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Article

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ORIGINAL ARTICLE

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Employment trajectories of workers in low-skilled jobs in Western Germany

Arthur Kaboth^{1*} , Lena Hünefeld¹ and Ralf Himmelreicher²

Abstract

According to the segmentation theory, low-skilled jobs belong to the secondary sector of the labour market. Low-skilled jobs do not require vocational training and workers are interchangeable. Therefore, workers in this sector have poor working conditions and are regularly affected by employment interruptions. The current state of research, however, does not provide any longitudinal information about individual employment stability of workers performing low-skilled jobs. Furthermore, most of these workers are employed full-time and have completed professional training. Against this background, this paper deals with employment trajectories of workers in low-skilled jobs and their changes over time with regard to standard employment relationship. The aim of the explorative study is to analyse the assignment of workers in low-skilled jobs within the segmentation theory and to determine how segments have changed over time.

We use data from the German Socio-Economic Panel (GSOEP) to analyse the employment trajectories of two cohorts aged 35 to 44 years in Western Germany over a period of ten years. The employment trajectories are compared by means of sequence analysis with optimal matching algorithm as well as cluster analysis applying the “Partitioning Around Medoids” method (PAM) in combination with results from hierarchical ward clusters. The employment trajectories indicate that low-skilled jobs can be assigned to both the secondary and the primary sectors. The cohort comparison of employment trajectories shows change and continuity in the context of segments.

Keywords Low-skilled jobs, Employment trajectories, Standard employment, Segmentation theory, Sequence and cluster analysis

JEL Classification C38, J42, J62

1 Introduction

Low-skilled jobs—meaning activities for which no professional training is required—are characterised by high physical as well as psychological demands that can have impacts on employees’ health. Moreover, jobs in this segment are more likely to be of a temporary nature with low incomes (Lück and Kopatz 2021; Hall and Sevindik

2020; Kaboth et al. 2021, 2022). However, findings also point to a noticeable change in low-skilled jobs. This change is characterised by an increase in more complex activities, greater autonomy and growing demands (Abel et al. 2011; Abel et al. 2009; Bosch and Weinkopf 2011; Jaehrling and Weinkopf 2006). In this context, Bosch and Weinkopf (2011) emphasise the increase in the number of employees with professional training working in low-skilled jobs as an important indication of the differentiation of low-skilled jobs (Bosch and Weinkopf 2011).

Against this background, the segmentation theory of the labour market developed by Sengenberger (1975, 1987) is of particular interest for low-skilled work. Firstly, these jobs assign to the unstructured labour market or the secondary sector, primarily due to unspecific human

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capital (qualification) and substitutability of workers. As a result, working conditions are poor and it is assumed that workers in these activities are regularly affected by employment interruptions. The opposite pertains to the primary market: good working conditions, specific qualification requirements as well as stable full-time employment. Secondly, according to Sengenberger, mobility between partial labour markets is only possible to a limited extent (Sengenberger 1978, 1987). In this respect, empirical analyses from Blossfeld and Mayer (1988) show that the level of individual qualification is decisive for the entry and long-term retention of employees in a certain sector. A more recent study implies that mobility barriers between primary and secondary sectors still remain (Garz 2013).

The employment trajectories of workers performing low-skilled jobs have not been studied so far, so that an empirical assignment of this group of workers to the segmentation theory is not yet complete. Moreover, low-skilled work has changed, especially with regard to the qualification structure. This might lead to different mobility patterns between or within segments. Therefore, our explorative study aims to assign low-skilled work within the segmentation theory by investigating employment stability from a longitudinal perspective with respect to (non-)standard employment. In addition, our study also aims to shed light on changes in labour market segments over time. Consequently, we analyse employment trajectories by skill levels as well as working time to identify (non-)standard employment relationship. Changes over time are verified by means of a cohort comparison. We examine the following questions: (1) how can labour market segments be characterised with respect to employment trajectories of workers in low-skilled jobs and (2) how do labour market segments change over time?

For this purpose, we use German Socio-Economic Panel (GSOEP) to construct occupational histories of individuals in Western Germany over a period of ten years. We divide the sample into two cohorts born between 1955 and 1959 as well as 1965 and 1969, aged 35 to 44, to see how employment trajectories and labour market segments have changed over time. Therefore, we use sequence analysis with optimal matching algorithm as well as cluster analysis. We combine results from hierarchical ward cluster analysis with the “Partitioning Around Medoids” method (PAM) to improve the quality of the clusters.

1.1 The changes within low-skilled work and labour market segmentation

The segmentation of the labour market described by Sengenberger (1978; 1987) serves as a theoretical reference

point for this paper. Sengenberger’s (1987) model distinguishes between three partial labour markets formed by the combination of two dimensions. The first dimension defines the partial labour markets by “the degree and type of (unilateral or reciprocal) commitment of employers and employees” (Sengenberger 1987, 117). The second dimension covers the quality of employment and divides jobs horizontally into a primary sector with high quality and a secondary sector with low quality job characteristics. This dualisation of the labour market with regard to the quality of employment attests to an accumulation of characteristics, so that the primary sector is described with high wages, low workloads, advancement and career opportunities, less and shorter periods of unemployment, job security and employment stability. The occupational partial labour market, assigned to the primary sector, requires employees to have undergone vocational training and to possess a minimum of occupational or sector-specific skills and knowledge. Another partial labour market in the primary sector is the internal labour market, in which employees from within a company are given preference over external applicants when filling positions (Sengenberger 1987).

The secondary sector—or unstructured labour market—is characterised by an accumulation of negative aspects (Sengenberger 1987; Kalina 2012; Garz 2013) and comprises low-skilled work, that is, activities requiring only “basic civilizational skills” (Sengenberger 1987, 120). The key feature of this segment is that the ties between employees and employers are loose, so that employees are easily exchangeable. This leads to low employment stability and frequent interruptions in employment, so that the employment relationships in this labour market are of low quality (Sengenberger 1987; Kalina 2012). The unstructured labour market, functioning as a buffer market to pass on costs and risks in order to stabilise employment relationships for the primary sector, can be subdivided into two segments: “While in the independent segment jobs and workers are not related to employment in other segments, this is the case in the dependent segment” (Sengenberger 1987, 211).

The dualisation of the labour market is highly interrelated with (non-)standard employment relationships. The primary sector is associated with the standard employment relationship, whereas the secondary sector is characterised by non-standard employment (Reich et al. 1973; Krause and Köhler 2011; Kalina 2012; Garz 2013). In this context, many different definitions of the standard employment relationship have been used to examine labour market processes. However, according to Bosch et al. (2001), full-time employment and employment stability are the core elements for describing the standard employment relationship because they “guarantee a

living wage for the family as well as sufficient social security [...]” (Bosch et al. 2001, 25).

The current state of research only partly supports the assignment of low-skilled jobs to the secondary sector or unstructured labour market. On the one hand, low-skilled jobs are mostly associated with negative characteristics: they are often described as involving monotonous and unhealthy activities with high physical and mental demands as well as low incomes—even in full-time employment. In addition, there is a high share of part-time and temporary employment (Hall and Sevindik 2020; Kaboth et al. 2021, 2022). On the other hand, cross-sectional studies indicate that a large proportion of workers in low-skilled jobs are employed full-time. Longitudinal studies that provide insights into the existence of a standard employment relationship in the context of low-skilled work are not yet available, although research in Germany has a long history. So far, it is unknown whether and to what extent workers in low-skilled jobs are employed in the standard employment relationship (Sengenberger 1978; Falk and Klös 1997; Zeller 2002; Bellmann and Stegmaier 2006; Hall and Sevindik 2020; Kaboth et al. 2022; Abel et al. 2009). In order to verify an empirical assignment of low-skilled work according to segmentation theory, our first research question deals with the following topic: How can labour market segments be characterised with respect to employment trajectories of workers in low-skilled jobs?

According to Sengenberger (1987), segmentation is a dynamic process, which results from the combination of unequal workplaces and unequal access to these jobs. In general, the boundaries between partial labour markets are more or less rigid: mobility between segments is restricted so that transitions between segments can only take place to a limited extent, especially between primary and secondary sectors. Within the primary sector, mobility distinguishes between horizontal, e.g. change of employer or position within the company, as well as vertical mobility in form of promotion or acquiring an additional qualification. Within the secondary sector, there are no restrictions on horizontal mobility due to the loose ties between employer and employee (Sengenberger 1987).

An important factor in the context of mobility is non-standard employment. Results suggest that non-standard employment, especially part-time employment, decreases vertical mobility and lead to so-called lock-in effects (Dütsch and Struck 2014). In addition, according to Blossfeld and Mayer (1988), segmentation of the Western German labour market is mainly the result of qualification barriers, especially between primary and secondary sectors. These results from life course perspective imply, that entry into a segment highly interrelates

with qualification level of employees and the affiliation to a segment remains stable over the course of their employment (Blossfeld and Mayer 1988). Garz (2013) also confirms that the boundaries between primary and secondary sectors remain.

Against this background, we observe changes of the qualification structure within low-skilled work. The share of workers performing low-skilled activities with at least a medium level of qualification, i.e. vocational training, has steadily increased. To date, more than three quarters of workers in low-skilled jobs have a medium or high level of education (Kaboth et al. 2022; Kutzner et al. 2019; Friedrich-Ebert-Stiftung 2006). Studies agree that low-skilled work is affected by a transformation of the work that manifests itself in an increase in more complex activities, in more autonomy and in increasing work demands (e.g. communication skills; (Abel et al. 2009; Abel et al. 2011; Bosch and Weinkopf 2011; Jaehrling and Weinkopf 2005)). According to several authors, the main indication of a change within low-skilled work and the associated increase in more complex activities are noticeable, in particular, in the differentiation of the qualification structure of employees (Abel et al. 2009; Bosch and Weinkopf 2011; Jaehrling and Weinkopf 2006). Findings by Hall and Sevindik (2020) show that the share of more complex activities in low-skilled work are proportionately higher than that of activities with less complexity (Hall and Sevindik 2020).

In summary, medium or high qualification enables workers in low-skilled jobs—assigned to the unstructured labour market—to transition to other segments. As a result, mobility between skill levels respectively segments may have changed. Since part-time employment is described as a barrier to vertical mobility, this change could be limited to those in a standard employment relationship. This leads to our second research question: How do labour market segments change over time?

1.2 Data und methods

The German Socio-Economic Panel (GSOEP), Version 36 (Liebig et al. 2021), serves as the data basis for the following analyses. This data set makes it possible to observe the employment status and working hours (e.g. full- or part-time employment) of people over long periods based on so-called episode or spell data. The monthly data are supplemented with information from the annual panel data.

For operationalising low-skilled work, there are numerous possibilities that have an effect on the proportion of workers in low-skilled jobs within the category of all dependent employees, with the respective proportions ranging from 8 to 40 per cent (Kaboth et al. 2022). The operationalisation method detailed in Abel et al. (2009),

which has been used for this paper, shows that in the representative BIBB/BAuA Employment Survey 2018, workers in low-skilled jobs account for about 25 per cent of all dependent employees (Kaboth et al. 2022). According to data from the IAB Establishment Panel, a representative employer survey of employment parameters at individual establishments, the proportion of those working in low-skilled jobs was 24 per cent overall in 2019, which corresponds to the results of the employment survey (Bellmann 2021; Kaboth et al. 2022). In the GSOEP, low-skilled work is thus operationalised as an activity for which no vocational training is required. Medium-skilled work, on the other hand, includes activities that require vocational training. High-skilled work describes activities that require a university degree or activities in management positions.

The survey includes white-collar workers, blue-collar workers and employed civil servants. Unemployed persons who are potentially available to the labour market are also included. Self-employed persons, on the other hand, are excluded from the study sample. A differentiation between Western and Eastern German employment trajectories is not possible due to the small number of cases. Therefore, the following analyses only reflect Western German employment biographies. In order to guarantee meaningful results on employment trajectories, the sample only includes persons who have provided information on their employment status for ten years (120 months) without interruption (balanced panel design). In comparison to other employment history analyses, this is considered an appropriate period of time (Trischler 2014; Zähle et al. 2009; Falk 2005). Gaps in the employment trajectories were filled using the approach of logical imputation developed by Scherer and Brüderl (2010). Due to the balanced panel design (ten years) and missing information on the occupational status (low-, medium- or high-skilled job) many cases had to be excluded.

The study population is divided into two cohorts in order to determine changes in employment trajectories over time and analysed separately. Two cohorts in the prime working age of 35 to 44 years are examined. The cohort born between 1955 and 1959 comprises 519 persons and therefore covers the period from 1990 to 2003. The cohort born between 1965 and 1969 consists of 795 persons. This corresponds to the period from 2000 to 2013.¹ These exact two cohorts have been selected for two reasons: (1) there is a relatively large time gap between the cohorts that enables the identification of

period effects; (2) the other cohorts in question consisted of too few cases. The most recent cohort of those born between 1970 and 1974 (2005 to 2018) available in the data has a significantly shorter participation period in the GSEOP compared to the cohorts included in our analyses.

In order to map and compare the employment trajectories, both sequence and cluster analyses are carried out. According to Stegmann et al. (2013), sequence analyses cannot serve to identify causal relationships. The focus of this method is on life courses that are followed as a whole and compared to other life courses (Stegmann et al. 2013). The advantage of this method, for example in comparison to latent class analysis, is that variations within employment histories are better represented. Research on low-skilled work has often been neglected, so that exploratory methods such as these can help to identify and develop further research questions as well as provide information for statistical models (Barban and Billari 2012; Piccarreta and Studer 2019). In order to identify patterns and similarities between employment trajectories, a distance matrix is needed. This is calculated using the so-called optimal matching algorithm (OM). Although the algorithm is criticised for various reasons (Liao et al. 2022; Studer and Ritschard 2016), we find OM appropriate for our research questions. The objective of OM is to identify similarities observed by duration of states, which is in line with our research questions concerning employment trajectories (Studer and Ritschard 2016; Halpin 2010). Moreover, Halpin (2010) underlines the relative robustness of the conventional OM, especially in terms of employment trajectories. Prior to this, however, the costs for the transformation of the data are determined via the transition rate, from which the (dis-) similarities of the sequences ultimately result (Stegmann et al. 2013; Scherer and Brüderl 2010; Biemann 2011). If, for example, the comparison of two sequences results in zero costs, the employment trajectories are identical and consist of the same chronological sequence of employment states.

By combining spell and panel data, a total of ten employment states have been identified that are relevant for answering the research questions: (1) full-time, low-skilled work (FTLW); (2) part-time, low-skilled work (PTLW); (3) full-time, medium-skilled work (FTMW); (4) part-time, medium-skilled work (PTMW); (5) full-time, high-skilled work (FTHW); (6) part-time, high-skilled work (PTHW); (7) full-time, no indication (FTNA); (8) part-time, no indication (PTNA); (9) unemployment (UE); and (10) inactivity (NW). Following Bosch et al. (2001), this study defines continuous full-time employment without any interruptions as a standard employment relationship. Accordingly, deviations are

¹ The different number of cases in the cohorts (519 vs. 795) is the result of the development of sample sizes of the GSOEP in general, in which the sample size has nearly doubled since 2000; see also Siegers et al. (2021).

considered as atypical or non-standard employment. In the GSOEP, an average worktime of 35 working hours per week is defined as full-time work, whereas employment of up to 34 h per week is regarded as part-time (Holst and Wieber 2014). Part-time employment also includes marginal part-time employment in what are also known as “mini-jobs”²

The comparison of the sequence data or employment trajectories is achieved by means of cluster analysis. In a first step, a hierarchical cluster analysis based on the Ward method is carried out. The results from the hierarchical model were used for the cluster analysis applying the Partitioning Around Medoids method (PAM), whereby the individual clusters show a high degree of homogeneity and are clearly distinguishable from one another. The PAM cluster analysis is a partitioning cluster analysis that uses representative sequences (medoid sequences) as a benchmark. The procedure aims to minimise the sum of the weighted distances between individual sequences and the medoid sequence (Studer 2013). Moreover, this flexible approach is less sensitive to outlying sequences, which might lead to misinterpretation (Kaufman and Rousseeuw 2005; Liao et al. 2022).

The optimal number of clusters was determined using the so-called elbow method and the average silhouette width (ASW) (see Appendix: Figs. 2 and 3, Tables 3 and 4), which are often used as evaluation criteria for the optimal number of clusters (Scherer and Brüderl 2010; Stegmann et al. 2013). Figure 2 shows that for the first cohort a solution with five clusters and for the second cohort a solution with three or four clusters is optimal. On the other hand, the ASW shows that there is an optimal solution with six clusters for both cohorts. We chose a five-cluster solution for both cohorts for several reasons. First, using a three- or four-cluster solution increases the risk of overplotting the sequence index plots, i.e. sequences being covered by other sequences because the number of observations in a plot is too large. This would lead to misinterpretation of the results (Liao et al. 2022). Second, a six-cluster solution does not lead to significantly better ASW overall and within clusters, as can be seen in Table 3 and 4 in the Appendix. Third, a six-cluster solution increases the amount of unnecessary information (related to our research questions) and the complexity of the results. Choosing a five-cluster solution does not significantly reduce the statistical evidence for a good cluster typology and at the same time reduces complexity. Fourth, aside from statistical quality, the equal number of clusters in both cohorts increases

the comparability and interpretability of the results (Piccarreta and Studer 2019). Finally, the five clusters show a suitable breakdown by requirement level of the activity and working hours, which is in line with the theoretical background of our study (Piccarreta and Studer 2019; Liao et al. 2022). However, when looking at the ASW within the clusters, it becomes clear that clusters 4 and 5 should be interpreted with caution, especially when comparing cohorts (Table 4).

For the analyses, both sequence index plots and descriptive results, as well as indices for the individual clusters, are used. The sequence index plots show the individual employment trajectories, from which the sequence and duration of the employment states can be deduced. However, since looking at the sequence index plots alone is not sufficient to accurately determine changes between the cohorts, statistics on the duration of the employment status per cluster are also presented (see Appendix). Furthermore, two common indices are used to analyse the data. The two indices (Shannon entropy and turbulence) are standardised measures for assessing “chaos” or “disorder” within a cluster. The interpretation of the values is the same for both indicators: a value of “zero” indicates that there is no disorder in the data. This would be true if all persons within a cluster and across all points in time had the same employment status. If the value of an index takes on the value “one”, the sequences are “chaotic” at most. Accordingly, all persons would have different and non-repeating states of employment at each point in time. In addition, the index of turbulence considers not only the number of different employment states, but also the durations of time spent in those respective employment states (Stegmann et al. 2013; Scherer and Brüderl 2010). Finally, selected socio-demographic characteristics of the individual clusters are presented in order to classify the results with regard to the current state of research on employment trajectories and low-skilled work.

2 Results

The results of the sequence and cluster analysis are illustrated in Fig. 1 by means of sequence index plots. Figure 1 compares the individual employment trajectories of both cohorts aged 35 to 44. In addition, the results are supplemented with information on the average time in years that the persons spent in the respective employment states (see Table 5 in the Appendix). Additional information on distributions of states are available in Fig. 4 (Appendix).

Cluster 1 contains employment trajectories that are predominantly characterised by full-time, low-skilled work (FTLW). In addition, phases of unemployment (UE) and full-time, medium-skilled work (FTMW) are

² Marginal part-time employment (“mini-jobs”) plays a minor role in this sample, because it only contributes to less than 0.9% of all employment states in both cohorts.

recognisable. The size of the cluster is 16.4% for the first cohort, born between 1955 and 1959. In this particular cluster, about one third are continuously employed in FTLW. In contrast, the other two thirds of the cohort have different employment trajectories that are characterised partly by transitions into, or out of, jobs with a different skill level or into, or out of, part-time employment. Frequent, albeit short, phases in FTMW are noticeable. The other part of the cohort is affected by actual interruptions in employment, mostly in the form of UE.

The first cluster of the second cohort (born 1965–1969) has become smaller with a share of 13.5% and differs from the first cohort. On the one hand, only about one fifth of the cohort can look back on trajectories under standard employment conditions. On the other hand, employment trajectories on the whole are apparently more differentiated. However, actual interruptions in employment due to UE or inactivity (NW) play a minor role here. In total, transitions into other types of employment—in particular, into, or out of, FTMW—can be identified as a frequent phenomenon in this cohort.

In cohort comparison, the number of transitions into FTMW, as well as the durations of time spent in this employment status, have expanded from the first to the second cohort. The results of cluster 1, especially in cohort comparison, are also confirmed by the average time spent in an employment status (see Table 5 in the Appendix). Thus, the duration of time spent in FTLW has decreased from 8.0 (first cohort) to 7.2 years (second cohort). Similarly, the time spent in UE fell to less than half, from an average of 0.7 to 0.3 years. On the other hand, the time spent in FTMW has increased from an average of 0.7 to 1.8 years.

Cluster 2 is characterised by employment trajectories that are predominantly spent in FTMW. It is the largest cluster in the first cohort and amounts to 30.4%. Here we can see that about one in three persons is continuously employed in FTMW. In addition, transitions into full-time, high-skilled work (FTHW) or FTLW, which mostly occur in one-year phases, are observable in this cluster. Interruptions in employment, e.g. through UE or NW, are rare.

The second cluster in the second cohort, accounts for 28.1% and is thus smaller than in the first cohort. Slightly fewer than half of the employment trajectories are characterised by continuous FTMW. The other employment trajectories are mostly characterised by short-term transitions into FTLW or FTHW. At first glance, periods of UE occur less frequently in the second cohort, but, when they do, they last longer.

The results of the average time spent in employment confirm these observations. In general, cluster 2 shows only slight changes between the cohorts. The average

time spent in FTMW remains stable at 8.0 years. Likewise, no changes are discernible in FTLW, with both cohorts spending an average of 0.9 years in this employment status. UE only increases slightly by 0.1 to 0.3 years.

Cluster 3 consists of employment trajectories with predominantly FTHW. Here we see that more than half of the employment trajectories are determined by standard employment relationships in the sense of continuous, full-time employment in high-skilled work. There are only few employment trajectories that are characterised by discontinuities. Interruptions in employment due to UE or NW hardly occur. Transitions out of, or into, FTMW are frequent. In the first cohort, this cluster has a share of 17.1%. In the second cohort, this share increases to 20.1%. Apart from the increase in shares, hardly any changes between the cohorts are discernible. Statistically speaking, the average time spent in the respective employment states is similar: In cohort comparison, the average time spent in FTHW has only decreased by 0.1 to 8.5 years in the second cohort. Similarly, FTMW has decreased from 0.9 (first cohort) to 0.5 years (second cohort). In both cohorts, UE is quantified at 0.1 years.

Clusters 4 and 5 can only be interpreted and compared with caution, as already described in the chapter on methods. Moreover, the employment histories are so different that a comparison of the average time spent by employment status has little significance. For this reason, the statistics on the average time spent in the employment status are not discussed.

Within the first cohort (born 1955–1959), cluster 4 is mainly comprised of part-time jobs, predominantly in medium-skilled work (PTMW), but also in low-skilled work (PTLW). This cluster has a share of 16.8%. There are no employment trajectories in the standard employment relationship, which suggests that uninterrupted full-time employment does not occur. Even among part-time employees, there are hardly any continuous employment trajectories without transitions into other types of employment. UE and, above all, NW occur frequently in this cluster. The second cohort (born 1965–1969) is characterised by PTMW as well as NW and has a share of 24.9%.

The employment trajectories in cluster 5 are characterised by (permanent) inactivity or PTLW. In the first cohort it has a share of 16.5% in which around one third of the persons are permanently inactive. Another third of the employment trajectories is characterised by short phases of part-time employment in addition to inactivity. This includes low-skilled, medium-skilled and high-skilled work. The last third of the cohort can look back on employment trajectories that consist of phases of inactivity and subsequent employment in PTLW for durations of up to seven years. In cluster 5 of the second

Table 1 Entropy and turbulence by clusters and cohorts

Cluster	Cohort '55–'59	Cohort '65–'69	±	Cohort '55–'59	Cohort '65–'69	±
	Entropy	Entropy		Turbulence	Turbulence	
1 FTLW	0.20	0.23	+	0.27	0.30	+
2 FTMW	0.19	0.17	–	0.27	0.25	–
3 FTHW	0.13	0.12	–	0.17	0.16	–
4 PTMW	0.28	0.23	–	0.34	0.29	–
5 NW/PTLW	0.20	0.27	+	0.24	0.35	+

GSOEPE v36; calculation, presentation and weighting of results by the authors

cohort, with a share of 12.8%, completely different trajectories can be observed, as there are fewer interruptions in employment or less continuous inactivity. The labour force in this cluster is predominantly employed in PTLW with phases of full-time employment, some of which last one to two years. For about half of the labour force, a transition to PTMW can be observed in the 44th year of life.

Even though the results in clusters 4 and 5 should be interpreted with caution, these clusters reflect the overall development of the Western German labour market: Labour force participation has increased strongly since the 1990s, which has led to a corresponding decrease in the number of inactive persons. The strong increase in overall labour force participation is partly due to the increase in atypical employment (Eichhorst and Buhlmann 2015).

In addition to considering the previous results, Table 1 compares the employment trajectories or clusters using two indices—entropy and turbulence. Both indices are indicators of “disorder” within a cluster and, in the light of the discontinuities that emerge, can provide information on empirical differences existing between the employment trajectories of low-skilled, medium-skilled and high-skilled work.

Table 1 yields two main findings. First, the values of entropy and turbulence are highest in the clusters that are predominantly characterised by low-skilled work. This applies both to cluster 1 with predominantly FTLW and to cluster 5 with predominantly PTLW (second cohort, born 1965–1969). In clusters 2 and 3, the values for both indices are significantly lower compared to low-skilled work and smallest in cluster 3 (FTHW). The “disorderliness” and the number of transitions thus depends on the skill requirements of the activity.

The second finding in Table 1 concerns the comparison of the cohorts in the respective clusters. Here it becomes apparent that the values of entropy and turbulence have

increased in clusters 1 and 5. However, in cluster 5 it should be noted that the comparability of the indices is limited due to the different employment patterns (see results for Fig. 1). By contrast, the indices have marginally decreased in the clusters outside low-skilled work or with low average time spent in low-skilled work: In a cohort comparison, the employment trajectories of persons in predominantly FTMW and FTHW have remained extremely stable.

Table 2 shows both the proportions, cases and a selection of socio-demographic characteristics as well as information about changes of employers for the respective clusters, thus enabling an assessment of the extent to which the clusters have changed between the cohorts, as well as how these results can be classified according to the current state of research.

The first cluster (FTLW) of the first cohort has a male share of 67.6%. Almost half of the persons in this cluster has a low qualification level (48.5%). Moreover, one third of persons has a migration background (33.6%). In combination with results, concerning employer changes per employee, it is obvious that employees tend to change their employer more than once. In comparison to the FTLW cluster of the second cohort, we observe an increase of male share (82.0%). Furthermore, the majority (83.6%) of people in this cluster have completed vocational training, which is in line with the findings of the current state of research. This corresponds to an increase of about 35 percentage points. In cohort comparison, the share of persons with migration background as well as the statistics concerning employer changes decreased. In relation to the previous evaluations (Fig. 1 and Table 5 in the Appendix), the transitions from low-skilled to medium-skilled work in cohort one are more likely due to employer changes. Whereas, in the second cohort transitions between these employment states can mostly be considered as transitions within the same employer (internal labour market).

Table 2 Shares and selected socio-demographic characteristics by clusters and cohorts

Cohort 1955–1959						Total	Cohort 1965–1969					Total
Cluster	1	2	3	4	5		1	2	3	4	5	
	FTLW	FTMW	FTHW	PTMW	NW		FTLW	FTMW	FTHW	PTMW	PTLW	
Share (%) ¹	16.4	30.4	17.0	16.8	19.5		13.5	28.1	20.8	24.9	12.8	
Cases (n) ¹	85	158	88	87	101	519	107	233	165	198	102	795
Sex (%)												
Men	67.6	62.9	81.8	0.0	5.0	48.7	82.0	82.7	85.4	2.9	2.7	53.2
Women	32.4	37.1	18.2	100.0	95.0	51.3	18.0	17.3	14.6	97.1	97.3	46.8
Qualification level (%) ²												
Low	48.5	1.8	0.0	5.4	13.3	9.5	13.6	2.4	0.0	8.9	13.3	7.2
Medium	47.7	73.9	21.1	71.7	59.1	56.7	83.6	77.7	15.5	44.0	82.0	61.2
High	3.7	24.3	78.9	22.9	27.6	33.9	2.7	19.9	84.5	47.1	4.7	31.6
Migration background (%) ³												
Yes	33.6	5.1	9.0	7.2	17.2	11.8	17.6	7.6	8.0	11.2	9.8	10.7
Change of Employer (% / Ø)												
Yes ⁴	46.7	43.2	48.6	77.1	51.9	51.5	31.7	44.1	57.1	67.2	86.0	55.1
Ø ⁵	1.07	0.85	0.77	1.39	0.86	0.95	0.59	0.66	1.03	1.22	2.38	1.07

¹ Unweighted results

² Based on ISCED-97; low qualification: Level 0–2, education up to and including lower secondary level; medium qualification: Level 3–4, education up to and including upper secondary level or vocational training; high qualification: Level 5–6, academic qualifications

³ Persons with a migration background include all those who either have a direct migration background, e.g. refugees, or an indirect migration background, e.g. persons who were born in Germany but have another citizenship in addition to their German one

⁴ Persons with at least one employer change

⁵ Average number of employer changes per employee during the study period
GSOEP v36; calculation, presentation and weighting of results by the authors.

The second cluster (FTMW) of the first cohort can be described as follows: predominantly men (62.9%), mostly without migration background and with medium (73.9%) or high (24.3%) level of qualification. 43.2% of persons had at least one employer change. In comparison to the second cohort, the share of men increased (82.7%). There are hardly any changes in the other socio-demographic characteristics compared to the first cohort. Concerning employer changes, we observe a decrease in the average number of employer changes per employee during the study period.

The third cluster (FTHW) in the first cohort has a high share of men (81.1%). None of the persons in this cluster has a low qualification (medium: 21.1%; high: 78.9%). 9.0% have a migrant background. The average number of employer changes are low (0.77) and lowest compared to the other clusters of this cohort. In the second cohort, the socio-demographic characteristics have barely changed, whereas the share and average number of employer changes increased.

The socio-demographic characteristics from clusters 4 and 5 are not compared. Nevertheless, it should be pointed out that especially in the second cohort high values are visible in the statistics on employer changes.

3 Discussion

According to segmentation theory, low-skilled work is assigned to the secondary sector of the labour market because workers in this sector are interchangeable as no qualification is required. Consequently, the employment instability in this sector is high and working conditions are poor. So far, there are no findings on the employment stability of workers in low-skilled jobs, as results are obtained using cross-sectional data. However, the current state of research shows that indications such as full-time employment and a changed qualification structure point to employment stability in the sense of the standard employment relationship. Therefore, we analyse GSOEP data to explore employment trajectories of workers in low-skilled

jobs by conducting sequence and cluster analysis in a cohort comparison. Our research questions address the assignment of workers performing low-skilled activities within the segmentation theory as well as changes of segments over time. Firstly, our results illustrate that low-skilled work can be assigned to both the secondary and the primary sectors. Secondly, we can confirm that the basic assumptions of the segmentation theory, concerning mobility between and within segments and sectors, remain over time.

On the one hand, our results indicate that some share of workers in low-skilled jobs belongs to the unstructured labour market: In cluster 5, we observe frequent interruptions of non-standard employment in the form of inactivity as well as frequent changes of employers, especially in the second cohort. The statistics as well as the indices also point to the conclusion that workers in low-skilled jobs in this cluster have the most chaotic employment trajectories with loose ties to employers. However, as mentioned in our methodology chapter, cluster 5 should be interpreted with caution.

On the other hand, workers in low-skilled jobs in cluster 1 (in both cohorts) show characteristics of the primary sector—the standard employment relationship. Combining results from sequence index plots and statistics across clusters, we can confirm that in the first cohort transitions are mostly attributable to employer changes within low-skilled work or more precisely within the secondary sector. In the second cohort, however, transitions into medium-skilled work is high whereas the share and average number of employer changes is low. This leads to the conclusion that based on employment trajectories some share of workers in low-skilled jobs in the second cohort assigns to the primary sector respectively to the internal labour market. Employees from within a company are given preference when filling positions. Our results are consistent with those of other studies that deal with segmentation theory (Blossfeld and Mayer 1988; Garz 2013). Transitions often take place within the respective segments and only rarely between the two sectors.

The changes in the transitions of low-skilled full-time and low-skilled part-time employment support our interpretation: Transitions between low-skilled and medium-skilled work mostly take place among employees in full-time employment, especially in the second cohort. Firstly, this result underlines the subdivision of the unstructured labour market into an independent and a dependent segment. In this context, part-time low-skilled work (cluster 5) assigns to the independent segment without any relations to other segments, especially to those in the primary sector. Secondly, some

share of full-time low-skilled work (cluster 1) assigns to the dependent unstructured labour market or as mentioned above to the primary sector, related to employment in other segments. Thirdly, transitions between the dependent and independent segments can hardly be observed (second cohort, cluster 5). As stated by Dütsch and Struck (2014) non-standard employment relationships decreases vertical mobility between segments and leads to lock-in effects.

The cohort comparison, the result for our second research question, indicates change and continuity in the context of segmentation. As mentioned above, employment trajectories as well as the assignment of workers in low-skilled jobs have changed. In the second cohort, we observe less continuous full-time employment in low-skilled work and more transitions into medium-skilled work. In contrast, in the clusters of full-time medium-skilled work (cluster 2) and full-time high-skilled work (cluster 3), both assigned to the primary sector, hardly any changes of employment trajectories are noticeable between the cohorts. In fact, there is an increase in stable employment trajectories, as the results of the indices show. Despite the changes within employment trajectories of workers in low-skilled jobs, the broad features of segmentation, the rigid boundaries between segments and especially between sectors, still remain.

Transitions of workers between low-skilled and medium-skilled jobs should not be seen as a convergence of the two forms of employment, but rather as a result of the differentiation of the qualification structure. In the second cohort, the number of employees possessing at least a medium level of qualification is much higher, which, in theory, qualifies them primarily for employment in the primary sector. The motives for transitioning between different types of employment are speculative. Transitions from medium-skilled to low-skilled work, for example, may have been triggered by health restrictions (Lück and Kopatz 2021). The elimination or substitution of certain jobs due to technological advances may also have caused these transitions (Dengler 2019). Furthermore, the high demand for qualified employees caused by a shortage of workers in medium-skilled jobs should not be disregarded (Bellmann and Hübler 2014). The employment trajectories of workers in medium-skilled jobs (cluster 2) show a large number of one-to-two-year phases of low-skilled work. This could indicate that workers in medium-skilled jobs often perform low-skilled work when a career interruption is imminent and no adequate employment as a qualified employee is available. Low-skilled work can therefore act as a temporary

type of employment to avoid unemployment and to cushion possible economic losses.

For women, who predominantly work in part-time employment (cluster 5), job elements that clash with family commitments or childcare obligations, for instance, are likely to make their move into the primary sector more difficult. The results make it clear that the level of individual qualifications may have a hinge function between the partial labour markets, but that other factors must be taken into account.

Despite the high-quality data provided by the GSOEP, this study has limitations that must be taken into account. For example, due to the small number of cases, a comparison with the employment trajectories of people in Eastern Germany was not feasible. However, considerable differences between the employment trajectories of Eastern and Western Germans are known and potentially relevant for low-skilled work, especially in the comparison of genders (Trischler 2014). Various data concerning the clusters, and especially the first cohort—for example information on economic sectors or employment relationships (fixed-term/permanent)—had to be excluded because of gaps in the longitudinal data. Furthermore, this study covers only two cohorts involving people in the prime employment age. However, information about the previous employment biography is crucial in order to understand the present situation.

4 Conclusion

The results lead to the conclusion that based on employment trajectories, low-skilled work can be assigned to both the secondary and the primary sectors. As stated by Sengenberger (1987), the segmentation of the labour market is a dynamic process in which the segments change and influence each other. However, the broad features of segmentation, especially the rigid boundaries between the primary and secondary sectors, remain despite this change. The results indicate that the level of qualification can no longer serve as the main barrier between the primary and secondary sectors in Western Germany. Workers in low-skilled jobs, who increasingly fulfil this prerequisite, seem to rarely switch between sectors. Other determinants must be taken into account that may hinder or favour mobility between the secondary and primary sectors or between low-skilled and medium-skilled work.

Although this study adds new insights to the state of research, further investigations are necessary to close research gaps and improve the employment situation of workers in low-skilled jobs. In addition, unaddressed—to name but a few—research questions are: What are the motives of employees for transitioning from, or into, low-skilled work? How precarious is low-skilled work, at the individual and the household level? How does the entry into and exit from working life of workers in low-skilled jobs look like?

Appendix

See Figs. 2, 3, 4 and Tables 3, 4, 5.

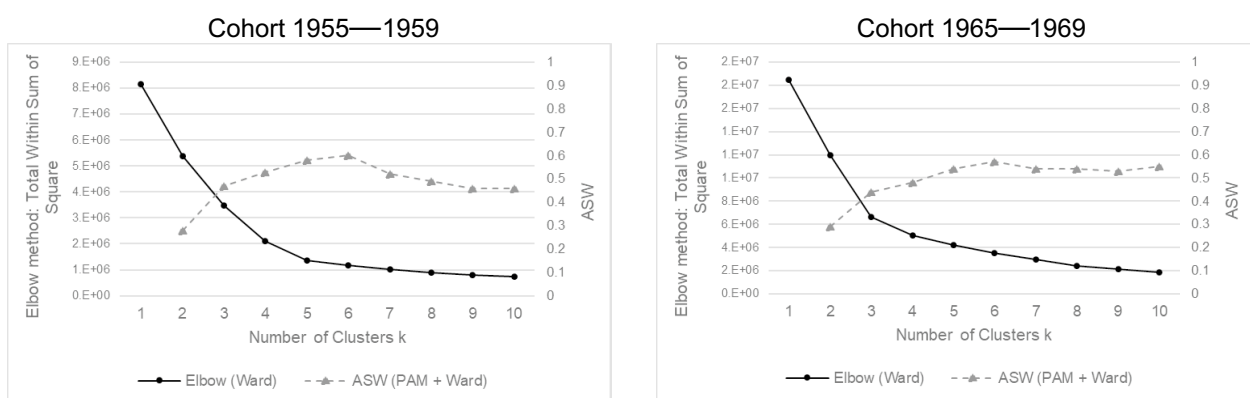


Fig. 2 Elbow Method and Average Silhouette Width (ASW) values for optimal number of clusters per cohort. GSOEP v36; calculation and presentation of results by the authors.

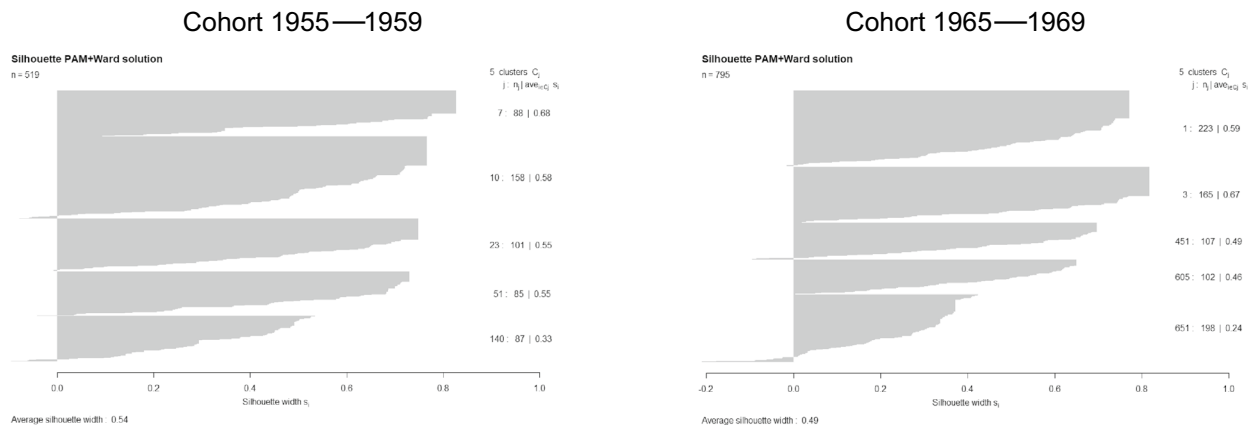


Fig. 3 Average Silhouette Width (ASW) values for 5 Cluster solution. GSOEP v36; calculation and presentation of results by the authors

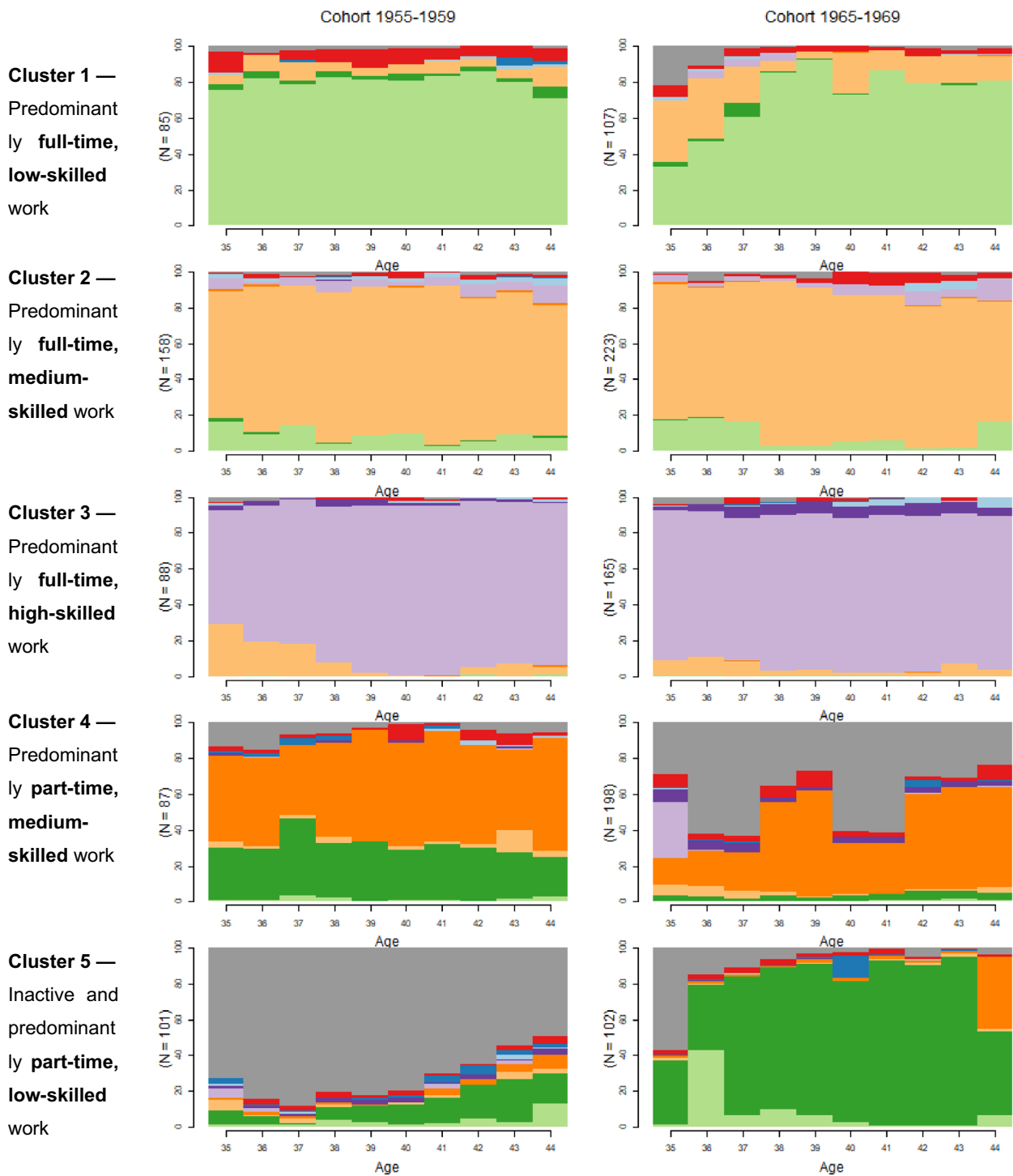


Fig. 4 Employment distribution and clusters by cohorts. GSOEP v36; calculation, presentation and weighting of results by the authors

Table 3 Average Silhouette Width values for optimal number of Clusters per Cohort and Cluster method

Cluster method		Cohort 1955–1959		Cohort 1965–1969	
		Ward	Ward + PAM	Ward	Ward + PAM
Cluster solutions	2 Cluster	0.32	0.28	0.30	0.29
	3 Cluster	0.46	0.47	0.42	0.44
	4 Cluster	0.52	0.53	0.39	0.48
	5 Cluster	0.57	0.58	0.45	0.54
	6 Cluster	0.59	0.60	0.46	0.57
	7 Cluster	0.43	0.52	0.44	0.54
	8 Cluster	0.40	0.49	0.46	0.54
	9 Cluster	0.37	0.46	0.48	0.53
	10 Cluster	0.36	0.46	0.50	0.55
	11 Cluster	0.35	0.46	0.49	0.53
	12 Cluster	0.37	0.48	0.46	0.54
	13 Cluster	0.38	0.47	0.40	0.55
	14 Cluster	0.38	0.49	0.43	0.56
	15 Cluster	0.40	0.48	0.44	0.57

GSOEP v36; calculation and presentation of results by the authors

Table 4 Average Silhouette Width values within Clusters per Cohort, Cluster method and Cluster solution

Cluster method		Cohort 1955–1959		Cohort 1965–1969	
		Ward	Ward + PAM	Ward	Ward + PAM
5 Cluster solution	1	0.58	0.55	−0.03	0.49
	2	0.54	0.58	0.86	0.59
	3	0.64	0.68	0.83	0.67
	4	0.25	0.33	0.52	0.46
	5	0.62	0.55	0.18	0.24
6 Cluster Solution	1	0.57	0.58	−0.04	0.51
	2	0.54	0.57	0.86	0.61
	3	0.64	0.68	0.83	0.66
	4	0.26	0.31	0.46	0.45
	5	0.60	0.50	0.19	0.37
	6	0.60	0.62	0.66	0.43

GSOEP v36; calculation and presentation of results by the authors

Table 5 Cohort comparison per cluster with regard to the average time (in years) spent in a specific employment status

	Employment status	Cohort 1955–1959			Cohort 1965–1969		
		Mean	SD	Rel. Freq.	Mean	SD	Rel. Freq.
Cluster 1—Predominantly full-time, low-skilled work	FTLW	8.0	2.2	0.80	7.2	2.3	0.72
	PTLW	0.3	1.0	0.03	0.2	0.4	0.02
	FTMW	0.7	1.1	0.07	1.8	1.7	0.18
	PTMW	0.0	0.0	0.00	0.0	0.2	0.00
	FTHW	0.0	0.0	0.00	0.1	0.6	0.01
	PTHW	0.0	0.0	0.00	0.0	0.0	0.00
	FTNA	0.1	0.4	0.01	0.1	0.4	0.01
	PTNA	0.1	0.3	0.01	0.0	0.1	0.00
	UE	0.7	1.5	0.07	0.3	1.1	0.03
	NW	0.2	0.5	0.02	0.4	0.8	0.04
Cluster 2—Predominantly full-time, medium-skilled work	FTLW	0.9	1.3	0.09	0.9	1.4	0.09
	PTLW	0.1	0.4	0.01	0.0	0.1	0.00
	FTMW	8.0	1.9	0.80	8.0	2.1	0.80
	PTMW	0.1	0.5	0.01	0.0	0.3	0.00
	FTHW	0.5	1.1	0.05	0.5	1.2	0.05
	PTHW	0.0	0.2	0.00	0.0	0.1	0.00
	FTNA	0.2	0.7	0.02	0.1	0.5	0.01
	PTNA	0.0	0.2	0.00	0.0	0.1	0.00
	UE	0.2	0.6	0.02	0.3	1.1	0.03
	NW	0.1	0.5	0.01	0.2	0.6	0.02
Cluster 3—Predominantly full-time, high-skilled work	FTLW	0.0	0.2	0.00	0.0	0.3	0.00
	PTLW	0.0	0.0	0.00	0.0	0.0	0.00
	FTMW	0.9	1.3	0.09	0.5	1.0	0.05
	PTMW	0.0	0.2	0.00	0.0	0.2	0.00
	FTHW	8.6	1.9	0.86	8.5	2.4	0.85
	PTHW	0.2	1.0	0.02	0.5	1.8	0.05
	FTNA	0.1	0.5	0.01	0.2	0.6	0.02
	PTNA	0.0	0.0	0.00	0.0	0.3	0.00
	UE	0.1	0.4	0.01	0.1	0.4	0.01
	NW	0.1	0.3	0.01	0.1	0.5	0.01
Cluster 4—Predominantly part-time, medium-skilled work	FTLW	0.1	0.4	0.01	0.1	0.5	0.01
	PTLW	3.0	3.2	0.30	0.3	0.8	0.03
	FTMW	0.3	0.6	0.03	0.2	0.8	0.02
	PTMW	5.3	3.4	0.53	3.9	3.3	0.39
	FTHW	0.0	0.2	0.00	0.3	0.6	0.03
	PTHW	0.1	0.3	0.01	0.4	1.4	0.04
	FTNA	0.0	0.4	0.00	0.0	0.2	0.00
	PTNA	0.1	0.5	0.01	0.1	0.3	0.01
	UE	0.3	0.8	0.03	0.5	1.4	0.05
	NW	0.6	1.1	0.06	4.2	3.4	0.42
Cluster 5—Inactive and predominantly part-time, low-skilled work	FTLW	0.3	0.8	0.03	0.8	0.9	0.08
	PTLW	1.1	1.9	0.11	7.1	1.8	0.71
	FTMW	0.2	0.6	0.02	0.1	0.5	0.01
	PTMW	0.3	0.7	0.03	0.5	0.8	0.05
	FTHW	0.1	0.5	0.01	0.0	0.0	0.00
	PTHW	0.2	0.9	0.02	0.0	0.2	0.00
	FTNA	0.1	0.3	0.01	0.0	0.2	0.00
	PTNA	0.2	0.6	0.02	0.2	0.4	0.02
	UE	0.2	0.7	0.02	0.2	1.1	0.02
	NW	7.3	2.5	0.73	1.1	1.4	0.11

Abbreviations

FTLW	Full-time, low-skilled work
PTLW	Part-time, low-skilled work
FTMW	Full-time, medium-skilled work
PTMW	Part-time, medium-skilled work
FTHW	Full-time, high-skilled work
PTHW	Part-time, high-skilled work
FTNA	Full-time, no indication
PTNA	Part-time, no indication
UE	Unemployment
NW	Inactivity
GSOEP	German Socio-Economic Panel
OM	Optimal matching
PAM	Partitioning around medoids

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Declarations

Competing interests

The authors declare that they have no competing interests.

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