with unemployment rates equal to the average for the youth and all unemployed. Overall, exit rates differ more between the three types of regions, and inflow rates more between east and west regions.

TABLE 3 ABOUT HERE

Due to the differences in exit and inflow transitions between youth and older workers, unemployment turnover must be lower, and unemployment spells must be longer for older workers. Table 3 provides the distribution of unemployment by duration. Each row sums up to 1 and shows the percentage distribution by duration for each considered age group. Long-term unemployment is, by definition, a duration of 12 months or more. For the age group 55-64 years, this applies to almost 50%, and within three months, only 20% of the stock will leave unemployment. In contrast, almost 57% of the age group 15-24 years leave unemployment within the first three months, and only 8.8% of them are, on average, long-term unemployed. A closer look at the other groups indicates that the shares within the different duration categories first fall and then rise with increasing unemployment duration. These findings precisely align with the arrival rates provided in Table 1.

The monthly transition rates for all unemployed are displayed in Figure 2.[9] Job finding and separation rates primarily move in the opposite direction. The separation rate spikes are always in January. This is related to limited contracts that end primarily in December. The data show that the financial crisis (period of recession between the two vertical grey lines) does not affect the German labor market flows much because of the labor market policy (mainly due to short-time compensation, wage moderation, and flexible working time accounts).[10] The recession covers the period 4th quarter of 2008 to the 4th quarter of 2009. During this period, employment declines by 0.5% only. The unemployment rate rose from 7.8% in 2008 to 8.1 in 2009. After the financial crisis, all series decline somewhat except the non-activity rate. For the exit flows, we observe an increasing discrepancy between job finding and non-activity, but both series are correlated moderately. Concerning the unemployment rate, separation is positively correlated, and non-activity is negatively correlated, both as expected. However, the remaining two flows do not provide a clear correlation pattern.

FIGURE 2 ABOUT HERE

4.1 Non-Steady-State

The non-steady-state framework provided in section 2 allows the analysis of the relative contributions of transition rates to the dynamics of actual unemployment rates. The beta values measure the percentage contributions of the individual flow rate to the variance of the actual unemployment rate within a three-state model framework. Hence, differences to the steady-state (see Appendix) result from local

[9] The distribution of exit and inflow rates for the youth, older workers, and all unemployed are provided in the section on policy implications.

[10] For a detailed discussion, see, for example, Burda and Hunt (2011).

labor markets, which are (temporarily) not in equilibrium. Table 4 provides the results for the non-steady-state approach and reports for each age group the relative contributions of the arrival rates. The correlation measures the linear statistical relationship between the right-hand side of equation 19 (Appendix) and the real data on unemployment. The first difference correlations are about 0.94, except for older workers. Perfect correlation is impossible as long the initial effect differs from zero.

All workers' relative inflow and outflow contributions (last row) are almost 50%:50%. The difference between a two-state and a three-state model, the flows from and to inactivity, explains almost 24% of actual unemployment dynamics. The relative contribution of job separation to explaining overall non-steady-state unemployment dynamics is approximately twice as large as the contribution from job finding.

For the youth (15-24 years old), I find that β^n is more than six times larger than β^f. In addition to discouragement and health reasons, the transition n includes mainly those who leave unemployment for an apprenticeship or an active labor market program (job creation scheme). The latter two are much more important for the youth. Table 4 also points out that flows from activity to unemployment explain almost 50% of the youth equilibrium unemployment rate variations. These are the young people (re)born into unemployment. That is, (first) unemployment experiences after graduating from school or university or finishing an apprenticeship. Activity and non-activity flows explain about 83% of actual youth unemployment dynamics.[11] The remaining roughly 17% are explained by separation and job finding rates. For the youth, the inflow and outflow contribution is 60%:40%.

TABLE 4 ABOUT HERE

Non-activity flows play a minor role, and activity flows' relative contribution

[11] The German labor market for the youth is characterized by the fact that young people mostly start an apprenticeship or go to a university after finishing school. Both are activity/non-activity flows.

is of minor importance for prime-age workers. The results indicate that the switch from youth to prime-age workers comes with large relative contributions of separation and job finding. The relative contributions of job finding and separation to prime-age worker unemployment rates vary between 74% and 81%. Hence, the relative impact switches from β^a to β^s and from β^n to β^f when people leave the age group of 15-24 years and enter the group of 25-54 years. This relates to workers earning most of their lifetime income in this life stage.

For older workers, the inflow rate has a more than 1.5 times larger contribution than exiting unemployment. The initial value has a significant contribution (9.5%) to the evolution of long-term unemployment of older workers. Hence, employment shocks are persistent, and the labor market seems less flexible for this age group. Only the youth has lower job finding rate contributions, and the exit contribution is the lowest among all age cohorts.

To sum up, separation rates always contribute more than job finding rates. In addition, separation flows account for the most part for unemployment dynamics, except for the youth. Hence, separation is the most crucial driver of falling and rising unemployment in better times and hard times. Among the exit flow contributions, the role of job finding is more important than the role of non-activity, except for the youth. The role of past labor market shocks (initial contributions) is negligible, except for older workers.

An alternative measure is the monthly relative flow contribution related to all flow contributions. In this case, the share of the regional monthly non-steady-state flows is considered and related to the local unemployment rate (Figure 3). In contrast to the covariance analyses provided in Table 4, the focus is on the relative importance of the monthly flows. On the horizontal axis, the regional monthly data are sorted by their level of the unemployment rate, and the left scale shows the contribution as share. The upper two lines are inflow and exit contributions that move around the 0.5 line, except unemployment is very low. This is a remarkably stable pattern for increasing unemployment rates across counties in Germany. The exit contribution is the sum of job finding and non-activity contribution, while separation and activity sum up to inflow. For low unemployment, separation is the most crucial driver. However, moderate unemployment is driven mainly by separation and non-activity. High unemployment rates (about 15% and more) are related to increasing contributions of separation and job finding, while activity and non-activity have decreasing contributions. Hence, in regions with high unemployment, the dynamics come primarily from the two-state model, and the policy should focus most on support to get re-employed.

FIGURE 3 ABOUT HERE

4.2 Regions

Next, in Table 5, we consider for the county groups discussed in Table 2 the contribution from transition rates in the non-steady-state framework. Table 4 serves as a reference. Concerning East-West county differences for the youth, inflow contributions are above average in the West (due to activity flows) and below in East Germany. Higher contributions of job finding and non-activity flows drive the latter. This is surprising since exit transition rates are lower in the East (Table 2). One explanation is the much larger apprenticeship job market in West Germany. Those who finished the apprenticeship successfully and search for a new employer enter unemployment through activity flows. For older workers, separation and job finding contribute more in the East, while activity/non-activity contributions are more important in the West. Hence, the three-state model is more important in explaining the dynamics in West German countries. Also, the contribution of employment shocks is twice as large in the West German countries. Concerning overall unemployment dynamics, job finding contributes more in the East, and non-activity flows more in the West.

For the three regional types, we find that for the youth only in rural regions, more contributions of separation and job finding flows and fewer activity/non-activity flows. For older workers, metropolitan and rural areas differ concerning the two-state model (more important in rural regions) and the three-state model (more important in metropolitan regions). Hence, in rural areas, labor market participation is less dynamic. Urban regions are very similar to the overall averages. The contribution of labor market shocks is substantial in metropolitan regions. This can be interpreted as more structural problems due to labor market dynamics.

For regions with a larger share of the youth, activity/non-activity flows are less important, as well as exit flows. Compared to other regions, labor market dynamics of the youth are still high but less momentous. According to Table 2, these regions exhibit low unemployment rates. In contrast, unemployment rates are high in regions with a smaller youth share. These regions show fewer contributions from activity flows but more from non-activity flows; hence, worker dynamics are less synchronized with job dynamics. The most crucial difference in older worker flows of these two types of counties is the contribution of shocks. The overall findings for regions with a smaller youth share are comparable to the reference, while regions with a larger youth share show more significant contributions for separation and lower contributions for non-activity flows. These markets are less attached to the three-state model, and low separation rates cause low unemployment rates.

Finally, we compare the contributions in counties with larger and smaller shares of older workers. The inflow contribution for the youth is smaller (larger) in regions with a smaller (larger) share of older workers, and within inflow, we observe a shift from separation to activity. Exit contributions for the two age groups are more relevant in counties with fewer older workers. Inflow contributions for older workers are smaller (larger) in regions with a larger (smaller) share of older workers. While regions with a minor share shift towards a two-state model, almost all contributions decline when regions with a larger share are considered. Although unemployment rates are not so much different in these two regions, those with a larger share of older workers suffer from serious structural problems. For all unemployed, in regions with a smaller share of older workers, the initial contribution compensates the contribution of separation. Compared to regional averages, the share of prime-age workers in these regions is 2.2 percentage points larger and 4.6 percentage points larger in regions with fewer older workers. Hence, the regions do suffer from aging also in the coming years. These counties are similarly distributed within the regional types: metropolitan areas 12.6%, urban areas 14.2%, and rural areas 14.3%. Also, 14.1% of the West-German counties and 12% of the East-German regions are concerned.

TABLE 5 ABOUT HERE

4.3 Policy Implications

We now focus on the relationship between regional inflow and exit rates and regional unemployment rates. The following three figures show the relationship across the regions for all unemployed (Figure 4) and the age groups 15-25 (Figure 5) and 55-65 (Figure 6), based on monthly county-level data. On the horizontal axis, we have the actual regional unemployment rate. The left scale provides the exit rate, and the right scale the inflow rate. In all cases, I choose an arbitrary scaling (left and right) that provides an intersection of inflow and exit rates corresponding to an observed unemployment rate of nearly 5%. It should be noted that this is not an equilibrium, but it helps to compare the different groups. The relationship between exit, inflow, and unemployment is strong in all three cases.[12] Exit rates decline with increasing unemployment rates, and inflow rates increase with unemployment rates. At high levels of unemployment, inflow rates reach a

[12] Unemployment rates above 20% have increased standard errors. The proportion of such high unemployment rates, however, is relatively small. For the age group 15-64, the proportion of unemployment rates above 20% is 0.2%; for the group aged 15-24, the proportion is 0.1%; and for those aged 55-64, the proportion is 0.7%.

turning point. Here, labor market policy should focus on reemployment programs and those to avoid separations (e.g., reduced working hours). On the other hand, exit dynamics are very high in areas with low unemployment rates, and policy programs should focus mainly on supporting fast reemployment. Generally, the figures provide regional policymakers with a clear pattern of declining inflow and exit rates as the older the workers are.

FIGURE 4 - 6 ABOUT HERE

To support the differences in the distribution of the diverging inflow and exit rates, Figure 7 and Figure 8 provide age group-specific distributions based on monthly data across all 402 regions and time (2007 to 2014). The kurtosis of each histogram is expanded the younger the group is, and the distribution shifts to the right side the younger the group is. While the inflow distribution for older workers does not differ much from the average, this age group's exit distribution differs remarkably from the average overall. Hence, each labor market shock will increase (at least temporarily) the persistent part of older worker unemployment. Since this age group also experiences persistence due to past shocks, helping older workers exit unemployment seems to be an urgent policy issue.

FIGURE 7 - 8 ABOUT HERE

The empirical analysis shows evidential differences in the relative flow contributions on unemployment dynamics across age groups. A critical policy concern is the low job find rate and the corresponding small contribution to older workers' unemployment fluctuation. Important reasons for this are older workers' low regional and occupational mobility. Due to an increasing relative share of older workers, aging reduces the labor market's average mobility. This makes the hiring process more costly for firms when the search on the firm side takes more time. Consequently, governments could provide incentives and support for higher mobility for those aged 50 and older. In addition, age-biased directed technological change is presumably related to separation and job finding rates of older workers.[13] Policy can mitigate these adverse effects by setting incentives for retaining and training older workers. Langot and Moreno-Galbis (2008) have demonstrated the benefits of such measures.

Relative low labor turnover (measured as separation rate plus job finding rate) can also be associated with the German labor market's institutional design. The benefit replacement rate and employment protection legislation are examples, especially for experienced workers.[14] Using international data, the share of older unemployed positively correlates with the replacement rate, while it is negatively related to employment protection.

5 Conclusions

This article examined the relative flow contributions to different age groups' unemployment dynamics using regional administrative data for Germany. I consider a three-state model that allows for different flows from/to unemployment and apply steady-state and non-steady-state approaches. The overall contribution of inflow and outflow rates is 50%:50% using the non-steady-state approach.

The dynamics arising from the inactivity and activity flow account for at least 20% of unemployment dynamics. More than 80% of unemployment dynamics can be explained by activity, and inactivity flows for the youth. Across five age groups, I find remarkable differences in flow contributions. For example, the relative contributions of separation and job finding rates are more significant for older workers than for young ones, while the activity/non-activity flows have a more significant

[13] According to Acemoglu (1998), "new technologies are not complementary to skills by nature, but by design." This may imply an advantage for younger workers when new technologies are implemented. This is also related to the discussion about routine jobs (Autor and Dorn (2008, 2009). In this case, also older workers suffer more than younger workers.

[14] Jung and Kuhn (2013) provide evidence that labor market institutions reduce Germany's matching efficiency.

relative contribution for younger workers. The contribution of separation rates is more important than the contribution of job find rates for all age groups. When the distribution of age groups is considered, we find low unemployment rates and fewer labor market participation fluctuations for regions with above-average youth shares. Also, agglomeration areas suffer more from structural labor market problems than urban or rural areas.

Based on the results, I conclude that labor force aging lowers labor market dynamics in the future. All arrival rates will decline on average if the share of older workers increases and the share of young workers declines. Compared to prime-age workers, older workers have lower inflow and exit rates. In addition, older workers' unemployment dynamics will experience more inflow contributions and fewer exit contributions. Finally, unemployment turnover will decrease in the future, and an economic downturn will lengthen labor market shocks.

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7 Appendix

7.1 Steady-State

The actual unemployment rate $u_t = U_t/(U_t + E_t)$ will be approximated using the equilibrium unemployment rate u_t^*. The stock of the unemployed is $U_t = U_{t-1} + s_t E_t - f_t U_t$. Adding the flows from and to inactivity, $a_t E_t$ and $n_t U_t$, and dividing by the labor force yield:

$$u_t = u_{t-1} + s_t (1 - u_t) - f_t u_t + a_t (1 - u_t) - n_t u_t \qquad (9)$$

In steady-state, inflow equals outflow, $\dot{u}_t = 0$. Rearranging (9) yields the steady-state unemployment rate

$$u_t^* = \frac{s_t + a_t}{s_t + a_t + f_t + n_t} = \frac{i_t}{i_t + e_t}. \tag{10}$$

The flow rates s_t and a_t can be added to the inflow rate $i_t = s_t + a_t$ and the rates f_t and n_t add up to the exit rate $e_t = f_t + n_t$, with $0 \leq i_t, e_t \leq 1$.

Taking first differences of i_t and e_t related to the stocks allows us to measure the absolute contribution of s_t, a_t, f_t, and n_t:

$$\frac{\Delta i_t}{i_{t-1}} = \frac{\Delta s_t}{i_{t-1}} + \frac{\Delta a_t}{i_{t-1}} \tag{11}$$

$$\frac{\Delta e_t}{e_{t-1}} = \frac{\Delta f_t}{e_{t-1}} + \frac{\Delta n_t}{e_{t-1}} \tag{12}$$

To calculate the relative contributions of unemployment inflows and outflows to unemployment fluctuations in the steady-state approach, the relative contributions are related to the equilibrium unemployment rate u_t^*.[15] Differencing (10) yields:

$$\Delta u_t^* = \frac{i_t}{i_t + e_t} - \frac{i_{t-1}}{i_{t-1} + e_{t-1}} = (1 - u_t^*)\, u_{t-1}^* \frac{\Delta i_t}{i_{t-1}} - u_t^* \left(1 - u_{t-1}^*\right) \frac{\Delta e_t}{e_{t-1}}. \tag{13}$$

We can approximate the percentage change in u_t^* by

[15] I follow the approaches in Petrongolo and Pissarides (2008) and Smith (2011). In the empirical section, I also consider the correlation of u_t^* and u_t to relate the contributions to steady-state equilibrium unemployment to the actual unemployment rate.

$$\frac{\Delta u_t^*}{u_{t-1}^*} \approx \underbrace{\left(1-u_{t-1}^*\right)\frac{\Delta i_t}{i_{t-1}}}_{u_t^{*i}} - \underbrace{\left(1-u_{t-1}^*\right)\frac{\Delta e_t}{e_{t-1}}}_{u_t^{*e}}. \tag{14}$$

u_t^{*i} measures the contribution of changes in the inflow rate i_t to changes in u_t^* while u_t^{*e} measures the corresponding contribution of the exit rate e_t.

Now, the relative contributions of the flow rates of interest, s_t, a_t, f_t, and n_t can be calculated as follows:

$$\begin{aligned} u_t^{*i} &\equiv u_t^{*s} + u_t^{*a} = \left(1-u_{t-1}^*\right)\frac{\Delta s_t}{i_{t-1}} + \left(1-u_{t-1}^*\right)\frac{\Delta a_t}{i_{t-1}}, \\ u_t^{*e} &\equiv u_t^{*f} + u_t^{*n} = \left(1-u_{t-1}^*\right)\frac{\Delta f_t}{e_{t-1}} + \left(1-u_{t-1}^*\right)\frac{\Delta n_t}{e_{t-1}}. \end{aligned} \tag{15}$$

I follow the literature and measure the individual flow related relative contribution to the fluctuations in u_t^* using the concept of "beta values":

$$\beta^k = \frac{cov\left(\Delta u_{t-1}^*, u_t^{*k}\right)}{var\left(\Delta u_{t-1}^*\right)}, \tag{16}$$

with $k = s, a, f, n$ and $\beta^s + \beta^a + \beta^f + \beta^n = \beta^i + \beta^e = 1$. The beta values measure the individual flow related percentage contributions to the variance of the equilibrium unemployment rate in the three-state model.

7.2 Non-Steady-State

The relative contributions of the flow rates to u_t^* are restricted to the assumption of equilibrium unemployment. Given, the labor market is not in equilibrium, the relative contributions to actual unemployment are of major interest and differ probably from the contributions to u_t^*. Therefore, I calculate in this section the relative flow contributions to changes in the actual unemployment rate u_t. With respect to such a non-steady-state decomposition I follow Smith (2011) and use (9) and (10) to calculate the actual unemployment rate

$$u_t = \frac{i_t}{i_t + e_t} - \frac{\dot{u}_t}{i_t + e_t} = \frac{i_t}{i_t + e_t} - \frac{du_t}{dt}\frac{1}{i_t + e_t}. \tag{17}$$

This equation allows to calculate the relative contribution of s_t, a_t, f_t, and n_t on u_t. Differencing (17) with respect to time, we get the following second-order differential equation:

$$\frac{d^2 u_t}{dt^2} = \frac{du_t^*}{dt}\left(i_{t-1} + e_{t-1}\right) + \frac{du_t}{dt}\left[\frac{1}{i_t + e_t}\frac{d\left(i_t + e_t\right)}{dt} - \left(i_t + e_t\right)\right]. \tag{18}$$

We get the following recursive expression for the dynamics of the actual unemployment rate if we treat (18) as a first-order differential equation in du/dt and rearrange:

$$\Delta u_t = \frac{\left(i_t + e_t\right) i_{t-1}\frac{\Delta u_t^*}{u_{t-1}^*} + \left(i_t + e_t\right)\Delta u_{t-1}}{\left(i_t + e_t\right)^2 + i_{t-1} + e_{t-1}} \tag{19}$$

Equation (19) shows that high transition rates (high dynamics) will lead to closer movements of the actual unemployment rate and the equilibrium rate. However, low transition rates (low dynamics) lead to a larger relative effect of past changes in both actual unemployment and equilibrium unemployment. The term $\Delta u_t^*/u_{t-1}^*$ can be interpreted as the rate of convergence to the steady-state unemployment rate.

The relative contribution of inflow and exit rates to changes in the actual unemployment rate can be calculated using (19) and the relationship in (14):

$$u_t^i = \frac{u_t^{*i}\left(i_t + e_t\right) i_{t-1} + u_{t-1}^i \left(i_t + e_t\right)}{\left(i_t + e_t\right)^2 + i_{t-1} + e_{t-1}}, \tag{20}$$

$$u_t^e = \frac{u_t^{*e}\left(i_t + e_t\right) i_{t-1} + u_{t-1}^e \left(i_t + e_t\right)}{\left(i_t + e_t\right)^2 + i_{t-1} + e_{t-1}}, \tag{21}$$

with $u_0^i = 0$ and $u_0^e = 0$.

The relative contributions of s_t, a_t, f_t, and n_t can be calculated analogue to (14) and (15). The difference to equation (14), however, is that we have here an additional contribution to the variation in actual unemployment from the initial condition at time $t = 0$

$$u_t^0 = \frac{u_{t-1}^0 \left(i_t + e_t\right)}{\left(i_t + e_t\right)^2 + i_{t-1} + e_{t-1}},$$

with $u_0^0 \equiv u_0 - u_0^*$.

This initial contribution is less (more) important for more (less) dynamic unemployment rates. The relative contribution of this term provides information on the role of past shocks for current unemployment.

Again, the individual flow related variance contribution to the dynamics in u_t will be measured with beta values:

$$\beta^k = \frac{cov\left(\Delta u_t, u_t^k\right)}{var\left(\Delta u_t\right)}, \tag{22}$$

with $k = s, a, f, n$ and $\beta^s + \beta^a + \beta^f + \beta^n = \beta^i + \beta^e \leq 1$. These beta values are the individual flow related percentage contributions to the variance of the three-state model's actual unemployment rate. They sum up to one if past shocks play no role for current unemployment.

8 Data Availability Statement

The administrative data supporting this study's findings are available at the German Federal Employment Agency [https://statistik. arbeitsagentur.de/Navigation/Statistik/Service/English-Site/English-Site-Nav.html]. These data are used as described in section 3.

9 Figures and Tables

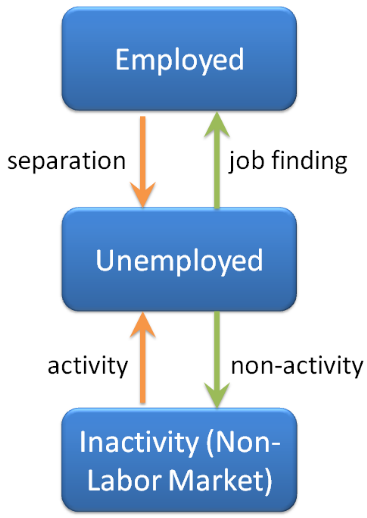

Figure 1: Considered Flows in the Labor Market

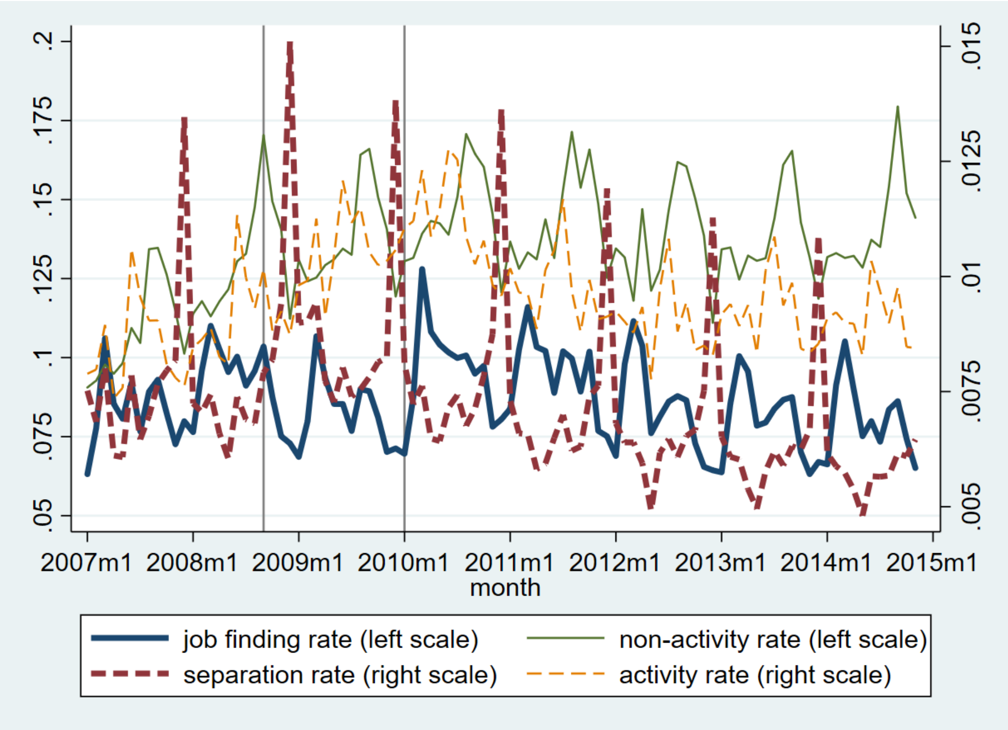

Figure 2: Transition Rates for All

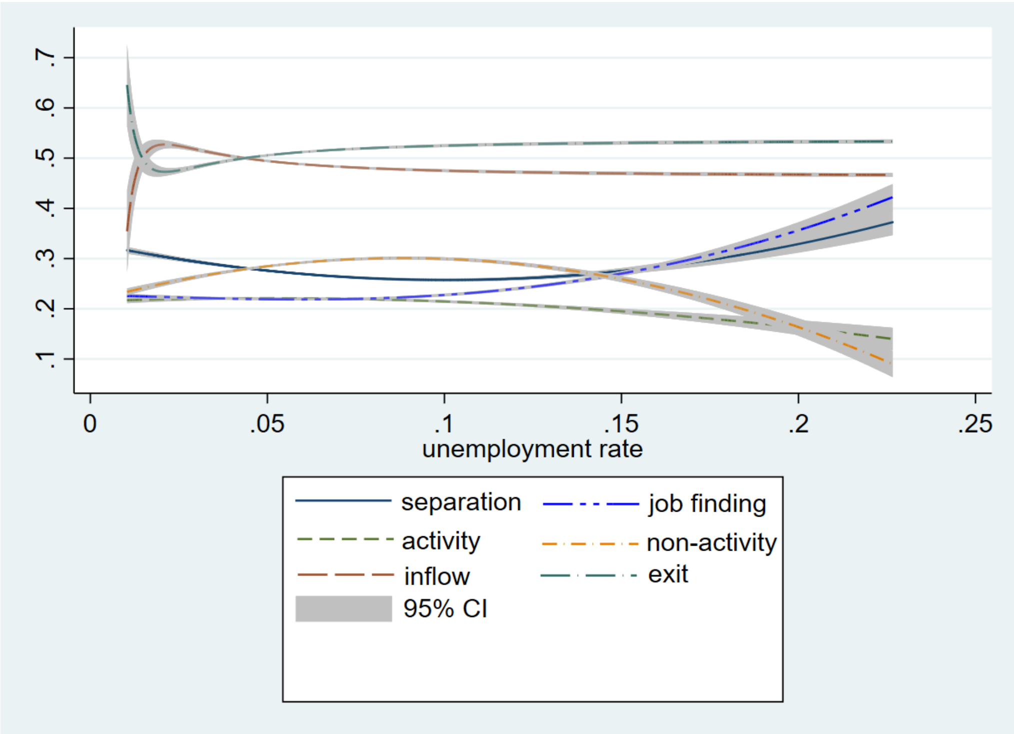

Figure 3: Shares of Flow Contributions in Non-Steady-State

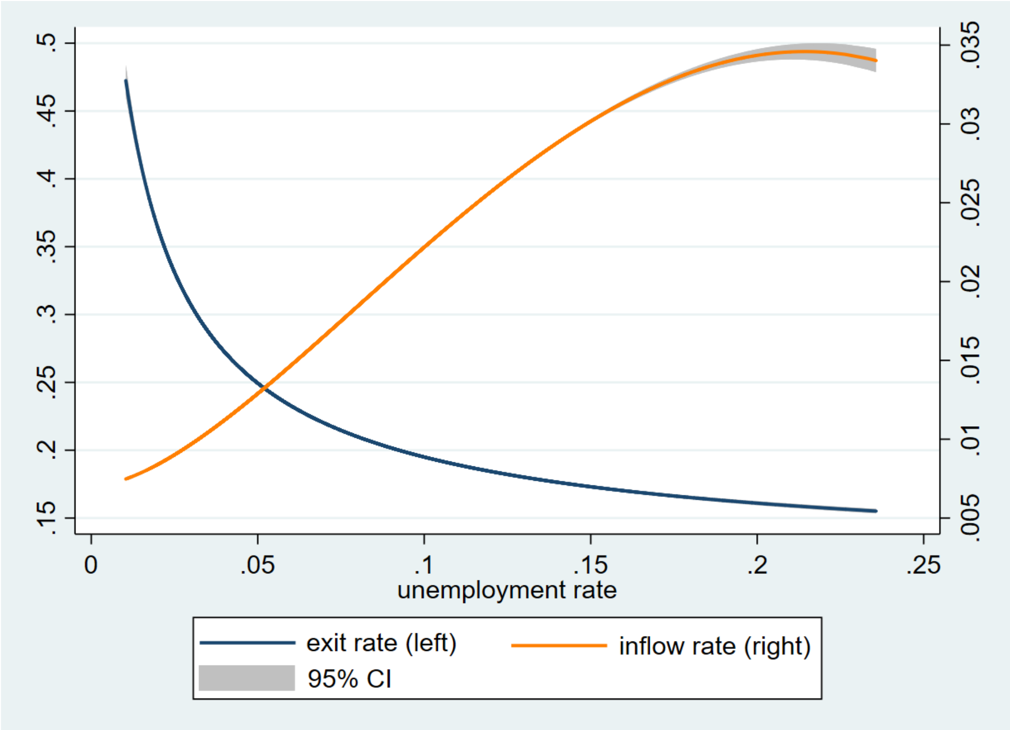

Figure 4: Regional inflow, exit, and unemployment rates for the age group 15-64

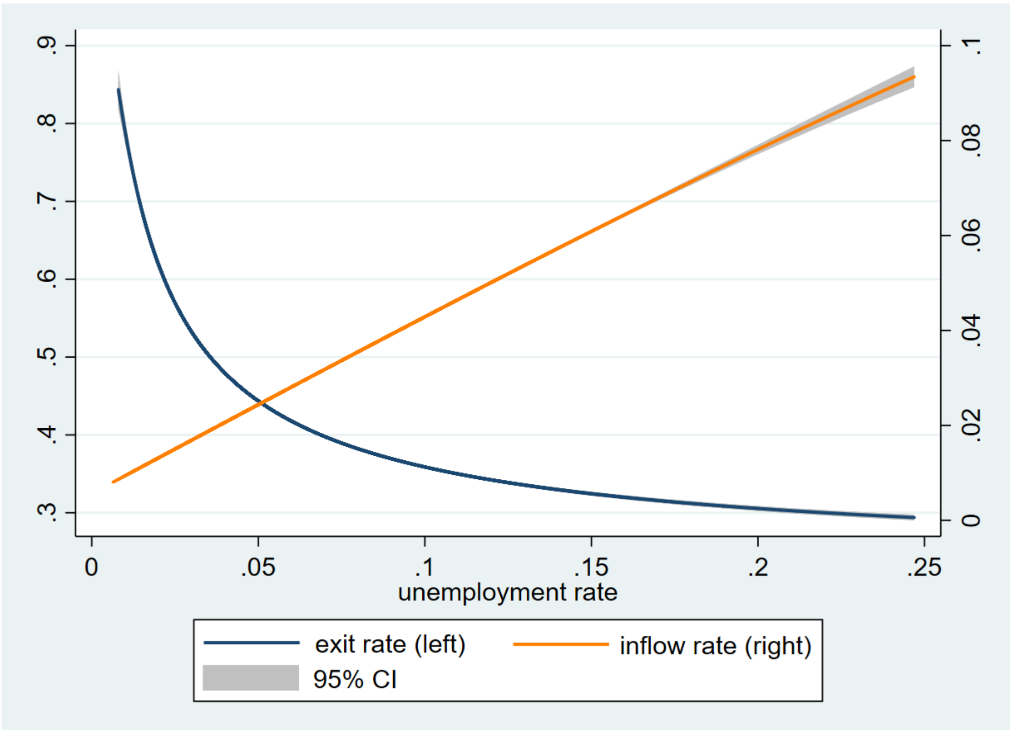

Figure 5: Regional inflow, exit, and unemployment rates for the age group 15-24

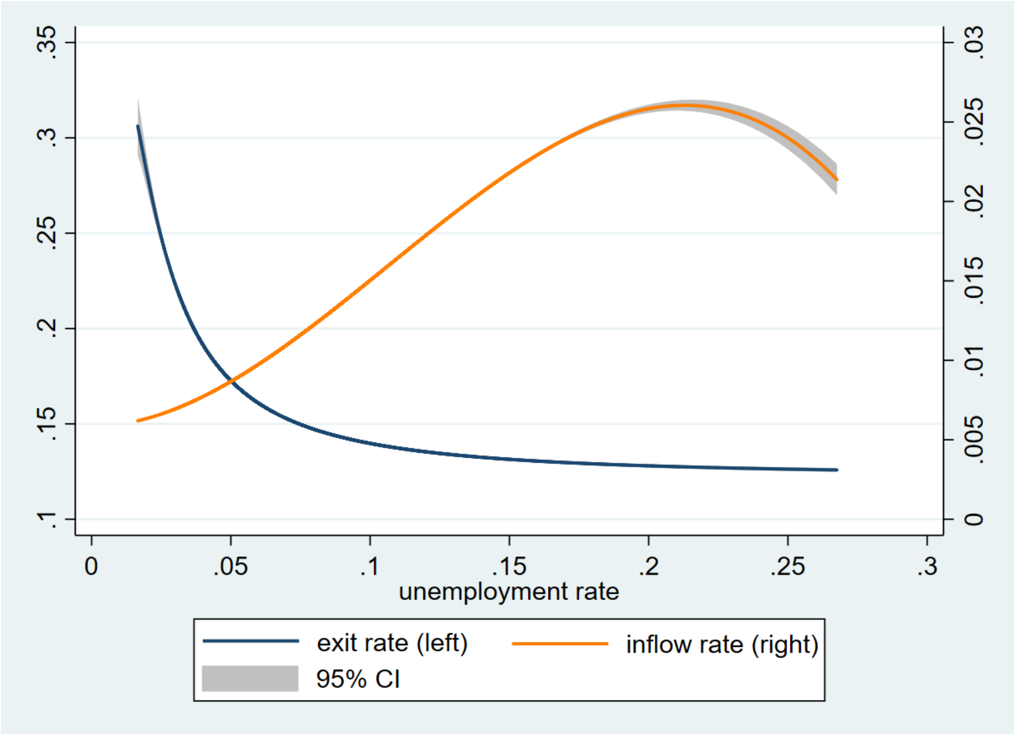

Figure 6: Regional inflow, exit, and unemployment rates for the age group 55-64

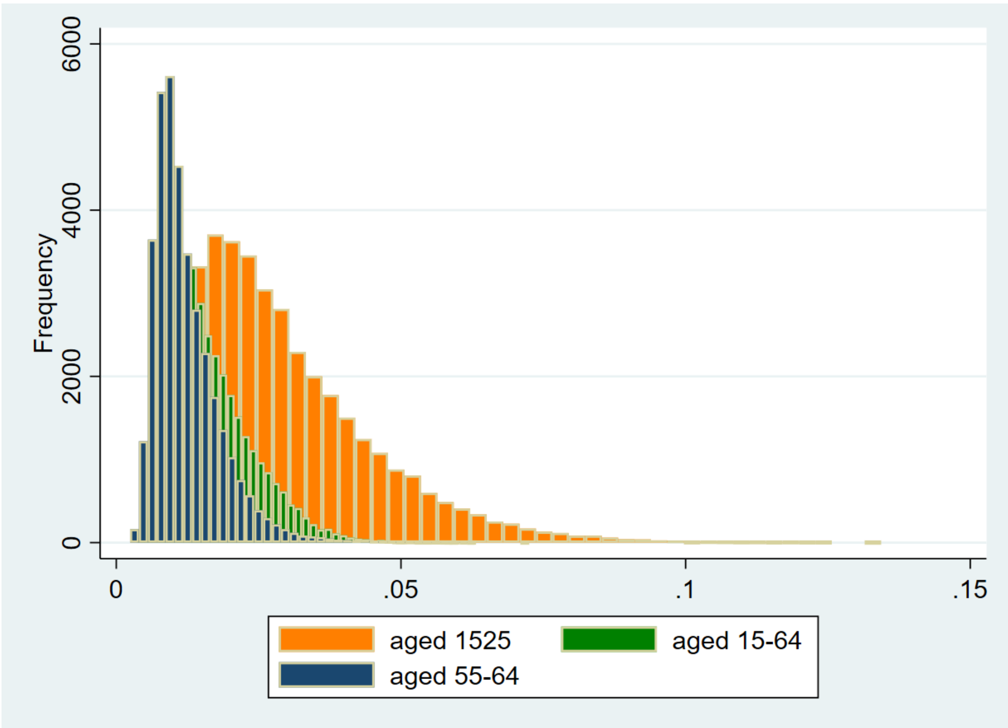

Figure 7: Inflow rates for different age groups

Table 1: Average Values on Arrival Rates and Unemployment Rates

	transition rates							
age groups	f_{rt}	n_{rt}	s_{rt}	a_{rt}	e_{rt}	i_{rt}	u^*_{rt}	u_{rt}
15-24	0.164	0.255	0.011	0.019	0.417	0.029	7.11	6.71
	(0.067)	(0.100)	(0.005)	(0.012)	(0.136)	(0.015)	(4.02)	(3.59)
25-34	0.106	0.133	0.010	0.012	0.239	0.023	9.29	9.11
	(0.039)	(0.040)	(0.004)	(0.006)	(0.068)	(0.010)	(4.54)	(4.23)
35-44	0.087	0.121	0.007	0.008	0.208	0.015	7.07	7.09
	(0.035)	(0.038)	(0.003)	(0.004)	(0.062)	(0.006)	(3.63)	(3.42)
45-54	0.074	0.121	0.006	0.008	0.195	0.014	7.41	7.43
	(0.032)	(0.039)	(0.004)	(0.004)	(0.059)	(0.007)	(4.04)	(3.78)
55-64	0.040	0.110	0.005	0.007	0.150	0.013	7.99	8.25
	(0.019)	(0.030)	(0.004)	(0.003)	(0.038)	(0.006)	(3.77)	(3.42)
all	0.087	0.135	0.007	0.010	0.222	0.017	7.53	7.48
	(0.031)	(0.039)	(0.004)	(0.005)	(0.061)	(0.007)	(3.75)	(3.52)

Notes: Average arrival rates and unemployment rates are calculated as described in section 2. For the arrival rates we have the relationships $f_t + n_t = e_t$ and $s_t + a_t = i_t$ (see section 2). The equilibrium unemployment rates are calculated according to equation (2) and (6). Regional data are weighted with age group specific labor force. Standard errors in parentheses. Period: January 2007 to December 2014. Number of regions: 402.

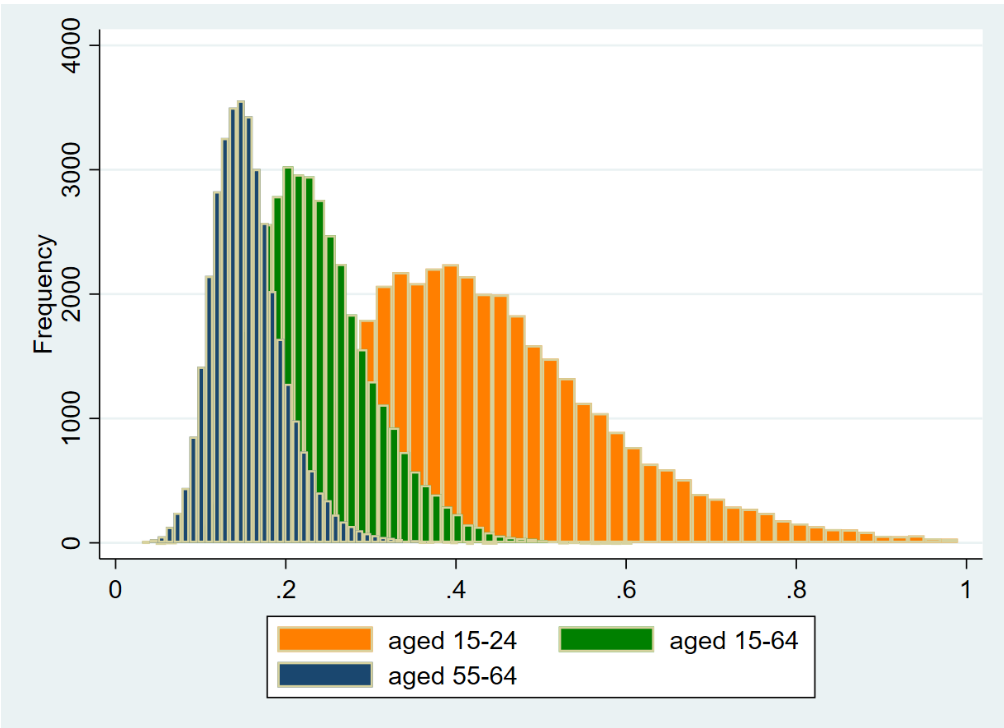

Figure 8: Exit rates for different age groups

Table 2: Average Values on Arrival Rates and Unemployment Rates by Regions

	county areas with ...				county areas				
	share1524		share5565						
age groups	>(mean+se)	<(mean-se)	>(mean+se)	<(mean-se)	west	east	type I	type II	type III
15-24									
exit	0.504	0.363	0.396	0.401	0.427	0.374	0.371	0.452	0.484
inflow	0.021	0.037	0.029	0.031	0.025	0.049	0.030	0.027	0.033
u^*_{rt}	4.37	9.42	7.19	7.94	6.00	12.07	7,91	6.09	7.11
u_{rt}	4.21	9.39	6.72	7.75	5.64	11.48	7.42	5.77	6.80
55-64									
exit	0.174	0.145	0.141	0.152	0.150	0.147	0.142	0.155	0.165
inflow	0.010	0.017	0.014	0.011	0.010	0.020	0.012	0.012	0.015
u^*_{rt}	5.65	10.39	9.10	7.31	6.76	12.37	8.08	7.47	9.12
u_{rt}	5.78	10.54	9.11	8.66	6.96	12.99	8.43	7.66	9.16
all									
exit	0.276	0.202	0.211	0.214	0.227	0.202	0.202	0.239	0.255
inflow	0.013	0.021	0.017	0.017	0.014	0.027	0.017	0.016	0.019
u^*_{rt}	4.70	9.57	7.78	8.13	6.45	11.88	8.11	6.65	7.64
u_{rt}	4.75	9.38	7.60	8.59	6.38	11.89	8.03	6.62	7.66

Notes: Average arrival rates and unemployment rates are calculated as described in section 2. For the arrival rates we have the relationships $f_t + n_t = e_t$ and $s_t + a_t = i_t$ (see section 2). The equilibrium unemployment rates are calculated according to equation (2) and (6). Regions: type I metropolitan areas, type II urban areas, and type III rural areas. Regional data are weighted with age group specific labor force. Period: January 2007 to December 2014. Number of regions: 402.

Table 3: Basic Statistics on Unemployment Duration by Age Groups

	shares by unemployment duration (in months)					
age groups	<1	≥1...<3	≥3...<6	≥6...<12	≥12...<24	≥24
15-24	24.7	30.2	21.6	15.4	7.2	2.1
	(8.8)	(6.5)	(5.0)	(5.0)	(3.6)	(2.2)
25-34	13.2	20.1	19.1	19.7	15.4	12.4
	(4.5)	(4.8)	(2.9)	(2.8)	(3.9)	(5.6)
35-44	10.7	16.5	16.6	18.7	16.6	20.9
	(4.0)	(4.9)	(3.3)	(2.9)	(3.4)	(7.9)
45-54	9.8	15.0	15.3	17.9	17.0	25.0
	(3.9)	(4.8)	(3.4)	(3.1)	(3.2)	(8.9)
55-64	7.3	11.9	13.6	18.8	21.3	27.0
	(2.8)	(3.8)	(3.3)	(3.9)	(4.0)	(10.2)
all	11.8	17.5	16.8	18.4	16.4	19.1
	(3.9)	(4.3)	(2.8)	(2.5)	(2.9)	(7.0)

Notes: Standard errors in parenthesis.

Table 4: Contributions from Transitions in Non-Steady-State

age groups	β^i	β^e	β^s	β^a	β^f	β^n	initial	$cor\left(\Delta u, \Delta u^{\text{real}}\right)$
15-24	0.588	0.398	0.108	0.480	0.053	0.345	0.014	0.928
25-34	0.463	0.530	0.463	0.000	0.273	0.257	0.007	0.943
35-44	0.501	0.487	0.490	0.011	0.287	0.200	0.012	0.944
45-54	0.515	0.463	0.508	0.006	0.295	0.168	0.023	0.946
55-64	0.561	0.344	0.502	0.059	0.213	0.131	0.095	0.780
all	0.490	0.503	0.485	0.006	0.273	0.230	0.007	0.964

Notes: The average transition rate contributions are calculated as described in section 2. The last column "initial" provides the relative contribution of the initial difference. Regional data are weighted with age group specific labor force. Period: January 2007 to December 2014. Number of regions: 402.

Table 5: Regional Contributions from Transition Rates in Non-Steady-State

age groups	β^i	β^e	β^s	β^a	β^f	β^n	initial
West-German counties							
aged 15-24	0.644	0.345	0.112	0.532	0.020	0.325	0.011
aged 55-64	0.539	0.334	0.437	0.103	0.145	0.190	0.127
all	0.520	0.449	0.457	0.063	0.207	0.242	0.031
East-German counties							
aged 15-24	0.498	0.484	0.103	0.395	0.107	0.377	0.018
aged 55-64	0.585	0.349	0.557	0.028	0.261	0.088	0.067
all	0.502	0.484	0.460	0.042	0.293	0.191	0.013
Typ I region counties							
aged 15-24	0.577	0.406	0.080	0.497	0.039	0.367	0.016
aged 55-64	0.486	0.323	0.402	0.084	0.137	0.186	0.192
all	0.439	0.520	0.409	0.029	0.225	0.295	0.041
Typ II region counties							
aged 15-24	0.611	0.376	0.109	0.502	0.043	0.333	0.013
aged 55-64	0.583	0.349	0.521	0.063	0.220	0.129	0.068
all	0.493	0.505	0.484	0.009	0.272	0.233	0.002
Typ III region counties							
aged 15-24	0.566	0.423	0.170	0.396	0.100	0.322	0.011
aged 55-64	0.611	0.356	0.582	0.029	0.278	0.078	0.033
all	0.540	0.446	0.519	0.022	0.294	0.152	0.014
counties with one se above mean share of the 15-24							
aged 15-24	0.620	0.367	0.163	0.457	0.076	0.292	0.013
aged 55-64	0.598	0.308	0.545	0.053	0.239	0.068	0.094
all	0.582	0.414	0.562	0.020	0.276	0.138	0.004
counties with one se below mean share of the 15-24							
aged 15-24	0.463	0.533	0.109	0.354	0.088	0.447	0.002
aged 55-64	0.595	0.380	0.564	0.031	0.268	0.111	0.025
all	0.515	0.484	0.483	0.033	0.262	0.221	0.001
counties with one se below mean share of the 55-64							
aged 15-24	0.546	0.454	0.143	0.403	0.077	0.377	0.000
aged 55-64	0.625	0.373	0.599	0.026	0.279	0.094	0.002
all	0.538	0.462	0.510	0.028	0.279	0.183	0.000
counties with one se above mean share of the 55-64							
aged 15-24	0.621	0.346	0.066	0.555	0.040	0.305	0.033
aged 55-64	0.306	0.218	0.266	0.040	0.124	0.095	0.476
all	0.422	0.498	0.395	0.027	0.296	0.202	0.080

Notes: Average transition rate contributions are calculated as described in section 2. The last column "initial" provides the relative contribution of the initial difference. Regional data are weighted with age group specific labor force. Regions: type I metropolitan areas, type II urban areas, and type III rural areas. Period: January 2007 to December 2014. Number of regions: 402.

Table 6: Average Values on Arrival Probabilities and Unemployment Rates

	transition probabilities							
age groups	F_{rt}	N_{rt}	S_{rt}	A_{rt}	$\check{E}_{rt}$	I_{rt}	u^*_{rt}	u_{rt}
15-24	0.150	0.222	0.011	0.018	0.371	0.029	7.70	6.71
	(0.055)	(0.073)	(0.005)	(0.011)	(0.109)	(0.015)	(4.19)	(3.59)
25-34	0.100	0.124	0.010	0.012	0.224	0.023	9.71	9.11
	(0.034)	(0.034)	(0.004)	(0.006)	(0.059)	(0.010)	(4.62)	(4.23)
35-44	0.083	0.113	0.007	0.008	0.196	0.014	7.37	7.09
	(0.031)	(0.033)	(0.003)	(0.004)	(0.055)	(0.006)	(3.70)	(3.42)
45-54	0.071	0.113	0.006	0.008	0.184	0.014	7.70	7.43
	(0.028)	(0.034)	(0.004)	(0.004)	(0.052)	(0.007)	(4.11)	(3.78)
55-64	0.039	0.104	0.005	0.007	0.143	0.012	8.29	8.25
	(0.018)	(0.027)	(0.004)	(0.003)	(0.035)	(0.006)	(3.83)	(3.42)
all	0.083	0.126	0.007	0.010	0.209	0.017	7.87	7.48
	(0.028)	(0.034)	(0.004)	(0.005)	(0.053)	(0.007)	(3.83)	(3.52)

Notes: Average arrival probabilities and unemployment rates are calculated as described in section 2. For the arrival probabilities we have the relationships $F_t + N_t \equiv \check{E}_t$ and $S_t + A_t \equiv I_t$ (see section 2). Regional data are weighted with age group specific labor force. Standard errors in parentheses. Period: January 2007 to December 2014. Number of regions: 402.

Table 7: Average Values on Arrival Probabilities and Unemployment Rates by Regions

	county areas with ...				county areas				
age groups	share1524		share5565						
	>(mean+se)	<(mean-se)	>(mean+se)	<(mean-se)	west	east	type I	type II	type III
15-24									
exit	0.444	0.326	0.353	0.361	0.379	0.335	0.334	0.399	0.428
inflow	0.021	0.036	0.028	0.031	0.025	0.049	0.029	0.027	0.033
u^*_{rt}	4.81	9.99	7.80	8.49	6.54	12.94	8.51	6.66	7.72
u_{rt}	4.21	9.39	6.72	7.75	5.64	11.48	7.42	5.77	6.80
55-64									
exit	0.165	0.139	0.135	0.145	0.143	0.141	0.135	0.148	0.156
inflow	0.010	0.017	0.014	0.011	0.010	0.020	0.012	0.012	0.015
u^*_{rt}	5.90	10.71	9.40	7.58	7.04	12.75	8.38	7.76	9.44
u_{rt}	5.78	10.54	9.11	8.66	6.96	12.99	8.43	7.66	9.16
all									
exit	0.256	0.191	0.199	0.202	0.213	0.192	0.191	0.224	0.238
inflow	0.013	0.021	0.017	0.017	0.014	0.026	0.017	0.016	0.019
u^*_{rt}	4.98	9.98	8.13	8.46	6.76	12.34	8.46	6.98	8.00
u_{rt}	4.75	9.38	7.60	8.59	6.38	11.89	8.03	6.62	7.66

Notes: Average arrival probabilities and unemployment rates are calculated as described in section 2. For the arrival probabilities we have the relationships $F_t + N_t \equiv \check{E}_t$ and $S_t + A_t \equiv I_t$ (see section 2). Regions: type I metropolitan areas, type II urban areas, and type III rural areas. Regional data are weighted with age cohort specific labor force. Period: January 2007 to December 2014. Number of regions: 402.

Table 8: Contributions from Transitions in Steady-State and Non-Steady-State

	steady-state contributions from transition rate							
age groups	β^i	β^e	β^s	β^a	β^f	β^n	$cor\,(u, u^*)$	$cor\,(\Delta u, \Delta u^*)$
15-24	0.414	0.586	0.018	0.396	0.100	0.486	0.960	0.811
25-34	0.620	0.380	0.425	0.195	0.190	0.190	0.945	0.674
35-44	0.522	0.478	0.324	0.198	0.284	0.194	0.925	0.677
45-54	0.539	0.461	0.271	0.268	0.303	0.158	0.904	0.618
55-64	0.594	0.406	0.296	0.297	0.175	0.231	0.837	0.535
all	0.403	0.597	0.367	0.036	0.364	0.233	0.933	0.667

	steady-state contributions from transition probability							
age groups	β^I	$\beta^{\dot{E}}$	β^S	β^A	β^F	β^N	$cor\,(u, u^*)$	$cor\,(\Delta u, \Delta u^*)$
15-24	0.446	0.554	0.020	0.426	0.103	0.451	0.963	0.824
25-34	0.633	0.367	0.435	0.199	0.183	0.183	0.946	0.675
35-44	0.537	0.463	0.333	0.204	0.277	0.186	0.925	0.678
45-54	0.552	0.448	0.278	0.275	0.297	0.151	0.905	0.619
55-64	0.603	0.397	0.301	0.302	0.176	0.221	0.836	0.536
all	0.416	0.584	0.379	0.037	0.361	0.223	0.933	0.668

	non-steady-state contributions from transition probability							
age groups	β^I	$\beta^{\dot{E}}$	β^S	β^A	β^F	β^N	initial	$cor\left(\Delta u, \Delta u^{\text{real}}\right)$
15-24	0.670	0.295	0.110	0.560	0.066	0.230	0.035	0.917
25-34	0.489	0.502	0.480	0.008	0.264	0.238	0.009	0.941
35-44	0.516	0.468	0.511	0.005	0.280	0.188	0.015	0.942
45-54	0.530	0.443	0.520	0.010	0.287	0.157	0.026	0.944
55-64	0.576	0.332	0.512	0.064	0.214	0.118	0.091	0.777
all	0.504	0.487	0.498	0.005	0.266	0.221	0.009	0.961

Notes: Average contributions of transition rates and transition probabilities are calculated as described in section 2. $cor(u, u^*)$ is the coefficient of correlation for the actual unemployment rate and the equilibrium unemployment rate. The last column "initial" provides the relative contribution of the initial difference. Regional data are weighted with age group specific labor force. Period: January 2007 to December 2014. Number of regions: 402.