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CHANGES IN THE PATTERNS OF POVERTY DURATION IN GERMANY, 1992-2009

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Using data from the German Socio-Economic Panel, this study explores how the duration of poverty and its determinants evolved in Germany between the early 1990s and the late 2000s. Shifts in the duration of poverty over time are captured with the application of a rolling window framework which allows us to identify when exactly a change occurred and to link it to trends in general macro-economic conditions and social policies. Joint modeling of poverty and non-poverty spells, controlling for unobserved heterogeneity, is applied within each window in order to uncover how the poverty experiences of individuals with different socio-economic characteristics have evolved over time. The results indicate that poverty has become more persistent and recurrent in Germany since the beginning of the 1990s. While those living in East Germany and in households with an EU head partially improved their situation over time, individuals over 55 years old, households with a disabled or uneducated head as well as single parent households have become more prone to poverty.

JEL Codes: I32, D31, C41

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1. Introduction

Despite the introduction of major social policy reforms, Germany is one of the OECD countries that have experienced the largest increase in income poverty rates over recent decades (OECD, 2008). Between 1992 and 2009, the percentage of people living below the poverty threshold, defined as 60% of median total net equivalised household income, rose from 11.2% to 15.3% in Germany.¹

Using individual records (Biewen and Juhasz, 2012; Peichl et al., 2012) or aggregated data (OECD, 2008), a number of scholars have tried to explore which changes in household structures and labour market conditions have potentially contributed to the shifts in income distribution and cross-sectional poverty rates. At the same time, little has been done to identify how the duration of poverty has changed over time. The issue was partly addressed by Groh-Samberg (2009), who showed that poverty has become more persistent in Germany since reunification. Using a set of successive five-year panels, he found that the proportion of people living under the poverty threshold during five consecutive years had been increasing in both East and West Germany between 1992 and 2006. Nevertheless, he neither analyzed temporal changes in the incidence and lengths of poverty spells nor explored how the poverty experiences of individuals with different characteristics had evolved over time.

There are a number of reasons why studying changes in poverty duration over time is important. First of all, it provides a better understanding of what stands behind the shifts in poverty rates. Looking only at temporal changes in cross-sectional poverty rates provides an incomplete picture of how the poverty experiences of people evolve over time. For example, an increase in poverty rates does not necessarily mean that more people face longer spells of poverty today than several years ago. Poverty could have become more dynamic rather than more persistent.² Secondly, understanding the changes in the duration of poverty has important policy implications. Dependent on whether it is transitory or persistent poverty that is increasing, either policies preventing poverty entry or those enhancing poverty exit are more appropriate. In a similar way, understanding which socio-economic groups have become more prone to long episodes of poverty over time is a prerequisite for developing better tailored and, hence, more efficient policies. Finally, knowledge about changes in poverty duration can provide complementary evidence about the success or failure of previously introduced socio-economic policies.

¹ Author's calculations based on German Socio-Economic Panel data (v27). Total net equivalised household income is adjusted for imputed rental value and the consumer price index.

² For example, Card and Blank (2008) found out that while poverty rates fell in the US, the incidence of poverty spells increased for some categories of the population but those spells became less persistent.

Taking advantage of the long-running German Socio-Economic Panel (SOEP, v27), this paper studies changes in the duration of poverty and its determinants in Germany between the early 1990s and late 2000s. To do this, we split the overall period of interest into a set of six-year long moving windows and use them to document changes in the incidence and lengths of poverty episodes over time. By applying joint modeling of poverty and non-poverty spells, with the control for time-invariant unobserved heterogeneity, we then analyse how the poverty experiences of individuals with different socio-economic characteristics have evolved since the beginning of the 1990s.

This paper contributes to the existing literature in several ways. First, it focuses on changes in poverty duration over time rather than on the duration of poverty itself³. Those rare studies which do analyse shifts in the duration of poverty (Stevens, 1994; Card and Blank, 2008; Jenkins, 2011), document temporal changes in poverty exit and re-entry rates as well as changes in the distribution of the total amount of time spent in poverty. However, they do not explore how the poverty experiences of people with different observed characteristics evolve over time. The only exception, to our knowledge, is the study by Damioli (2010), who analysed heterogeneous trends in the duration of poverty for specific population subgroups between 1993 and 1997 and between 1998 and 2006, in Britain. In contrast with Damioli (2010), we use a rolling window framework in order to detect temporal changes in the probability for individuals possessing different socio-economic characteristics to exit and re-enter poverty. The advantage of such a design is that it allows us to identify exactly when a change occurs and to link it to changes in macro-economic conditions and social policies.

Secondly, the study sheds additional light on the relationship between temporal trends in poverty rates and its duration. By following their simultaneous development over time, we can uncover what hides behind the growth of income poverty rates in Germany – an increase in the incidence of poverty episodes, their duration or both. This knowledge is important because the spread of persistent poverty is associated with more detrimental effects and a larger burden for society than an increase in temporary poverty (Bane and Ellwood, 1986; Biewen, 2006).

Thirdly, we show that patterns of poverty duration for people with different socio-economic background do change a lot as time elapses. These changes are not necessarily gradual and can sometimes be quite sudden and substantial, signifying that some groups of

³ The duration of poverty is widely analysed in the existing literature. See, among others: Bane and Ellwood (1986) and Stevens (1999) for the US; Jarvis and Jenkins (1997), Devicienti (2002, 2011), Damioli (2010) and Jenkins (2011) for the UK; Arranz and Canto (2012) for Spain; Devicienti, Gualtieri and Rossi (2012) for Italy; and Hansen and Wahlberg (2009) for Sweden.

the population become more, or less, prone to long episodes of poverty over time. Such evidence reveals the importance of regular reconsideration of social policies since those policies which were efficient several years ago might not lead to the same outcomes today.

Finally, the study extends existing knowledge about the duration of poverty and its temporal changes in Germany, where these two issues have been less investigated than in other countries. While temporal changes in the incidence and lengths of poverty spells over time have been analyzed for the UK (Jenkins and Rigg, 2001; Jenkins, 2011) and USA (Stevens, 1994; Card and Blank, 2008), no similar studies have been performed for Germany. Regarding the duration of poverty itself, the few works available in the field (Headey et al., 1994; Krause, 1998; Biewen, 2006; Moll, 2006; Fertig & Tamm, 2010) cover the period prior to 2004, that is before the introduction of the most important social policy reforms. The evidence about what happened afterwards is limited and mainly based on descriptive analysis⁴. In addition, East Germany is often excluded from the analysis (see, for example, Headey et al., 1994; Biewen, 2006) which complicates any inference about the duration of poverty in unified Germany and precludes analysis of the convergence of poverty patterns in its Western and Eastern parts. Taking advantage of the most recent waves in the SOEP, we extend the period of analysis up to 2009 and incorporate both East and West Germany into it. This allows us to trace the evolution of poverty duration over a longer period of time, including the second half of the 2000s when the most pronounced changes in poverty rates, macroeconomic conditions and social policies took place.

The paper is structured as follows. Section 2 summarizes trends in poverty rates, macroeconomic conditions and the tax-benefit system in Germany between 1992 and 2010. Section 3 describes the data while Section 4 specifies econometric methods used in the empirical part of the paper. Results of the descriptive and explanatory analysis are provided in Section 5. Section 6 summarizes and concludes.

2. Context: trends in poverty rates, macroeconomic conditions, social policies and demographics

In order to understand the context within which the duration of poverty has been evolving in Germany over the last two decades, we summarize temporal trends in 1) poverty rates and macroeconomic indicators; 2) social policies; 3) the demographic structure of the population and labour market conditions since the beginning of the 1990s.

⁴ See, among others, Groh-Samberg (2009), Frick and Grabka (2009).

Trends in poverty rates and macroeconomic conditions

Figure 1 depicts trends in unemployment, real GDP growth and poverty rates between 1992 and 2010. It shows that the fraction of people living below the poverty threshold was fluctuating between 10% and 12% during the 1990s, being relatively high at the beginning and relatively low at the end of the period. It started steadily increasing only from 2000 onwards, gaining more than 3 percentage points by 2009.

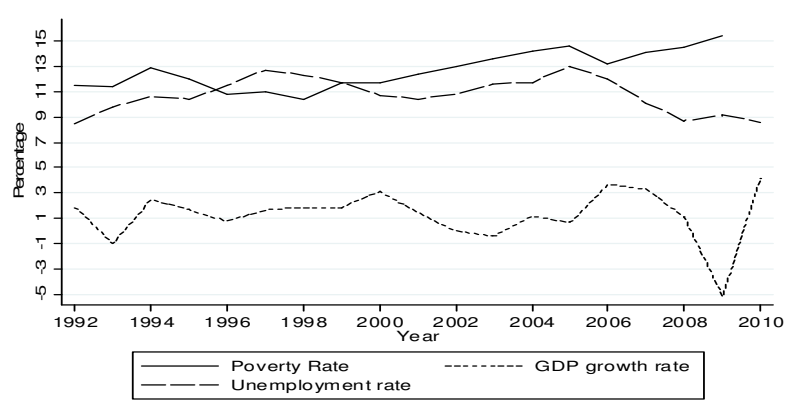


Figure 1. Trends in unemployment rates, real GDP growth rates and total poverty rates in Germany, 1992-2010

Note: The poverty threshold is fixed at 60% of median total net equivalised household income accounting for imputed rental value and the consumer price index. Real GDP growth rates represent a percentage change of real GDP compared to the previous year. The unemployment rate is defined as the ratio of unemployed individuals registered with the German Labour Office to the overall number of civil gainfully and dependently employed people.

Source: Cross-sectionally weighted SOEP data (for poverty rates) and German Statistical Office (for unemployment rates and real GDP growth rates).

Turning to the development of the key macroeconomic indicators over time, one can see that apart from the sharp economic decline in 1993, unified Germany was experiencing a small but steady economic growth during the 1990s.⁵ The situation, however, changed at the beginning of the 2000s when the annual GDP growth rate fell much below the level of the 1990s. That was also the period when the total poverty rate started steadily increasing; it has declined only once since then, in 2006, when Germany experienced the highest growth of real GDP since reunification.

Figure 1 shows that unemployment rates did not always develop in line with the trends in business cycle. Straight after reunification, Germany experienced a pronounced increase in unemployment rates which grew by 4.2 percentage points between 1992 and 1997. That increase was partly alleviated at the end of the 1990s but the progress achieved was lost again

⁵ According to Eurostat, however, this growth was small in comparison with other well-developed countries.

during the period of poor economic performance at the beginning of the 2000s. From 2005 onwards, the unemployment rate started steadily decreasing and, despite the deep economic crisis, reached its lowest level in 2009. Such trends can be partially explained by the expansion of part-time, low-paid employment and temporary jobs as a result of labour market reforms introduced over the 2000s (Faik, 2012). The decline in the unemployment rate, however, did not coincide with a reduction of poverty. After a small decrease in 2006, the poverty rate started increasing again and jumped above 15% in 2009. We expect that, during this period, the duration of poverty also increased the most.

Changes in social policies

Since the beginning of the 1990s, a series of social policy reforms have been introduced in Germany. Rather than review all of them, we will focus only on those which could have potentially reflected on the incidence and lengths of poverty episodes. Most of these reforms were directed at unemployed individuals, families with children and the elderly.

In 1998, in response to the increase in unemployment rates straight after reunification, the German government enacted the first substantial labour market reform, aiming to reduce the number of unemployed people through job placement services and other active labour market measures (Wunsch, 2005). In 2001 two other reforms were introduced, switching the focus from an active to an activating labour market policy and aiming to enhance the creation of new job opportunities.⁶ While the first reform coincides with a slight decrease in the unemployment rate, around the 2000s, the introduction of the other two does not seem to have produced any reduction in unemployment (see Figure 1). Besides, the poverty rate started steadily increasing from 1998 onwards.

The new increase in the unemployment rate motivated the government to introduce a series of reforms (the Hartz reforms) aiming to modify not only activation measures for unemployed people (Hartz I-III) but also the systems of unemployment benefits and social assistance (Hartz IV). The Hartz IV reform is considered to be the most important social policy reform in Germany since reunification (Jacobi and Kluve, 2006; Eichhorst et al., 2010). It did not modify the replacement rates for unemployment benefits but it did shorten the maximum length of their payment for the oldest category of recipients (from up to 32 to up to 24 months). In addition, the unemployment assistance scheme, for those who are not eligible for unemployment benefits or for whom the maximum period of claim has expired,

⁶ I.e. Job-ACTIVE-Act and the Pact on Part-time Work and on Fixed-Term Contracts, see Schmidt (2002) for a detailed description of these reforms.

was changed substantially. Before the reform, such individuals were eligible to claim means-tested unemployment assistance for an unlimited time period, with a replacement rate of up to 53% of previous earnings (57% for families with children). In case either unemployment benefits or unemployment assistance did not guarantee a legally defined minimum standard of living, an individual could also claim social assistance to cover the difference. After the reform, unemployment assistance and social assistance were combined in a so-called unemployment benefit II, which is a means-tested flat allowance for those who are capable of working at least 15 hours per week but who remain unemployed.

For most previous beneficiaries of unemployment assistance, the Hartz IV reform introduced a decrease in benefits and thus might have resulted in an increase in poverty. Contrarily, for those able-bodied individuals who previously received only social assistance and were switched to the unemployment benefit II after the reform, the new legislation made it possible to get marginally higher benefits as well as access to job search services (Eichhorst et al., 2010; Biewen & Juhasz, 2012). Hence, their disposable income might have increased over time.

In addition to labour market reforms, two pension reforms were introduced in Germany during the period of interest (Bonin, 2001). First, the Pension Reform Act came into force in 1992 with the aim of reducing the number of people benefiting from early retirement and to increase the statutory retirement age to 65 years old during the first half of the 2000s. Then, in 2001, another pension reform was enacted which introduced private pension plans as a supplement to public pension schemes. It is difficult, however, to predict how these two reforms could have potentially influenced incidences and duration of poverty over the 2000s.

The system of benefits directed at families with newborn children also changed considerably in the late 2000s.⁷ Instead of getting a monthly parental allowance of between 300 and 500 Euros for up to 24 months following childbirth, since 2007, parents of newborns receive an allowance with a replacement rate of up to 67% of their previous earnings (no less than 300 and no more than 1800 Euros) but only for up to 14 months. The impact of this reform on the income situation of families with newly born children largely depends on the size of their previous earnings. Families with high labor market income have benefited from the reform while families with low labor market income have lost the opportunity to receive parental benefits for the full 24 months without any substantial increase in the size of the payments.

⁷ See Wörz (2011).

In addition to the modification of benefit schemes, Germany also underwent a number of reforms in personal income taxation. First, the minimum tax rate was increased from 19% to 25.9% in 1996. Then, a series of tax reforms was implemented aimed at reducing both minimum and maximum tax rates in a stepwise manner during the first half of the 2000s. By 2005, they correspondingly decreased to 15% and 42%. Although these reforms positively affected the disposable income of all individuals subjected to taxation, individuals in the upper tail of income distribution benefited more than those in its lower tail (Biewen and Juhasz, 2012).

Changes in the demographic structure of the population and labour market conditions

Apart from general macroeconomic indicators and social policies, the demographic structure of the population and labour market conditions also influence the distribution of equivalised disposable income (Jenkins, 2000).

The evolution of demographic and labour market conditions in Germany over the past two decades has been extensively discussed in a number of studies (see, among others, Fitzenberger et al., 2011; Biewen and Juhasz, 2012; Faik, 2012; Peichl et al., 2012). Their findings reveal a substantial increase in the number of single parent and childless households, a rise in the percentage of elderly and migrants in the total population, an expansion in temporary employment, a decline in unionization and a rapid increase in earnings inequality. Given that all these factors contributed to the increase in the overall income inequality and cross-sectional poverty (Biewen and Juhasz, 2012; Peichl et al., 2012), they might similarly have had an impact on the duration of poverty.

3. Data

The empirical analysis is based on data from the SOEP (v27). This is a longitudinal survey launched in 1984 in the Federal Republic of Germany and expanded to the former German Democratic Republic after their reunification in June 1990.⁸ Designed as a panel, the SOEP collects annual data on a variety of socio-economic characteristics of individuals and their households (demographics, educational attainment, income components, labour market information, etc.) which makes it the best available dataset for exploring changes in the duration of poverty in Germany over a long period of time.

⁸ Detailed description of the SOEP dataset is provided in Haisken-DeNew and Frick (2005).

Although the SOEP started in 1984, the data used for this analysis covers the period between 1991 and 2010 with the purpose of including East Germany. The entire sample is split into a set of overlapping subsamples (rolling windows) of the same width, in order to trace changes in the duration of poverty and its determinants over time. The advantage of such a design, compared to others, lies in its ability not only to detect whether the parameters of interest change as time elapses but also to identify when it occurs. This, in turn, permits us to link changes in the duration of poverty and its determinants to changes in the macroeconomic conditions and social policies.

The poverty status of individuals is derived according to the official definition of relative income poverty in the European Union, i.e. a person is considered to be poor if his / her net equivalised household income is less than 60% of the median equivalised income in the corresponding country. The variable used for the construction of poverty status is the annual net household income which represents the total income obtained by all family members during the previous year in the form of labour earnings, asset flows, private retirement income, private transfers, public transfers and social security contributions with the deduction of total family taxes (Grabka, 2010). Preference is given to annual rather than monthly income (both variables are available in the SOEP) because it permits the smoothing out of seasonal and other short-term fluctuations in disposable income over the year. The total net household income is also adjusted for the imputed rental value, in order to account for differences in housing costs between house owners and tenants. Both total net household income and imputed rental value are then converted to 2010 prices and divided by the modified OECD equivalence scale to adjust for inflation and household economies of scale.⁹ Finally, we lag the equivalised income variable by one year to avoid the time mismatch between income reference period and covariates.¹⁰ The unit of analysis is individual, since individuals can be followed over time even if they move between households.

The width of the rolling windows is defined so as to obtain within each window five consecutive periods when a poverty exit or re-entry can occur after the exclusion of left-

⁹ Consumer price indices were calculated separately for East and West Germany until 2001 which accounts for the price differences between them straight after reunification. The OECD modified equivalence scale gives the value of 1 to the first adult in the household; the value of 0.5 to each additional adult and the value of 0.3 to each child below 14 (Grabka, 2010).

¹⁰ To check sensitivity, we also performed the analysis with un-lagged income and obtained very similar results. All temporal trends in the probabilities of exiting and re-entering poverty, as well as in the coefficients associated with individual attributes, remained the same. The only difference is that some coefficients had a more pronounced effect when income was un-lagged.

censored spells.¹¹ The exclusion of left-censored spells means that we always deal only with re-entries rather than with initial entries into poverty. Within each window, the start of a poverty spell corresponds to the first year in which a person's total net equivalised income falls below the poverty threshold after having previously been above it. Correspondingly, the end of a poverty spell corresponds to the first year when income is higher than the poverty threshold after having previously been below it. A similar definition is applied for non-poverty spells. Such a design implies that the first exit (or re-entry) into poverty within each window can occur only in the second year of observations, given that left-censored spells have already been excluded. In the case that an individual has a gap in records within the window, only the waves prior to the gap are taken into account. If he or she returns to the survey, information from those waves is used in later windows. Having done everything described above, we obtained thirteen 6-year-long rolling windows with a five-year overlap between each of them (1992-1997, 1993-1998, ... 2004-2009) and a number of person-period observations per window ranging from 10,060 to 12,800 (see Table 1 in the Appendix).

In order to identify how the patterns of poverty duration have changed over time for individuals with different socio-economic characteristics, we link transitions into and out of poverty to a set of covariates capturing their socio-economic background. Most of these covariates are measured at the household level and refer either to the head of the household (nationality, educational attainment, disability status) or to the household itself (type of household and region where it resides).¹² Apart from household level characteristics, the age and gender of individuals are incorporated into the analysis as the only two variables measured at the individual level.¹³ This allows us to explore the poverty experiences of people representing different age and gender groups.

To mitigate a feedback effect of current poverty status on future outcomes of household composition and other characteristics, all transitions out of and into poverty which occur in period t are linked to covariates measured in period $t-1$. A potential threat to endogeneity is also the reason why we did not include the employment status of the household head in the analysis and use educational attainment as its proxy.¹⁴

¹¹ Since the choice of the length of the window is somewhat arbitrary, for the sensitivity check we also performed the analysis with longer windows. This exercise confirmed our results for the six-year time frame.

¹² Household head is defined in the paper as the person with the largest share of personal income in the total household income. We also performed a sensitivity analysis with the original definition of household head from the SOEP data but did not find any substantial differences in the results.

¹³ Initially we considered the possibility of including the educational attainment of both household head and spouse. However, these two variables were found to be significantly correlated (0.3186 with $p\text{-value} < 0.001$) which led us to keep only one of them (educational attainment of household head) in the model.

¹⁴ See Biewen (2009), Devicienti, 2011 and Maes (2013) for similar applications.

Table 1 in the Appendix summarizes descriptive statistics across the windows (means and standard deviations) for all explanatory variables used in the analysis. Looking at their evolution over time, we can see that the proportion of children, EU and non-EU immigrants, those living in East Germany, as well as individuals living in multiple person households decreased by the end of the 2000s as compared to the beginning of the 1990s. In addition, the sample became more educated over time. On the one hand, these trends are, to a large extent, in line with the temporal changes in the composition of the population in Germany. On the other hand, they can also be seen as evidence that some population sub-groups have become more, or less, prone to poverty over time. Above all, this refers to immigrants, since their share in the total population increased by 1.5% between the early 1990s and the late 2000s (Statistisches Bundesamt, 2012) while it decreased in our sample.

4. Estimation approach

The empirical part of this paper is based on the joint modeling of probabilities to exit and re-enter poverty, controlling for observed and unobserved characteristics of individuals. This approach was introduced in the field of poverty dynamics by Stevens (1999) and became widely used to analyse determinants of poverty duration thereafter.¹⁵ Its key advantage, as compared to the separate estimation of the probabilities to exit or re-enter poverty, is that it makes it possible to analyze the duration of poverty across multiple spells providing better estimates of poverty persistence (Stevens, 1999; Devicienti, 2011; Jenkins, 2011).

Consider two mutually exclusive states (s) that an individual can occupy at a certain point in time where s can equal poverty (P) or non-poverty (N). Correspondingly, there are two types of events that he or she can potentially experience, e.g. exits from and entries into poverty. For a random individual (i), the probability of moving from one state to another (h_{it}^s) in a given time period t ($t = 0, 1, 2, \dots, T$) after having been in the current state for a number of periods d ($d = 1, 2, \dots, D$) can be expressed as a logit function:

$$h_{it}^s(t | d, X_{it-1}^s, v_i^s) = \frac{\exp[a_d^s + \beta^s X_{it-1}^s + v_i^s]}{1 + \exp[a_d^s + \beta^s X_{it-1}^s + v_i^s]} \quad (4.1)$$

¹⁵ See, among others, Jenkins and Rigg (2001), Biewen (2006), Fertig and Tamm (2010), Devicienti (2011) and Jenkins (2011).

In the expression above X_{it}^s is a vector of individual observable characteristics that can vary over time; β^s is a vector of parameters associated with X_{it}^s and a_d^s represents a baseline hazard capturing the function of time spent in the current state (s), specified in the most flexible way as a set of dummies corresponding to different lengths of poverty (or non-poverty) spells, d . Finally, v_i^s stands for unobserved fixed-in-time individual effects. In the context of multiple spells, accounting for this becomes important because the same unobserved forces might influence an individual's likelihood to both exit and re-enter poverty, invoking correlation across spells (Stevens, 1999; Jenkins and Rigg, 2001; Devicienti, 2011). Another reason for incorporating unobserved heterogeneity into the model is the necessity to distinguish it from the effects of true state dependence. When neglected, the impact of unobserved heterogeneity confounds with the estimates of duration dependence, increasing their magnitude and evoking a downward bias on the estimated hazard rates (Kiefer, 1988; Cameron and Trivedi, 2005; Jenkins and Rigg, 2001; Damioli, 2010).

In order to avoid the aforementioned problems, poverty and non-poverty spells have to be estimated simultaneously, allowing for the correlation of individual unobserved components (v_i^s) across spells. These components follow a joint distribution $g(v_i^P, v_i^N)$ that is unspecified but can be approximated either parametrically or semi-parametrically. In the first case, strict assumptions about the form of the distribution should be made which evokes a relatively high risk of misspecification with subsequent inaccurate estimation of the parameters. Therefore, we took advantage of the second option, according to which a joint distribution of unobserved terms v_i^P and v_i^N can be approximated in a discrete way with a finite number of support points (Heckman & Singer, 1984). This approach builds on the assumption that the population under study consists of q ($q = 1, 2, \dots, Q$) types of individuals, with different propensities to enter and exit poverty due to differences in unobserved characteristics. The number of subpopulation types is determined by the number of combinations of support points derived from the data. Each q is assigned an associated probability measure p ($0 \leq p \leq 1$ and $\sum_{q=1}^Q P_q = 1$) which reflects the probability that a randomly selected individual belongs to the corresponding type of subpopulation. All together, they form a probability mass function showing how individuals are distributed across the defined subpopulation groups. Support points and their corresponding probabilities are estimated

through the maximum likelihood procedure, together with other parameters of the model (β^s, a_d^s) .¹⁶

The contribution of an individual (i) towards the likelihood function is:

$$L_i(v^P, v^N) = \prod_{t=1}^T [h_{it}^P(\theta^P)^{e_{it}} \cdot (1 - h_{it}^P(\theta^P))^{1-e_{it}}]^{P_{it}} * [h_{it}^N(\theta^N)^{e_{it}} \cdot (1 - h_{it}^N(\theta^N))^{1-e_{it}}]^{1-P_{it}} \quad (4.2)$$

Superscript P_{it} is a dummy variable capturing the poverty status of an individual at time t (with $P_{it} = 1$ if the individual is poor and $P_{it} = 0$ if not). Superscript e_{it} is a dummy variable that shows whether there was a change in the poverty status of the individual in period t as compared to the period $t - 1$.

The log-likelihood function to be maximized for the whole sample can be then expressed as follows, with $K(v^P)$ and $K(v^N)$, depicting the number of support points for v^P and v^N respectively:

$$\log L = \sum_{i=1}^N \log \left\{ \int_{K(v^P)} \int_{K(v^N)} L_i(v^P, v^N) \cdot df(v^P, v^N) \right\} \quad (4.3)$$

An important issue that raises concerns while estimating the duration of poverty is censoring. The analytical framework described above accounts for right-censored spells (the spells with unobserved endings) by integrating their durations in the estimation of the hazards for poverty exits (or re-entries) up to the period when an individual is no longer observed. Contrarily, the incorporation of left-censored spells (the spells with unobserved beginnings) into the model is more problematic due to the absence of information about the elapsed duration. At the same time, the characteristics of individuals who experience left-censored spells might differ from the characteristics of those for whom the entrance into that state is observed (Arranz and Canto, 2012). In order to check for a possible bias related to the exclusion of left-censored spells, we took advantage of Heckman's (1981) procedure and estimated equations for poverty exits and re-entries together with the equation for initial conditions for the overall period of interest (1992-2009) by allowing them to be correlated

¹⁶ We started calculations by assuming that each heterogeneity term has two support points with one of them being normalized to zero. As a next step, we followed the suggestion of Heckman and Singer (1984) and tried to gradually increase the number of support points and their corresponding probabilities. However, the data did not support the presence of more heterogeneous types of individuals.

through unobserved characteristics.¹⁷ Nevertheless, the random term in the initial condition equation was found to be insignificant and the overall fit of the model, with the control for initial conditions, was worse than the one where such a control was not performed (see Table 2 in the Appendix). In addition, the inclusion of an initial condition equation did not substantially influence the size and the direction of coefficients in the equations for poverty exits and re-entries. Due to this reason, we will use a more parsimonious specification while exploring temporal changes in poverty experiences of individuals with different socio-economic characteristics across rolling windows.¹⁸

The estimates from equation (4.1) can be used to simulate the total amount of time spent in poverty by individuals with different socio-economic characteristics. The simulation provides a better way of exploring temporal changes in the patterns of poverty duration of individuals who differ in more than one observed covariate and facilitates interpretation of how unobservable characteristics influence their probabilities to exit (or re-enter) poverty.

We start the simulation by generating an artificial dataset for 10 000 individuals, each observed for six consecutive years. An error term (ε^s) is assumed to be independently distributed and is obtained by random draws from the logistic distribution. We then use the estimates of support points and their corresponding probabilities to reproduce the distribution of unobservable characteristics in the original sample. By fixing X_i at the values of interest and using estimates of a_d^s and β^s from the original model, we can approximate exits from and re-entries into poverty (I^s) through the following latent function, where exit (or re-entry) into poverty occurs when I^s is greater than zero:

$$I_i^s = \nu_i^s + a_d^s + \beta^s \cdot X_i + \varepsilon^s \quad (4.5)$$

Otherwise, an individual survives in the state.¹⁹ Each individual is assumed to be poor in the first year and can potentially exit poverty from the second year onwards. Having derived multiple sequences of poverty transitions separately for each individual, we can generate poverty and non-poverty spells, estimate poverty exit and re-entry probabilities and derive a frequency distribution of the total number of years spent in poverty over the 6-year period. Application of this simulation procedure separately for each window, with the

¹⁷ In such a case the unobserved components follow trivariate distribution and an initial condition equations is added to the likelihood function.

¹⁸ Similar conclusions were also reached by Biewen (2006) and Devicienti (2011).

¹⁹ For similar applications see, among others: Stevens (1999), Jenkins and Rigg (2001), Biewen (2006), Devicienti (2011), Fertig and Tamm (2010).

subsequent comparison of the results between windows, allows us to detect temporal changes in the patterns of poverty duration experienced by individuals with different sets of characteristics.

5. Results

5.1. Descriptive statistics

Figure 2 depicts the evolution of probabilities to re-enter (Panel A) and exit (Panel B) poverty, conditional on the amount of time individuals spent in the corresponding state between the beginning of the 1990s and the end of the 2000s. Poverty exit rates are calculated by dividing the number of people who exit poverty after t years of being in it by the total number of people who remained poor for at least t years. Similarly, poverty re-entry rates represent the conditional probability to re-enter poverty after having spent a certain number of years out of it.

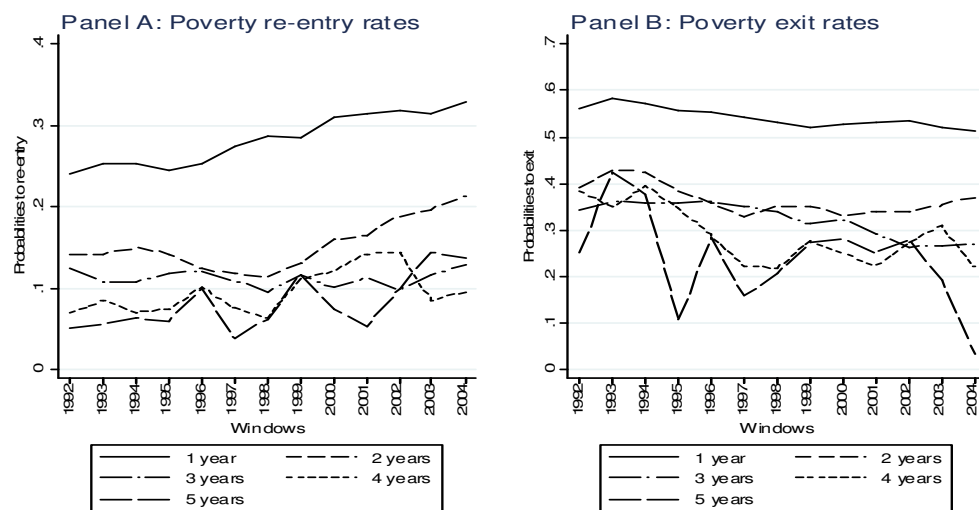


Figure 2. Dynamics of poverty exit and re-entry rates across time windows

Note: Life-table estimates based on all fresh non-poverty (Panel A) and poverty (Panel B) spells. Each window is marked with the first year it covers (e.g. '1992' for window 1 covering 1992-1997). These are un-weighted estimates.

Source: SOEP data, author's calculations.

Panel A in Figure 2 shows that the probability of re-entering poverty increased for all spell lengths since the beginning of the 1990s. For example, only 24% of fresh non-poverty spells ended with a re-entry after the first year in 1992-1997 compared to 33% in 2004-2009. A similar increase is also observed for longer non-poverty spells, although the estimates

become less precise for 5-year long spells. As a result, the proportion of people who managed to avoid returning to poverty over five consecutive years after exiting it decreased from 50% in the early 1990s to 36% in the late 2000s, signifying that poverty became more recurrent than it was before.²⁰

A closer look at Panel A in Figure 2 reveals that, while remaining more or less stable over the 1990s, the probability of re-entering poverty started increasing in the 2000s. This was also the period when poverty rates increased the most. Two major jumps occurred at the very beginning of the 2000s and between 2004 and 2005, coinciding with the economic downturn and tax reforms in the first case and the introduction of the Hartz IV reform in the second.

Panel B in Figure 2 shows that, in parallel to the rise in the incidence of poverty episodes, the length of time individuals uninterruptedly spent in poverty, once they had entered it, also increased in the last two decades. The probability of exiting poverty after the first year of being poor has declined from window to window and reached 51.4% in 2005-2009 compared to 56.2% in 1992-1997. The same trend was observed for poverty spells with longer durations, suggesting that poverty has become more persistent over time. All in all, the likelihood of spending at least five consecutive years in poverty, for those who have just started a poverty spell, doubled between the early 1990s and late 2000s.

Contrary to the trends in the poverty re-entry rates, the decline in the probability of exiting poverty started being observed earlier, in the late 1990s. It was followed by a relative stagnation in the mid-2000s and a new, steep, decline at the end of the last decade. Up to 2005, these trends were largely overlapping with the dynamics of the unemployment rate. The responsiveness of poverty exit rates to the fluctuations in general macroeconomic conditions can also be seen between 2006 and 2007 when, following the years of economic boom, the probability of exiting poverty increased.

Combining the estimates of poverty exit rates with the estimates of poverty re-entry rates allows us to derive a distribution of the total number of years spent in poverty when multiple spells are taken into account. Table 1, below, presents such a distribution, calculated for individuals who were poor at the beginning of each time window.²¹

²⁰ In order to make sure that these results are not influenced by the refreshment sub-samples in the SOEP, we also estimated poverty exit and re-entry probabilities while controlling for sub-sample dummies. In some windows the magnitude of the estimates slightly increased but the general temporal trends remained the same.

²¹ The importance of taking into account multiple spells of poverty has been emphasized by Jarvis and Jenkins (1997), Stevens (1999), Devicienti (2002), Devicienti (2011) and Jenkins (2011).

Table 1. Distribution of the total amount of time spent in poverty over the 6-year time frame by individuals just falling into poverty at the beginning of each window

Windows (years covered)	Total number of years spent in poverty out of six (%)						Average
	1 year	2 years	3 years	4 years	5 years	6 years	
1992-1997	30.0	22.1	17.6	13.6	8.7	8.0	2.73
1993-1998	30.5	23.6	17.7	12.7	9.8	5.7	2.65
1994-1999	30.2	22.9	17.8	13.7	9.5	5.9	2.67
1995-2000	29.3	22.0	17.8	13.4	7.2	10.3	2.78
1996-2001	28.6	22.1	17.5	12.6	9.9	9.3	2.81
1997-2002	28.6	20.0	16.9	12.2	9.2	13.1	2.92
1998-2003	28.3	19.8	16.5	12.4	10.4	12.6	2.95
1999-2004	25.4	21.0	16.8	13.6	11.9	11.3	3.00
2000-2005	24.1	20.2	17.0	14.5	12.7	11.5	3.06
2001-2006	23.2	21.0	16.8	13.9	12.3	12.8	3.09
2002-2007	23.0	20.8	16.4	14.8	13.1	11.9	3.10
2003-2008	23.2	19.3	17.1	15.9	11.8	12.7	3.12
2004-2009	21.4	19.5	18.0	15.2	9.1	16.8	3.22

Note: The distributions are derived from the estimates of poverty exit and re-entry rates (Figure 2) by integrating out the probabilities of all possible sequences of poverty and non-poverty spells over the 6-year time frame. For a detailed description of the procedure, see Stevens (1999), Devicienti (2002) and Biewen (2006).

Source: Author's calculations based on the SOEP data.

It shows that the probability of spending only one year in poverty out of six decreased from 30% in the first time window to 21.4% in the last one. A decline of 2.6 percentage points also occurred in the probability of remaining poor for only two years out of six. Contrarily, the chances of spending more than two years in poverty within each window increased over time. This provides additional evidence that those individuals who fall into poverty nowadays, on average, will tend to spend more time in poverty than they would have two decades ago.

In order to conclude whether or not the observed changes in the average number of years spent in poverty between windows are statistically significant, we performed a non-parametric bootstrapping procedure which accounts for the longitudinal nature of the data and the interdependence of rolling windows. More specifically, we bootstrapped the difference in the average number of years spent poor between each pair of neighboring windows as well as between the first and the last windows.²² The results did not yield significant differences between neighboring windows but the difference between the first and the last window was found to be statistically significant, suggesting that the duration of poverty has indeed increased over the years.

²²See Cameron and Trivedi (2005) for theoretical description and Jenkins and Van Kerm (2011) for practical application in the field of individual income growth. The idea is to bootstrap individuals from the original panel covering all years and only then to construct windows, perform data cleaning and derive statistics of interest (in our case, the between-window difference in the average number of years spent in poverty out of six). The bootstrapped replications are then used to estimate bootstrapped standard errors and t values for the statistics of interest and to compute their confidence bands.

5.2. Regression analysis

5.2.1. Changes in the determinants of the duration of poverty in Germany between 1992 and 2010

In order to detect how the poverty experiences of people with different socio-economic characteristics have evolved over time, we looked at the dynamics of the estimated coefficients capturing the effects of these characteristics on the probabilities to exit and re-enter poverty across thirteen overlapping time windows. The estimates from all thirteen models are given in Table 3 in the Appendix.

Figure 3 below depicts the evolution of the coefficients for duration dummies in poverty exit and re-entry equations between the early 1990s and the late 2000s. It shows that as soon as we control for observed and unobserved characteristics of individuals, the clear pattern of duration dependence, which was found in the simple life-table estimates, disappeared in the equation for poverty exits. Although the duration dummies are statistically significant in all periods except for those around 2000, their effects are very similar in size meaning that, all other things being equal, the amount of time spent in poverty does not influence the probability of exiting it.

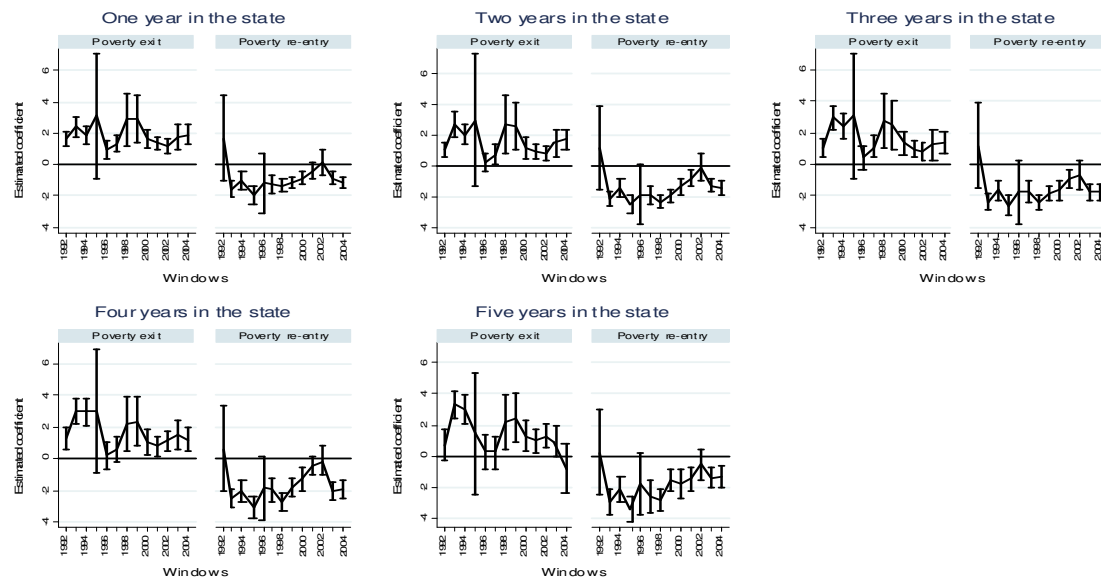


Figure 3. Dynamics of the coefficients for duration dummies across time windows

Note: Vertical lines represent confidence intervals while horizontal lines combine estimated parameters between windows. Each window is marked with the first year it covers (e.g. ‘1992’ for window 1 covering 1992–1997). All coefficients are logit estimates.

Source: Author’s calculations based on the SOEP data.

In contrast to the equations of poverty exits, a clear pattern of duration dependence remains even after we control for observed and unobserved characteristics of individuals in the equations for poverty re-entries (except of those covering 1992-1997, 1996-2001 and 2002-2007 where the estimates are imprecise). Such evidence suggests that, on average, the more time an individual spends out of poverty, the lower is the likelihood to re-enter it.

Looking at the evolution of the coefficients for duration dummies over time, we can see that the absolute magnitude of the estimates in both poverty exit and re-entry equations decreased since the beginning of the 1990s. It confirms our previous findings that both the incidence and length of poverty episodes have increased in Germany over the last two decades and signifies that the control for observed and unobserved characteristics of individuals does not eliminate this trend.

Figure 4 presents the evolution of the coefficients associated with the socio-economic characteristics of individuals between the early 1990s and the late 2000s. It reveals that the association of these characteristics with the probability to exit (or re-enter) poverty did not remain stable over time. While individuals with some characteristics improved their chances of exiting poverty over the last two decades, individuals with other characteristics became more prone to more frequent and longer episodes of poverty.

Panel A in Figure 4 depicts the evolution of the coefficients for different age categories. It shows that the situation for children and youths did not change a lot over the last twenty years. Compared to the reference group (those between 25 and 54), children almost always had a substantially higher probability of re-entering poverty but their chances of exiting it were the same until 2001, when children became more prone to longer poverty spells than adults. The negative effect disappeared from 2005 onwards, returning only once in the late 2000s. The likelihood of exiting and re-entering poverty also remained relatively stable over time for individuals between 18 and 24. They experienced a higher chance of re-entering poverty only during the crisis of 2008.

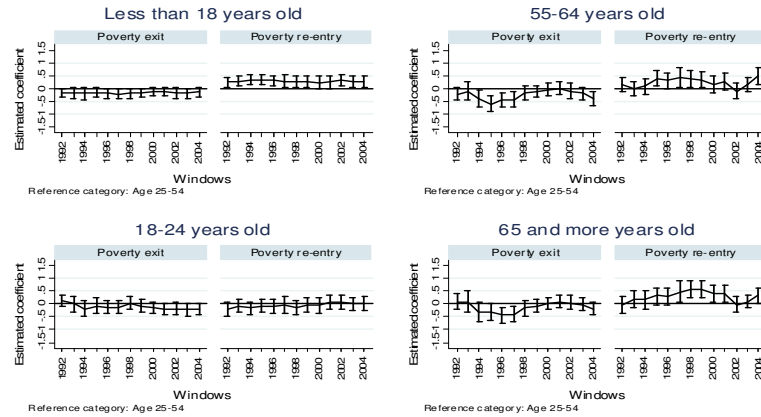
Contrary to the situation for children and young adults, the situation for individuals of pre-retirement age (between 55 and 64) and the elderly (more than 65 years old) worsened between the early 1990s and the late 2000s. First, around 2000, individuals of pre-retirement age started experiencing a significantly lower probability of exiting poverty compared to those aged 25-54. Then, the probability of them re-entering poverty increased with the significant and most pronounced effects found in the early 2000s. These trends partially overlap with the economic downturn and increase in unemployment, which could have made individuals of pre-retirement age more vulnerable in the labour market. At the same time, the

minimum retirement age was gradually increased at the beginning of the 2000s which also might have influenced the poverty experiences of individuals of pre-retirement age. As for the elderly, apart from the early 2000s they have never experienced a lower probability of exiting poverty than those aged 25-54. However, from 2002 onwards the probability of them re-entering poverty increased. A plausible explanation of this trend could be the introduction of the supplementary pension schemes in 2001, which was expected to negatively reflect on incomes of individuals retiring straight after the introduction of the reform. The significance of the effects disappeared afterwards but came back in 2009, which might be a reflection of the crisis.

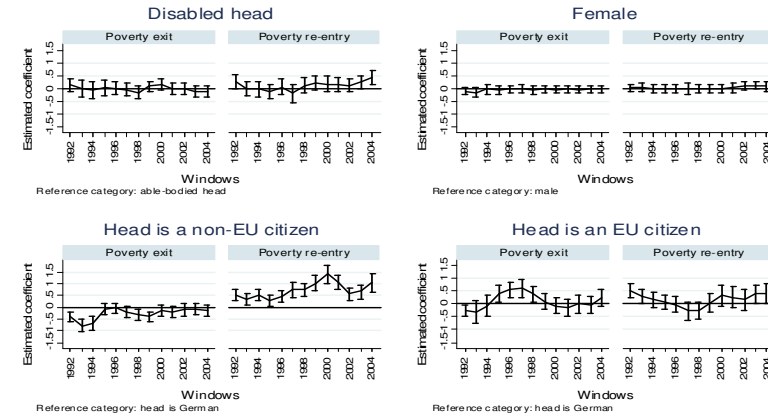
Panel B in Figure 4 summarizes the evolution of the coefficients for other demographic characteristics such as individual's gender, disability status and the nationality of the household head. It shows that men and women had the same chances of exiting and re-entering poverty across all time windows. Such evidence is in line with the previous findings of Biewen (2006), who showed that there is no association between gender and length of poverty episodes in Germany. The coefficients associated with the disability status of the household head were also relatively small and non-significant over almost all windows. A substantial change occurred in the late 2000s, when individuals living in households with a disabled head became more prone to re-entering poverty compared to those who live in households with an able-bodied head. The effect remained significant and increased in size in 2009, suggesting that the economic crisis substantially hit this group of people.

The effects of the nationality of the household head also have changed over time. More specifically, individuals living in households where the head is an EU citizen improved their situation over the last two decades. Having had a lower chance of exiting poverty compared to the reference group (individuals living in households with a German head) at the beginning of the 1990s, they started experiencing a higher likelihood of moving out of poverty than their counterparts (with a German head of household) at the beginning of the 2000s. The effects, however, disappeared in the second half of the 2000s, equalizing the chances of both groups to exit poverty. In addition, individuals living in households with an EU-head stopped experiencing a higher probability of re-entering poverty which were observed at the very beginning of the 1990s. The effects came back during the economic crisis of 2008-2009 but their magnitude was smaller than two decades ago.

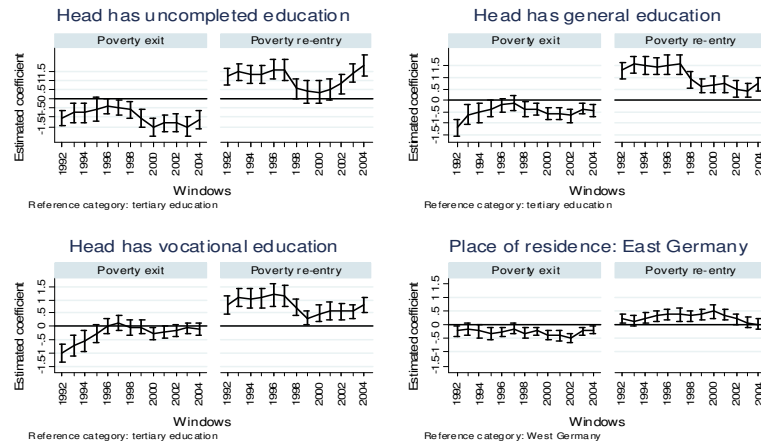
Panel A



Panel B



Panel C



Panel D

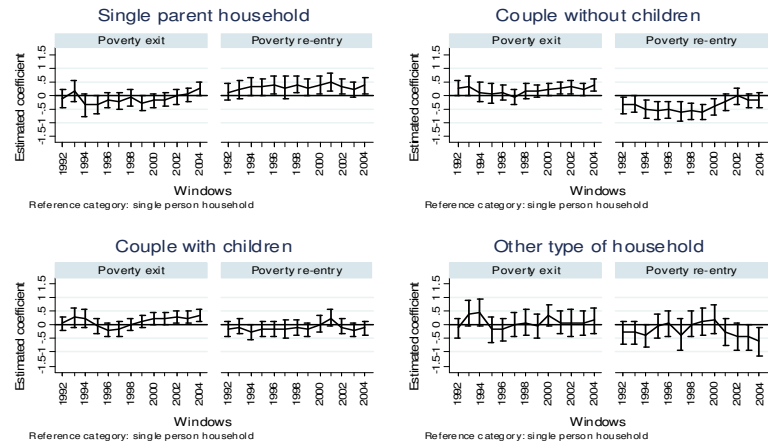


Figure 4. Temporal changes in the estimated coefficients associated with the socio-economic characteristics of individuals

Note: All coefficients are logit estimates. They are combined through windows with a horizontal line to show the general trend. Vertical lines represent upper and lower 95% confidence bounds for estimated coefficients. Each window is marked with the first year it covers (e.g. '1992' for window 1 covering 1992-1997).

Source: GSOEP data, author's calculations.

The situation appears different for individuals living in households with a non-EU head. They not only always had a higher probability of re-entering poverty than those living in households with a German head, but also the magnitude of the effect increased over time. This negative trend was partially softened by the upward shift in the likelihood of them exiting poverty: from 2005 onwards individuals living in households with a non-EU head experienced the same chances of exiting poverty as those living in households with a German head. It means that although the incidence of poverty episodes increased for people living in households with a non-EU head, the length of these episodes decreased over time.

Panel C in Figure 4 depicts the evolution of the coefficients for educational attainment and place of residence. Turning to the place of residence first, we can see that although individuals living in East Germany were, on average, more prone to longer episodes of poverty than those from the western part of the country, from 2008 onwards they experience the same chances of re-entering it. These changes might be explained by the smoothing out of regional differences between East and West Germany and by the effects of the deep economic crisis of 2008-2009.

The evolution of coefficients for dummies capturing the educational characteristics of household heads shows that individuals with an incomplete education became more prone to longer episodes of poverty at the end of the 2000s as compared to the beginning of the 1990s. Although they almost always had a substantially lower chance of exiting poverty than holders of a tertiary degree, the magnitude of the effects substantially increased over time, especially since 2005. This could be seen as a consequence of the introduction of the Hartz IV reform, which could have negatively impacted on the incomes of individuals with an incomplete education. Another possible explanation might be an increase in precarious employment and the spread of mini jobs in the second half of the 2000s (see Faik, 2012). In addition to the decrease in the probability of exiting poverty, the likelihood for this group of individuals to re-enter it increased over time and was especially high at the very end of the 2000s when the crisis hit the German economy. Hence, one can conclude that it is not only the length of poverty episodes but also their frequency that have increased over time for individuals with an incomplete education.

Contrary to uneducated individuals, those who have completed their general education improved their situation over the last two decades. Although the chances of re-entering poverty were substantially higher for this group of people than for highly educated individuals in all windows, the difference decreased between the beginning of the 1990 and the end of the 2000s. The same trend was observed for the probability of them exiting poverty: although

individuals with general education on average had a lower likelihood of climbing out of poverty than highly educated people, it substantially decreased over the years. Similarly to people who completed their general education, individuals with a vocational degree also improved their relative situation over time. Their chances of re-entering poverty were always higher than for people with tertiary education but the effects became less pronounced towards the end of the 2000s as compared to the beginning of the 1990s. Such trends can partially be explained by the introduction of labour market reforms in 2003-2005, which negatively affected the incomes of highly educated people. Withdrawing the possibility of receiving earnings-related unemployment assistance during an unlimited period of time, the Hartz IV reform, undermined the guaranteed relatively high standard of living for highly educated unemployed individuals and could have potentially decreased their advantage compared to people who have lower levels of education.

Panel D in Figure 4 presents the evolution of the coefficients for the dummies capturing household composition. It shows that individuals living as couples without children used to enjoy a lower probability of re-entering poverty than individuals living alone. This advantage, however, disappeared from 2006 onwards, being compensated for by the increase in the probability of them exiting poverty in the late 2000s. Remarkably, individuals living as couples with children have never been worse off in terms of the likelihood to exit or re-entry poverty than those living alone. Moreover, they started enjoying an even higher chance of exiting poverty in the second half of the 2000s than before. These trends coincide with the introduction of earnings-related parental benefits, which might have improved the situation of families with small children. Contrarily, single parent households became more prone to recurrent episodes of poverty during the 2000s as compared to the early 1990s.

In addition to the observed covariates, the effects of unobserved characteristics have also changed over time. The distribution of unobserved heterogeneity reveals that there are two types of individuals in the data – those who are less likely to re-enter poverty once they have exited it (non-poverty type) and those who are prone to experiencing longer episodes of poverty (pro-poor type). Figure 5, below, shows the evolution of the relative proportion of each subgroup over the last two decades.

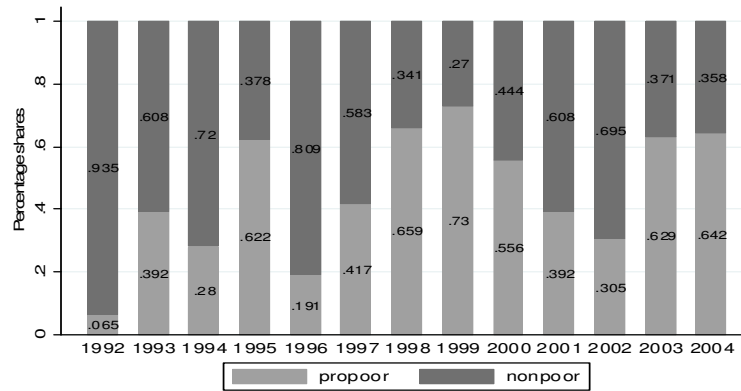


Figure 5. Dynamics of the estimated proportions of two types of individuals (based on their unobserved characteristics)

Note: Each window is marked with the first year it covers (e.g. '1992' for window 1 covering 1992-1997). The estimates of support points and corresponding probabilities were found insignificant in the windows covering 1995-2000 and 1996-2001.

Source: Author's calculations based on the SOEP data.

Figure 5 reveals that the share of individuals not prone to poverty has declined over the last two decades. While in the 1990s the share of respondents belonging to this type constituted no less than 60%, by the end of the 2000s it dropped to 35%. Correspondingly, the proportion of the poverty-prone type in the sample increased from around 30% in the 1990s to more than 60% in the late 2000s. These trends provide additional evidence about the increase in the duration of poverty in Germany over the last two decades.

5.2.2. Simulation of the total amount of time spent in poverty by individuals with different sets of socio-economic characteristics over the six-year time span

As has been highlighted in Section 4, the estimates from poverty exit and re-entry equations can be used to simulate the average number of years spent in poverty by individuals who differ in more than one characteristic (Table 2).

We start by simulating the average number of years spent in poverty by an individual with the most poverty-prone observed characteristics (except that of age, which is fixed at 25-54 years old), i.e. a female in a single-parent household with a disabled, uneducated non-EU head living in East Germany. In the next step, we started changing these characteristics for more favorable ones, looking at the shifts in the average amount of time spent in poverty. Finally, we compared the temporal evolution of the average number of years spent in poverty across different types of individuals.

Table 2. Simulation of the average number of years spent in poverty over the 6-year time frame by individuals just falling into poverty

Socio-economic characteristics of individuals and their households	Windows													Overall change
	1992-1997	1993-1998	1994-1999	1995-2000	1996-2001	1997-2002	1998-2003	1999-2004	2000-2005	2001-2006	2002-2007	2003-2008	2004-2009	
<i>Reference individual: a female between 25 and 54 years old who lives in East Germany in a single parent household with the head of household being a disabled non-EU citizen with an incomplete education</i>	3.89	3.28	3.85	3.29	3.94	3.98	3.94	4.56	5.00	4.92	4.81	4.97	4.69	+0.80
<i>The same as reference individual except for:</i>														
- being male	3.79	3.17	3.83	3.25	3.92	3.97	3.91	4.53	4.95	4.88	4.73	4.91	4.66	+0.87
- living in household with able-bodied head	3.92	3.29	3.81	3.36	3.91	4.01	3.79	4.55	5.05	4.88	4.78	4.83	4.54	+0.62
- living in household with German head	3.27	2.72	3.15	3.07	3.67	3.52	3.38	3.93	4.56	4.50	4.56	4.77	4.38	+1.11
- living in West Germany	3.57	3.14	3.59	2.93	3.50	3.71	3.60	4.29	4.64	4.51	4.34	4.81	4.57	+1.00
- being of age between 18-24	3.66	3.24	3.92	3.29	4.02	4.10	3.87	4.58	5.08	5.10	4.97	5.11	4.81	+1.15
- living in household where head has tertiary education	2.40	2.18	2.70	2.31	2.77	2.91	3.28	3.76	3.70	3.70	3.48	3.39	3.43	+1.03
- living in a couple without children	3.29	2.88	3.11	2.58	3.23	3.51	3.31	3.95	4.49	4.40	4.41	4.76	4.52	+1.23
- being male living in household with able-bodied head	3.81	3.18	3.80	3.34	3.90	4.00	3.76	4.52	5.02	4.84	4.70	4.78	4.51	+0.70
- being male living in household with able-bodied German head	3.16	2.64	3.11	3.12	3.63	3.54	3.18	3.87	4.58	4.40	4.44	4.55	4.13	+0.97
- being male living in West Germany in a household with able-bodied German head	2.85	2.52	2.87	2.78	3.19	3.28	2.83	3.51	4.09	3.89	3.91	4.35	4.00	+1.15
- being male living in West Germany in a household with able-bodied German head who has tertiary education	1.76	1.66	1.94	1.91	2.14	2.25	2.22	2.55	2.54	2.58	2.57	2.47	2.36	+0.6
- being male living in West Germany in a couple without children where household head is able-bodied, has German citizenship and tertiary education	1.56	1.50	1.57	1.55	1.76	1.92	1.80	1.97	1.97	2.06	2.24	2.17	2.06	+0.5

Note: Simulations are performed according to the procedure described in Section 4.

Table 2 shows that an individual with reference characteristics just starting a poverty spell in 1992 would have spent 3.79 years in poverty over the 6-year time frame. As would be expected, the figure is lower for individuals with more favorable characteristics. For example, being a man rather than a woman would have produced a one-month reduction in the average amount of time spent in poverty. Similarly, living in a household with a German rather than a non-EU head or living in a couple without kids rather than in a single parent household would have resulted in a half-year reduction in the average amount of time spent in poverty. The largest decrease in the average number of years spent in poverty is for individuals who possess the same reference characteristics but have tertiary rather than an incomplete education. Starting a poverty spell in 1992, they would have spent one and a half years less in poverty than individuals with all the reference characteristics.

The results presented in Table 2 reveal an even more pronounced reduction in the average number of years spent in poverty when several poverty-prone characteristics are changed simultaneously for more favorable ones. Thus, for example, a male living in West Germany in a single parent household with an able-bodied German head who also has tertiary education would have spent only 1.76 years in poverty at the beginning of the 1990s. The figure would have dropped by an additional 0.2 points if this individual were living in a couple without children rather than a single parent household.

Looking at the trends over time, we can see that the average number of years spent in poverty increased for all socio-economic types of individuals. However, the magnitude of this increase was not the same for individuals with different sets of characteristics. For example, an individual with the most favorable characteristics (male living in West Germany in a couple without children where the household head is able-bodied, has German citizenship and tertiary education) just falling into poverty in 2004 would have spent 2.06 years in poverty compared to 1.56 years if he had fallen into poverty in the early 1990s. At the same time, an individual with the most unfavorable reference characteristics (a 'reference individual') would have spent 4.69 years in poverty in the late 2000s compared to 3.89 years in the early 1990s. Such evidence suggests that the amount of time spent in poverty by individuals with unfavorable socio-economic characteristics has increased to a larger extent over time than the amount of time spent in poverty by individuals with more favorable characteristics.

A more detailed analysis of the results given in Table 2 shows that, for individuals living in households where the head has tertiary education or is a German citizen as well as those living in couples without children and residing in West Germany, the relevant advantage in spending less time in poverty has decreased over time, compared to the reference group. Although the differences

did not disappear completely, their magnitude has decreased at the end of the 2000s as compared to the beginning of the 1990s. This evidence is in line with the findings from the previous section.

6. Conclusions

Using a set of successive 6-year rolling windows constructed from the SOEP, this paper has explored changes in poverty duration and its determinants in Germany between the early 1990s and the late 2000s.

The results show that the duration of poverty has increased in Germany over the last two decades. This has happened due to the increase in both the frequency and the length of poverty episodes. The incidence of poverty episodes started increasing at the beginning of the 2000s, largely coinciding with the economic downturn and the introduction of the tax and Hartz IV reforms. The decrease in the probability to exit poverty started several years earlier, in the late 1990s, overlapping with an increase in the unemployment rate.

The increase in the duration of poverty is present even after we control for observed and unobserved characteristics of individuals. The results of the regression analysis also show that, while individuals with some characteristics have become less prone to poverty over time, individuals with other characteristics are likely to spend more time in poverty. More specifically, individuals older than 55 as well as those living in single parent households, in households with a disabled head or where the head is a non-EU citizen or has an incomplete education became more prone to poverty at the end of the 2000s as compared to the beginning of the 1990s. Contrarily, those living in East Germany as well as in households with an EU-head partially improved their situation over time. The trends in the patterns of poverty duration over time overlap with the trends in macroeconomic conditions and changes in social policies, above all, with pension reforms (early 2000s), the Hartz IV reform (2005) and parental leave reform (2007).

While interpreting the findings from this paper, one should keep in mind that, although it provides extensive evidence about the evolution of poverty duration and its determinants over time, it does not explore causal relationships between changes in poverty duration and trends in macroeconomic conditions, social policies or demographics. To do that, more specific studies focusing on a particular economic or social change are needed. We are leaving this for future research. In addition, it would be interesting to analyze how compositional shifts in household structures and labour market conditions have influenced the amount of time individuals spend in poverty.

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Appendix

Table 1. Descriptive statistics of the sample characteristics

Variables	Windows												
	1992-1997	1993-1998	1994-1999	1995-2000	1996-2001	1997-2002	1998-2003	1999-2004	2000-2005	2001-2006	2002-2007	2003-2008	2004-2009
Age													
Below 18	0.28 (0.45)	0.28 (0.45)	0.28 (0.45)	0.28 (0.44)	0.28 (0.44)	0.27 (0.44)	0.27 (0.44)	0.25 (0.43)	0.24 (0.42)	0.24 (0.42)	0.24 (0.42)	0.24 (0.42)	0.23 (0.42)
18 – 24	0.12 (0.32)	0.12 (0.32)	0.11 (0.31)	0.12 (0.32)	0.12 (0.32)	0.12 (0.32)	0.12 (0.32)	0.12 (0.32)	0.12 (0.32)	0.12 (0.31)	0.12 (0.32)	0.12 (0.32)	0.12 (0.32)
25 – 54 (<i>ref.</i>)	0.37 (0.48)	0.38 (0.48)	0.39 (0.48)	0.40 (0.49)	0.40 (0.48)	0.39 (0.49)	0.40 (0.49)	0.40 (0.48)	0.39 (0.48)	0.39 (0.48)	0.39 (0.48)	0.40 (0.48)	0.41 (0.49)
55 – 64	0.12 (0.32)	0.11 (0.32)	0.11 (0.31)	0.11 (0.30)	0.11 (0.31)	0.12 (0.31)	0.11 (0.31)	0.12 (0.32)	0.12 (0.32)	0.11 (0.31)	0.11 (0.31)	0.11 (0.30)	0.10 (0.29)
65 and more	0.10 (0.29)	0.09 (0.28)	0.08 (0.28)	0.09 (0.28)	0.09 (0.29)	0.10 (0.30)	0.10 (0.30)	0.11 (0.31)	0.13 (0.34)	0.14 (0.34)	0.15 (0.35)	0.14 (0.34)	0.14 (0.35)
Female	0.55 (0.49)	0.54 (0.49)	0.54 (0.49)	0.54 (0.49)	0.54 (0.49)	0.54 (0.49)	0.54 (0.49)	0.55 (0.49)	0.55 (0.49)	0.55 (0.49)	0.55 (0.49)	0.55 (0.49)	0.55 (0.49)
Citizenship of HH													
German (<i>ref.</i>)	0.77 (0.42)	0.76 (0.43)	0.76 (0.42)	0.77 (0.42)	0.77 (0.42)	0.78 (0.41)	0.79 (0.40)	0.80 (0.39)	0.83 (0.37)	0.85 (0.36)	0.85 (0.35)	0.86 (0.34)	0.87 (0.34)
EU citizen	0.08 (0.27)	0.08 (0.27)	0.08 (0.27)	0.08 (0.27)	0.08 (0.27)	0.08 (0.26)	0.08 (0.26)	0.06 (0.23)	0.05 (0.22)	0.04 (0.21)	0.05 (0.21)	0.05 (0.20)	0.04 (0.19)
Non-EU citizen	0.15 (0.35)	0.16 (0.36)	0.16 (0.36)	0.15 (0.36)	0.15 (0.35)	0.14 (0.35)	0.13 (0.33)	0.14 (0.34)	0.12 (0.32)	0.11 (0.30)	0.10 (0.30)	0.09 (0.29)	0.09 (0.29)
Disabled head	0.09 (0.28)	0.08 (0.28)	0.08 (0.28)	0.08 (0.28)	0.09 (0.28)	0.10 (0.30)	0.10 (0.29)	0.10 (0.30)	0.11 (0.31)	0.11 (0.31)	0.12 (0.32)	0.11 (0.31)	0.11 (0.31)
Live in East Germ.	0.39 (0.48)	0.34 (0.47)	0.32 (0.46)	0.30 (0.45)	0.29 (0.45)	0.28 (0.44)	0.27 (0.44)	0.26 (0.43)	0.27 (0.44)	0.28 (0.44)	0.29 (0.45)	0.30 (0.46)	0.31 (0.46)
Level of education													
Uncompleted	0.06 (0.24)	0.06 (0.24)	0.06 (0.24)	0.06 (0.23)	0.05 (0.22)	0.05 (0.22)	0.04 (0.18)	0.03 (0.17)	0.03 (0.16)	0.03 (0.16)	0.03 (0.17)	0.03 (0.16)	0.03 (0.16)
General	0.23 (0.42)	0.25 (0.43)	0.25 (0.43)	0.26 (0.44)	0.26 (0.43)	0.26 (0.43)	0.25 (0.43)	0.23 (0.42)	0.22 (0.41)	0.21 (0.40)	0.21 (0.41)	0.21 (0.40)	0.21 (0.40)
Vocational	0.61 (0.48)	0.61 (0.48)	0.60 (0.48)	0.60 (0.49)	0.60 (0.48)	0.60 (0.48)	0.62 (0.48)	0.64 (0.48)	0.65 (0.47)	0.66 (0.47)	0.65 (0.47)	0.65 (0.47)	0.65 (0.47)
Tertiary (<i>ref.</i>)	0.09 (0.28)	0.08 (0.27)	0.08 (0.26)	0.08 (0.27)	0.09 (0.28)	0.09 (0.28)	0.09 (0.28)	0.10 (0.29)	0.10 (0.29)	0.10 (0.30)	0.11 (0.31)	0.11 (0.31)	0.11 (0.31)
Type of household													
Single person (<i>ref.</i>)	0.12 (0.32)	0.12 (0.31)	0.12 (0.31)	0.12 (0.32)	0.13 (0.33)	0.14 (0.35)	0.15 (0.36)	0.17 (0.37)	0.18 (0.38)	0.18 (0.38)	0.18 (0.38)	0.18 (0.38)	0.19 (0.39)
Single parent	0.12 (0.32)	0.12 (0.31)	0.11 (0.31)	0.13 (0.33)	0.13 (0.34)	0.14 (0.34)	0.14 (0.34)	0.14 (0.35)	0.16 (0.36)	0.16 (0.36)	0.17 (0.38)	0.18 (0.38)	0.17 (0.37)
Couple	0.16 (0.32)	0.15 (0.36)	0.15 (0.35)	0.15 (0.35)	0.16 (0.36)	0.16 (0.37)	0.16 (0.36)	0.17 (0.37)	0.19 (0.39)	0.20 (0.39)	0.19 (0.39)	0.19 (0.39)	0.19 (0.39)
Couple with children	0.55 (0.49)	0.56 (0.49)	0.57 (0.49)	0.56 (0.49)	0.55 (0.49)	0.53 (0.49)	0.52 (0.49)	0.49 (0.49)	0.44 (0.49)	0.43 (0.49)	0.42 (0.49)	0.42 (0.49)	0.42 (0.49)
Other	0.05 (0.22)	0.06 (0.23)	0.05 (0.22)	0.04 (0.19)	0.03 (0.18)	0.03 (0.18)	0.03 (0.17)	0.03 (0.17)	0.03 (0.17)	0.03 (0.18)	0.03 (0.17)	0.03 (0.17)	0.03 (0.16)
<i>N</i> individuals	3672	3624	3532	3456	3165	3720	3860	3946	4048	4129	3919	3943	3800
<i>N</i> observations	11344	11215	11219	10836	10060	10149	10799	11220	11753	12800	12141	11923	11337

Note: Calculations are performed with the cleaned sample for both poverty and non-poverty spells. All estimates are not weighted.

Source: Author's calculations based on the SOEP data.

Table 2. Hazard model estimates of poverty exits and re-entries in Germany, 1992-2009

Covariates	Model 1 (without unobserved heterogeneity and initial conditions)		Model 2 (with unobserved heterogeneity)		Model 3 (with unobserved heterogeneity and initial conditions)	
	Coefficient	(SE)	Coefficient	(SE)	Coefficient	(SE)
<i>Equation for poverty exits</i>						
<i>Duration dummies</i>						
1 year in poverty	0.427	(0.113)***	1.237	(0.118)***	1.200	(0.119)***
2 years in poverty	-0.232	(0.125)	0.784	(0.132)***	0.737	(0.134)***
3 years in poverty	-0.498	(0.136)***	0.659	(0.144)***	0.608	(0.147)***
4 years in poverty	-0.631	(0.154)***	0.633	(0.156)***	0.579	(0.159)***
5 years in poverty	-0.862	(0.206)***	0.477	(0.172)**	0.422	(0.175)*
6 years in poverty	-1.083	(0.237)***	0.306	(0.192)	0.252	(0.195)
7 years in poverty	-1.247	(0.303)***	0.172	(0.225)	0.118	(0.228)
8 years in poverty	-1.514	(0.403)***	-0.079	(0.276)	-0.133	(0.278)
9 years in poverty	-1.875	(0.467)***	-0.414	(0.362)	-0.465	(0.364)
10 years in poverty	-2.349	(0.694)***	-0.871	(0.483)	-0.919	(0.484)
11 years and more	-1.521	(0.347)***	-0.013	(0.277)	-0.060	(0.278)
<i>Socio-economic characteristics</i>						
Age below 18	-0.146	(0.030)***	-0.215	(0.052)***	-0.213	(0.052)***
Age between 18 and 24	-0.056	(0.056)	-0.142	(0.066)*	-0.144	(0.066)*
Age below 55 and 64	-0.197	(0.068)**	-0.220	(0.070)**	-0.217	(0.070)**
Age 65 and above	-0.148	(0.07)*	-0.131	(0.073)	-0.125	(0.073)
Female	-0.017	(0.025)	-0.034	(0.040)	-0.034	(0.040)
Disabled head	-0.054	(0.082)	-0.082	(0.062)	-0.082	(0.061)
Head is an EU citizen	0.263	(0.119)*	0.217	(0.089)*	0.220	(0.088)*
Head is a non-EU citizen	-0.194	(0.094)*	-0.312	(0.069)***	-0.309	(0.069)***
East Germany	-0.208	(0.060)***	-0.270	(0.046)***	-0.265	(0.046)***
Head has general education	-0.490	(0.108)***	-0.533	(0.080)***	-0.529	(0.079)***
Head has vocational education	-0.240	(0.103)*	-0.261	(0.072)***	-0.259	(0.072)***
Head has uncompleted education	-0.822	(0.158)***	-0.834	(0.113)***	-0.833	(0.113)***
Couple	0.257	(0.072)***	0.277	(0.068)***	0.278	(0.068)***
Single parent	-0.055	(0.087)	-0.044	(0.077)	-0.042	(0.077)
Couple with children	0.227	(0.069)***	0.229	(0.066)***	0.230	(0.066)***
Other type of household	0.159	(0.153)	0.243	(0.113)*	0.241	(0.113)*
<i>Equation for poverty re-entries</i>						
1 year out of poverty	-1.829	(0.133)***	-1.128	(0.120)***	-1.122	(0.122)***
2 years out of poverty	-2.532	(0.144)***	-1.680	(0.129)***	-1.675	(0.131)***
3 years out of poverty	-2.836	(0.149)***	-1.867	(0.138)***	-1.862	(0.139)***
4 years out of poverty	-3.034	(0.161)***	-1.989	(0.145)***	-1.985	(0.147)***
5 years out of poverty	-3.252	(0.180)***	-2.141	(0.153)***	-2.139	(0.155)***
6 years out of poverty	-3.713	(0.204)***	-2.565	(0.171)***	-2.562	(0.172)***
7 years out of poverty	-3.631	(0.238)***	-2.421	(0.177)***	-2.420	(0.178)***
8 years out of poverty	-3.758	(0.241)***	-2.524	(0.192)***	-2.523	(0.193)***
9 years out of poverty	-3.816	(0.266)***	-2.534	(0.211)***	-2.533	(0.212)***
10 years out of poverty	-3.452	(0.280)***	-2.135	(0.205)***	-2.136	(0.207)***
11 years and more	-4.044	(0.225)***	-2.655	(0.188)***	-2.659	(0.189)***
<i>Socio-economic characteristics</i>						
Age below 18	0.190	(0.031)***	0.312	(0.058)***	0.306	(0.058)***
Age between 18 and 24	-0.053	(0.059)	0.059	(0.072)	0.056	(0.072)
Age below 55 and 64	0.167	(0.073)*	0.238	(0.078)**	0.236	(0.078)**
Age 65 and above	0.108	(0.076)	0.138	(0.079)	0.130	(0.079)
Female head	0.034	(0.027)	0.055	(0.046)	0.054	(0.046)
Disabled head	0.156	(0.086)	0.168	(0.071)*	0.174	(0.071)*
Head is an EU citizen	0.131	(0.137)	0.218	(0.099)*	0.22	(0.099)*
Head is a non-EU citizen	0.372	(0.110)***	0.549	(0.079)***	0.548	(0.079)***
East Germany	0.089	(0.065)	0.143	(0.052)**	0.137	(0.052)**
Head has general education	0.933	(0.138)***	1.070	(0.089)***	1.074	(0.089)***
Head has vocational education	0.711	(0.123)***	0.841	(0.081)***	0.846	(0.081)***
Head has uncompleted education	0.978	(0.211)***	1.148	(0.133)***	1.154	(0.133)***
Couple	-0.228	(0.078)**	-0.318	(0.075)***	-0.320	(0.075)***
Single parent	0.297	(0.092)***	0.282	(0.086)***	0.280	(0.086)***
Couple with children	-0.074	(0.073)	-0.162	(0.074)*	-0.164	(0.074)*
Other type of household	-0.115	(0.179)	-0.296	(0.126)*	-0.298	(0.126)*
<i>Equation for initial conditions</i>						
Father has a vocational degree					0.336	(0.111)**
Father has other degree					0.360	(0.201)
Father has no degree					0.217	(0.122)
Father's degree is unknown					0.093	(0.116)
Grew up in a small city					0.128	(0.066)*
Grew up in a medium city					-0.048	(0.069)
Grew up in a large city					-0.057	(0.064)
Constant					0.369	(0.126)***

Table 2 (continued)

Covariates	Model 1 (without unobserved heterogeneity and initial conditions)		Model 2 (with unobserved heterogeneity)		Model 3 (with unobserved heterogeneity and initial conditions)	
	Coefficient	(SE)	Coefficient	(SE)	Coefficient	(SE)
<i>Distribution of unobserved heterogeneity</i>						
<i>Support points</i>						
thP			-1.439	(0.076)***	-1.406	(0.078)***
thNP			-1.735	(0.070)***	-1.731	(0.071)***
Thq					0.147	(0.082)
<i>Estimated probabilities</i>						
π (prone to poverty type)			0.595	(0.026)***	0.600	(0.027)***
$\pi-1$ (non-poverty type)			0.405	(0.026)***	0.400	(0.027)***
Log likelihood	-22739.594		-22539.735			
No of individuals	7730		7730		7730	
No of person-year observations	48763		48763		48763	

Note: Coefficients are logit estimates. The stars next to the standard errors reflect the level of significance: * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001. Standard errors reported in Model 1 account for clustering of individuals within households. Standard errors for the probabilities π and $\pi-1$ (distribution of unobserved heterogeneity) are derived by Delta method. Model 1 summarizes the results of the joint estimation of poverty exit and poverty re-entry equations without accounting for unobserved heterogeneity and initial conditions. Model 2 allows both observed and unobserved characteristics of individuals to be associated with the probabilities of exiting and re-entering poverty. Model 3 extends Model 2 by accounting for initial conditions.

Source: Author's calculations based on the SOEP data.

Table 3. Joint estimation of poverty exits and re-entries across time windows

Variables	Windows												
	1992-1997	1993-1998	1994-1999	1995-2000	1996-2001	1997-2002	1998-2003	1999-2004	2000-2005	2001-2006	2002-2007	2003-2008	2004-2009
<i>Equation for poverty exits</i>													
1 year	1.61 (0.23)	2.41 (0.32)	1.86 (0.28)	3.07 (2.06)	0.92 (0.29)	1.32 (0.26)	2.87 (0.86)	2.88 (0.76)	1.65 (0.32)	1.34 (0.20)	1.18 (0.21)	1.76 (0.43)	1.88 (0.32)
2 years	1.07 (0.25)	2.74 (0.40)	2.04 (0.34)	3.00 (2.23)	0.23 (0.33)	0.75 (0.31)	2.71 (0.95)	2.60 (0.80)	1.22 (0.36)	0.94 (0.23)	0.81 (0.25)	1.48 (0.48)	1.73 (0.35)
3 years	0.98 (0.29)	2.96 (0.39)	2.42 (0.39)	3.05 (2.05)	0.41 (0.38)	1.10 (0.36)	2.77 (0.89)	2.50 (0.78)	1.33 (0.38)	0.95 (0.26)	0.78 (0.30)	1.23 (0.48)	1.41 (0.36)
4 years	1.28 (0.35)	3.01(0.40)	2.95 (0.41)	3.02 (1.97)	0.19 (0.44)	0.63 (0.41)	2.19 (0.88)	2.32 (0.78)	1.06 (0.41)	0.79(0.31)	1.10 (0.33)	1.53 (0.46)	1.19 (0.37)
5 years	0.69 (0.50)	3.34 (0.44)	3.00 (0.48)	1.46 (2.01)	0.26 (0.56)	0.25 (0.54)	2.17 (0.91)	2.45 (0.81)	1.29 (0.51)	0.96 (0.38)	1.31 (0.39)	0.91 (0.50)	-0.81 (0.80)
Female	-0.09 (0.06)	-0.16 (0.09)	-0.02 (0.10)	-0.05 (0.08)	-0.02 (0.07)	-0.01 (0.07)	-0.06 (0.07)	-0.04 (0.06)	-0.05 (0.06)	-0.04 (0.07)	-0.05 (0.07)	-0.04 (0.06)	-0.02 (0.06)
Disabled head	0.13 (0.12)	-0.01(0.16)	-0.06 (0.16)	0.02 (0.15)	0.01 (0.13)	-0.04 (0.12)	-0.15 (0.13)	0.07 (0.11)	0.13 (0.11)	-0.01 (0.11)	-0.01 (0.12)	-0.12 (0.11)	-0.13 (0.11)
EU citizen	-0.25 (0.12)	-0.31(0.22)	-0.06 (0.20)	0.38 (0.17)	0.55 (0.15)	0.61 (0.17)	0.37 (0.16)	0.09 (0.14)	-0.08 (0.15)	-0.15 (0.16)	-0.01 (0.17)	-0.04 (0.16)	0.25 (0.16)
Non-EU citizen	-0.39 (0.10)	-0.78 (0.14)	-0.67 (0.15)	-0.08 (0.13)	-0.05 (0.11)	-0.22 (0.11)	-0.31 (0.12)	-0.40 (0.10)	-0.14 (0.11)	-0.21 (0.11)	-0.11 (0.13)	-0.07 (0.12)	-0.16 (0.12)
East Germany	-0.23 (0.09)	-0.13 (0.11)	-0.21 (0.12)	-0.30 (0.10)	-0.26 (0.08)	-0.13 (0.09)	-0.29 (0.09)	-0.23 (0.08)	-0.34 (0.08)	-0.40 (0.08)	-0.48 (0.09)	-0.21 (0.07)	-0.18 (0.07)
Age below 18	-0.15 (0.08)	-0.17 (0.11)	-0.19 (0.12)	-0.17 (0.10)	-0.20 (0.09)	-0.21 (0.10)	-0.19 (0.09)	-0.18 (0.09)	-0.12 (0.09)	-0.12 (0.09)	-0.17 (0.10)	-0.20 (0.09)	-0.14 (0.09)
Age 18-24	0.14 (0.11)	0.01 (0.15)	-0.18 (0.16)	-0.08 (0.15)	-0.12 (0.12)	-0.14 (0.13)	0.02 (0.12)	-0.06 (0.11)	-0.16 (0.11)	-0.21 (0.11)	-0.18 (0.12)	-0.23 (0.11)	-0.18 (0.11)
Age 55-64	-0.21 (0.12)	-0.09 (0.17)	-0.39 (0.17)	-0.60 (0.16)	-0.44 (0.13)	-0.42 (0.14)	-0.16 (0.14)	-0.11 (0.12)	-0.05 (0.12)	-0.01(0.12)	-0.09 (0.14)	-0.20 (0.12)	-0.40 (0.13)
Age 65 and more	0.09 (0.16)	0.07 (0.20)	-0.30 (0.20)	-0.31 (0.17)	-0.43 (0.15)	-0.40 (0.15)	-0.17 (0.15)	-0.06 (0.12)	0.01 (0.12)	0.09 (0.12)	0.04 (0.14)	-0.02 (0.12)	-0.19 (0.12)
General education of HH	-1.20 (0.18)	-0.63 (0.21)	-0.52 (0.21)	-0.36 (0.18)	-0.20 (0.15)	-0.13 (0.15)	-0.38 (0.15)	-0.38 (0.13)	-0.57 (0.13)	-0.58 (0.13)	-0.66 (0.14)	-0.35 (0.12)	-0.45 (0.13)
Vocational education	-1.02 (0.17)	-0.74(0.20)	-0.54 (0.19)	-0.29 (0.17)	0.02 (0.14)	0.13 (0.14)	-0.06 (0.14)	-0.03 (0.12)	-0.24 (0.11)	-0.23(0.11)	-0.16 (0.12)	-0.06 (0.10)	-0.10 (0.11)
Uncompleted education	-1.05 (0.21)	-0.73(0.27)	-0.75 (0.25)	-0.54 (0.33)	-0.41 (0.20)	-0.48 (0.22)	-0.60 (0.23)	-1.03 (0.24)	-1.55 (0.23)	-1.30 (0.23)	-1.25 (0.24)	-1.49 (0.25)	-1.13 (0.24)
Couple	0.25 (0.14)	0.33 (0.18)	0.12 (0.18)	0.06 (0.17)	0.09 (0.14)	-0.05 (0.14)	0.16 (0.13)	0.16 (0.11)	0.21 (0.11)	0.25 (0.11)	0.30 (0.13)	0.20 (0.11)	0.36 (0.11)
Single parent	-0.12 (0.15)	0.15 (0.20)	-0.36 (0.21)	-0.35 (0.17)	-0.17 (0.15)	-0.22 (0.15)	-0.09 (0.15)	-0.28 (0.13)	-0.21 (0.13)	-0.15 (0.13)	-0.04 (0.14)	0.02 (0.12)	0.23 (0.12)
Couple with children	0.05 (0.13)	0.27(0.17)	0.23 (0.17)	-0.03 (0.14)	-0.18 (0.13)	-0.15 (0.13)	0.01 (0.12)	0.12 (0.11)	0.23 (0.10)	0.25 (0.11)	0.28 (0.12)	0.26 (0.10)	0.34 (0.11)
Other type of household	-0.10 (0.17)	0.42 (0.23)	0.46 (0.26)	-0.17 (0.23)	-0.16 (0.20)	0.01 (0.21)	0.10 (0.23)	-0.03 (0.21)	0.35 (0.20)	0.08 (0.21)	0.07 (0.24)	0.06 (0.22)	0.15 (0.23)
<i>Equation for poverty re-entries</i>													
1 year	1.65 (1.39)	-1.60 (0.25)	-1.01 (0.29)	-1.99 (0.28)	-1.19 (0.95)	-1.22 (0.29)	-1.35 (0.20)	-1.12 (0.18)	-0.86 (0.23)	-0.42 (0.25)	0.16 (0.41)	-0.89 (0.20)	-1.16 (0.18)
2 years	1.23 (1.40)	-2.14 (0.26)	-1.42 (0.31)	-2.51 (0.30)	-1.88 (0.99)	-1.92 (0.32)	-2.34 (0.22)	-1.91 (0.20)	-1.35 (0.27)	-0.79 (0.26)	-0.12 (0.46)	-1.26 (0.23)	-1.43 (0.20)
3 years	1.18 (1.38)	-2.36 (0.28)	-1.66 (0.32)	-2.61 (0.33)	-1.79 (1.01)	-1.70 (0.34)	-2.42 (0.24)	-1.89 (0.22)	-1.65 (0.31)	-0.94 (0.27)	-0.70 (0.47)	-1.73 (0.26)	-1.78 (0.24)
4 years	0.60 (1.38)	-2.51 (0.31)	-2.08 (0.35)	-3.07 (0.36)	-1.88 (1.00)	-1.94 (0.37)	-2.77 (0.29)	-1.79 (0.27)	-1.29 (0.35)	-0.43(0.28)	-0.16 (0.46)	-2.02 (0.30)	-1.95 (0.29)
5 years	0.24 (1.39)	-2.96 (0.42)	-2.12 (0.42)	-3.39 (0.43)	-1.82 (1.02)	-2.63 (0.53)	-2.82 (0.35)	-1.58 (0.34)	-1.79 (0.47)	-1.45 (0.39)	-0.54 (0.50)	-1.38 (0.35)	-1.35 (0.36)
Female	0.02 (0.07)	0.04 (0.07)	-0.01 (0.08)	-0.01 (0.07)	-0.02 (0.08)	-0.02 (0.10)	-0.01 (0.08)	0.01 (0.08)	-0.01 (0.09)	0.02(0.09)	0.10 (0.08)	0.11 (0.08)	0.07 (0.08)
Disabled head	0.24 (0.13)	-0.02 (0.14)	-0.02 (0.15)	-0.12 (0.15)	0.06 (0.15)	-0.19 (0.17)	0.13 (0.14)	0.18 (0.14)	0.17 (0.14)	0.16 (0.14)	0.09 (0.12)	0.24 (0.12)	0.42 (0.13)
EU citizen	0.53 (0.14)	0.27 (0.14)	0.15 (0.15)	0.06 (0.14)	-0.01 (0.15)	-0.27 (0.18)	-0.25 (0.16)	0.03 (0.17)	0.34 (0.20)	0.26 (0.20)	0.14 (0.20)	0.37 (0.18)	0.39 (0.20)
Non-EU citizen	0.52 (0.11)	0.32 (0.12)	0.53 (0.12)	0.29 (0.11)	0.44 (0.12)	0.73 (0.16)	0.73 (0.14)	1.01 (0.16)	1.39 (0.19)	1.05 (0.15)	0.56 (0.14)	0.65 (0.15)	1.03 (0.19)
East Germany	0.22 (0.09)	0.13 (0.09)	0.24 (0.09)	0.32 (0.09)	0.38 (0.09)	0.37 (0.12)	0.33 (0.10)	0.38 (0.09)	0.47 (0.12)	0.37 (0.11)	0.22 (0.09)	0.09 (0.09)	0.02 (0.09)
Age below 18	0.25 (0.09)	0.29 (0.09)	0.33 (0.09)	0.32 (0.09)	0.29 (0.10)	0.28 (0.12)	0.25 (0.10)	0.26 (0.10)	0.22 (0.12)	0.23 (0.12)	0.30 (0.11)	0.27 (0.10)	0.24 (0.11)
Age 18-24	-0.20 (0.12)	-0.07 (0.12)	-0.16 (0.13)	-0.08 (0.12)	-0.09 (0.13)	-0.04 (0.16)	-0.14 (0.13)	-0.05 (0.13)	-0.05 (0.15)	0.06 (0.15)	0.07 (0.13)	0.01 (0.12)	0.01 (0.13)
Age 55-64	0.14 (0.13)	-0.02 (0.14)	0.07 (0.15)	0.38 (0.14)	0.29 (0.16)	0.43 (0.19)	0.36 (0.16)	0.33 (0.15)	0.15 (0.16)	0.24 (0.17)	-0.09 (0.16)	0.14 (0.14)	0.49 (0.16)
Age 65 and more	-0.03 (0.16)	0.17 (0.16)	0.15 (0.17)	0.31 (0.16)	0.29 (0.17)	0.47 (0.20)	0.55 (0.16)	0.58 (0.16)	0.40 (0.17)	0.40 (0.16)	-0.02 (0.15)	0.09 (0.13)	0.33 (0.15)
General education of HH	1.31 (0.18)	1.56 (0.19)	1.54 (0.20)	1.48 (0.19)	1.55 (0.22)	1.57 (0.22)	0.91 (0.17)	0.63 (0.16)	0.70 (0.18)	0.70 (0.19)	0.49 (0.17)	0.42 (0.15)	0.71 (0.16)
Vocational education	0.80 (0.17)	1.09 (0.17)	1.06 (0.19)	1.08 (0.18)	1.18 (0.21)	1.15 (0.20)	0.72 (0.15)	0.32 (0.14)	0.49 (0.16)	0.55 (0.17)	0.56 (0.15)	0.56 (0.13)	0.83 (0.14)
Uncompleted education	1.24 (0.22)	1.46 (0.23)	1.32 (0.24)	1.30 (0.25)	1.60 (0.25)	1.59 (0.28)	0.56 (0.28)	0.42 (0.31)	0.37 (0.31)	0.48 (0.30)	0.80 (0.26)	1.40 (0.26)	1.83 (0.30)
Couple	-0.35 (0.15)	-0.33 (0.15)	-0.51 (0.16)	-0.56 (0.16)	-0.53 (0.16)	-0.59 (0.19)	-0.57 (0.15)	-0.62 (0.14)	-0.41 (0.15)	-0.24 (0.16)	-0.04 (0.14)	-0.20 (0.12)	-0.18 (0.14)
Single parent	0.13 (0.16)	0.21 (0.16)	0.31 (0.16)	0.29 (0.16)	0.39 (0.16)	0.27 (0.20)	0.38 (0.15)	0.26 (0.15)	0.36 (0.16)	0.49 (0.17)	0.31 (0.15)	0.20 (0.14)	0.35 (0.14)
Couple with children	-0.13 (0.14)	-0.06 (0.14)	-0.26 (0.14)	-0.14 (0.13)	-0.14 (0.14)	-0.15 (0.17)	-0.10(0.13)	-0.16 (0.13)	0.04 (0.14)	0.26 (0.15)	-0.06 (0.13)	-0.19 (0.12)	-0.11 (0.13)
Other type of household	-0.28 (0.20)	-0.27 (0.20)	-0.38 (0.21)	-0.03 (0.21)	0.05 (0.23)	-0.34 (0.30)	0.04 (0.23)	0.14 (0.25)	0.20 (0.25)	-0.25 (0.25)	-0.42 (0.25)	-0.44 (0.24)	-0.59 (0.26)
<i>Distribution of unobserved characteristics</i>													
thP	-1.89 (0.36)	-2.80 (0.22)	-2.63 (0.22)	-2.95 (1.98)	-1.32 (0.33)	-1.68 (0.22)	-3.03 (0.81)	-2.94 (0.21)	-1.76 (0.27)	-1.78 (0.15)	-2.01 (0.17)	-2.06 (0.38)	-2.25 (0.27)
thNP	-4.12 (1.29)	-1.43 (0.15)	-1.88 (0.19)	-1.51 (0.17)	-1.77 (0.81)	-2.45 (0.22)	-2.04 (0.36)	-3.14 (0.72)	-2.65 (0.25)	-2.47 (0.31)	-2.04 (0.21)	-2.49 (0.22)	
Non-poverty type	0.93 (0.02)	0.61 (0.04)	0.72 (0.03)	0.37 (0.15)	0.81 (0.17)	0.58 (0.05)	0.34 (0.05)	0.27 (0.04)	0.44 (0.06)	0.60 (0.03)	0.70 (0.05)	0.37 (0.07)	0.36 (0.03)
Pro-poverty type	0.07 (0.02)	0.39 (0.04)	0.28 (0.03)	0.62 (0.15)	0.19 (0.17)	0.41 (0.05)	0.65 (0.05)	0.73 (0.04)	0.55 (0.06)	0.39 (0.03)	0.30 (0.05)	0.63 (0.07)	0.64 (0.03)
Log likelihood	-6065.5098	-5983.4531	-5903.1494	-5661.6581	-5336.8651	-5394.63	-5743.1487	-6199.1436	-6606.8785	-7219.0949	-6956.6492	-6884.6577	-6600.2106
Number of observations	11344	11215	11219	10836	10060	10149	10799	11220	11753	12800	12141	11923	11337



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