

## 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. To do this, we split the overall period of interest into a set of six-year long rolling windows and use them to document changes in the incidence and length of poverty episodes over time. A joint modeling of poverty and non-poverty spells controlling for unobserved heterogeneity is applied within each window in order to uncover how 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. Individuals living in households whose head is a citizen from a European Union country, or has general or vocational training, partially improved their situation over time whereas those over 55 years old, households with a disabled or uneducated head, and single parent households became more prone to poverty.

**JEL Codes:** C41, D31, I32

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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 percent of median total net equivalized household income, rose from 11.2 to 15.3 percent in Germany.<sup>1</sup>

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

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<sup>1</sup>Author’s calculations based on German Socio-Economic Panel data (v27). Total net household income is adjusted for imputed rental value and the consumer price index, and then equivalized with the OECD modified equivalence scale. This scale gives a weight of 1 to the first adult in the household, a weight of 0.5 to each additional adult, and a weight of 0.3 to each child aged 0–14 years.

changes in household structures and labor 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 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, it provides a better understanding of what stands behind the shifts in poverty rates. Looking only at 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.<sup>2</sup> Second, 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.

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 (1992–2009) 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 analyze how the poverty experiences of individuals with different socio-economic characteristics have evolved since the beginning of the 1990s.

The 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 itself.<sup>3</sup> Those rare studies which do analyze 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

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

<sup>3</sup>The duration of poverty is widely analyzed in the existing literature. See, among others: Bane and Ellwood (1986) and Stevens (1999) for the U.S.; Jarvis and Jenkins (1997), Jenkins (2000), Devicienti (2002, 2011), Damioli (2010), and Jenkins (2011) for the U.K.; Arranz and Cantó (2012) for Spain; Devicienti *et al.* (2014) for Italy; and Hansen and Wahlberg (2009) for Sweden.

poverty experiences of people with different observed characteristics evolve over time. The only exception, to our knowledge, is the study by Damioli (2010), who analyzed 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 with different socio-economic characteristics to exit and re-enter poverty. The advantage of using a rolling window lies in its ability to capture the development of the outcomes of interest over time. Such a design makes it possible to detect the timing and direction of the changes in the duration of poverty and search for plausible explanations of these changes in terms of macroeconomic trends and introduced social policies.

Second, the study sheds additional light on the relationship between temporal trends in poverty rates and poverty 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).

Third, we show that patterns of poverty duration for people with different socio-economic backgrounds do change considerably as time elapses. These changes are not necessarily gradual and can sometimes be quite sudden and substantial, signifying that some groups of 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 changes over time in Germany, where these two issues have been less investigated than in other countries. While changes in the incidence and lengths of poverty spells over time have been analyzed for the U.K. (Jenkins and Rigg, 2001; Jenkins, 2011) and U.S. (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 and 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 analysis.<sup>4</sup> 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 pronounced changes in poverty rates, macroeconomic conditions, and social policies took place.

<sup>4</sup>See, among others, Groh-Samberg (2009) and Frick and Grabka (2009).

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; and (3) the demographic structure of the population and labor market conditions since the beginning of the 1990s.

2.1. Trends in Poverty Rates and Macroeconomic Conditions

Figure 1 depicts trends in unemployment, real GDP growth, and poverty rates in reunified Germany between 1992 and 2010. It shows that the fraction of people living below the poverty threshold was fluctuating between 10 and 13

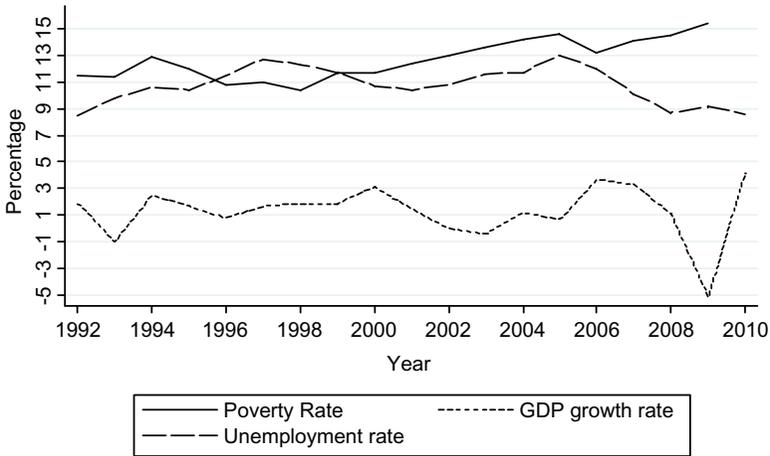


Figure 1. Trends in Unemployment Rates, Real GDP Growth Rates, and Total Poverty Rates in Germany, 1992–2010

Notes: The poverty threshold is fixed at 60% of median total net equivalized household income accounting for imputed rental value and the consumer price index. Real GDP growth rates (in prices of 2005) 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 Labor Office to the overall number of civil gainfully employed people.

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

percent during the 1990s, being relatively high at the beginning and relatively low at the end of the period. It started to increase in 1999 and first moved above its historical range after 2000.

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.<sup>5</sup> 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 to increase; 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 cycles. Right after reunification, Germany experienced a pronounced increase in unemployment rate 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 during the period of poor economic performance at the beginning of the 2000s. From 2005 onwards, the unemployment rate started steadily to decrease and, despite the deep economic crisis, reached its lowest level in 2008. Such trends can be partially explained by the expansion of part-time, low-paid employment and temporary jobs as a result of labor 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 percent in 2009.

## 2.2. *Changes in Social Policies*

Since the beginning of the 1990s, a number of social policy reforms have been introduced in Germany. Rather than reviewing all of them, we will focus only on those which could have potentially reflected on the incidence and length 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 right after reunification, the German government enacted the first substantial labor market reform, aiming to reduce the number of unemployed people through job placement services and other active labor market measures. In 2001 two other reforms, Job-AQTIVE-Act and the Pact on Part-Time Work and on Fixed-Term Contracts, were introduced, switching the focus from an active to an activating labor market policy and aiming to enhance the creation of new job opportunities (Wunsch, 2005).<sup>6</sup> 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). Given that

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

<sup>6</sup>Whereas active labor market policies included, inter alia, an increase in the provision of job placement services and training programs, activating policies were called to intensify the monitoring of job search efforts.

earnings take a large share in total household income, even a small decline in unemployment from 1998 to 2001 may potentially have affected the indicators of poverty duration in Germany.

A new increase in the unemployment rate from 2002 onwards 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, 2003–04) but also the systems of unemployment benefits and social assistance (Hartz IV, 2005–06). The Hartz IV reform is considered to be the most important social policy reform in Germany since reunification (Jacobi and Kluve, 2007; Eichhorst *et al.*, 2010). Implemented in two stages, the reform has introduced a reduction in the duration of unemployment benefits for recipients over 44 years old and modified the unemployment assistance scheme for those whose maximum period of claim for unemployment benefits has expired.<sup>7</sup> Before the reform, such individuals were eligible for means-tested but unlimited in time unemployment assistance with the replacement rate of up to 53 percent of the previous earnings (57 percent for families with children). In the case that 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 remain unemployed.

For most previous beneficiaries of unemployment assistance, the Hartz IV reform led to a decrease in benefits and thus might have resulted in an increase in poverty. In contrast, 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 and Juhasz, 2012). Hence, disposable income of this group might have increased over time.

In addition to labor 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 increasing 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 along with a slight reduction in the generosity of public pension schemes. It is difficult, however, to predict how these two reforms could have potentially influenced incidences and duration of poverty episodes over the 2000s.

The system of benefits directed at families with newborn children also changed in the late 2000s. 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 percent of their previous earnings (no less than 300 and no more than 1800 Euros)

<sup>7</sup>The replacement rate for unemployment benefits is fixed at 60 percent of the previous earnings (67 percent for families with children).

but for no longer than 14 months (see Wörz, 2011). 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 income have benefited from the reform, while families with low labor income have lost the opportunity to receive parental benefits for the full 24 months without any substantial increase in the size of the payments.

In addition to the modification of benefit schemes, Germany also underwent reforms in personal income taxation. First, the minimum tax rate was increased from 19 to 25.9 percent in 1996. Then, a series of tax reforms were implemented, aiming to reduce both minimum and maximum tax rates in a stepwise manner during the first half of the 2000s. By 2005, they had decreased to 15 and 42 percent, respectively. Although those 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).

### 2.3. *Changes in the Demographic Structure of the Population and Labor Market Conditions*

Apart from general macroeconomic indicators and social policies, the demographic structure of the population and labor market conditions also influence the distribution of equivalized disposable income (Jenkins, 2011).<sup>8</sup>

The evolution of demographic and labor 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 also 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 representative longitudinal survey of the non-institutionalized adult population launched in 1984 in the Federal Republic of Germany and expanded to the former German Democratic Republic after their reunification in June 1990.<sup>9</sup> Designed as a panel, the SOEP collects annual data on a variety of characteristics of individuals and their households (demographics, educational and labor market outcomes, income components, etc.) which makes it the best available dataset for exploring changes in the duration of poverty in Germany over a long period of time.

<sup>8</sup>Previous research has shown that poverty estimates might also be sensitive to the choice of equivalence scales (Buhmann *et al.*, 1988). However, the sensitivity is high only for cross-sectional analysis of poverty measures whereas the impact of using different scales on trends in poverty over time is relatively small (Jenkins, 2011). The study of Moll (2006) demonstrates that this evidence also holds for Germany.

<sup>9</sup>A detailed description of the SOEP dataset is provided in Haisken-DeNew and Frick (2005).

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 labor earnings, property income, private retirement income, private transfers, public transfers, and social security pensions with the deduction of total family taxes (Grabka, 2010). Preference is given to annual rather than monthly income (both variables are available) because it permits the smoothing out of seasonal and other short-term fluctuations in disposable income over the year. To account for differences in housing costs between house owners and tenants the total net household income is also adjusted for the imputed rental value. The imputed rental value represents a fictitious market rent with a deduction of all owner related costs (maintenance costs, interest payments or mortgages, property taxes) for owner-occupied housing and for renters who pay a rent below the market price (Grabka, 2010). The sum of the total net household income and imputed rental value is then converted to 2010 prices and divided by the modified OECD equivalence scale to adjust for inflation and household economies of scale.<sup>10</sup> Finally, we lag the obtained income variable by one year to avoid the time mismatch between income reference period and covariates.<sup>11</sup>

The poverty status of individuals is derived from the constructed income variable according to the official definition of relative income poverty in the European Union—that is, a person is considered to be poor if his/her net equivalized household income is less than 60 percent of the median equivalized income in the corresponding country. Following the literature on poverty dynamics in Germany (see, *inter alia*, Groh-Samberg, 2009; Fertig and Tamm, 2010; Grabka and Frick, 2010), we use a common poverty threshold for eastern and western parts of the country.<sup>12</sup> The unit of analysis is individual because individuals can be followed over time even if they move between households.

Although the SOEP started in 1984, the data used in this paper cover 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

<sup>10</sup>The conversion of incomes to the prices of 2010 is performed to account for the differences in prices between East and West Germany right after reunification (consumer price indices were calculated separately for these regions until 2001). 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).

<sup>11</sup>As a sensitivity check, 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 more pronounced effects when incomes were un-lagged.

<sup>12</sup>Given substantial differences in the income levels between East and West Germany in the early years after reunification and their gradual convergence over time, application of a common poverty threshold might influence estimates of poverty duration downwards over time, other things being equal. The use of separate consumer price indices for East and West Germany for the adjustment of income values partially eliminates this issue. Although it does not account for the differences in purchasing power parities between East and West Germany in 1991, it accounts for the decline in these differences over time (Moll, 2006). One should keep in mind, however, that this adjustment does not eliminate differences in prices between rural and urban areas, or across different geographical regions. Hence, the derived nationwide poverty estimates might be exaggerated for certain areas, as low-income regions tend to have low prices.

the same width, in order to trace changes in the duration of poverty and its determinants over time. 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. 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.

Within each window, the start of a poverty spell refers to the first year in which a person's total net equivalized income falls below the poverty threshold after having previously been above it. Correspondingly, the end of a poverty spell is assigned 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. Since it is impossible to identify the elapsed duration of the spells which are in progress at the beginning of the window (left-censored spells), we eliminate them from the analysis.<sup>13</sup> The exclusion of left-censored spells means that our sample comprises individuals who have been poor at least once over the observation period. It also implies that all non-poverty spells with the observed beginnings may end with re-entries rather than initial entries into poverty, because there is always a poverty spell in front. We keep all non-left-censored spells in the sample, allowing individuals to experience multiple episodes of poverty (non-poverty) within each time window.

Having done everything described above, we obtained 13 six-year-long rolling windows with a five-year overlap between each of them (1992–97, 1993–98, . . . 2004–09) and a number of person-period observations per window ranging from 10,060 to 12,800 (see Table A.1 in the Appendix).<sup>14</sup>

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 these characteristics. Most of the covariates are measured at the household level and refer either to the head of the household or to the household itself.<sup>15</sup> The logic behind is that poverty status of individuals is based on household income, which makes household level characteristics more relevant for predicting poverty transitions than covariates measured at the individual level.<sup>16</sup> Building on existing studies in the field, we use nationality, educational attainment, and disability status of the household head as

<sup>13</sup>In contrast to right-censored spells (the spells with unobserved endings), left-censored spells cannot be used in the estimation of survivor and hazard functions because of the unknown elapsed duration. The exclusion of left-censored spells is usually associated with a selection bias and underestimation of the amount of time spent in poverty. In the context of the current paper, which focuses on changes in the duration of poverty, it would have posed a problem if the share of the long-term poor among the left-censored cases had been fluctuating substantially over time. This is, however, not the case. Hence, even though the exclusion of left-censored spells may lead to underestimation of the amount of time spent in poverty within the windows, it is not expected to influence the general trend in the estimates of the duration of poverty across windows.

<sup>14</sup>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.

<sup>15</sup>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.

<sup>16</sup>For similar specifications, see Biewen (2006), Fertig and Tamm (2010), Devicienti (2011), and Maes (2013).

well as type of household and region of its residence as predictors of poverty transitions at the household level.<sup>17</sup> Initially we were also considering the possibility of including characteristics of both household head and spouse in the model, but (1) it would be possible only for couple-based households, and (2) in couple-based households characteristics of household head and spouse have been found to be significantly correlated. In addition to household level characteristics, age and gender are two covariates which are incorporated in the analysis at the individual level in order to explore changes in the patterns of poverty duration for people of different age and sex. Finally, we control for local unemployment rate to account for local labor market conditions.

To mitigate a feedback effect of current poverty status on 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 exogeneity is also the reason why we did not include employment status as a covariate in the model. Instead, we use educational attainment of the household head as a proxy of his/her labor market attachment.<sup>18</sup>

Table A.1 in the Appendix presents separately for each window means and standard deviations of 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 (Table A.2 in the Appendix). On the other hand, they can also be seen as evidence that some population sub-groups have become more prone, or less prone, to poverty over time. Above all, it refers to German citizens whose share decreased in the total population but who became more represented in our sample comprising individuals with at least one transition across the poverty line.

#### 4. ESTIMATION APPROACH

The empirical part of the paper is based on the joint modeling of probabilities of exiting and re-entering 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 thereafter.<sup>19</sup> Its key advantage, as compared to the separate estimation of the probabilities of exiting and re-entering poverty, is that it makes it possible to analyze the amount of time spent in poverty across multiple spells providing better estimates of poverty persistence (Stevens, 1999; Jenkins, 2011).

<sup>17</sup>Regarding household structure, the major choice to make was whether to include the variable capturing household typology or two other variables capturing the exact number of children and adults in the household. We have chosen the first option in order to identify how the duration of poverty has changed for individuals living in different types of households.

<sup>18</sup>See Biewen (2009), Devicienti (2011), and Maes (2013) for similar applications.

<sup>19</sup>See, among others, Biewen (2006), Fertig and Tamm (2010), Devicienti (2011), and 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, 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:<sup>20</sup>

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

In the expression above  $X_{it-1}^s$  is a vector of individual observable characteristics that can vary over time,  $\beta^s$  is a vector of parameters associated with  $X_{it-1}^s$ , 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 these effects becomes important because the same unobserved forces might influence an individual's likelihood to both exit and re-enter poverty, causing correlation across spells (Stevens, 1999; Jenkins and Rigg, 2001). 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, which might lead to a bias in hazard rate estimates (Kiefer, 1988; Cameron and Trivedi, 2005).

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 functional form of the distribution should be made which can lead to a relatively high risk of misspecification with consequent inaccurate estimation of the parameters. Therefore, we chose 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 and 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 of entering and exiting 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

<sup>20</sup>If  $s = P$ , the individual is in state  $P$  at time  $t - 1$  and  $h$  gives the probability of exiting poverty at time  $t$ . If  $s = N$ , then the individual is in state  $N$  at time  $t - 1$  and  $h$  gives the probability of re-entering poverty.

belongs to the corresponding type of subpopulation. 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 ( $\beta^s, a_d^s$ ) separately for each time window defined in Section 3.<sup>21</sup> The contribution of an individual  $i$  to the likelihood function can be defined as:

$$(2) \quad L_i(v^P, v^N) = \prod_{t=1}^T \left[ h_{it}^P(v^P)^{e_{it}} \cdot (1 - h_{it}^P(v^P))^{1 - e_{it}} \right]^{P_{it}} \cdot \left[ h_{it}^N(v^N)^{e_{it}} \cdot (1 - h_{it}^N(v^N))^{1 - e_{it}} \right]^{1 - P_{it}}.$$

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 sample of individuals within each time window can then be expressed as follows, with  $K(v^P)$  and  $K(v^N)$  depicting the number of support points for  $v^P$  and  $v^N$ , respectively:

$$(3) \quad \log L = \sum_{i=1}^N \log \left\{ \int_{K(v^P)} \int_{K(v^N)} L_i(v^P, v^N) \cdot dF(v^P, v^N) \right\}.$$

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. The incorporation of left-censored spells (the spells with unobserved beginnings) into the model, however, 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 Cantó, 2012).

In order to check for a possible bias related to the exclusion of left-censored spells, we followed 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).<sup>22</sup> The overall fit of the model with the control for initial conditions was found worse than the one where such a control had not been performed (see Table A.3 in the Appendix). In addition, the inclusion of the initial condition equation did not substantially affect the size and direction of the coefficients in the equations for poverty exits and re-entries. For these

<sup>21</sup>To start with, we assumed 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.

<sup>22</sup>In this case the unobserved components follow a trivariate distribution.

reasons, we will use a more parsimonious specification (Model 2 of Table A.3 in the Appendix) for the analysis of the changes in the patterns of poverty duration further in the paper.

#### 4.1. *Simulation of the Total Amount of Time Spent in Poverty*

The estimates of  $a_d^s$ ,  $\beta^s$ , and  $v^s$  from equation (1) obtained separately for each time window can be used to simulate the total amount of time spent in poverty by individuals with different observed and unobserved characteristics. By doing it we can explore differences in the duration of poverty for individuals who differ in more than one characteristic and analyze how these differences have evolved over time.

We start the simulation by generating an artificial dataset for 10,000 individuals, each observed for six consecutive years. An error term ( $\varepsilon^s$ ) 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  $\beta^s$  from the original model, we can approximate exits from ( $s = P$ ) and re-entries ( $s = N$ ) into poverty ( $I^s$ ) through the following latent function:

$$(4) \quad I_i^s = v_i^s + a_d^s + \beta^s \cdot X_i + \varepsilon^s.$$

In equation (4), exit (or re-entry) into poverty occurs when  $I^s$  is greater than zero. Otherwise, an individual survives in the state. 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.

## 5. RESULTS

### 5.1. *Descriptive Statistics*

Figure 2 and Table A.4 in the Appendix present separately for each window the probabilities of exiting and re-entering poverty, conditional on the amount of time spent in the corresponding state.<sup>23</sup> Table A.4 also presents the unconditional probabilities of exiting and re-entering poverty in each period. Poverty exit rates are calculated by dividing the number of people who exit poverty after  $t$  years of

<sup>23</sup>All estimates presented in this section are un-weighted because of the difficulties with identifying the population of reference for the unbalanced sample of individuals and constructed spells. Conditionality on spell duration and individual characteristics also mitigates the necessity of using weights in the regression analysis.

being in it by the total number of people who remained poor for at least  $t$  years. Poverty re-entry rates are derived in a similar way.

Figure 2 shows that the probabilities of exiting and re-entering poverty are the highest during the first year of being poor or non-poor. They drop substantially between the first and the second year, but afterwards the decline slows down or disappears. Relatively weak duration dependence is especially typical for poverty spells, where the conditional probabilities of exiting poverty are not strictly decreasing with time in most windows. For non-poverty spells, a consistent decline in the hazard probabilities as time in the spell elapses is observed in the windows prior to 2004. However, it disappears afterwards, signifying a decrease in duration dependence over time.

Panel A in Figure 2 also reveals a decline in the conditional probabilities of exiting poverty over time. The probability of exiting poverty after the first year of being poor has decreased from 56.2 percent in 1992–97 to 51.4 percent in 2005–09. A relatively steady decline is also documented for the conditional probabilities of exiting poverty after two and three years of being poor (by 2 and 7.5 percentage points, respectively). For longer durations, the trend is somewhat volatile but the

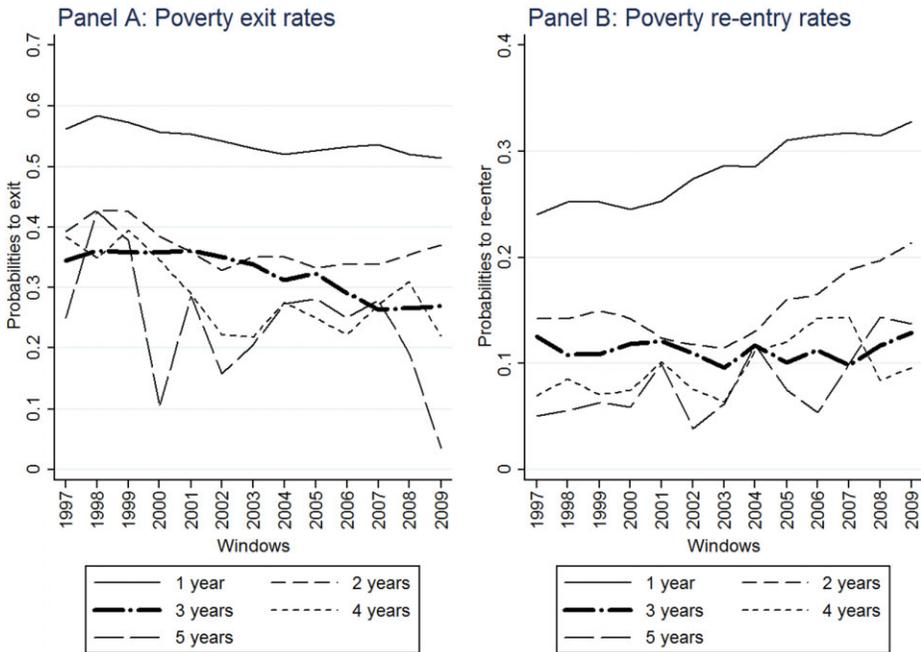


Figure 2. Dynamics of Poverty Exit and Re-Entry Rates Across Time Windows

*Notes:* Life-table estimates based on all fresh non-poverty (Panel A) and poverty (Panel B) spells. Each window is marked with the last year it covers (e.g., “1997” for window 1 covering 1992–97). These are un-weighted estimates.

*Source:* SOEP data, author’s calculations.

decline is pronounced if comparing the first and last windows, suggesting that poverty has become more persistent over time.<sup>24</sup>

Panel B in Figure 2 shows that the conditional probabilities of re-entering poverty increased for all spell lengths over the last two decades. Similarly to the probabilities of exiting poverty, the increase in the conditional probabilities of poverty re-entry is more consistent for short durations and quite volatile for long non-poverty spells.<sup>25</sup> All in all, the unconditional probability of re-entering poverty (see Table A.4 in the Appendix) increased from 17.8 percent in the first window to almost 25 percent in the last one, signifying that poverty has become more recurrent over time.

A closer look at Figure 2 reveals that the decline in the conditional probabilities of exiting poverty started in the late 1990s. It was followed by a relative stagnation between 2004 and 2007 and a new decline afterwards. 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 unconditional probability of exiting poverty increased. At the same time, the conditional probabilities of re-entering poverty started to increase only in the 2000s. The probability of re-entering poverty after one year of being non-poor jumped from 24.5 to 28.6 percent between 2000 and 2003, coinciding to a large extent with the economic downturn and tax reforms. Having stagnated in 2004, it started increasing again in the second half of the 2000s. The probability of re-entering poverty after the second year in non-poor status has also been on the rise since 2003. Among other things, these trends might be influenced by the Hartz reforms and deep economic crisis of 2009.

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

The probability of spending only one year in poverty out of six decreased from 30 percent in the first time window to 21.4 percent in the last one. A decline of 2.6 percentage points also occurred in the probability of being poor for only two years out of six. On the other hand, the chances of spending more than two years in poverty increased over time. This provides additional evidence that individuals who enter into poverty tend to spend more time below the poverty line nowadays than 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 data and the interdependence of rolling windows. More

<sup>24</sup>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 trends over time remained the same.

<sup>25</sup>This volatility in the estimates can be explained by a smaller number of spells and transitions across the poverty line at long durations (Bane and Ellwood, 1986; Jenkins, 2000). Because the estimates at longer durations become less reliable, we specify the baseline hazard in equation (1) with three duration dummies corresponding to one, two, and more than two years in poverty.

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

*Notes:* The distributions are derived from the estimates of poverty exit and re-entry rates (Table A.4 in the Appendix) 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.

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.<sup>26</sup> 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 increased over time.

## 5.2. Regression Analysis

### 5.2.1. Changes in the Determinants of the Duration of Poverty in Germany between 1992 and 2009

In order to detect how the poverty experiences of people with different characteristics have evolved over time, we looked at the dynamics of the estimated coefficients capturing the effects of these characteristics on the probabilities of exiting and re-entering poverty across the 13 overlapping time windows. The estimates from all 13 models based on equation (1) and their standard errors are given in Table A.5 in the Appendix.

Figure 3 depicts the evolution of the coefficients for duration dummies in poverty exit and re-entry equations during the period of interest. It shows that as soon as we control for observed and unobserved characteristics of individuals,

<sup>26</sup>See Cameron and Trivedi (2005) for a theoretical description of the method and Jenkins and Van Kerm (2011) for its application in practice. The idea is to bootstrap individuals from the original panel covering all years and only afterwards to construct windows, perform data cleaning, and derive statistics of interest. The bootstrapped replications are then used to estimate bootstrapped standard errors and t-values for the statistics of interest.

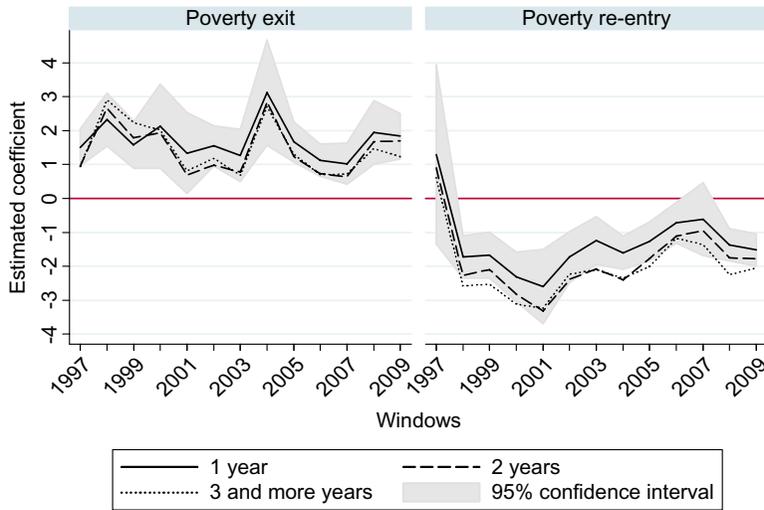


Figure 3. Dynamics of the Coefficients for Duration Dummies Across Time Windows

*Notes:* The horizontal lines combine the estimated parameters for duration dummies (Table A.5 in the Appendix) between windows. Each window is marked with the last year it covers (e.g., “1997” for window 1 covering 1992–97). The plotted 95% confidence interval refers to the estimated coefficients for exiting (re-entering) poverty after the first year of being poor (non-poor). All coefficients are logit estimates.

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

moderate duration dependence, which can be seen in the simple life-table estimates (Table A.4 in the Appendix), disappears in the equation for poverty exits. Although the estimated coefficients for the duration dummies are statistically significant in most periods, their effects are very similar in size, especially for the durations above one year. The fact that the 95 percent confidence bound for the duration dummy corresponding to one year in poverty overlaps with the estimates for other duration dummies confirms that the amount of time spent poor does not have significant influence on the exit probability, other things being equal.<sup>27</sup>

In contrast to the equations of poverty exits, duration dependence remains in the equations for poverty re-entries even after we control for observed and unobserved characteristics of individuals. This is applicable to the majority of windows, especially if comparing the chances of re-entering poverty after one and three and more years of being non-poor. This 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, one may notice that the duration dependence has not changed much for both poverty exits and re-entries between 1992 and 2009. However, the conditional

<sup>27</sup>This non-significance, however, should be taken with caution because in the model where all windows are pooled together (Table A.3 in the Appendix) and therefore the number of observations increases, the chances to exit poverty in the first year are significantly higher than in any further year. Similarly to the rolling windows, duration dependence in the overall model disappears at the durations above one year (albeit the coefficients for duration dummies decline as time in the spell elapses, their confidence intervals overlap to a large extent).

probabilities of re-entering poverty have been on the rise since 2002. This evidence confirms our previous finding that the incidence of poverty episodes increased in Germany over the last two decades and the control for observed and unobserved characteristics of individuals does not eliminate this trend. Compared to poverty re-entries, the trend in the estimated coefficients from poverty exit equations is more volatile, signifying that the increase in the length of poverty spells observed in the descriptive part of the paper might have touched only individuals with certain characteristics.

Figures 4 and 5 present the evolution of the coefficients associated with the socio-economic characteristics of individuals over time. For comparability reasons, all coefficients are plotted using the same scale. The estimates and their standard errors can also be found in Table A.5 in the Appendix.

Looking at Panel A in Figure 4 first, one can see that the situation for children and young adults did not change much over the last 20 years. In contrast, the situation for individuals of pre-retirement age (between 55 and 64) and the elderly (more than 65 years old) worsened during the period of interest. First, from 1999, individuals of pre-retirement age started experiencing a significantly lower probability of exiting poverty compared to those aged 25–54 (the effect disappeared in 2003 but came back during the years of the crisis). Then, the probability of them re-entering poverty increased, with the significant and most pronounced effects found in the first half of the 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 labor market.

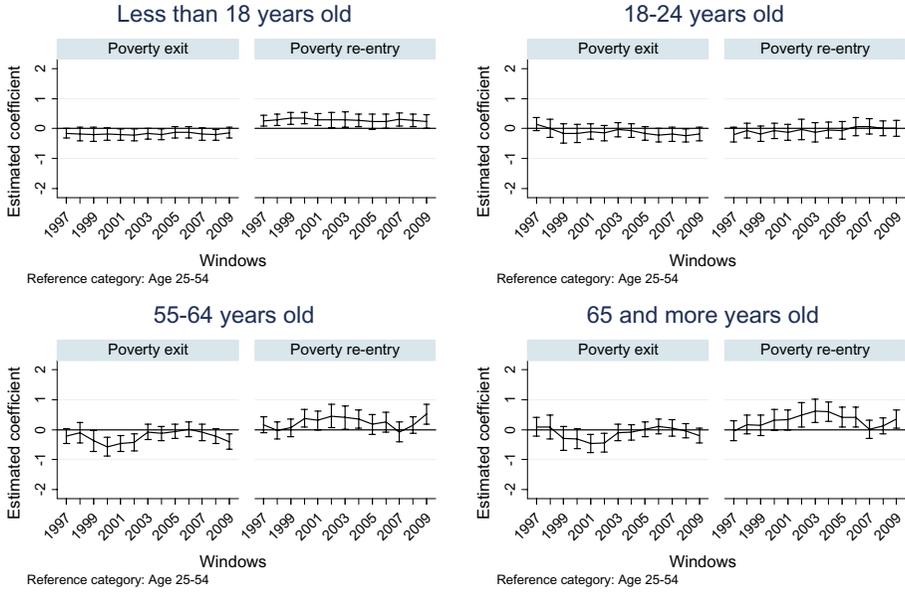
With regard to the elderly, apart from the early 2000s they have never experienced a lower probability of exiting poverty than those aged 25–54. However, from 2001 onwards the probability of them re-entering poverty increased. A plausible explanation of this trend could be the German pension reform of 2001, which was expected to negatively affect incomes of individuals retiring immediately after its introduction.<sup>28</sup>

Panel B in Figure 4 summarizes the evolution of the coefficients for gender as well as disability status and nationality of the household head. 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 once other characteristics are controlled for. 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 2009 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 coefficients associated with nationality of household head have also changed over time. More specifically, individuals living in households where the head is an EU citizen stopped experiencing higher probabilities of re-entering

<sup>28</sup>People retiring in the first years after the reform were burdened with the reduction in public pension levels while they also did not have enough time to accumulate compensating private pension plans (Bonin, 2001).

Panel A



Panel B

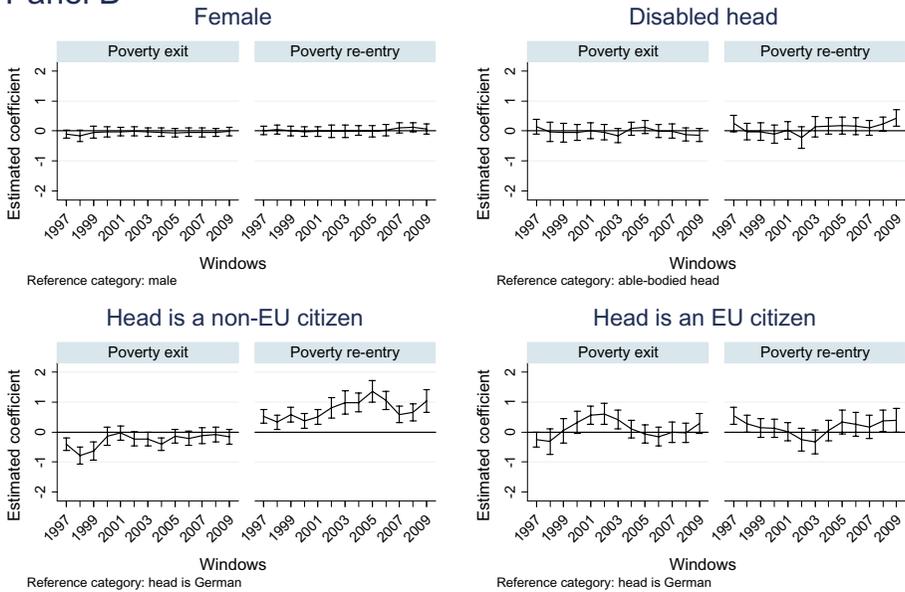
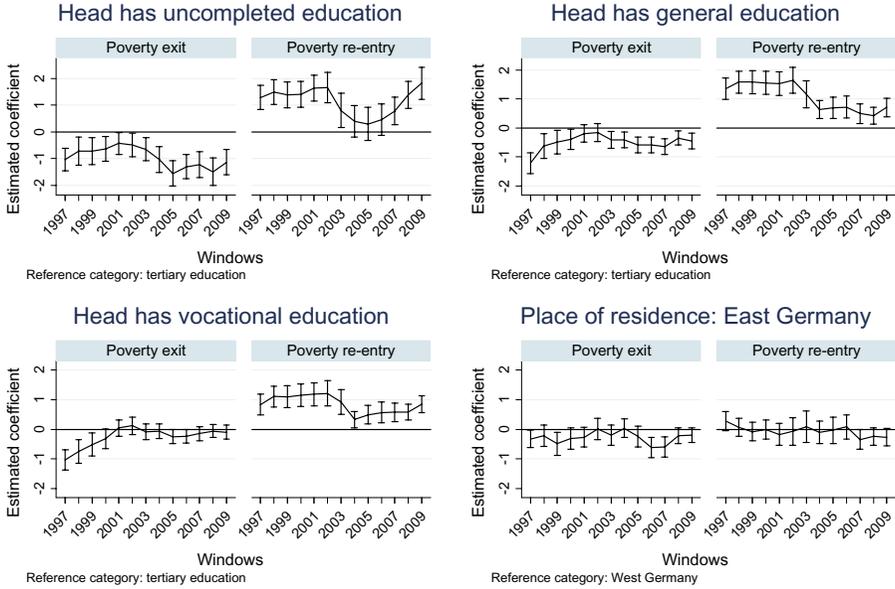


Figure 4. Dynamics of the Estimated Coefficients for Age, Gender, Disability Status, and Citizenship Across Time Windows

Notes: All plotted coefficients are logit estimates from Table A.5 in the Appendix. 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 last year it covers (e.g., “1997” for window 1 covering 1992–97).

Source: GSOEP data, author’s calculations.

**Panel A**



**Panel B**

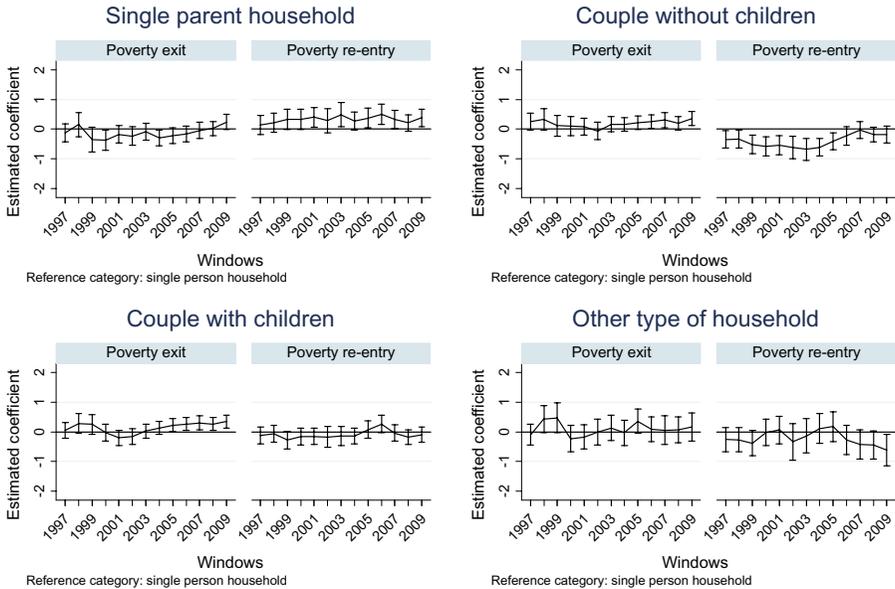


Figure 5. Dynamics of the Estimated Coefficients Associated with Place of Residence, Education, and Household Type Across Time Windows

*Notes:* All coefficients are logit estimates from Table A.5 in the Appendix. 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 last year it covers (e.g., “1997” for window 1 covering 1992–97).

*Source:* GSOEP data, author’s calculations.

poverty compared to households with a German head. The “disadvantageous” effect came back during the economic crisis of 2008–09 but its magnitude was smaller than two decades ago. In addition, the probabilities of exiting poverty have increased for this group over time.

The situation developed differently 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, meaning 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 A in Figure 5 depicts the evolution of the coefficients for educational attainment and place of residence. Turning to the place of residence first, we can see that, once we control for characteristics of individuals and especially for the local unemployment rate, we do not find a significant difference in the probabilities of exiting and re-entering poverty between residents of East and West Germany across almost all time windows. Although the estimated probability of exiting poverty was lower for individuals living in East than in West Germany in some windows, the difference was statistically significant only in windows ending in 1999, 2006, and 2007.<sup>29</sup>

The evolution of the coefficients for educational characteristics shows that individuals with an incomplete education became more prone to longer episodes of poverty over time. Although they always had substantially lower chances of exiting poverty than holders of a tertiary degree, the magnitude of the differential increased substantially since 2005. In addition, after a profound decline in 2003–05, the likelihood of re-entering poverty started rapidly increasing for this group in the second half of the 2000s. In contrast, those with general education or a vocational training degree have improved their situation over the last two decades. Although the chances of re-entering poverty were substantially higher for these groups of people than for highly educated individuals in all windows, the difference has decreased since 2003. Along with the decline in the probabilities of poverty re-entry, individuals with general education or vocational training started enjoying higher probabilities of exiting poverty over time, with an especially rapid increase taking place up to 2002. Remarkably, the major changes in the chances of exiting and re-entering poverty for all educational groups have occurred since 2003, coinciding with the period of the Hartz reforms. Judging from the observed trends, one may assume that the reforms have helped to improve the relative income position for individuals with general education or vocational training but worsen it for those with uncompleted education. The observed trends also reveal that the “premium” from having a tertiary education has decreased over time.

Panel B in Figure 5 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

<sup>29</sup>In the same model estimated without the control for local unemployment rate, lower probabilities of exiting and higher probabilities of re-entering poverty were found for people living in East than in West Germany.

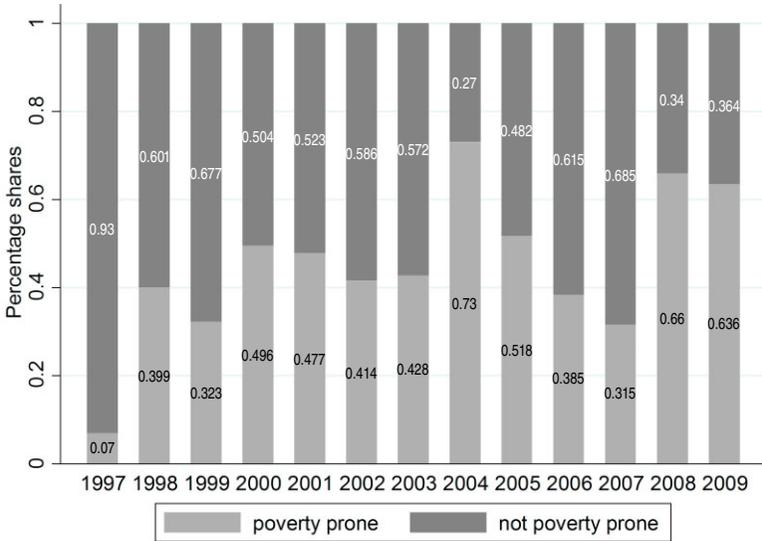


Figure 6. Dynamics of the Estimated Proportions of Two Types of Individuals (based on their unobserved characteristics)

Notes: Each window is marked with the last year it covers; estimates from Table A.5 in the Appendix.

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

individuals living alone. This advantage disappeared from 2006 onwards, being compensated for, however, by a slight increase in the probability of exiting poverty. Individuals living as couples with children have started enjoying even higher chances of exiting poverty compared to single person households from 2005 onwards. On the other hand, single parent households became slightly 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 of individuals on the duration of spells in and out of poverty have also changed over time (see Figure 6).

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).<sup>30</sup> The evolution of the shares of these two types of individuals is quite volatile over time but still allows us to document an increase in the proportion of the poverty prone group between the first and the last time windows.

### 5.2.2. Simulation of the Average Amount of Time Spent in Poverty by Individuals with Different Sets of Socio-Economic Characteristics

As has been highlighted in Section 4, the estimates from the poverty exit and re-entry equations can be used to simulate the average number of years spent in

<sup>30</sup>One should keep in mind that the estimates in Figure 6, as well as all other estimates presented in the paper, are based on the sample of individuals who have experienced at least one transition in or out of poverty.

poverty by individuals who differ in more than one characteristic. We start by simulating the average number of years spent in poverty for an individual with the most poverty-prone observed characteristics (except that of age, which is fixed at 25–54 years old)—that is, a female in a single-parent household with a disabled, uneducated non-EU head living in East Germany. In the next step, we start changing these characteristics for more favorable ones, looking at the shifts in the average amount of time spent in poverty. Finally, we compare the temporal evolution of the average number of years spent in poverty across different types of individuals. The results of this exercise are presented in Table 2.

Table 2 shows that an individual with reference characteristics just starting a poverty spell in 1992 would have spent 3.9 years out of 6 in poverty. As would be expected, the number gets lower for individuals with more favorable characteristics. For example, living in a household with a German rather than a non-EU head or living in a couple without children 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 difference in the average number of years spent in poverty over the six-year time span is observed between the reference type and individuals who have the same characteristics but live in households where the head has tertiary education. The difference is also more pronounced when several poverty-prone characteristics typical for the reference type are changed simultaneously for more favorable ones. For example, a male living in West Germany in a couple without children with an able-bodied German head who also has tertiary education would have spent only 1.52 years in poverty between 1992 and 1997.

Looking at the trends over time, we can see that the average number of years spent in poverty increased for all 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 (the last line in Table 2) would have spent 0.61 additional years in poverty if he or she had entered it in 2004 rather than in 1992, whereas for an individual with the most unfavorable characteristics (the “reference type”), the increase would have been equal to 0.74 years.

## 6. CONCLUSIONS

Using longitudinal data from the SOEP, this paper explores changes in the duration of poverty and its determinants in Germany between 1992 and 2009. In order to do that, we divide the overall period of interest into a set of successive six-year-long windows and use them to document changes in the amount of time spent in poverty by individuals with different socio-economic characteristics.

The results suggest that poverty has become more persistent and recurrent in Germany over the last two decades. The conditional probabilities of exiting poverty after one, two, and three years of being poor have declined over time, leading to an increase in the proportion of individuals with long poverty spells. At the same time, the unconditional probability of re-entering poverty for those who are non-poor has increased between the first and the last time windows. As a result, the proportion of individuals who enter poverty at the beginning of the window and remain poor for only one year out of six (given that the person can exit and

TABLE 2  
SIMULATION OF THE AVERAGE NUMBER OF YEARS SPENT IN POVERTY OVER THE 6-YEAR TIME SPAN 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:</i> 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	3.90	3.29	3.84	3.43	3.66	3.77	4.32	4.22	4.77	4.92	4.71	4.85	4.64	+0.74
<i>The same as reference individual except for:</i>														
Being male	3.80	3.17	3.81	3.41	3.65	3.77	4.30	4.19	4.73	4.89	4.64	4.79	4.62	+0.82
Living in household with able-bodied head	3.93	3.28	3.80	3.44	3.66	3.81	4.11	4.21	4.83	4.88	4.67	4.71	4.47	+0.54
Living in household with German head	3.26	2.73	3.13	3.13	3.39	3.27	3.73	3.53	4.28	4.49	4.43	4.63	4.31	+1.05
Living in West Germany	3.47	3.14	3.54	3.21	3.52	3.81	4.10	4.28	4.59	4.41	4.30	4.76	4.54	+1.07
Living in household where head has tertiary education	2.41	2.18	2.68	2.35	2.51	2.71	3.41	3.38	3.45	3.72	3.35	3.25	3.37	+0.96
Living in a couple without children	3.29	2.88	3.10	2.65	2.97	3.28	3.65	3.55	4.20	4.41	4.29	4.62	4.46	+1.17
Being male living in household with able-bodied head	3.82	3.17	3.78	3.43	3.65	3.80	4.09	4.18	4.79	4.85	4.60	4.65	4.44	+0.62
Being male living in household with able-bodied German head	3.17	2.65	3.09	3.14	3.37	3.30	3.48	3.48	4.29	4.41	4.32	4.39	4.04	+0.87
Being male living in West Germany in a household with able-bodied German head	2.78	2.53	2.87	2.94	3.23	3.34	3.25	3.55	4.07	3.80	3.85	4.31	3.99	+1.21
Being male living in West Germany in a household with able-bodied German head who has tertiary education	1.75	1.66	1.94	1.97	2.14	2.32	2.38	2.61	2.58	2.53	2.59	2.53	2.43	+0.68
Being male living in West Germany in a couple without children where household head is able-bodied, has German citizenship and tertiary education	1.52	1.48	1.57	1.56	1.76	1.95	1.86	2.00	2.00	2.03	2.24	2.23	2.13	+0.61

Notes: Simulations are performed according to the procedure described in Section 4. The local unemployment rate is set at the average level documented within the window.

re-enter poverty again) dropped from 30 percent in 1992–97 to 21.4 percent in 2004–09. In contrast, the proportion of those remaining poor during all six years has increased from 8 to 16.8 percent over time.

The results of the regression analysis reveal that the changes in the probabilities of exiting and re-entering poverty, and, hence, in the total amount of time spent below the poverty line, were not the same for all individuals. Individuals older than 55, as well as those living in single parent households, in households with a disabled head or where the head has an incomplete education, have become more likely to re-enter poverty in 2004–09 as compared to 1992–97. For these population sub-groups, poverty has become more recurrent over time. Furthermore, individuals of pre-retirement age and those living in households with uneducated heads have become more prone to longer spells of poverty once they enter it. On the other hand, households where the head is an EU citizen, has general education or vocational training have decreased their probabilities of re-entering poverty and, once poor, tend to exit poverty faster nowadays than 20 years ago.

The changes observed in the patterns of poverty duration over the last two decades to some extent coincide with the trends in macroeconomic conditions and changes in social policies. Above all, these patterns seem to be influenced by the economic downturns of 2000–03 and 2008–09, pension reforms enacted in the early 2000s, the Hartz reforms, and the parental leave reform of 2007. However, to shed light on causal relationships between trends in the duration of poverty and macroeconomic conditions (social policies), more specific studies focusing on a particular economic or policy change would be needed. The latter constitutes a good venue for future research.

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### SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

- Table A.1:** Descriptive statistics of the sample characteristics (means and standard deviations)  
**Table A.2:** Official statistics on the composition of the German population, 1991–2010 (in %)  
**Table A.3:** Hazard model estimates of poverty exits and re-entries in Germany, 1992–2009  
**Table A.4:** Estimates of the hazard and survivor functions for poverty and non-poverty spells  
**Table A.5:** Joint estimation of poverty exits and re-entries across time windows