LIETUVOS BANKAS
EUROSISTEMA

The Life-cycle Profile of Worker Flows in Europe: an Empirical Investigation

Discussion Paper Series

No. 16 / 2019

ISSN 2345-0835 (online)

Discussion Paper Series

No. 16 / 2019

Etienne Lalé

(Université du Québec à Montréal, CIRANO and IZA)[*]

Linas Tarasonis

(Vilnius University and Bank of Lithuania)[†]

November 2019[‡]

[*] Address: Department of Economics, Université du Québec à Montréal, C.P. 8888, Succursale centre ville, Montréal (QC) H3C 3P8, Canada – Phone: +1 514 987 3000, ext. 3680 – E-mail: lale.etienne@uqam.ca.

[†] Address: Faculty of Economics and Business Administration, Vilnius University, Saulėtekio al. 9, 10222 Vilnius, Lithuania – Phone: + 370 5 236 6156 – E-mail: linas.tarasonis@evaf.vu.lt.

[‡] We are grateful for comments from seminar participants at Aix-Marseille University, the Bank of Lithuania, Stockholm University and the 2nd Baltic Economic Conference. Etienne Lalé thanks the European University Institute for hospitality and for providing access to the German SOEP data.

Gedimino pr. 6, LT-01103 Vilnius

www. lb.lt

Discussion Papers describe research in progress by the author(s) and are published to stimulate discussion and critical comments.

The series is managed by Applied Macroeconomic Research Division of Economics Department and the Center for Excellence in Finance and Economic Research.

ABSTRACT

In this paper, we first provide a comprehensive account of the relationship between cross-country differences in aggregate employment and disaggregated differences in worker flows along the life cycle. To this end, we use survey micro-data for 31 European countries, and estimate the life-cycle profiles of transition probabilities across employment, unemployment and non-participation for each country. We develop a decomposition measuring the contribution of these transition probabilities to aggregate employment differences. We find substantial cross-country and cross-gender heterogeneity with respect to the role of worker flows between each labor market state.

Keywords: Employment, Unemployment, Labor Force Participation, Life cycle, Worker Flows, Labor Market Institutions.

JEL codes: E02, E24, J21, J64, J82.

1 Introduction

This paper uses micro data sets from thirty-one European country to provide a full picture of labor market mobility of European workers over the life cycle. We focus on the behavior of worker flows and measure life-cycle transition probabilities between the labor market statuses of employment, unemployment and non-participation. In doing so we show that labor market experiences vary significantly over the life cycle, across countries and genders.

We start by estimating average transition probabilities for men and women to uncover large differences between European regions. In terms of labor market flows, Nordic countries appear to be the most dynamic for both genders whereas the flows between different labor market statuses in Eastern European countries are the smallest. This extends the work of Elsby et al. (2013) who documented cross-country differences in aggregate worker flows in fourteen OECD countries.

Next, we show that labor market flows vary significantly over the life cycle and for most European countries the profiles are similar qualitatively. For both genders, job-loosing probability shows an increase until early 20s and then a steady decrease during the rest of the working life. Transition probabilities to non-participation both from employment and from unemployment portray stable patterns for prime-age individuals (those aged 25 to 54), while they show a negative slope at younger ages and an increase for older workers. The job-finding probability out of unemployment shows an increase until mid-20s and then a slight but persistent decrease. These findings are consistent with Choi et al. (2015) who use data from the Current Population Survey to study how worker flows shape the unemployment and participation rates in the U.S. labor market.

While most European countries display similar profiles in terms of their shape, the levels vary significantly. When focusing on France, Germany and Italy - the 'big three' of Continental Europe - we show that large differences exist when focusing on specific periods of a life cycle. French workers are facing transition probabilities that are overall similar to European averages, however older workers of both gender confront a significantly lower probability of finding a job when unemployed compared to older workers in other European countries. German labor market is less dynamic overall: finding jobs out of unemployment is less likely, but once employed, jobs last longer. A striking difference appears when looking at job-finding rates in the Italian job market: young workers of both genders are facing a significantly lower job-finding probability than their peers in Europe. The gap in job-finding rates closes down only in the 40s. These findings confirm that focusing on the life cycle aspect of the flows is relevant and that large cross-country differences persist despite similar average transition rates.

To assess the importance of each worker flow in accounting for each country's aggregate labor market outcomes, we develop a decomposition method that relies on a first-order Markov chain to link worker stocks and flows. The method allows us to decompose aggregate employment differences into the following three components: demographics, i.e. the composition of workers of different age in the population, initial conditions, i.e. the distribution of workers across different labor market states at the age of 16, and transition probabilities. The latter can be further decomposed into a contribution of each transition probability. We show that labor flows are key in understanding differences in male and female aggregate employment gaps across countries: transition probabilities explain 91.91% and 97.55% of total variance.

We find substantial cross-country and cross-gender heterogeneity with respect to the role of worker flows. For males, job separations to unemployment account for almost half of the cross-country variance in aggregate employment. This result is in contrast with a literature that documents the importance of fluctuations in the job-finding probability in explaining unemployment fluctuations at the business cycle frequencies in the U.S. (see Shimer (2012); Fujita and Ramey (2009) among others). For young male workers, half of the variance is accounted by the flow from non-participation to employment. For female workers, the picture is very different: two thirds of the total variance is explained by the job-finding rate out of non-participation and it remains the most important flow for all age groups.

So far, most of the literature on labor market flows has focused on their importance on the business cycle.[1] Ward-Warmedinger and Macchiarelli (2014) provides evidence that worker flows vary significantly by age but their analysis is limited to large age groups and they do not investigate the consequences of it. Our paper is the first to provide a comprehensive picture of labor market flows over the life cycle in European labor markets.

The remainder of the paper is organized as follows. Section 2 presents the data and the measurement of the labor flows. Section 3 presents the estimated flows and fits a first-order Markov chain. Section 4 formalizes, presents and discusses the results of the decomposition. Section 5 concludes.

2 Data and Measurement

2.1 Data Sources

We use micro-data from the Statistics on Income and Living Conditions (EU-SILC) collected by Eurostat. The EU-SILC is an unbalanced household-level panel survey that collects comparable multidimensional annual micro-data on a few thousand households per country, starting in 2004. The dataset is particularly well suited for our study as it contains a retrospective calendar of the monthly labor force status (employment, unemployment, non-participation) of workers living in the following countries: Austria, Belgium, Bulgaria, Croatia, the Czech republic, Cyprus, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. Our sample covers the period 2004-2016. Sample size varies depending on the country and ranges from 2,250 households in Malta to 5,750 households in the U.K. We end up with a total of 4,167,231 individual-year observations corresponding to 1,392,329 individuals in our final sample. Due to lack of longitudinal data in the EU-SILC, we add data for Germany by using recent waves of the German Socio-Economic Panel (GSOEP) and Switzerland using the Swiss Household Panel (SHP).

[1] See Petrongolo and Pissarides (2008), Gomes (2012), Fujita and Ramey (2009), Ward-Warmedinger and Macchiarelli (2014).

2.2 Measurement

Measurement error. We consider three labor force status: employment (E), unemployment (U) and non-participation (N). Measurement error is a potentially important concern, especially for flows between unemployment and non-participation. To address this issue, we develop an approach much in the spirit of Elsby et al. (2015) de-NUN-ification procedure.

We treat our data as being quarterly instead of monthly. Suppose for instance that we look at data from January (month 1) to June (month 6) for individual i. We define i's labor force status during the first quarter as her labor force status in February (month 2). Likewise, her status in the second quarter is taken to be that in May (month 5). If we observe the sequence NUN within the first (second) quarter, then we recode i's labor status in month 2 (5) as being N. We treat the sequence UNU in the same fashion, by recoding i's labor status in month 2 (or 5, if looking at the second quarter) into U.

Our procedure to deal with measurement error leaves the stocks and flows roughly unchanged in levels, and it increases the precision of our estimates.

Measuring transition probabilities. Letting $s_{i,a,t}$ denote the indicator function that takes the value of 1 if individual i's labor force status is $s \in \{E, U, N\}$ in period t, when i's age is a, and denoting by w_i the relevant (cross-sectional) survey weight of individual i, we calculate

$$S_{a,t} = \sum_i w_i s_{i,a,t}. \tag{1}$$

$S_{a,t}$ is the stocks of individuals of age a in period t whose labor force status is s. Likewise, we construct $F^{ss'}_{a,t}$, worker flows from labor force status s to status s' at age a in period t, based on age-specific individual indicator function$f^{ss'}_{i,a,t}$ that takes the value of 1 if individual i's labor force status is $s \in \{E, U, N\}$ in period t and $s' \in \{E, U, N\}$, $s \neq s'$, in period $t+1$, and using the relevant (longitudinal) survey weights.[2] We increase the precision of our calculations by using three-year bins centered on each age a. For instance, to calculate $S_{30,t}$, we pool data on individuals aged 29, 30 and 31 in period t. We proceed in the same fashion with respect to t, i.e. we pool data from $t-1$, t and $t+1$ to compute the period-t stocks and flows statistics.

Life-cycle profiles. Then, by taking the ratio between flows (F) and stocks data (S), we obtain estimates of quarterly transition probabilities across employment, unemployment and non-participation, $P^{ss'}_{a,t} = \frac{F^{ss'}_{a,t}}{S_{a,t}}$.

Next, to separate the effects due to the business cycle we extract the life-cycle profile of stocks and flows using a non-parametric approach by running the following regressions:

$$P^{ss'}_{a,t} = p^{ss'}_a \mathbf{D_a} + \psi_t \mathbf{D_t} + \varepsilon_{a,t}, \tag{2}$$

[2] In the EU-SILC, we do not have longitudinal weights tailored to our empirical exercise. Therefore we take the average of an individual's cross-sectional weights to construct longitudinal weights. The other micro-data sets we use provide longitudinal in addition to cross-sectional weights. In particular, for France and the United Kingdom, we compare the flows based on the longitudinal weights that we construct with those based on weights provided in the survey micro-data of the FLFS and UKLFS. We find no significant differences.

where $P_{a,t}^{ss'}$ is age-specific transition probability at time t, $\mathbf{D_a}$ ($\mathbf{D_t}$) is a full set of age (time) dummies and $\varepsilon_{a,t}$ is the residual of the regression. The life-cycle profile of a stocks or flows statistic refers to the coefficients $p_a^{ss'}$ on the age dummies. We use the same procedure to extract the life-cycle profile of individuals stocks, $S_{a,t}$.

Time aggregation. Finally, we clear the transition probabilities from time aggregation bias using the continuous-time adjustment procedure developed by Shimer (2012) and we store the adjusted, age-a quarterly transition probabilities in a matrix denoted as Γ_a:

$$\Gamma_a = \begin{bmatrix} p_a^{EE} & p_a^{EU} & p_a^{EN} \\ p_a^{UE} & p_a^{UU} & p_a^{UN} \\ p_a^{NE} & p_a^{NU} & p_a^{NN} \end{bmatrix}. \tag{3}$$

where the probabilities of staying in each state, p_a^{ss}, are calculated as the residuals given the estimated probabilities of transitioning out of a given state.

3 A First Look at the Data

3.1 Worker Flows

In Tables 1a and 1b, we report average transition probabilities for men and women, respectively. We provide figures for the whole working-age population as well as for prime-age individuals (those aged 25 to 54) to separate out the effects of specific transition patterns at the beginning and at the end of the working life. In each table, we have created 5 groups of countries: Nordic countries, countries of Western and Southern Europe, Baltic states and countries of Eastern Europe. The last row of each country group reports the (unweighted) average of the numbers in each column. The last row of the table reports the (unweighted) European average.

Consistently with the findings of Elsby et al. (2013), Tables 1a and 1b uncover large differences in average labor market transitions between different European regions. For example, workers in the Nordic countries, compared to European averages, are about 30% more likely to find a job out of unemployment and more than 100% more likely when coming out of non-participation. Also, not surprisingly, prime-age workers are facing better employment prospects than those in the overall working-age population: their job-finding probabilities are consistently higher and, once employed, their jobs last longer.

Figures 1a, 1b and 1c display the life-cycle transition probabilities respectively for France, Germany, and Italy – the 'big three' of Continental Europe. To give more context to the country-specific estimates we plot them against the average life-cycle transition probabilities across all countries in our sample, calculated as a population-weighted average of country specific estimates. Notice that the scale of the vertical axis is different across countries. For each country we use the same scale on the vertical axis for men (upper panel) and women (lower panel) to emphasize differences across gender.

Looking at European average first, for both genders, job-loosing probability (EU) shows an increase until early 20s and then a steady decrease over the life cycle. Transition probabilities to

Table 1a: Average transition probabilities: Men

	Aged 16 to 65						Aged 25 to 54					
	EU	*EN*	*UE*	*UN*	*NE*	*NU*	*EU*	*EN*	*UE*	*UN*	*NE*	*NU*
Nordic countries:												
Denmark	1.27	1.58	17.89	8.85	6.20	2.28	1.17	0.80	18.71	5.84	7.62	3.03
Finland	2.57	3.29	16.75	6.39	10.49	2.75	2.34	1.72	18.67	5.11	14.12	4.81
Iceland	1.60	3.78	30.44	7.58	34.20	5.18	1.48	1.98	30.98	6.71	27.49	6.77
Norway	0.51	1.37	17.32	5.94	5.71	1.21	0.51	0.77	15.77	5.68	7.81	1.81
Sweden	1.46	2.62	27.66	13.68	13.96	4.33	1.14	1.16	30.81	8.51	17.07	4.96
Average	**1.48**	**2.53**	**22.01**	**8.49**	**14.11**	**3.15**	**1.33**	**1.29**	**22.99**	**6.37**	**14.82**	**4.28**
Western Europe:												
Austria	2.12	1.34	26.08	4.68	4.46	1.26	1.97	0.57	28.22	3.02	7.70	2.31
Belgium	1.03	1.10	7.61	4.37	3.05	2.05	0.93	0.74	10.82	2.54	5.60	2.61
Switzerland	0.61	1.11	25.49	6.83	7.80	1.24	0.52	0.43	27.51	5.61	11.46	2.58
Germany	0.93	0.82	9.64	4.06	4.65	1.25	0.77	0.29	10.48	2.46	7.04	3.01
France	1.57	0.71	13.82	2.11	1.82	0.90	1.39	0.18	15.55	1.21	3.78	2.02
Ireland	1.77	1.20	9.22	2.71	4.54	1.92	1.68	0.49	10.01	2.13	5.46	2.72
Luxembourg	0.94	0.50	16.35	3.12	1.47	0.63	0.86	0.23	17.62	1.99	4.23	1.57
Netherlands	0.89	1.45	11.56	3.74	6.15	0.79	0.84	0.75	14.20	2.69	11.57	2.27
United Kingdom	1.05	1.10	19.87	5.92	5.02	1.56	0.91	0.54	20.04	4.70	5.39	2.09
Average	**1.21**	**1.04**	**15.52**	**4.17**	**4.33**	**1.29**	**1.10**	**0.47**	**17.16**	**2.93**	**6.91**	**2.35**
Southern Europe:												
Cyprus	3.03	0.66	27.26	3.03	2.57	1.94	2.86	0.23	29.24	2.06	4.88	3.46
Spain	3.60	0.78	16.96	2.12	3.27	1.92	3.49	0.36	18.48	1.43	4.37	3.43
Greece	2.80	0.66	17.49	1.88	1.85	1.80	2.83	0.26	18.64	1.15	2.97	2.86
Italy	1.62	1.00	12.33	3.02	2.83	1.87	1.55	0.60	13.57	2.45	6.97	3.60
Malta	0.70	0.97	11.60	3.12	3.16	0.81	0.64	0.41	11.02	2.06	4.77	1.73
Portugal	2.64	2.21	14.83	3.66	6.73	2.25	2.55	1.97	15.45	3.00	6.91	2.96
Average	**2.40**	**1.05**	**16.75**	**2.81**	**3.40**	**1.76**	**2.32**	**0.64**	**17.73**	**2.03**	**5.14**	**3.01**
Baltic States:												
Estonia	2.06	1.16	16.81	3.81	4.98	1.56	1.95	0.65	17.06	2.46	5.50	1.61
Lithuania	2.30	1.07	14.77	2.57	4.01	1.55	2.22	0.64	15.08	1.75	3.82	2.25
Latvia	3.06	0.98	16.13	2.56	4.07	1.98	2.99	0.52	16.57	1.75	4.93	3.09
Average	**2.47**	**1.07**	**15.90**	**2.98**	**4.35**	**1.69**	**2.39**	**0.60**	**16.24**	**1.98**	**4.75**	**2.32**
Eastern Europe:												
Bulgaria	2.82	0.89	13.18	1.30	3.06	1.44	2.67	0.42	14.05	0.79	4.78	1.52
Czech Republic	1.10	0.47	16.04	2.62	1.91	1.17	0.94	0.12	16.64	1.22	3.25	1.73
Croatia	3.40	1.69	10.36	1.32	5.50	1.72	3.13	0.71	10.73	0.84	5.33	1.51
Hungary	2.63	1.01	23.23	3.45	2.67	1.19	2.51	0.55	25.27	2.61	4.79	1.73
Poland	1.93	1.08	17.89	2.49	3.54	1.49	1.77	0.67	19.27	1.86	4.88	1.58
Romania	0.42	0.51	10.83	2.90	1.65	0.57	0.42	0.34	12.03	2.59	3.29	1.12
Slovenia	1.46	0.50	13.55	8.23	1.82	2.19	1.28	0.18	15.53	6.38	3.75	5.53
Slovakia	1.38	0.93	13.32	2.36	2.98	1.81	1.21	0.62	13.31	1.38	4.72	2.31
Average	**1.89**	**0.89**	**14.80**	**3.08**	**2.89**	**1.45**	**1.74**	**0.45**	**15.85**	**2.21**	**4.35**	**2.13**
European Average	**1.78**	**1.24**	**16.66**	**4.21**	**5.36**	**1.76**	**1.66**	**0.64**	**17.78**	**3.03**	**6.98**	**2.73**

NOTE: The entries in the table are averages of quarterly transition probabilities expressed in percentage point. The last row of each country group reports the (unweighted) average of the numbers in each column.

Table 1b: Average transition probabilities: Women

	Aged 16 to 65						Aged 25 to 54					
	EU	*EN*	*UE*	*UN*	*NE*	*NU*	*EU*	*EN*	*UE*	*UN*	*NE*	*NU*
Nordic countries:												
Denmark	1.17	2.36	17.22	10.04	5.80	2.27	1.18	1.37	18.74	8.37	6.97	4.15
Finland	2.13	4.69	18.32	8.61	11.64	2.15	1.89	3.24	20.74	7.53	14.11	3.03
Iceland	1.28	4.32	28.13	13.84	20.47	3.91	1.32	2.87	30.13	12.35	17.92	4.95
Norway	0.57	2.22	16.92	5.71	5.39	0.69	0.56	1.61	16.90	5.08	7.70	1.20
Sweden	1.21	3.98	25.92	16.49	15.19	3.52	1.04	2.26	26.34	12.63	16.76	4.09
Average	**1.27**	**3.52**	**21.30**	**10.94**	**11.70**	**2.51**	**1.20**	**2.27**	**22.57**	**9.19**	**12.69**	**3.49**
Western Europe:												
Austria	2.00	2.55	21.42	7.11	4.09	0.96	1.93	1.88	22.68	6.16	6.21	1.51
Belgium	1.26	1.67	8.52	4.36	2.95	1.26	1.16	1.40	10.77	3.64	4.89	1.44
Switzerland	0.70	2.19	19.44	7.95	6.51	0.90	0.67	1.54	20.00	7.42	8.31	1.33
Germany	0.89	1.71	8.15	5.31	4.98	1.33	0.79	1.36	8.88	4.54	6.54	1.98
France	1.67	1.04	13.38	3.14	2.17	0.69	1.56	0.57	15.25	2.44	3.81	0.98
Ireland	1.69	2.80	19.44	6.90	3.96	0.84	1.56	2.25	20.57	6.46	4.29	0.98
Luxembourg	1.08	1.32	16.74	6.09	2.02	0.57	1.07	1.18	16.36	5.86	3.75	0.76
Netherlands	0.87	1.79	8.80	3.60	4.66	0.61	0.88	1.19	11.03	3.02	6.50	1.16
United Kingdom	0.75	2.46	21.53	7.88	5.48	0.83	0.67	2.00	21.34	7.32	6.80	0.94
Average	**1.21**	**1.95**	**15.27**	**5.82**	**4.09**	**0.89**	**1.14**	**1.49**	**16.32**	**5.21**	**5.68**	**1.23**
Southern Europe:												
Cyprus	3.67	0.94	28.24	3.49	2.11	1.40	3.45	0.61	29.27	3.03	3.13	1.33
Spain	4.39	1.41	14.88	4.59	2.68	2.52	4.38	1.02	15.68	4.27	3.28	3.85
Greece	3.23	1.63	12.87	2.80	1.73	1.21	3.31	1.28	13.63	2.67	2.40	1.52
Italy	1.88	1.98	10.80	6.62	1.93	1.53	1.90	1.63	11.54	6.60	2.86	2.11
Malta	0.50	2.15	14.47	8.74	2.19	0.28	0.37	1.77	14.34	8.85	2.45	0.24
Portugal	2.89	3.23	14.56	5.35	6.13	2.31	2.86	2.96	14.80	4.93	7.42	2.77
Average	**2.76**	**1.89**	**15.97**	**5.26**	**2.79**	**1.54**	**2.71**	**1.55**	**16.54**	**5.06**	**3.59**	**1.97**
Baltic States:												
Estonia	1.36	2.04	18.52	6.86	5.51	1.11	1.42	1.58	18.55	5.64	8.08	1.55
Lithuania	1.52	1.52	13.38	4.19	3.80	1.11	1.51	1.13	14.24	3.36	5.98	1.92
Latvia	2.11	1.84	16.29	5.19	4.14	2.08	2.11	1.43	16.36	4.38	6.22	3.38
Average	**1.67**	**1.80**	**16.06**	**5.41**	**4.48**	**1.43**	**1.68**	**1.38**	**16.39**	**4.46**	**6.76**	**2.29**
Eastern Europe:												
Bulgaria	2.41	1.44	11.13	2.66	2.51	1.18	2.43	0.90	12.36	1.89	4.80	1.86
Czech Republic	1.26	1.51	13.64	3.78	2.26	1.02	1.21	1.18	14.02	2.66	5.09	1.88
Croatia	3.40	2.04	9.56	2.73	4.02	2.14	3.17	0.74	9.52	2.49	3.25	4.11
Hungary	2.03	1.92	19.79	5.74	2.66	1.04	2.00	1.33	20.97	5.09	4.88	1.62
Poland	1.78	1.83	12.63	4.43	2.77	1.20	1.69	1.29	12.89	4.10	3.91	1.86
Romania	0.22	1.36	7.93	4.32	1.83	0.19	0.22	1.13	8.35	4.28	3.05	0.16
Slovenia	1.65	0.58	12.03	8.38	1.27	1.92	1.55	0.29	13.02	7.01	3.43	6.09
Slovakia	1.29	1.78	11.69	3.70	2.88	1.47	1.25	1.45	11.51	3.09	5.71	2.58
Average	**1.75**	**1.56**	**12.30**	**4.47**	**2.52**	**1.27**	**1.69**	**1.04**	**12.83**	**3.83**	**4.27**	**2.52**
European Average	**1.71**	**2.08**	**15.69**	**6.15**	**4.70**	**1.43**	**1.65**	**1.50**	**16.48**	**5.39**	**6.14**	**2.17**

NOTE: The entries in the table are averages of quarterly transition probabilities expressed in percentage point. The last row of each country group reports the (unweighted) average of the numbers in each column.

non-participation both from employment (EN) and from unemployment (UN) portray stable patterns for prime-age individuals (those aged 25 to 54), while they show a negative slope at younger ages and an increase for older workers. The job-finding probability (UE) shows an increase until mid-20s and then a slight but persistent decrease. The probabilities of going from non-participation to both employment and unemployment (NE and NU) show hump-shaped patterns, peaking in the mid-20s and steadily decreasing from that point to age 65. These findings are very similar to the ones documented for the U.S. by Choi et al. (2015).

As for the differences between males and females, we can see that their profiles portray similar shape and mostly differ by levels. The differences in levels are mainly concentrated on transitions towards non-participation, particularly so around ages 20-30, which is likely related to fertility and child-rearing.

Figure 1a portrays life-cycle transition profiles of male and female workers in France. Comparing transition probabilities to European averages, we see that French workers are facing transition probabilities that are overall relatively similar to European averages. Older workers of both gender appear to face a significantly lower probability of finding a job when unemployed compared to their colleagues in other European countries.

German labor market, depicted in Figure 1b, portray large differences in levels of transition probabilities between employment and unemployment, which persist over the whole of the life cycle. For both genders, job-loosing (EU) and job-finding (UE) probabilities are significantly below European averages. This implies German labor market is less dynamic overall: finding jobs out of unemployment is more difficult, but once employed, jobs last longer.

Italian labor market, depicted in Figure 1c, is characterized by labor market transitions out of employment (EU and EN) that are similar to European averages for both genders. A striking difference appears when looking at job finding rates: young workers of both sexes in Italy are facing a significantly lower job finding probability (UE) than their peers in Europe. The gap in job-finding rates closes down only in the 40s. This is consistent with a well known fact that Italy has one of the highest youth unemployment rates in Europe (see, e.g., Caliendo and Schmidl (2016)). Also, female transition to employment out of non-participation is remarkably low across all of the life cycle. This is consistent with low female participation an Italy, a phenomena common to most countries in Southern Europe (see Olivetti and Petrongolo (2008); Dolado et al. (2017) among others).

3.2 Markov Chain

Following much of the literature, we use a first-order Markov chain to link worker stocks and flows data. This process is a key building block of the analysis that we undertake in the next section. It is therefore important to verify whether it can aptly describe the main outcomes of interest.

Starting from the distribution of workers across at age $a = 16$, $\begin{bmatrix} E & U & N \end{bmatrix}'_{16}$, we calculate

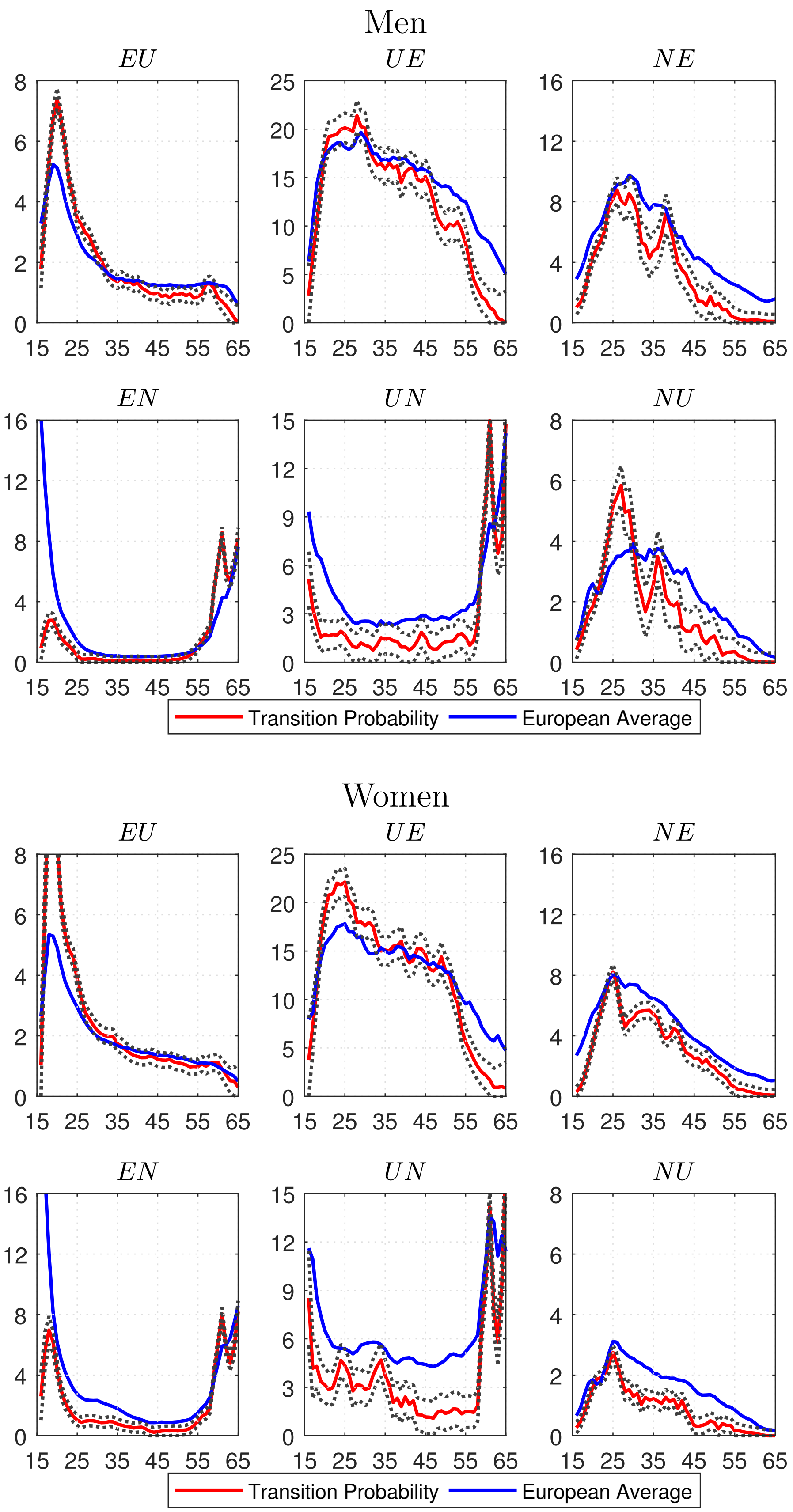

Figure 1a: Transition probabilities in France: Men (top) and women (bottom)

NOTE: The plots show quarterly transition probabilities expressed in percentage points. The dotted lines are 95 percent confidence intervals.

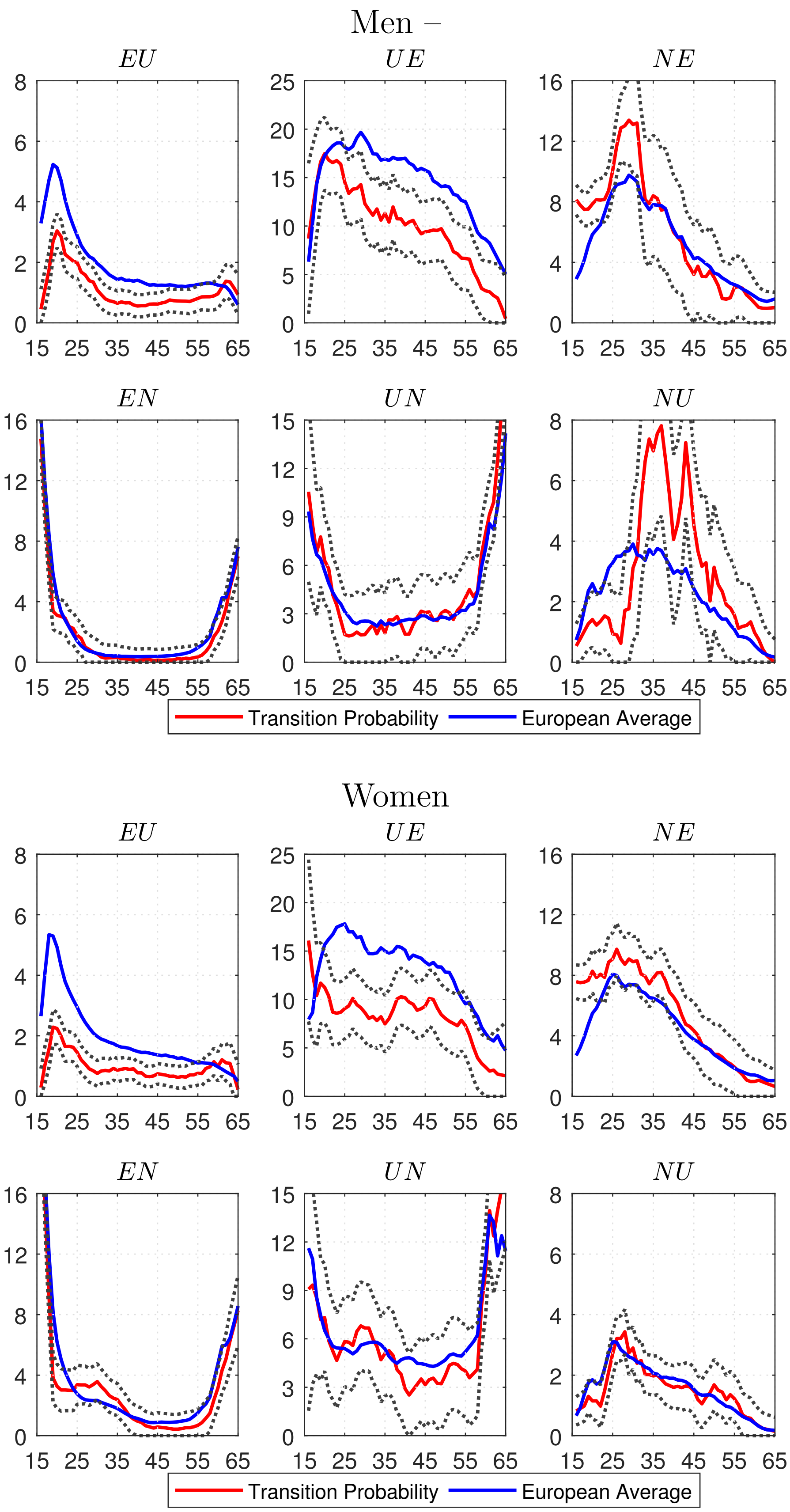

Figure 1b: Transition probabilities in Germany: Men (top) and women (bottom)

NOTE: The plots show quarterly transition probabilities expressed in percentage points. The dotted lines are 95 percent confidence intervals.

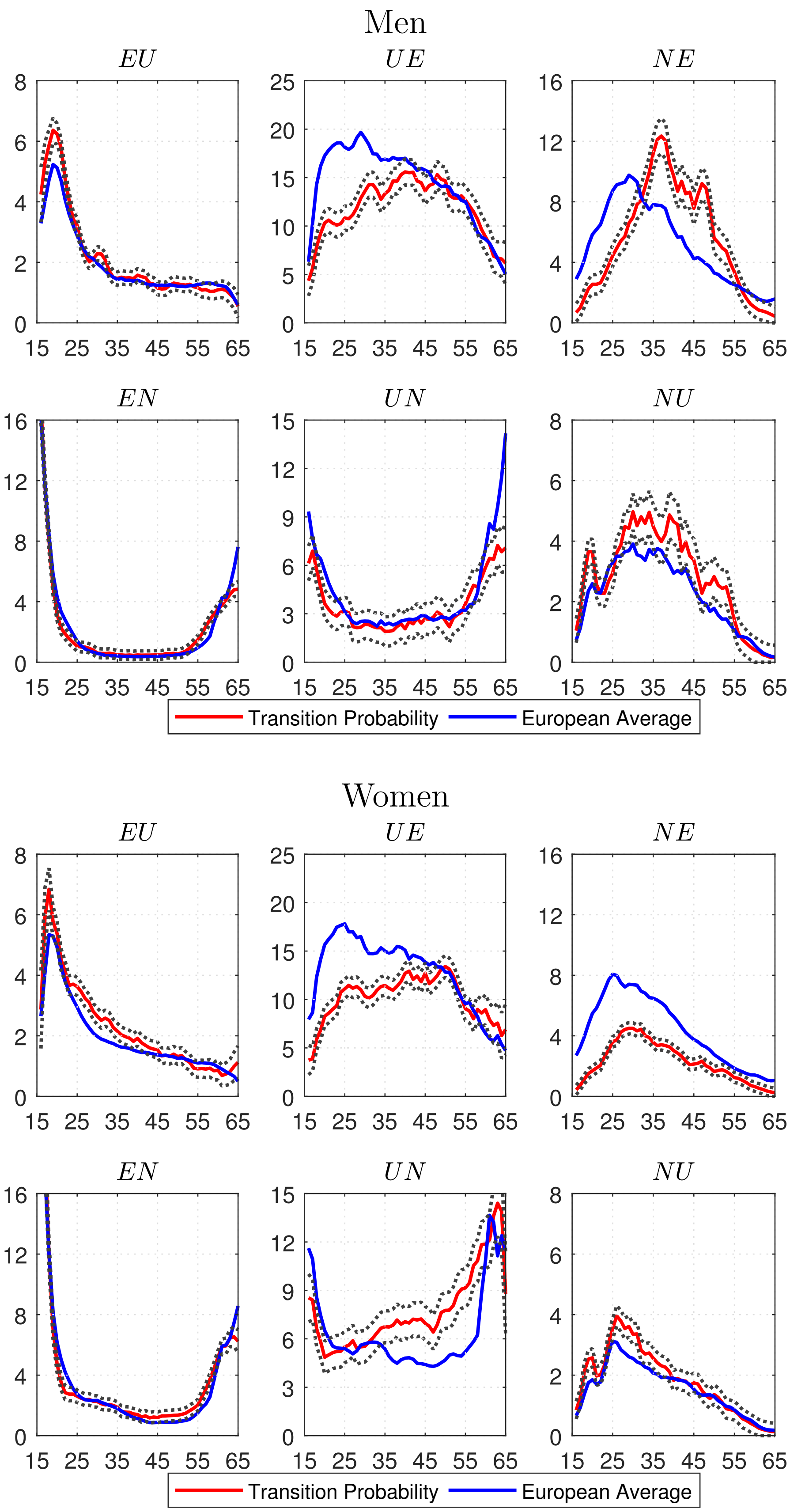

Figure 1c: Transition probabilities in Italy: Men (top) and women (bottom)

NOTE: The plots show quarterly transition probabilities expressed in percentage points. The dotted lines are 95 percent confidence intervals.

the predicted stocks in each labor market state at any age a , by

$$\begin{bmatrix} E \\ U \\ N \end{bmatrix}_a = \prod_{\tau=16}^{a-1} \left(\Gamma'_\tau\right)^4 \begin{bmatrix} E \\ U \\ N \end{bmatrix}_{16} . \tag{4}$$

The specific question we address is: based on the quarterly transition probabilities that we estimated in the previous section, are the employment rates implied by a first-order Markov-chain (i.e. based on the stocks in equation (4)) consistent with their actual counterparts? The answer to this question depends not only on the transition probabilities but also on some initial conditions, namely the distribution of workers across E, U, N at age $a = 16$. We set initial conditions by searching a distribution at age 16, $\begin{bmatrix} E & U & N \end{bmatrix}'_{16}$, that maximizes the fit between the Markov-implied employment rates and the actual employment rates.[3]

The plots of Figure 2 show that we obtain a very good fit for the 'big three' economies of Continental Europe. In fact, in all countries the R-squared of the regression of the dotted line against the solid line is above 95 percent. Notice that the Markov chain model does very well in reproducing a hump in female employment around ages 25-40 in France and Germany. The fit of implied employment profiles is important, because in what follows we are going to use the statistical model to make a decomposition.

4 Statistical Decompositions

From this point on, for each country we use the initial distribution across E, U, N derived in Subsection 3.2 and the subsequent distributions implied by the Markov chain.

4.1 Framework

Our goal is to relate aggregate cross-country differences in employment rates to the behavior of worker flows over the life cycle. Aggregate differences depend not only on worker flows, but also on demographics and on the initial conditions at age $a = 16$. To see this, denote by E^c the aggregate employment rate of country c, and let E^r refer to some reference employment rate (say, the average of employment rates across the thirty-one countries in our sample). The employment rate of country c is given by

$$E^c = \sum_a W_a^c E_a^c, \tag{5}$$

where W_a^c is the population weight of workers at age a and E_a^c denotes their employment rate.[4] We call E_a^c the age (or life-cycle) profile of employment in country c. To compare c and r, we can use

$$E^c - E^r = \sum_a \left(W_a^c - W_a^r\right) E_a^c + \sum_a \left(E_a^c - E_a^r\right) W_a^r. \tag{6}$$

[3]We use a pattern-search approach to find the initial labor force distribution.

[4]Just like the other life cycle profiles, we extracted W_a^c using the estimation based on equation (2).

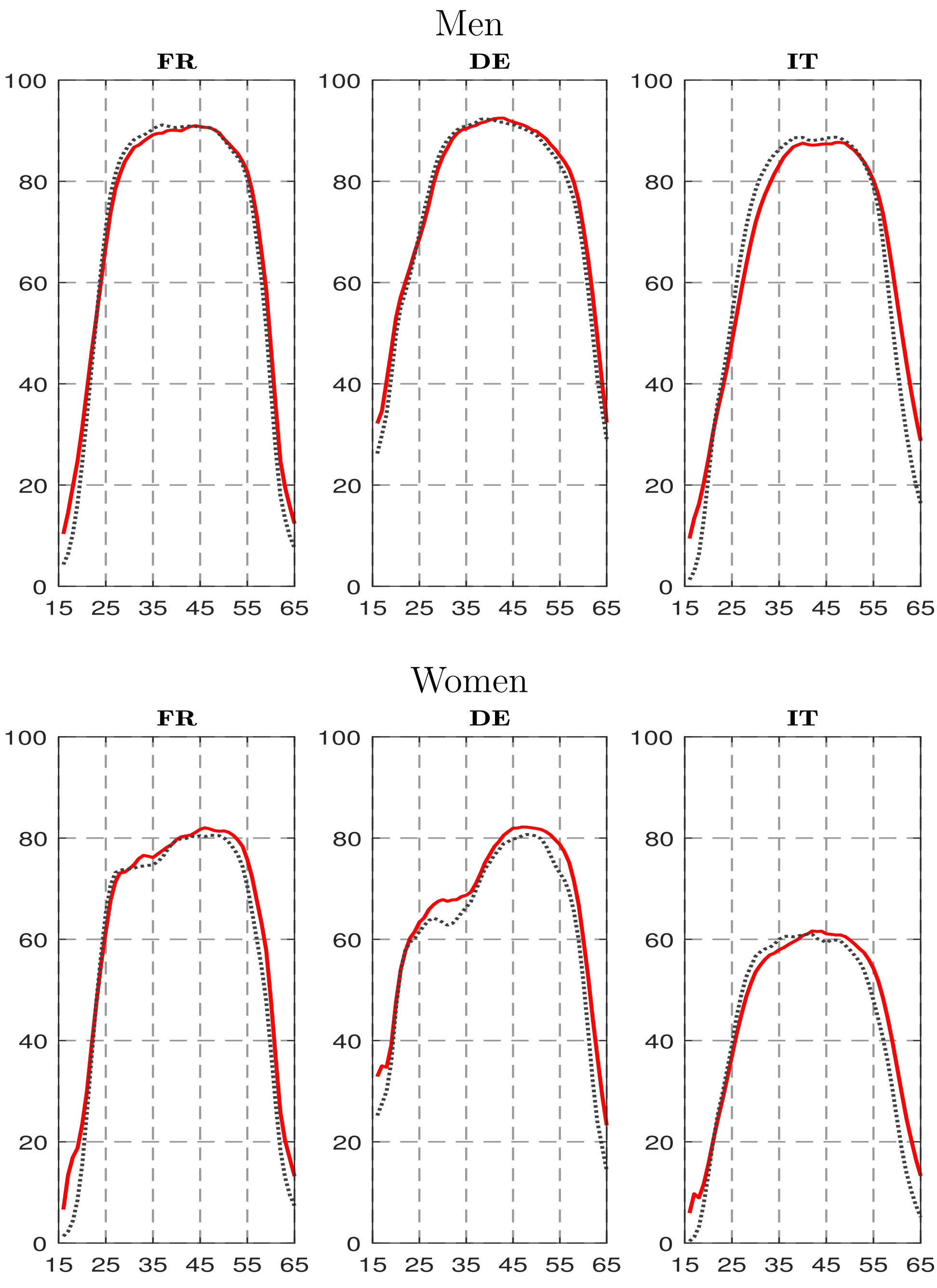

Figure 2: Markov-implied vs. actual employment rates: Men (top) and women (bottom)

NOTE: The plots show the employment rates in France, Germany and Italy. The solid lines are the Markov-implied and the dotted lines are the actual employment rates.

Equation (6) *minimizes* the role of demographics in explaining employment differences between c and r. Since we have little to say about demographic differences, we seek to keep the demographics-adjusted employment gap, $\sum_a (E_a^c - E_a^r) W_a^r$, as large as possible.

Next, consider calculating the life-cycle profile of employment based on country c's transition probabilities and r's initial conditions (instead of using country c's initial conditions). Denote by $\widetilde{E_a^c}$ this counter-factual employment profile. We have:

$$E_a^c - E_a^r = E_a^c - \widetilde{E_a^c} + \widetilde{E_a^c} - E_a^r, \tag{7}$$

which can be plugged into equation (6). So doing, we arrive at

$$E^c - E^r = \underbrace{\sum_a (W_a^c - W_a^r) E_a^c}_{\text{demographics}} + \underbrace{\sum_a \left(E_a^c - \widetilde{E_a^c}\right) W_a^r}_{\text{initial conditions}} + \underbrace{\sum_a \left(\widetilde{E_a^c} - E_a^r\right) W_a^r}_{\text{transition probabilities}}. \tag{8}$$

In what follows, we focus on explaining the employment gap driven by transition probabilities, namely $\sum_a \left(\widetilde{E_a^c} - E_a^r\right) W_a^r$.

The goal of the subsequent step is to isolate the contribution of each labor market flow to the employment gap due to transition probabilities. Let $\widetilde{E_a^c}^{p_1,p_2,\dots}$ denote the age-profile of employment in country c starting from r's initial condition *and* using r's transition probabilities $p_1, p_2, \dots$. The remaining probabilities of the counterfactual transition matrices ($\widetilde{\Gamma}_a$'s) are those measured in country c, and we keep the $\widetilde{\Gamma}_a$'s well defined by adjusting the probabilities of staying in each state $\{EE, UU, NN\}$. So, we decompose the difference in life-cycle employment profiles between c and r due to transition probabilities based on

$$\widetilde{E_a^c} - E_a^r = \underbrace{\widetilde{E_a^c} - \widetilde{E_a^c}^{EU}}_{EU} + \underbrace{\widetilde{E_a^c}^{EU} - \widetilde{E_a^c}^{EU,EN}}_{EN} + \underbrace{\widetilde{E_a^c}^{EU,EN} - \widetilde{E_a^c}^{EU,EN,UE}}_{UE} \tag{9}$$

$$+ \underbrace{\widetilde{E_a^c}^{EU,EN,UE} - \widetilde{E_a^c}^{EU,EN,UE,UN}}_{UN} + \underbrace{\widetilde{E_a^c}^{EU,EN,UE,UN} - \widetilde{E_a^c}^{EU,EN,UE,UN,NE}}_{NE} + \underbrace{\widetilde{E_a^c}^{EU,EN,UE,UN,NE} - E_a^r}_{NU}.$$

Notice that the decomposition of $\widetilde{E_a^c} - E_a^r$ along the lines of equation (9) is path-dependent and thus not unique. In fact, there are $6! = 720$ ways of writing this decomposition, and $2^{6-1} = 32$ ways of measuring the contribution of a given transition probability. The employment rate depends on the transition probabilities in a non-linear fashion, and therefore those different approaches to decomposing $\widetilde{E_a^c} - E_a^r$ might lead to different results. We address this issue using the Shapley decomposition following Shorrocks (2013). The procedure calculates marginal contributions of each transition probability to the aggregate employment gap in all 720 decompositions and then averages them out. The major gain from this approach is that it eliminates path-dependency (i.e. the specific order in which, for instance, we write equation (9)) in the measurement of the role of each worker flow. To our knowledge, we are the first to apply the Shapley decomposition to the study of worker flows.

4.2 Results

Tables 2a and 2b present the results of decomposing each country's employment gap relative to the population-weighted average of employment rates across the thirty-one countries in our sample using the Shapley decomposition. Tables 2a and 2b are for male and female individuals, respectively. Again, we group our sample of countries into the following groups: Nordic countries, countries of Western and Southern Europe, Baltic states and countries of Eastern Europe. The last row of each country group reports the (unweighted) average of the numbers in each column.

Looking at Table 2a, the first column shows the raw aggregate employment gap (relative to the population-weighted average employment across countries). It uncovers large differences in aggregate employment rates for male workers across Europe. The total gap varies from -13.63 percentage points in Croatia to 14.73 percentage points in Switzerland. Nordic and Western Europe economies appear to be employing a significantly larger share of their male workforce as opposed to the rest of the Europe. Male employment in Baltic states appear to be particularly low with an average gap of almost 6 percentage points.

The second, third and fourth columns of Table 2a show the total gap explained by differences in demographics, initial conditions and transition probabilities, corresponding to the components of equation (8). The results show that most of the gap in aggregate male employment across European countries is due to the transition probabilities. The demographics and the initial conditions play almost a negligible role. Interestingly, the Baltic states is the only region where the demographic composition of the male workforce explains on average more than 1 percentage point of the total gap in aggregate employment.

The rest of the columns in Table 2a present the results of decomposing each country's total contribution of transition probabilities based on each labor market flow using the Shapley decomposition. Despite a lot of variance in the data, some patterns emerge. Transitions out of employment (EU and EN) appear to be the most important quantitatively. On the other hand, the contributions of flows from non-participation to employment (NE) appear to be very important as well. Interestingly, the importance of job-finding rates out of unemployment (UE) shows up to be of second order.

Table 2b presents the results for females. The differences in total female employment rates across European countries are more striking. They vary from -13.21 percentage points in Italy to 17.14 percentage points in Iceland. Again, Nordic and Western Europe economies appear to be employing a significantly larger share of their female workforce. This group is joined by the Baltic states with an average female employment 2.4 percentage point higher comparing with the average across all countries. Southern European countries appear to be doing the worst: their female employment rates are on average 7.05 percentage point lower.

4.3 Variance Decomposition

To synthesize our main findings, Table 3 computes a variance decomposition of both equations that we use to make statistical decompositions: the total gap in employment and the contributions of transition probabilities. The top and bottom panels show the results for male and

Table 2a: Decomposing the employment gap: Men

	Total gap	Demog-raphics	Initial cond.	Transition probab.	Transition probablities *EU*	*EN*	*UE*	*UN*	*NE*	*NU*
Nordic countries:										
Denmark	1.32	0.27	-0.52	1.57	1.54	-1.86	0.93	-1.32	2.02	0.26
Finland	-5.42	-0.18	-0.14	-5.10	-3.69	-8.36	1.08	-0.66	5.85	0.68
Iceland	9.61	-1.00	0.32	10.30	0.51	-7.11	3.98	-0.52	12.51	0.93
Norway	1.21	-1.60	-1.08	3.89	5.71	-1.54	0.55	-0.93	0.63	-0.53
Sweden	7.04	-0.56	-0.04	7.63	0.92	-3.71	3.49	-0.98	7.08	0.84
Average	**2.75**	**-0.61**	**-0.29**	**3.66**	**1.00**	**-4.52**	**2.00**	**-0.88**	**5.62**	**0.43**
Western Europe:										
Austria	3.10	0.10	0.07	2.93	-1.27	-0.93	3.97	-0.34	1.55	-0.06
Belgium	-5.51	-0.22	0.05	-5.34	3.09	-2.78	-3.86	-0.10	-1.74	0.05
Switzerland	14.73	0.72	1.07	12.93	4.65	2.82	2.47	-0.29	3.52	-0.24
Germany	6.15	-0.03	0.49	5.69	4.10	3.25	-2.75	-0.05	1.06	0.08
France	-2.44	-1.43	-1.21	0.20	0.43	3.35	-1.35	1.29	-3.08	-0.45
Ireland	-7.40	-3.06	-0.39	-3.95	-0.81	0.15	-4.30	0.16	0.72	0.13
Luxembourg	1.13	1.15	-1.20	1.18	3.05	2.03	-0.25	0.31	-3.17	-0.80
Netherlands	4.09	1.28	-0.31	3.12	3.23	-2.92	-0.62	0.45	3.36	-0.39
United Kingdom	5.29	0.35	-0.14	5.08	2.69	0.49	1.58	-0.89	1.31	-0.11
Average	**2.13**	**-0.12**	**-0.17**	**2.43**	**2.13**	**0.61**	**-0.57**	**0.06**	**0.39**	**-0.20**
Southern Europe:										
Cyprus	-3.22	-3.32	-0.19	0.30	-4.87	3.53	4.57	0.63	-3.12	-0.44
Spain	-4.77	1.24	-0.15	-5.87	-7.42	1.88	0.70	1.25	-2.47	0.20
Greece	-5.10	1.12	-0.65	-5.58	-4.64	1.92	1.00	1.20	-4.85	-0.21
Italy	-3.27	1.06	0.08	-4.41	-0.28	-1.08	-2.02	0.25	-1.62	0.33
Malta	3.22	-0.83	0.42	3.63	5.38	1.15	-1.91	0.32	-0.95	-0.38
Portugal	-8.25	-0.79	0.78	-8.24	-3.83	-7.60	0.07	0.14	2.80	0.17
Average	**-3.57**	**-0.25**	**0.05**	**-3.36**	**-2.61**	**-0.03**	**0.40**	**0.63**	**-1.70**	**-0.05**
Baltic States:										
Estonia	-4.77	-1.52	-0.50	-2.75	-1.96	-1.01	0.75	-0.28	0.19	-0.44
Lithuania	-6.85	-1.30	0.15	-5.70	-2.95	-1.23	-0.35	0.60	-1.50	-0.27
Latvia	-5.76	-0.90	0.20	-5.06	-5.84	-0.91	0.51	0.87	0.04	0.28
Average	**-5.79**	**-1.24**	**-0.05**	**-4.50**	**-3.58**	**-1.05**	**0.30**	**0.40**	**-0.42**	**-0.14**
Eastern Europe:										
Bulgaria	-5.74	-0.23	0.13	-5.64	-5.16	1.10	-1.64	1.90	-1.43	-0.42
Czech Republic	3.01	-0.41	-1.18	4.60	2.33	6.30	0.16	1.73	-5.00	-0.91
Croatia	-13.63	-0.44	-0.04	-13.15	-6.81	-4.77	-4.67	1.31	1.79	-0.01
Hungary	-4.86	-0.88	0.09	-4.06	-3.67	-1.15	3.09	0.21	-2.06	-0.48
Poland	-2.62	-0.13	0.26	-2.75	-1.01	-2.06	0.94	0.51	-0.75	-0.38
Romania	7.44	0.21	2.62	4.61	7.23	5.55	-2.80	0.86	-5.03	-1.20
Slovenia	-3.17	0.65	-0.02	-3.80	0.44	2.91	-0.91	-2.07	-5.17	1.00
Slovakia	-3.53	-1.45	0.41	-2.49	1.31	-0.27	-1.79	1.23	-2.46	-0.51
Average	**-2.89**	**-0.34**	**0.28**	**-2.84**	**-0.67**	**0.95**	**-0.95**	**0.71**	**-2.51**	**-0.36**

NOTE: The entries in the table are employment gaps (relative to the population-weighted average of employment across countries) expressed in percentage point. The first column shows the raw employment gap; the second and third columns show the gap explained by differences in demographics and initial conditions, respectively; the fourth column shows the gap explained by differences in transition probabilities. The latter is decomposed into the gap explained by each transition probability in the remaining columns of the table. The last row of each country group reports the (unweighted) average of the numbers in each column.

Table 2b: Decomposing the employment gap: Women

	Total gap	Demog-raphics	Initial cond.	Transition probab.	Transition probablities					
					EU	*EN*	*UE*	*UN*	*NE*	*NU*
Nordic countries:										
Denmark	4.81	-0.36	-0.53	5.70	1.72	-0.45	1.46	-1.02	2.86	1.12
Finland	3.41	-0.55	-0.14	4.10	-1.75	-8.89	2.45	-0.65	11.98	0.95
Iceland	17.14	-0.44	0.43	17.16	1.42	-5.81	4.08	-1.12	17.23	1.36
Norway	3.65	-1.75	-1.08	6.47	4.81	-0.52	0.95	-0.10	2.26	-0.93
Sweden	14.96	-0.38	0.01	15.33	1.89	-3.25	3.15	-0.92	13.35	1.12
Average	**8.79**	**-0.70**	**-0.26**	**9.75**	**1.62**	**-3.78**	**2.42**	**-0.76**	**9.54**	**0.72**
Western Europe:										
Austria	-1.56	0.52	-0.77	-1.31	-1.03	-4.21	3.06	-0.42	1.70	-0.41
Belgium	-2.91	-0.58	-0.06	-2.26	2.14	-0.16	-2.90	0.36	-1.45	-0.25
Switzerland	14.69	0.08	1.43	13.18	4.17	0.88	1.58	-0.15	7.07	-0.38
Germany	7.40	0.64	0.35	6.40	4.08	2.63	-2.93	0.29	2.37	-0.04
France	2.70	-0.82	-0.67	4.19	-0.20	8.06	-0.30	1.82	-4.11	-1.07
Ireland	-6.38	-0.73	-0.40	-5.25	-0.17	-5.50	2.28	-0.65	-0.11	-1.11
Luxembourg	0.00	1.04	-2.16	1.12	2.83	3.28	0.66	-0.03	-4.25	-1.38
Netherlands	6.51	0.93	-0.12	5.69	3.56	0.56	-1.86	0.49	3.57	-0.62
United Kingdom	6.97	0.47	0.07	6.44	3.65	-2.51	2.18	-0.65	4.57	-0.79
Average	**3.05**	**0.17**	**-0.26**	**3.13**	**2.11**	**0.34**	**0.20**	**0.12**	**1.04**	**-0.67**
Southern Europe:										
Cyprus	0.18	-1.79	-0.82	2.79	-6.65	7.45	6.16	1.71	-5.37	-0.52
Spain	-6.20	0.92	0.05	-7.17	-9.43	2.74	0.40	0.56	-3.55	2.11
Greece	-12.32	0.41	-0.06	-12.67	-5.12	0.40	-0.95	1.56	-8.31	-0.27
Italy	-13.21	0.47	-0.08	-13.60	-0.97	-2.13	-2.21	-0.72	-7.95	0.38
Malta	-7.18	-0.92	0.21	-6.48	6.06	-1.99	0.35	-0.96	-7.27	-2.67
Portugal	-3.55	-0.62	0.39	-3.31	-4.28	-7.27	0.38	0.48	6.35	1.03
Average	**-7.05**	**-0.25**	**-0.05**	**-6.74**	**-3.40**	**-0.13**	**0.69**	**0.44**	**-4.35**	**0.01**
Baltic States:										
Estonia	3.92	-1.87	-0.08	5.87	0.78	0.25	1.67	-0.40	3.98	-0.43
Lithuania	1.68	-1.46	-0.10	3.24	0.23	2.29	-0.08	0.40	0.52	-0.12
Latvia	1.61	-1.30	-0.04	2.96	-2.32	1.41	1.46	0.25	0.84	1.32
Average	**2.40**	**-1.55**	**-0.07**	**4.02**	**-0.44**	**1.32**	**1.02**	**0.09**	**1.78**	**0.26**
Eastern Europe:										
Bulgaria	-3.25	-1.02	-0.03	-2.21	-3.58	3.62	-1.70	2.06	-2.44	-0.17
Czech Republic	-0.82	-1.31	-1.30	1.79	1.50	3.98	-0.52	1.70	-4.61	-0.26
Croatia	-9.71	-1.16	-0.04	-8.51	-6.24	0.23	-4.69	1.75	-1.43	1.88
Hungary	-4.88	-1.70	-0.02	-3.17	-1.52	-0.88	2.18	-0.06	-2.59	-0.29
Poland	-5.98	-1.12	0.02	-4.89	-0.14	-0.86	-1.13	0.45	-3.15	-0.04
Romania	-1.93	-0.60	0.73	-2.07	8.27	3.80	-3.30	0.48	-8.74	-2.56
Slovenia	-1.00	-0.54	-0.30	-0.16	-0.14	7.94	-2.22	-1.25	-7.19	2.70
Slovakia	-1.39	-1.48	-0.41	0.50	1.54	0.16	-1.82	1.44	-1.13	0.31
Average	**-3.62**	**-1.11**	**-0.17**	**-2.34**	**-0.04**	**2.25**	**-1.65**	**0.82**	**-3.91**	**0.20**

NOTE: The entries in the table are employment gaps (relative to the population-weighted average of employment across countries) expressed in percentage point. The first column shows the raw employment gap; the second and third columns show the gap explained by differences in demographics and initial conditions, respectively; the fourth column shows the gap explained by differences in transition probabilities. The latter is decomposed into the gap explained by each transition probability in the remaining columns of the table. The last row of each country group reports the (unweighted) average of the numbers in each column.

Table 3: Variance decomposition

	Total Gap			Transition probablities					
	Demog-raphics	Initial cond.	Transition probab.	*EU*	*EN*	*UE*	*UN*	*NE*	*NU*
Males	5.03	3.06	91.91	48.71	16.25	17.66	-5.40	23.46	-0.69
15-24	-0.06	24.65	75.41	18.38	22.48	11.73	-0.12	48.14	-0.62
25-54	1.59	-0.42	98.83	57.14	22.64	15.76	-5.12	10.49	-0.92
55-65	-4.01	-0.05	104.05	11.61	39.27	18.62	-0.05	28.71	1.84
Females	0.82	1.63	97.55	23.02	-2.50	15.68	-4.02	66.64	1.17
15-24	-0.74	17.17	83.57	13.21	13.29	12.91	2.07	58.39	0.12
25-54	-0.60	-0.25	100.85	28.05	4.11	14.24	-3.73	55.18	2.15
55-65	-1.57	-0.004	101.58	2.40	40.20	11.43	0.54	42.26	3.17

NOTE: The entries in the table are contributions of each factor (in columns) to total aggregate employment variance across European countries.

female workers, respectively. We compute the results for all workers and also by splitting our sample into young (those aged 16-24), prime-age (25-54) and older (55-65) workers. Table 3 confirms the result that labor flows are key in understanding differences in labor market outcomes over the life cycle across countries: transition probabilities explain 91.91% and 97.55% of total variance in male and female employment gaps across countries. Not surprisingly, we find that initial conditions matter and only to a certain degree at the beginning of the life-cycle, i.e. among young workers. Variance in initial conditions explain 24.65% and 17.17% of total employment variance across young male and female workers, respectively.

As a result of these findings, we shall focus on the employment gaps due to transition probabilities and, by abuse of language, shall refer to them as total employment gaps.

Turning to the second half of Table 3, we see that job separations to unemployment (EU) explain almost half of the variance in total employment gaps. The second most important flow is the job-finding out of non-participation flow (NE), which accounts for almost half of the total variance. The rest of the variance is accounted by job separations to unemployment (EU) and job findings out of unemployment (UE). The flows between unemployment and non-participation (UN and NU) do not appear to be of any importance in understanding employment gaps across Europe. Our findings change a bit quantitatively when considering age subgroups. Not surprisingly, for young individuals the most important margin is the job finding rate out of non-participation (NE). It explains almost half of the variance in employment of young male workers across countries. For older workers, flows between employment and non-participation account for more than two third of the total variance with the most important being the job separations into non-participation.

Looking at the results for female workers, two third of the total variance is accounted by the job-finding rate out of non-participation (NE). The latter flow remains the most important when considering the results by age subgroups. Again, for older female workers labor flows between employment and non-participation (EN and NE) account for the majority of the cross-country variance in the employment gaps.

5 Conclusion

In this paper, we provide a comprehensive account of the relationship between cross-country differences in aggregate employment and disaggregated differences in worker flows along the life cycle. Overall, our results shed light on the importance of separations when accounting for differences in employment outcomes both aggregate and over the life-cycle across Europe. Our result complements the literature on the importance of the worker flows in explaining the dynamics of unemployment. Elsby et al. (2013) show that, unlike the US labor market, most European labor market are characterized by the importance of the inflows of the unemployment. We add to this picture the fact the the inflows are also key in understanding cross-country differences in aggregate labor market outcomes.

References

Caliendo, M. and R. Schmidl (2016): "Youth unemployment and active labor market policies in Europe," *IZA Journal of Labor Policy*, 5, 1.

Choi, S., A. Janiak, and B. Villena-Roldán (2015): "Unemployment, participation and worker flows over the life-cycle," *The Economic Journal*, 125, 1705–1733.

Dolado, J. J., C. Garcia-Peñalosa, and L. Tarasonis (2017): "The changing nature of gender selection into employment: Europe over the Great Recession," *IZA Discussion paper 10729*.

Elsby, M. W., B. Hobijn, and A. Şahin (2013): "Unemployment dynamics in the OECD," *Review of Economics and Statistics*, 95, 530–548.

——— (2015): "On the importance of the participation margin for labor market fluctuations," *Journal of Monetary Economics*, 72, 64–82.

Fujita, S. and G. Ramey (2009): "The cyclicality of separation and job finding rates," *International Economic Review*, 50, 415–430.

Gomes, P. (2012): "Labour market flows: Facts from the United Kingdom," *Labour Economics*, 19, 165–175.

Olivetti, C. and B. Petrongolo (2008): "Unequal pay or unequal employment? A cross-country analysis of gender gaps," *Journal of Labor Economics*, 26, 621–654.

Petrongolo, B. and C. A. Pissarides (2008): "The ins and outs of European unemployment," *American Economic Review*, 98, 256–62.

Shimer, R. (2012): "Reassessing the ins and outs of unemployment," *Review of Economic Dynamics*, 15, 127–148.

Shorrocks, A. F. (2013): "Decomposition procedures for distributional analysis: A unified framework based on the Shapley value," *Journal of Economic Inequality*, 1–28.

Ward-Warmedinger, M. and C. Macchiarelli (2014): "Transitions in labour market status in EU labour markets," *IZA Journal of European Labor Studies*, 3, 17.