Can Low-Wage Employment Help People Escape from the No-Pay – Low-Income Trap?

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Abstract The experience of unemployment itself increases the risk of staying unemployed, and the unemployed face a high poverty risk. Moreover, experiencing poverty reduces the chances of reemployment. As wage inequality has expanded in recent decades, low-paid employment and in-work poverty have both risen. This study analyzes whether low-pay employment helps people escape the no-pay – low-income trap. Survey data from the German Socio-Economic Panel for the period 1995–2012 are used to estimate correlated random-effects probit models on the labor-market and income dynamics. The findings suggest that low-paid employment is especially helpful to exit the no-pay – low-income trap for persons who are long-term unemployed, as well as for those over 40 who have been unemployed for a short period of time. No indications of a low-pay – low-income trap are found.

Keywords: unemployment dynamics, low-pay dynamics, poverty dynamics, random-effects probit models, maximum simulated likelihood

JEL classification: J64, J62, J31, I32

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1. Introduction

The increasing inequality in wages and income[2] provides a focus for policy makers and researchers. In recent decades, the wage gap has intensified in the vast majority of OECD states; this has translated into a wider distribution of household income and an increased share of low-income households (Biewen and Juhasz 2012). This trend has continued unabated during the most recent economic crisis (OECD 2015).

Among scholars, there is broad agreement that unemployment increases the poverty risk (OECD 2009). However, most studies have analyzed the dynamics on the labor market and on the income level separately. When it comes to unemployment dynamics, it is a regular empirical feature that people who were unemployed in the past more often find themselves unemployed in the future (Heckman 2001). The probability being affected by persistence in unemployment depends on the characteristics of the worker, e.g. educational background. However, the experience of unemployment itself may increase the risk of staying unemployed. As labor markets are characterized by incomplete information, signals play an important role: for example, firms might use labor-market history as a screening device to estimate the productivity of an applicant, and spells of unemployment may be interpreted as a negative signal (Vishwanath 1989). Several studies have supported the hypothesis of state dependence in unemployment (see, inter alia, Mühleisen and Zimmermann 1994; Arulampalam et al. 2000; Plum and Ayllón 2015).

Just as in the labor-market dynamics, the data reveal persistence in low income (see, e.g., Cappellari and Jenkins 2002, 2004). Thus, someone who is poor has a significantly greater risk of being poor in the coming period than does someone living in a non-poor household. By analyzing the employment and income dynamics in a joint model, studies have found evidence that unemployment and poverty exert a negative influence on one another, and that an affected individual slips into a trap of no-pay and low income (Biewen 2009; Ayllón 2015).

One explanation for the spillover effect of poverty on employment prospects is that poverty increases the risk of social exclusion (Devicienti and Poggi 2011), and social ties (such as family

[2] In this study, income refers to the household level and wage, resp. earnings, to the individual level.

and friends) are an important resource in finding a new job (Montgomery 1991). Moreover, poverty-induced stress may reduce the efforts somebody makes in searching for a new (or a better) job. Thus, being unemployed and poor increases the risk of being stuck in a no-pay – low-income trap. However, the growing incidence of in-work poverty shows that being employed is not necessarily an efficient antidote to poverty (OECD 2009). The aim of this study is to compare the labor-market and income prospects of low-paid employed and unemployed individuals, and to determine which group faces the greater risk of being trapped in a no-pay – low-income cycle. Moreover, we examine whether, by moving from unemployment into employment in the low-wage sector, a low-pay – low-income trap replaces this cycle.

In order to analyze the interrelationship of poverty, unemployment, and low pay, labor-market and income dynamics are estimated simultaneously. However, individuals differ not only in their observables, but also in their unobservables, and this unobserved heterogeneity might persist over time (Heckman 1981a). Furthermore, the unobservables may be correlated between the different stages, e.g. someone who is highly motived to leave the ranks of the unemployed might also be highly motivated to escape poverty. For this reason, based on maximum simulated likelihood, a three-equation correlated random-effects probit model is estimated.

This study finds evidence that the labor-market and income processes are interrelated: compared to higher-paid employment, low-paid employment increases the risk of poverty by 6.8 percentage points (pp) on average, and of unemployment by 26.3pp on average. However, in contrast to the studies of Biewen (2009) and Ayllón (2015), the effect of poverty on labor-market prospects is rather small: poverty increases the risk of future unemployment by 0.7pp on average, and reduces the chances of someone climbing the salary ladder by 3.5pp on average. Moreover, the long-term unemployed profit significantly from low pay, as the risk of being stuck in a no-pay – low-income trap is substantially reduced. Likewise, the over-40 short-term unemployed can profit from a low-paid job, since their labor-market prospects suffer more from unemployment than do those of their younger colleagues. No indications are found of a low-pay – low-income trap.

The remainder of this paper is structured as follows: Section 2 reviews the key economic literature on labor-market dynamics and poverty processes. Section 3 introduces the data and provides descriptive statistics, and Section 4 describes the empirical strategy. The results are presented in Section 5, and the conclusions in Section 6.

2. Literature Review

2.1 The Scarring Effect of Unemployment

There are several theoretical explanations for why, compared to employment, the experience of unemployment *itself* increases the risk of remaining unemployed. To explain negative duration dependence in unemployment, Vishwanath (1989: 488) assumes that, in order to evaluate a potential worker's productivity, firms might use unemployment duration as an indicator, simply because "high ability workers may have shorter (unemployment) spells". In Blanchard and Diamond's (1994) labor-market model with job creation/destruction and matching, firms' hiring decisions are also based on the length of unemployment duration. Using the spell length as a ranking device, the authors show that already unemployed workers have a lower rate of exit from unemployment than do employed workers who became unemployed. Acemoglu (1995) provides a further theoretical explanation. On the assumption that human capital deteriorates during a period of unemployment (a notion initially popularized by Becker 1962), and that its maintenance is costly and not observable, firms will avoid hiring unemployed workers. Anticipating this strategy on the part of firms, workers will avoid investing in their own human capital, and the probability of exiting unemployment declines in line with the duration of unemployment. However, Pissarides (1990) shows that unemployment does not necessarily have to be stigmatizing. As there are fewer higher-quality jobs, the highly skilled unemployed may be prepared to wait for a job vacancy that corresponds to their skill level. Firms might anticipate this search strategy, which is why unemployment may not necessarily be regarded in a negative light.

Based on survey data, there is ample empirical evidence for the existence of state dependence in unemployment – for example in the US (Heckman and Borjas 1980), in Germany (Mühleisen and Zimmermann 1994), in the UK (Arulampalam et al. 2000), and in Europe (Plum and Ayllón

2015). Studies based on experimental data provide a more mixed picture. Based on field experiments in the US (Kroft et al. 2013) and Switzerland (Oberholzer-Gee 2008), there are strong indications of negative duration dependence in unemployment. However, only little evidence of a stigmatizing effect is found for Sweden (Eriksson and Rooth 2014).

Analyzing 20 European countries, Ayllón and Plum (2016) find evidence that state dependence in employment and in unemployment increases with age.[3] Though younger and older workers are affected by unemployment more than the average, the labor-market prospects of those two groups are highly heterogeneous. On the one hand, persistence in employment might increase with age. One theoretical explanation for this is that, according to the efficiency-wage theory, to stop employees from shirking, entry wages start at below the productivity level and later increase by more than the rate of productivity (Lazear 1981). Hence, getting dismissed when older is associated with losing a wage which is above the individual productivity; thus senior worker might be more motivated in undertaking measures to avoid becoming dismissed. Moreover, according to Pissarides (1990) a beneficial worker–firm match is stable, as separation is associated with costs. However, a beneficial match requires searching time, which might be correlated with the age of the employee. Thus, an older worker is more likely to have found his match, than is someone younger. Furthermore, to mitigate the social costs of lay-offs, most OECD countries have put employment protection legislation in place. Criteria such as tenure or (in the case of mass lay-offs) social aspects determine which worker should be dismissed, and this favors more senior employed workers.

On the other hand, state dependence in unemployment might also increase with age. One explanation is that the strength of the unemployment signal might be correlated with the likelihood of unemployment faced by the various age groups: since a younger worker is more likely to be dismissed (not yet found the best match; dismissed in a round of mass layoffs), being unemployed might be evaluated less negatively than in the case of an older worker, who should have found the best match, or who is especially protected by law against certain kinds of dismissal. Moreover, there is an age-related decline in job-search intensity (Ljungqvist and

[3] Mosthaf et al. (2011) and Fok et al. (2015) also present indications for a heterogeneous effect of unemployment on the employment prospects over age.

Sargent 1998) and a lower adaptation rate to new technologies (Friedberg 2003), and this may have a positive influence on state dependence in unemployment.

2.2 Low Pay and Employment Prospects

While there is a clear perception about the direction in which unemployment affects employment prospects, this is not the case for low-paid employment. On the one hand, compared to unemployment, working in the low-wage sector might slow the deterioration in human capital, or in fact even improve a worker's skills. On the other hand, taking low-paid employment may harm future earnings prospects. McCormick (1990) argues that highly skilled workers will shun low-quality jobs, as these will be less satisfying. Firms will anticipate this search strategy and, alongside the unemployment record, will use the employment record of an applicant as a device by which to screen his productivity. This could trap the worker in low-quality, low-pay jobs, and leave him with poorer prospects of climbing the salary ladder.

To date, several studies have analyzed the effect of low-paid employment on employment and earnings prospects. For the UK, Stewart (2007) finds no significant difference in the future unemployment risk of previously unemployed and low-paid employed. For Australia, Buddelmeyer et al. (2010: 46) conclude that "among men there appears to be no significant difference between low-paid and high-paid employment," a finding that is confirmed by Cai (2014). However, Cai (2015) presents evidence of a no-pay – low-pay cycle for Australia. Indications of persistence in low pay have also been found for Italy (Cappellari 2007) and right across Europe (Clark and Kanellopoulos 2013). Several studies dealing with Germany have found a positive effect of low-paid employment (compared to unemployment) on the employment and earnings prospects (Uhlendorff 2006; Knabe and Plum 2013; Mosthaf 2014). Mosthaf et al. (2011) emphasize that the characteristics of the employing firm also has a substantial impact on the earning prospects of a low-wage worker.

2.3 Persistence in Poverty

Many studies have shown that, in comparison to being employed, being unemployed carries a substantially higher risk of becoming poor (Martínez et al. 2001; Saunders 2002; OECD 2009).

However, compared to their better-paid colleagues, the low-paid employed also suffer a higher risk of poverty (Nolan and Marx 2000; Goos and Manning 2007; Lohmann 2008; Maitre et al. 2012). There are several theoretical explanations for why the experience of poverty *itself* increases the risk of staying poor. Maintaining a social network is costly and less affordable when one is poor, and weaker social ties increase the risk of social exclusion (Gordon et al. 2000; Gallie et al. 2003). Moreover, due to reduced financial circumstances, a person might move into a socially disadvantaged area with limited job prospects and less stable networks (Britt 1994; Brooks-Gunn et al. 1997). Still, poverty might not only increase the risk of staying poor: it may also increase the risk of becoming unemployed. For example, poverty-induced stress may curtail job-search efforts and thus increase the likelihood of a person remaining unemployed (Miech et al. 1999; Wadsworth et al. 2008; Santiago et al. 2011).

Several studies have provided evidence of state dependence in poverty (see, e.g., Cappellari and Jenkins 2002, 2004). Estimating poverty and unemployment dynamics simultaneously, Biewen (2009) presents evidence for Germany for a no-pay – low-income trap: the experience of poverty and the experience of unemployment likewise negatively influence each other's prospects respectively. Ayllón (2015) confirms these findings for men below 30 in several different European countries.

3. Data and Descriptive Statistics

3.1 German Socio-Economic Panel

The German Socio-Economic Panel (SOEP) is a survey that contains a rich set of information at the individual and the household level. This makes it very suitable for tracing labor-market and income trajectories. Our sample covers the period 1995–2012. As the Eastern and the Western German labor markets differ substantially (Snower and Merkl 2006), we focus on West Germany. Furthermore, as the labor-market dynamics of men and women are likely to differ, we restrict our sample to men (subsection 4.2 shows the findings for women). To avoid feedback from schooling and retirement schemes, only prime-aged men (25 to 55) who have

completed their education are considered. Moreover, civil servants and people who are self-employed are dropped from the sample. Our final sample consists of 11,906 observations.

This study focuses on the interrelation of poverty, unemployment, and low-pay employment. As a first step, we define the labor-market positions. Someone is defined as unemployed if the individual gives his labor-market position as non-employed, and i) has been looking for work in the past two weeks and is ready to take up work within four weeks (the International Labour Organization (ILO) definition of unemployment), or ii) has registered with the federal employment agency as unemployed, or iii) states a wish to become employed within the next year.[4] Those that are employed are separated into two categories: an employed worker with a gross hourly wage below the annually adjusted 25th percentile of the gross hourly wage distribution of the total male labor force is classified as low-paid employed; if he is above that threshold then he is regarded as higher-paid employed.[5] The distribution of the labor-market positions is displayed in **Table 1**, last column.

Furthermore, we have to identify low-income households. Poverty is measured at the household level, and so we use the declaration about monthly household net income and adjust the figure according to the number of household members using the OECD-modified scale (Hagenaars et al. 1994). Again, we take as a threshold the 25th percentile to separate the sample into poor and non-poor households. According to this definition, 13.1% of households are considered poor.

A first impression of the interrelationship between individual labor-market position and poverty status at the household level is captured in **Table 1** (column one and two). It can readily be seen that the vast majority of men who are higher-paid employed are not affected by poverty (only 6.1%). The share of poor households is noticeably higher among the low-paid employed

[4] As the number of men being inactive is small and the vast majority of them do not leave this labor market position, the sample is restricted to unemployed and employed men. When a man turns inactive, he is dropped from the sample and not allowed to return.

[5] The OECD (1997) suggested taking two-thirds of the median gross hourly wage as a threshold (for an application, see Knabe and Plum 2013). However, other studies used specific points on the pay distribution (e.g. Uhlendorff 2006), or just a fixed level (e.g. Stewart 2007). The findings hold when applying the OECD definition. Estimation results are available upon request from the author.

(26.9%). However, with 70.9% the largest share of poor households can be found among the currently unemployed.

Table 1: Labor market positions and poverty

	Non-poor HH_t	Poor HH_t	$Share_t$
Higher-$paid_t$	0.938	0.061	0.801
Low-$paid_t$	0.730	0.269	0.134
$Unemployed_t$	0.290	0.709	0.065
Total	0.868	0.131	

Source: SOEP 1995-2012, own calculations. *N*=11,906.

3.2 Unemployment and Poverty Risk with Age

To evaluate how difficult it is to leave the ranks of the unemployed or the low-paid employed the probability of a change in labor-market position between the previous period *t-1* and the current period *t* is calculated. As Stewart (2007) shows in his study, the risk of unemployment differs considerably between the continuously unemployed and the repeatedly unemployed. In the spirit of Stewart (2007), we differentiate between two groups of unemployed: the short-term and the long-term unemployed. In this study, we look at the proportion of months for which an individual has been unemployed between two consecutive interview time points.[6] An individual unemployed at *t-1* is defined as long-term unemployed if he has spent at least 90% of the months between the interview time points in *t-2* and *t-1* unemployed; otherwise he is defined as short-term unemployed. Based on this definition, roughly half of the unemployed are defined as short-term unemployed or long-term unemployed.

A first impression of the relationship between the labor-market positions at two consecutive time points can be found by looking at a transition matrix (see **Table 2**). Referring to the employed in **Table 2**, the transition matrix shows that the largest conditional probabilities can be found on the main diagonal – i.e. remaining in the same labor-market position as in the previous period (95% for the higher-paid employed and 65% for the low-paid employed). While

[6] In SOEP, interviews are conducted on an annual basis and the interviewed are asked to provide information of their labor market position for each month since the last interview. We use a relative measure to differentiate between short-term unemployment and long-term unemployment as the interviews are not conducted in the same month each year (see **Figure S 1**, left hand panel). The distribution of the proportion of months an individual has been unemployed between two consecutive interview time points can be found in **Figure S 1**, right hand panel.

about 87% of the long-term unemployed stay unemployed, the share is much lower for the short-term unemployed (59%). Furthermore, **Table 2** indicates that the conditional probability of becoming higher-paid employed is lower for the short-term unemployed (16%) than for the low-paid employed (27%). In the case of long-term unemployment, only a small share manages to enter higher-paid employment in the subsequent period (1.8%). However, it must be kept in mind that **Table 2** only gives an impression of the labor-market trajectories, as it has not been controlled for the influence of differences in observable and unobservable characteristics. Another shortcoming of the transition matrix in **Table 2** is that, as pointed out by Ayllón and Plum (2016), labor-market transitions might be unevenly distributed by age.

Table 2: Transition matrix of labor market positions

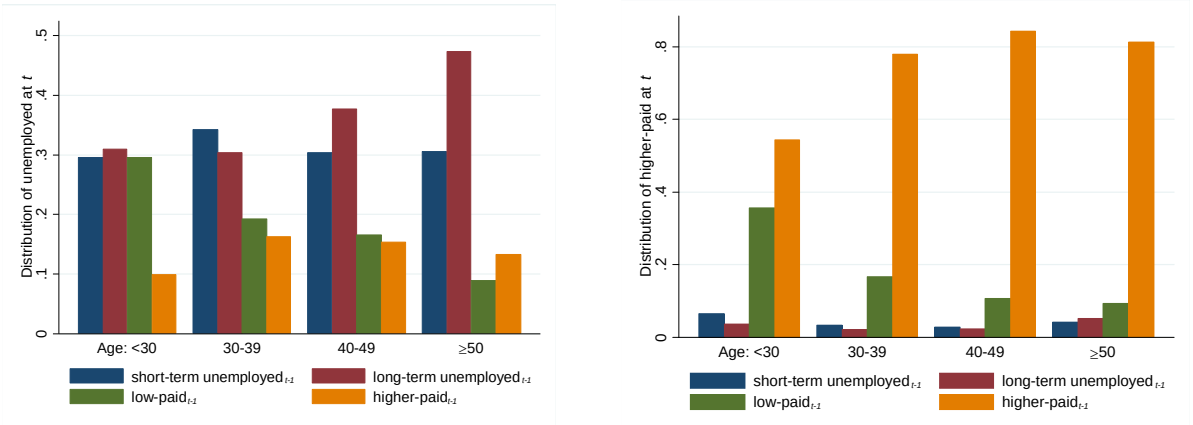
	Higher-paid employed$_t$	Low-paid employed$_t$	Unemployed$_t$	Total$_{t-1}$
Higher-paid employed$_{t-1}$	0.945	0.038	0.012	0.796
Low-paid employed$_{t-1}$	0.273	0.651	0.075	0.141
Short-term unemployed$_{t-1}$	0.163	0.246	0.590	0.034
Long-term unemployed$_{t-1}$	0.018	0.112	0.869	0.028
Total$_t$	0.801	0.134	0.065	

Source: SOEP 1995-2012, own calculations. *N*=11,906.

Descriptive evidence of persistence in the respective labor-market position by age is presented in **Figure 1**. The left-hand panel differentiates the currently unemployed according to their labor-market position in the previous period, for four different age groups. Whereas about a third each of unemployed workers below 30 were short-term or long-term unemployed at *t-1*, the share of long-term unemployed increases to about 48% among the 50+ age group, while the share of short-term unemployed is almost unaffected. Moreover, across the age groups there is a steady decline in the share of the unemployed who were low-paid in the previous period. As for the labor-market origins of the currently higher-paid employed (**Figure 1**, right-hand panel), we can discern an increase in higher-pay persistence over the different age groups. At the same time, the share of low-paid employed moving into higher-paid employment drops noticeably. One reason for the decline in the transition from low pay into higher pay could be the definition of the low-pay threshold, which is based on the gross hourly wage distribution over *all* age groups. However, according to the life cycle theory (Heckman 1976) and the efficiency-wage

theory (Lazear 1981), wages increase with age. This results in a below-average gross hourly wage and an above-average share of low-wage workers among young workers (see also the distributional chart of **Figure S 2** in the Supplement).

Figure 1: Labor market persistence over age



Source: SOEP 1995-2012, own calculations. *N*=11,906. The left (right) panel shows the distribution of currently unemployed (higher-paid employed) according to their previous labor market position for four different age groups.

However, persistence is not restricted to the labor market; it can also be found in relation to poverty. The transition matrix between previous and current poverty status (see **Table 3**) reveals that most of those individuals living in a non-poor household at *t-1* are not affected by low income at *t* (95%). Whereas about two-thirds of those living in a poor household remain poor, about a third manage to exit poverty.

Table 3: Transition matrix of poverty status

	Non-poor$_t$	Poor$_t$	Total$_{t-1}$
Non-poor$_{t-1}$	0.949	0.058	0.868
Poor$_{t-1}$	0.341	0.659	0.132
Total$_t$	0.869	0.131	

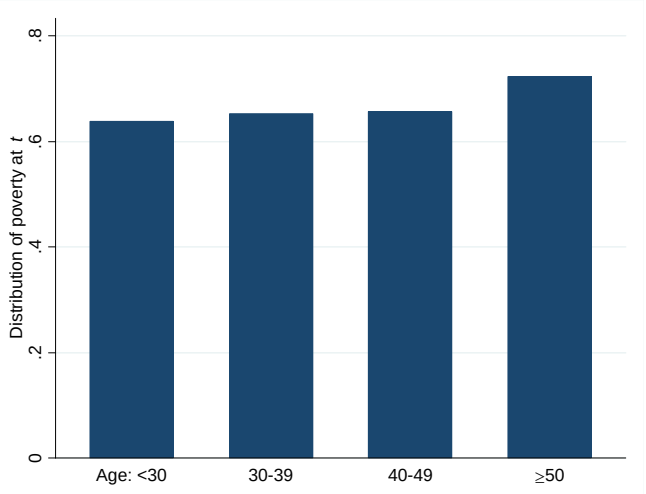
Source: SOEP 1995-2012, own calculations. *N*=11,906.

As in the case of the labor-market dynamics, it might be argued that persistence in poverty increases with age. Labor-market transitions are more frequent at the start of the working career, and exiting unemployment is identified as a major way of reducing the risk of poverty. Moreover, the reduced chances of older people exiting unemployment might increase poverty persistence over age. According to the efficiency-wage model, entry wages start at below the

market clearing level and increase thereafter (Lazear 1981). This might help people to escape from in-work poverty during tenure and to stay non-poor thereafter.

With reference to low-income households, **Figure 2** illustrates how the share of individuals who were already poor in the previous period increases with age: about 63% of young workers below 30 live in a low-income household at *t*, whereas this share rises to 73% for workers aged 50+. To sum up the findings, there are indications that labor-market and income transitions are rather high among younger workers, and that persistence in labor-market position and income group increases with age. Hence, when estimating the relationship between poverty and labor-market position, special attention should be devoted to age-specific effects. Otherwise persistence might be overestimated among younger workers and underestimated among older workers.

Figure 2: Poverty persistence over age



Source: SOEP 1995-2012, own calculations. *N*=11,906. Figure shows the share of poor individuals in *t* who were already poor in *t-1*.

4. Econometric Model

This study puts its focus on the interrelation of poverty, unemployment and low-pay employment and estimates the effect of low-wages on the probability of exiting the no-pay – low-income trap. The observed binary outcome variables with respect to the labor market are defined as:

$$y_{it}^{(\mathrm{Ue})} = \begin{cases} 1 & \text{if the person is unemployed,} \\ 0 & \text{otherwise,} \end{cases} \tag{1a}$$

and,

$$y_{it}^{(\text{Hp})} = \begin{cases} 1 & \text{if the person is higher-paid employed,} \\ 0 & \text{otherwise,} \end{cases} \tag{1b}$$

and,

$$y_{it}^{(\text{Lp})} = \begin{cases} 1 & \text{if the person is low-paid employed,} \\ 0 & \text{otherwise.} \end{cases} \tag{1c}$$

Note that the labor market positions are mutually exclusive; each observation can only be in one of the three labor market positions. Moreover, the observed binary outcome variable with respect to the income level of the household is defined as the following:

$$y_{it}^{(\text{Poor})} = \begin{cases} 1 & \text{if the person is living in a poor household,} \\ 0 & \text{otherwise.} \end{cases} \tag{1d}$$

Following the models of Stewart (2007) and Ayllón (2015), the model is defined as:

$$y_{it}^{(\text{Ue})} = \mathbf{1}\left\{ \begin{array}{l} \delta_{11} y_{it-1}^{(\text{Hp})} \text{age}_{1(t-1)} + \sum_{j=3}^{4} \delta_{1j} y_{it-1}^{(\text{Hp})} \text{age}_{j(t-1)} + \sum_{j=1}^{4} \lambda_{1j} y_{it-1}^{(\text{Lp})} \text{age}_{j(t-1)} + \sum_{j=1}^{4} \gamma_{1j} y_{it-1}^{(\text{Ue-short})} \text{age}_{j(t-1)} + \\ \sum_{j=1}^{4} \varphi_{1j} y_{it-1}^{(\text{Ue-long})} \text{age}_{j(t-1)} + \eta_{11} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Hp})} + \eta_{12} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Lp})} + \eta_{13} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Ue})} + x_{it}^{'} \beta_1 + \varepsilon_i^{(\text{Ue})} + u_{it}^{(\text{Ue})} > 0 \end{array} \right\} \tag{2a}$$

and if $y_{it}^{(\text{Ue})} = 0$,

$$y_{it}^{(\text{Hp})} = \mathbf{1}\left\{ \begin{array}{l} \delta_{21} y_{it-1}^{(\text{Hp})} \text{age}_{1(t-1)} + \sum_{j=1}^{2} \delta_{2j} y_{it-1}^{(\text{Hp})} \text{age}_{j(t-1)} + \sum_{j=1}^{4} \lambda_{2j} y_{it-1}^{(\text{Lp})} \text{age}_{j(t-1)} + \sum_{j=1}^{4} \gamma_{2j} y_{it-1}^{(\text{Ue-short})} \text{age}_{j(t-1)} + \\ \sum_{j=1}^{4} \varphi_{2j} y_{it-1}^{(\text{Ue-long})} \text{age}_{j(t-1)} + \eta_{21} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Hp})} + \eta_{22} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Lp})} + \eta_{23} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Ue})} + x_{it}^{'} \beta_2 + \varepsilon_i^{(\text{Hp})} + u_{it}^{(\text{Hp})} > 0 \end{array} \right\} \tag{2b}$$

and,

$$y_{it}^{(\text{Poor})} = \mathbf{1}\left\{ \sum_{j=1}^{4} \upsilon_j y_{it-1}^{(\text{Poor})} \text{age}_{j(t-1)} + \theta_2 y_{it}^{(\text{Lp})} + \theta_3 y_{it}^{(\text{Ue})} + x_{it}^{'} \beta_3 + \varepsilon_i^{(\text{Poor})} + u_{it}^{(\text{Poor})} > 0 \right\} \tag{2c}$$

The subscripts i and t refer to the labor market position of individual $i = 1, \ldots, N$ at time $t = 1, \ldots, T$. It is assumed that factors x_{it}, which can be time-varying (such as the number of children living in the household) or time-constant (such as educational background which is hold fix), have an impact on the labor market position and on the poverty status of the household.[7] Moreover, it is assumed that the current labor market position is influenced by the previous labor market position, interacted with the categorical variable age_j with $j \in \{1, 2, 3, 4\}$ and $\text{age}_1 = \begin{cases} 1 & \text{if age<30} \\ 0 & \text{else} \end{cases}$, $\text{age}_2 = \begin{cases} 1 & \text{if age} \geq 30 \text{ and age<40} \\ 0 & \text{else} \end{cases}$, $\text{age}_3 = \begin{cases} 1 & \text{if age} \geq 40 \text{ and age<50} \\ 0 & \text{else} \end{cases}$ and $\text{age}_4 = \begin{cases} 1 & \text{if age} \geq 50 \\ 0 & \text{else} \end{cases}$. Note that in equations **(2a)** and **(2b)**, being higher-paid employed at $t-1$ and at age 30 to 40 is chosen as reference category. Furthermore, it is assumed that the poverty status in the previous period interacted with the previous labor market position has an impact on the current labor market position. Referring to the unemployment risk of equation **(2a)** and **(2b)**, the unemployed at *t-1* are differentiated into the long-term and short-term unemployed. Referring to the current poverty status of equation **(2c)**, it is assumed that the poverty status of the previous year interacted with the age group indicator has an impact on current poverty status. Moreover, it is controlled for an influence of the current labor market position on the current poverty risk. Being currently higher-paid employed is chosen as reference category. As noted by Heckman (1981*a*), individuals may not only differ in observable but also in unobservable characteristics; therefore, individual-specific time-constant error terms $\varepsilon_i^{(l)}$ with $l \in \{\text{Hp,Lp,Poor}\}$ are included.[8] The time-specific idiosyncratic error term is denoted by $u_{it}^{(l)}$.

When analyzing dynamic nonlinear models, the initial conditions problem must be taken into consideration (Heckman 1981*b*): the labor market position in the initial period might not be

[7] The following explanatory variables are included in the regression: German citizenship (dummy), number of children of age 16 or below living at home (0,1,2,3,4+), living in South Germany (dummy) or West Germany (dummy), suffering from bad health (dummy), having vocational training (dummy) or a college degree (dummy), living together with a partner/spouse (dummy), living in a suburb are (dummy) or rural area (dummy) and a year indicator. Due to data restrictions, firm characteristics are not taken into account.

[8] Biewen (2009) analyzes the interrelation of poverty, employment and whether the person is living together with other persons. Referring to the individual-specific time-invariant error term, the three-equation estimator includes a common individual-specific error component with loading factors which "severely restricts the cross-process unobserved correlation structure." [Biewen 2009, p. 1103]. Following the suggestion of Ayllón (2015), an unrestricted model is applied in which each equation has its own individual-specific error component and a free correlation structure.

randomly distributed, but instead influenced by a person's motivation or ability, captured by the individual-specific time-constant error terms. To address the initial conditions problem, we follow Wooldridge's (2005) suggestion by conditioning the dynamic labor market and income process on the outcome in the initial period $t = 0$. Thus, $\varepsilon_i^{(l)}$ takes the following form:

$$\varepsilon_i^{(\text{Ue})} = a_{01} + \overline{x}_i\varphi_1 + y_{i0}^{(\text{Hp})}\tau_{11} + y_{i0}^{(\text{Lp})}\tau_{12} + \alpha_i^{(\text{Ue})} \tag{3a}$$

$$\varepsilon_i^{(\text{Hp})} = a_{02} + \overline{x}_i\varphi_2 + y_{i0}^{(\text{Hp})}\tau_{21} + y_{i0}^{(\text{Lp})}\tau_{22} + \alpha_i^{(\text{Hp})} \tag{3b}$$

and

$$\varepsilon_i^{(\text{Poor})} = a_{03} + \overline{x}_i\varphi_3 + y_{i0}^{(\text{Poor})}\tau_3 + \alpha_i^{(\text{Poor})} \tag{3c}$$

As normalizations for the random-effects error terms, it is assumed that $\alpha_i^{(l)} \sim N(0, \sigma^2_{\alpha^{(l)}})$ and that the three random-effects error terms may be correlated. The variance-covariance matrix of the random-effects error terms, takes the following form:

$$V_\alpha = \begin{pmatrix} \sigma^2_{\alpha^{(\text{Ue})}} & & \\ \rho_{\alpha^{(\text{Ue})(\text{Hp})}}\sigma_{\alpha^{(\text{Ue})}}\sigma_{\alpha^{(\text{Hp})}} & \sigma^2_{\alpha^{(\text{Hp})}} & \\ \rho_{\alpha^{(\text{Ue})(\text{Poor})}}\sigma_{\alpha^{(\text{Ue})}}\sigma_{\alpha^{(\text{Poor})}} & \rho_{\alpha^{(\text{Hp})(\text{Poor})}}\sigma_{\alpha^{(\text{Hp})}}\sigma_{\alpha^{(\text{Poor})}} & \sigma^2_{\alpha^{(\text{Poor})}} \end{pmatrix} \tag{4}$$

For identification, it is assumed that the idiosyncratic error terms are standard-normal distributed, i.e., $u_{it}^{(l)} \sim N(0,1)$. The individual outcome probabilities are:

$$P_{it}(\alpha^*_{(\text{Ue})}, \alpha^*_{(\text{Hp})}, \alpha^*_{(\text{Poor})}) = \left\{\Phi\left[\mu^{(\text{Ue})}\right]\Phi\left[\mu^{(\text{Poor})}\right]\right\}^{y_{it}^{(\text{Ue})}} \left\{\Phi\left[\mu^{(\text{Ue})}\right]\Phi\left[\mu^{(\text{Poor})}\right]\Phi\left[\mu^{(\text{Hp})}\right]\right\}^{\left(1-y_{it}^{(\text{Ue})}\right)} \tag{5}$$

and Φ refers to the cumulative univariate normal distribution function and

$$\mu^{(\text{Ue})} = \delta_{11}y_{it-1}^{(\text{Hp})}\text{age}_{1(t-1)} + \sum_{j=3}^{4}\delta_{1j}y_{it-1}^{(\text{Hp})}\text{age}_{j(t-1)} + \sum_{j=1}^{4}\lambda_{1j}y_{it-1}^{(\text{Lp})}\text{age}_{j(t-1)} + \sum_{j=1}^{4}\gamma_{1j}y_{it-1}^{(\text{Ue-short})}\text{age}_{j(t-1)} +$$
$$\sum_{j=1}^{4}\varphi_{1j}y_{it-1}^{(\text{Ue-long})}\text{age}_{j(t-1)} + \eta_{11}y_{it-1}^{(\text{Poor})}y_{it-1}^{(\text{Hp})} + \eta_{12}y_{it-1}^{(\text{Poor})}y_{it-1}^{(\text{Lp})} + \eta_{13}y_{it-1}^{(\text{Poor})}y_{it-1}^{(\text{Ue})} + x_{it}'\beta_1 + \overline{x}_i\varphi_1 + ,$$
$$y_{i0}^{(\text{Hp})}\tau_{11} + y_{i0}^{(\text{Lp})}\tau_{12} + \sigma_{\alpha^{(\text{Ue})}}\alpha^*_{(\text{Ue})}$$

$$\mu^{(\text{Hp})} = \delta_{21} y_{it-1}^{(\text{Hp})} \text{age}_{1(t-1)} + \sum_{j=1}^{2} \delta_{2j} y_{it-1}^{(\text{Hp})} \text{age}_{j(t-1)} + \sum_{j=1}^{4} \lambda_{2j} y_{it-1}^{(\text{Lp})} \text{age}_{j(t-1)} + \sum_{j=1}^{4} \gamma_{2j} y_{it-1}^{(\text{Ue-short})} \text{age}_{j(t-1)} +$$
$$\sum_{j=1}^{4} \varphi_{2j} y_{it-1}^{(\text{Ue-long})} \text{age}_{j(t-1)} + \eta_{21} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Hp})} + \eta_{22} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Lp})} + \eta_{23} y_{it-1}^{(\text{Poor})} y_{it-1}^{(\text{Ue})} + x_{it}^{'} \beta_2 + \overline{x}_i \varphi_2 + ,$$
$$y_{i0}^{(\text{Hp})} \tau_{21} + y_{i0}^{(\text{Lp})} \tau_{22} + \sigma_{\alpha^{(\text{Hp})}} \alpha_{(\text{Hp})}^{*}$$

$$\mu^{(\text{Poor})} = \sum_{j=1}^{4} \upsilon_j y_{it-1}^{(\text{Poor})} \text{age}_{j(t-1)} + \theta_2 y_{it}^{(\text{Lp})} + \theta_3 y_{it}^{(\text{Ue})} + x_{it}^{'} \beta_3 + \overline{x}_i \varphi_3 + y_{i0}^{(\text{Poor})} \tau_3 + \sigma_{\alpha^{(\text{Poor})}} \alpha_{(\text{Poor})}^{*}$$

with $\alpha_{(l)}^{*} = \alpha^{(l)} / \sigma_{\alpha^{(l)}}$. The individual likelihood contribution is:

$$L_i = \int_{\alpha_{(\text{Ue})}^{*}} \int_{\alpha_{(\text{Hp})}^{*}} \int_{\alpha_{(\text{Poor})}^{*}} \left\{ \prod_{t=1}^{T} P_{it}(\alpha_{(\text{Ue})}^{*}, \alpha_{(\text{Hp})}^{*}, \alpha_{(\text{Poor})}^{*}) \right\} g(\alpha_{(\text{Ue})}^{*}) g(\alpha_{(\text{Hp})}^{*}) g(\alpha_{(\text{Poor})}^{*}) \text{d}\alpha_{(\text{Ue})}^{*} \text{d}\alpha_{(\text{Hp})}^{*} \text{d}\alpha_{(\text{Poor})}^{*} \quad (6)$$

and $g(\alpha_{(l)}^{*})$ are the probability density functions that need to be integrated out. Using random numbers based on prime numbers (also called Halton draws, see Train 2009), three times R standard uniform distributed draws $\tilde{\alpha}_j^r \in \{0,\ldots,1\}$ are derived and transformed by the inverse cumulative standard normal distribution $\Phi^{-1}\left(\tilde{\alpha}_j^r\right)$. For each draw, the likelihood is derived for each observation, multiplied over all individuals and time-points and finally averaged over all draws. In this application, we use 75 Halton draws. Using artificial data, Plum (2016) illustrates the effect of the number of Halton draws on the estimation results of a bivariate random-effects probit model.

5. Results

Estimation results for the coefficients referring to the (lagged) labor-market position and the lagged poverty status can be found in **Table 4**. The main findings will be briefly introduced, as there will be a detailed discussion of the average partial effects thereafter. Comparing a full model with a restricted one that does not account for correlated random-effects error terms, the likelihood ratio test statistic $\overline{\chi}_{01}^2 = 382.56\ [\text{p} - val < 0.001]$ indicates that the full model is significantly better than the restricted one. The correlation parameter $\hat{\rho}_{\alpha^{(\text{Ue})(\text{Hp})}} = -0.422$ tells us that the personality traits between the risk of becoming unemployed and the chance of

becoming higher-paid employed are negatively correlated. Thus, someone with above-average motivation or ability has a lower risk of becoming unemployed and a higher chance of higher-paid employment, all other aspects being held constant. Moreover, such a person also has a lower risk of becoming unemployed and poor $\left(\hat{\rho}_{\alpha^{(\text{Ue})(\text{Poor})}} = 0.461\right)$ and a better chance of becoming higher-paid employed and living in a non-poor household $\left(\hat{\rho}_{\alpha^{(\text{Poor})(\text{Hp})}} = -0.258\right)$.

The left-hand panel of **Table 4** shows the risk of becoming unemployed at time point *t*, depending on previous labor-market position and differentiated according to four age groups, and the lagged poverty status interacted with the lagged labor-market position. It may be noted that, compared to the reference category of being higher paid and aged 30–39, being higher paid in a different age category has only a small impact on the risk of becoming unemployed. Moreover, compared to being higher-paid employed at age 30–39, being low-paid employed at *t-1* increases the risk of becoming unemployed at *t* only slightly. With reference to the unemployed, independent of the age category, a general increase in the unemployment risk can be detected. Furthermore, compared to the short-term unemployed, the long-term unemployed face a higher risk of staying unemployed, especially those workers aged below 30 and those aged 40–49. It must also be noted that with reference to the short-term unemployed the coefficients increase with age. Finally, the risk of becoming unemployed increases when living in a poor household and being low-paid employed or unemployed.

The middle panel of **Table 4** refers to the chances of becoming higher-paid employed. Men who were already higher-paid employed in the previous period and are aged below 30 have a significantly lower chance of staying higher-paid employed than their higher-paid employed colleagues aged 30–39 (reference category). This finding is not surprising, since the very definition of the low-pay threshold means that the share of low-wage workers is especially high among young workers. With reference to the low-paid employed and the short-term unemployed, there is a substantially lower chance of becoming higher-paid employed. In the case of the long-term unemployed, there is a noticeably lower chance of becoming higher-paid employed for men over 30, compared to their counterparts who are short-term unemployed. Moreover, independent of the lagged labor-market position, being poor reduces the chances of

entering higher-paid employment, compared to the reference category of living in a non-poor household.

Finally, the right-hand panel of **Table 4** refers to the risk of living in a low-income household. There are indications of a state dependence in poverty, which increases over age. Furthermore, compared with the reference category of being higher-paid employed, being low-paid employed – and especially being unemployed – increases the risk of poverty.

To facilitate interpretation of the results, average partial effects are calculated (see the Supplement for details). **Table 5**, column 1, presents the difference in the probability of becoming unemployed at *t* for someone who was low-paid employed in the previous period *t-1* and for someone short-term unemployed, all remaining characteristics being held constant. For men below 30, no significant difference is detected. For the remaining age groups, there is a reduction in the risk of becoming unemployed of between 6.7 percentage points (pp) (40–49) and 15.9pp (over 50); this is significantly different from zero at the 1% level. With reference to the long-term unemployed (column 2 of **Table 5**), a strong and significant reduction in the risk of unemployment can be noticed; this ranges from 9.9pp (30–39) to 27.2pp (below 30).

The average partial effects of becoming low-paid employed are presented in columns 3 and 4 of **Table 5**. With respect to the short-term unemployed, only small differences are found in comparison with the reference category of being low-paid employed, and none of those differences is significantly different from zero at any conventional level. Comparing the prospects of the long-term unemployed and the low-paid employed, for the age groups above 30 there are indications that the long-term unemployed have a substantially higher chance of moving into low-paid employment, though none of the effects is significantly different from zero.

Table 4: Estimation results

	Coefficient	*Std. Error*		*Coefficient*	*Std. Error*		*Coefficient*	*Std. Error*
Dependent variable: unemployed in t			***Dependent variable: higher-paid employed in t***			***Dependent variable: poor in t***		
Higher-paid$_{t-1}$ (age: <30)	0.073	0.230	Higher-paid$_{t-1}$ (age: <30)	-0.492	0.141	Non-Poor$_{t-1}$	*reference category*	
Higher-paid$_{t-1}$ (age: 30-39)	*reference category*		Higher-paid$_{t-1}$ (age: 30-39)	*reference category*		Poor$_{t-1}$ (age: <30)	0.534	0.161
Higher-paid$_{t-1}$ (age: 40-49)	0.096	0.121	Higher-paid$_{t-1}$ (age: 40-49)	0.085	0.085	Poor$_{t-1}$ (age: 30-39)	0.748	0.076
Higher-paid$_{t-1}$ (age: ≥50)	0.331	0.149	Higher-paid$_{t-1}$ (age: ≥50)	0.230	0.127	Poor$_{t-1}$ (age: 40-49)	0.720	0.086
Low-paid$_{t-1}$ (age: <30)	0.389	0.203	Low-paid$_{t-1}$ (age: <30)	-1.238	0.143	Poor$_{t-1}$ (age: ≥50)	1.025	0.128
Low-paid$_{t-1}$ (age: 30-39)	0.105	0.167	Low-paid$_{t-1}$ (age: 30-39)	-0.926	0.102	Higher-paid$_{t}$	*reference category*	
Low-paid$_{t-1}$ (age: 40-49)	0.308	0.175	Low-paid$_{t-1}$ (age: 40-49)	-0.905	0.118	Low-paid$_{t}$	0.579	0.070
Low-paid$_{t-1}$ (age: ≥50)	0.362	0.224	Low-paid$_{t-1}$ (age: ≥50)	-0.919	0.177	Unemployed$_{t}$	1.571	0.102
Unemployed (short)$_{t-1}$ (age: <30)	0.791	0.288	Unemployed (short)$_{t-1}$ (age: <30)	-1.122	0.397			
Unemployed (short)$_{t-1}$ (age: 30-39)	1.020	0.202	Unemployed (short)$_{t-1}$ (age: 30-39)	-0.723	0.255			
Unemployed (short)$_{t-1}$ (age: 40-49)	1.138	0.210	Unemployed (short)$_{t-1}$ (age: 40-49)	-1.110	0.301			
Unemployed (short)$_{t-1}$ (age: ≥50)	1.728	0.234	Unemployed (short)$_{t-1}$ (age: ≥50)	-1.023	0.382			
Unemployed (long)$_{t-1}$ (age: <30)	2.037	0.453	Unemployed (long)$_{t-1}$ (age: <30)	-1.095	1.212			
Unemployed (long)$_{t-1}$ (age: 30-39)	1.216	0.332	Unemployed (long)$_{t-1}$ (age: 30-39)	-1.845	0.778			
Unemployed (long)$_{t-1}$ (age: 40-49)	1.947	0.350	Unemployed (long)$_{t-1}$ (age: 40-49)	-1.828	0.760			
Unemployed (long)$_{t-1}$ (age: ≥50)	2.205	0.311	Unemployed (long)$_{t-1}$ (age: ≥50)	-2.176	0.866			
Non-Poor$_{t-1}$	*reference category*		Non-Poor$_{t-1}$	*reference category*				
Poor$_{t-1}$ & Higher-paid$_{t-1}$	-0.090	0.165	Poor$_{t-1}$ & Higher-paid$_{t-1}$	-0.435	0.106			
Poor$_{t-1}$ & Low-paid$_{t-1}$	0.422	0.131	Poor$_{t-1}$ & Low-paid$_{t-1}$	-0.149	0.111			
Poor$_{t-1}$ & Unemployed (short)$_{t-1}$	0.193	0.167	Poor$_{t-1}$ & Unemployed (short)$_{t-1}$	-0.297	0.273			
Poor$_{t-1}$ & Unemployed (long)$_{t-1}$	0.235	0.280	Poor$_{t-1}$ & Unemployed (long)$_{t-1}$	-0.469	0.736			
$\hat{\sigma}^2_{\alpha^{(Ue)}}$	0.706	0.175	$\hat{\sigma}^2_{\alpha^{(Hp)}}$	0.983	0.150	$\hat{\sigma}^2_{\alpha^{(Poor)}}$	0.511	0.078
$\hat{\rho}_{\alpha^{(Ue)(Hp)}}$	-0.422	0.091	$\hat{\rho}_{\alpha^{(Ue)(Poor)}}$	0.461	0.080	$\hat{\rho}_{\alpha^{(Poor)(Hp)}}$	-0.258	0.062
			N	11,906				
			log likelihood	-5877.1244				

Source: SOEP 1995-2012, own calculations. The complete estimation table results including the covariates (and their time means) can be found in **Table S 4** in the Supplement.

Then the chances of becoming higher-paid employed are compared (columns 5 and 6 of **Table 5**). When comparing the prospects of the low-paid employed and the short-term unemployed, it must be noted that, for age groups below 50, the difference is rather small and is not significantly different from zero. For the age group 50 and above, an increase of 12.2pp can be detected if, instead of being short-term unemployed, the worker was low-paid employed. In the case of long-term unemployment (column 6), the low-paid employed always have better wage prospects and these also increase noticeably with age: for the age group below 30, the average partial effect is at 11.2pp, rising to 35.4pp for the age group 50+. However, the difference is significant only for the two older age groups.[9]

Table 5: Average partial effects on labor market and poverty dynamics

	Unemployed$_t^*$		*Low-paid*$_t^*$		*Higher-paid*$_t^*$		*Poor*$_t^{**}$
Age	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$	
<30	-0.037	-0.272	0.038	0.160	-0.001	0.112	0.075
	(0.039)	(0.119)	(0.078)	(0.167)	(0.074)	(0.168)	(0.026)
30-39	-0.072	-0.099	0.054	-0.114	0.017	0.213	0.103
	(0.031)	(0.052)	(0.039)	(0.147)	(0.043)	(0.143)	(0.015)
40-49	-0.067	-0.200	-0.009	-0.070	0.075	0.271	0.094
	(0.031)	(0.084)	(0.047)	(0.133)	(0.051)	(0.135)	(0.014)
50+	-0.159	-0.259	0.037	-0.095	0.122	0.354	0.133
	(0.055)	(0.086)	(0.058)	(0.156)	(0.068)	(0.154)	(0.023)
Poor$_{t-1}^{***}$	0.007		0.028		-0.035		
	(0.009)		(0.016)		(0.016)		

Source: SOEP 1995-2012, own calculations. *N*=11,906. Standard errors in parenthesis. *Refers to the average partial effect of becoming unemployed, resp. low-paid employed or higher-paid employed, at *t* between a worker who was low-paid employed and a worker who was short-term, resp. long-term, unemployed at *t-1*, differentiated according to four age groups. *Reading example*: A worker of age below 30 has in average a 3.7 pp (27.2 pp) lower risk of becoming unemployed when he was low-paid employed instead of short-term (long-term) unemployed in the previous period. **Refers to the average partial effect of becoming/staying poor at *t* between a worker who lived already in a poor household and a worker who has not lived in a poor household a *t-1*, differentiated according to four age groups. *Reading example*: A worker of age below 30 has in average a 7.5 pp higher risk of staying poor when he was already living in a poor household in *t-1* compared to a worker who was living in a non-poor household. ***Refers to the average partial effect of becoming unemployed, resp. low-paid employed or higher-paid employed, at *t* between a worker who was poor and a worker who was non-poor at *t-1*. *Reading example*: A worker has on average a 0.7 pp higher risk of becoming unemployed when he was living in a poor household at *t-1* compared to a non-poor worker.

Turning to income prospects, there are indications of state dependence in poverty. Moreover, this increases with age (see **Table 5**, final column): a man aged below 30 has a 7.5pp higher risk

[9] **Table S 1** in the Supplement presents the difference in the probability being unemployed, low-paid or higher-paid employed at *t* respectively for someone who was higher-paid employed at *t-1* and someone low-paid employed, short-term unemployed and long-term unemployed respectively.

of living in a poor household if he already lived in a low-income household in the previous period, than if he lived in a non-poor household; this figure rises to 13.3pp for men aged 50+.

Besides state dependence in the respective labor-market and income processes, we also expect the experience of poverty to have a negative impact on employment prospects, which would translate into increased risk of unemployment and lower chances of becoming higher-paid employed. The last row of **Table 5** shows that, based on the actual labor-market position at *t-1*, on average the risk of being unemployed increases by 0.7pp if an individual lives in a poor household rather than a non-poor household. This effect is not significantly different from zero. The chances of becoming higher-paid employed are on average 3.5pp lower for someone who lives in a poor household than for someone from a non-poor household. This number is significantly different from zero at the 1% level.[10]

Table 6: Average partial effect of the labor market position on the poverty risk

	$Poor_t$
Low-paid$_t$	0.068
	(0.014)
Unemployed$_t$	0.263
	(0.037)

Source: SOEP 1995-2012, own calculations. *N*=11,906. Standard errors in parenthesis. Refers to the average partial effect of becoming poor at *t* between a low-paid, resp. unemployed, worker and a higher-paid worker at *t*. *Reading example*: A worker has on average a 6.8 pp higher risk of becoming unemployed when he was living in a poor household at *t-1* compared to a non-poor worker.

It is also expected that the labor-market positions have an impact on the risk of poverty. Compared to the reference category of being currently higher-paid employed, being low-paid

[10] The effects are smaller than in previous studies. For example Biewen (2009) calculated for Germany (2000–2006) that on average the experience of poverty increases the unemployment risk by 9.3pp. However, it must be noted that that study applied a stricter model: the three-equation estimator on the interrelation of poverty, employment and whether the person is living together with other persons includes a common individual-specific error component with loading factors that "severely restrict the cross-process unobserved correlation structure." [Biewen 2009, p. 1103]. Ayllón (2014) used European Community Household Panel data for Germany (1994–2001) and calculated an average increase in the risk of unemployment of 4.9pp. However, in that study the sample was restricted to men aged 16–29.

employed increases the risk of living in a low-income household by 6.8pp (**Table 6**). However, being currently unemployed has a much stronger impact on the risk of poverty: being unemployed increases the risk by 26.3pp on average.[11]

To sum up the findings, as in previous studies, there are indications of state dependence in labor-market and poverty dynamics. However, this study detects substantial differences between the short-term and long-term unemployed in terms of labor-market and income prospects, pointing to a substantially greater risk of staying unemployed and lower chances of climbing the salary ladder for the long-term unemployed. Furthermore, there is evidence of an age-related increase in state dependence, indicating a deterioration in the labor-market prospects of the short-term unemployed and decreasing wage prospects for the unemployed in general as they get older. Moreover, evidence is presented that the labor-market and income processes are interrelated: being unemployed increases the risk of poverty, while poor individuals are less likely to climb the salary ladder. However, it must be noted that leaving the ranks of the unemployed has a much greater impact on the risk of poverty than switching from a poor to a non-poor household has on labor-market position.

5.1 Exiting the No-Pay – Low-Income Trap

Do low wages help people escape from the no-pay – low-income trap? So far, only partial effects have been considered. As a next step, we calculate the difference in the probability of being unemployed and in a low-income household at time point *t* for someone who was low-paid employed and poor at *t-1* and for someone who was short-term (or long-term) unemployed and poor at *t-1* (**Table 7**, columns 1 and 2). In the case of the short-term unemployed, on average the reduction in risk through gaining low-paid employment rather than staying short-term unemployed is small, ranging from 0.8pp (age below 30) to 6.4pp (age 50+). However, with reference to the long-term unemployed, the reduction in the risk of entering the no-pay – low-income trap is noticeably greater, ranging from 4.5pp for the age group 30–39 to 12.3pp for those aged 50+, indicating that low-paid employment helps people exit the no-pay – low-income trap.

[11] These numbers are on a comparable level with those of Biewen (2009), who calculated an average partial effect of unemployment on the poverty risk of 23.5pp. However, Ayllón (2014) estimated a much lower effect of 5.1pp.

Table 7: Average Partial Effect on the risk of becoming unemployed and poor

	Basic Model		*Without post-sec. educated*		*Age specific low-pay and income thresholds*		*Women*	
Age	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$	*Ue-short*$_{t-1}$	*Ue-long*$_{t-1}$
<30	-0.008	-0.109	0.009	-0.159	-0.007	-0.112	0.004	-0.083
	(0.013)	(0.038)	(0.015)	(0.051)	(0.012)	(0.040)	(0.016)	(0.035)
30-39	-0.027	-0.045	-0.030	-0.062	-0.025	-0.040	-0.023	-0.039
	(0.009)	(0.015)	(0.011)	(0.020)	(0.007)	(0.013)	(0.009)	(0.014)
40-49	-0.023	-0.085	-0.018	-0.113	-0.023	-0.080	-0.007	-0.055
	(0.008)	(0.020)	(0.010)	(0.028)	(0.008)	(0.020)	(0.010)	(0.018)
50+	-0.064	-0.123	-0.061	-0.156	-0.054	-0.109	-0.045	-0.096
	(0.017)	(0.027)	(0.020)	(0.037)	(0.016)	(0.026)	(0.018)	(0.026)

Source: SOEP 1995-2012, own calculations. *N*=11,906. Standard errors in parenthesis. Refers to the average partial effect of becoming unemployed and poor at *t* between a worker who was low-paid employed **and** poor and a worker who was short-term, resp. long-term, unemployed **and** poor at *t-1*. *Reading example*: In the basic model, a worker of age below 30 has in average a 0.8 pp (10.9 pp) lower risk of becoming unemployed and poor when he was low-paid employed and poor instead of short-term (long-term) unemployed and poor in the previous period.

To evaluate the stability of the findings, two robustness estimations are conducted. In the study of Knabe and Plum (2013), evidence is presented that the labor-market prospects of workers with post-secondary education differ from the prospects of those workers without post-secondary education. There is concern that an education-specific variable might not be sufficient to capture the differences between the two groups. In the first robustness estimation, the sample is restricted to workers without post-secondary education (**Table 7** columns 3 and 4). The findings from the basic model are replicated, indicating that low wages mainly benefit the long-term unemployed in exiting the no-pay – low-income trap.

When calculating the labor-market position, an individual is identified as working in the low-pay sector if the gross hourly wage is below a certain threshold. With reference to income dynamics, a household is defined as poor when the adjusted household net income falls below a certain threshold. In both cases, the threshold is calculated on the gross hourly wage distribution (or the adjusted net household income distribution) of the total sample. However, labor-market entrants start on a low wage, and the wage then increases with age. On the one hand, this means that young workers are affected more than average by low wages. On the other hand, it is easier for them to exit the low-pay sector thanks to wage increases during the early years of their working career. As household income is highly determined by wages, a similar relationship can be assumed for poverty dynamics. Hence, the positive effect of low-paid employment on the prospects of becoming higher-paid employed and of exiting poverty might be influenced by

the wage increases of labor-market entrants. Here, an age-group specific wage and income threshold is calculated, which reduces the number of low-paid young and poor workers. The results of this estimation with regard to exiting the no-pay – low-income trap can be found in **Table 7**, columns 5 and 6. However, no major differences from the basic findings can be detected.

Though there are indications that, especially for the long-term unemployed, low pay helps in exiting the no-pay – low-income trap, it could be a concern that low-paid workers might instead enter a low-pay – low-income cycle. However, with reference to the poor and short-term unemployed at *t-1* (see **Table S 2** in the Supplement), on average no difference is found in the risk of becoming low-paid and poor between them and those who were poor and low-paid employed. The risk of poor, long-term unemployed workers to be trapped in a low-pay – no-income cycle is actually reduced if they find low-paid employment (except for the age group below 30). However, it must be noted that on average this effect is not significantly different from zero. These findings are stable for the different specifications.

Finally, the chances of leaving poverty and picking up higher-paid employment are calculated (see **Table S 3** in the Supplement). In the case of the poor short-term unemployed, picking up low-paid employment substantially increases the probability of exiting poverty and becoming higher-paid employed for workers age 40 and above. The increase in probability is even more pronounced if we compare poor low-paid employed with poor long-term unemployed. Moreover, there are indications that the chances increase with age: while a poor low-paid worker below 30 has on average 12.3pp greater probability of becoming higher-paid employed and non-poor than does a poor long-term unemployed person, the difference increases to 34.2pp for a worker aged 50 and above. Again, these findings are replicated in the two robustness estimations.

5.2 Labor-Market and Income Prospects for Women

The labor-market and income dynamics of men and women might differ more substantially than can be captured by a simple sex indicator variable; this is why gender-specific samples are generated. In the study of Knabe and Plum (2013) there are indications that compared with men

women have lower chances of becoming higher-paid employed, they also benefit from low wages – in the sense that the future risk of unemployment is reduced, and the probability of climbing up the pay distribution is improved. These findings were confirmed by the study of Mosthaf et al. (2014).

The last two columns of **Table 7** show the differences in the probability of a woman who was low-paid employed and poor at *t-1* becoming unemployed and poor at *t*, compared to a woman who was short-term (column 7) or long-term (column 8) unemployed and poor at *t-1*. The direction and intensity of the findings for women are comparable to those for men: while small differences in the risk of entering the no-pay – low-income trap are found between short-term unemployed and low-paid employed women, in the case of long-term unemployed women, there are indications that this groups benefits substantially from taking low-paid employment.

6. Conclusion

The focus of this study has been to determine whether low wages help people to exit the no-pay – low-income trap, and whether a low-pay – low-income trap replaces it. Indications are presented that the labor-market and the income process are interrelated. Compared to being higher-paid employed, being low-paid employed (by 6.8pp on average) and being unemployed (by 26.3pp on average) significantly increases the risk of poverty. In contrast to previous studies, poverty only slightly increases the risk of becoming unemployed (by 0.7pp on average). Poverty rather reduces the chances of becoming higher-paid employed (by 3.5pp on average). Moreover, we find indications of an increased persistence in unemployment and poverty over age.

Referring to the probability of escaping from the no-pay – low-income trap by picking up a low-paid employment, a heterogeneous effect in dependence of the unemployment duration is detected: compared to short-term unemployment the long-term unemployed have a much greater risk of staying unemployed and lower chances of moving up the pay distribution, which makes low-paid employment especially helpful for this group. Moreover, the chance of becoming higher-paid employed and non-poor are substantially improved. As the employment prospects of the short-term unemployed deteriorate over age, evidence is presented for short-

term unemployed over the age of 40 that low pay helps in exiting the no-pay – low-income trap and increases the chance of becoming higher-paid employed and non-poor. Independent of the unemployment duration, no indications of a low-pay – low-income trap are found.

The success of a policy intervention also depends on the identification of a needy group. This study shows that labor-market and social policies should be considered simultaneously. Even though the size of the low-wage sector has increased in most Western countries, unemployment is the major source of poverty, and gaining low-paid employment substantially reduces the risk of poverty. Furthermore, labor-market intervention should focus on avoiding the short-term unemployed turning into the long-term unemployed – for example, by introducing appropriate incentives for people to take low-paid employment. This is especially relevant for the older unemployed, who suffer from particularly depressing labor-market prospects.

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