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Article — Accepted Manuscript (Postprint)

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Advances in Life Course Research

Provided in Cooperation with:
WZB Berlin Social Science Center

Suggested Citation: Hübgen, Sabine (2020) : Understanding lone mothers' high poverty in Germany: Disentangling composition effects and effects of lone motherhood, Advances in Life Course Research, ISSN 1040-2608, Elsevier, Amsterdam, Vol. 44, pp. --, <https://doi.org/10.1016/j.alcr.2020.100327>

This Version is available at:
<https://hdl.handle.net/10419/231291>

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Understanding lone mothers' high poverty in Germany: Disentangling composition effects and effects of lone motherhood

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Lone mothers are among the groups most affected by income poverty in Germany. Previous research shows that both lone mothers' social composition (e.g. employment status, age, number of children) and the institutional context (e.g. family and labour market policies) are crucial for explaining this high vulnerability. Yet we know little about the underlying mechanisms. Hence, this study develops a theoretical framework that disentangles effects of composition (selection into lone motherhood) and lone motherhood per se (shaped by institutional contexts) on lone mothers' poverty. Three major routes to lone motherhood can be identified that differ regarding their timing, selectivity and related risk of poverty: lone motherhood after marriage, after cohabitation, and out-of-relationship child birth. Using data from the German Socio-Economic Panel, this study first analyses the relationship between the three routes and poverty before and during lone motherhood. Second, conditional difference-in-differences models are used to identify the lone motherhood effect on lone mothers' poverty controlling for composition. Results reveal that two years prior to the transition, all, but particularly cohabiting-to-be lone mothers, already show notably higher poverty rates than women who do not experience lone motherhood. Moreover, divorced lone mothers face the highest poverty-enhancing effect of lone motherhood on poverty.

Keywords: lone motherhood; poverty; social composition; Germany; difference-in-differences; GSOEP.

INTRODUCTION

In today's Germany, one in five households with children is headed by a lone mother (Federal Statistical Office Germany, 2016). Thus, a substantial share of women and their children experience at least one episode of lone motherhood in their life courses. At the same time, these households' risk of poverty is disproportionately high: In 2016, 32.5% of lone mothers in Germany were 'at risk of poverty', according to the EU's official poverty threshold¹ (Federal Statistical Office Germany, 2018b). This is striking because their poverty rate is twice as high as that of the overall population (16.5%) and even three times higher than that

¹ Definition: A household is at risk of poverty if its net equivalised income falls below 60% of a country's median household net equivalised income (https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Glossary:At-risk-of-poverty_threshold).

of partnered mothers (11%) in the same year (ebd. 2018). From existing literature we know that labour market-related individual characteristics like low qualification, working in the low-wage sector or being unemployed are important factors to explain lone mothers' poverty in Germany (Achatz et al., 2013; Boehle, 2019; Fux, 2011; Heimer et al., 2009; Jaehrling et al., 2011; Ott et al., 2011).

Furthermore, lone mothers' scope of action is also shaped by the welfare state: In countries with welfare universalism and progressive work-family policies lone mothers face lower risks of poverty than in countries where most benefits are targeted to specific groups and the welfare state promotes a rather traditional gender role model (Boeckmann et al., 2015; Brady and Burroway, 2012; Huber et al., 2009; Misra et al., 2007; Misra et al., 2012). The German welfare state strongly relies on employment-related social insurances, thus providing a comparatively high level of social security for those continuously in (fulltime) employment (Scheiwe, 1994). At the same time, a gendered division of labour and a corresponding low provision of public childcare have been predominant since the 1950s in Germany (Boehle, 2019; Leitner et al., 2008). This specific institutional context makes it particularly hard for lone mothers to reconcile their dual role as main earners and main care givers (Hobson, 1994; Kilkey and Bradshaw, 1999).

Despite these manifold research contributions, the underlying mechanisms of the relationship between lone motherhood and poverty remain unclear. Are high poverty rates among lone mothers in Germany a result of selection processes into lone motherhood or rather a result of lone motherhood as such, or both? These are open research questions, because the mostly cross-sectional research designs or descriptive scope of existing studies cannot account for already existing risks of poverty before lone motherhood. Moreover, the underlying theoretical mechanisms are often not made explicit and empirically tested. Hence, this paper is guided by the following research question: *To what extent are lone mothers' high poverty*

rates in Germany the result of selection or effects of lone motherhood? How does social policy influence these relationships? What can we learn from differentiating by routes to lone motherhood for the analysis of lone mothers' poverty?

To fill this research gap, this paper provides a more theory-driven framework for explaining lone mothers' poverty, applying a life course perspective and DiPrete's concept of trigger events (2002). Based on this framework, the present study – unlike other studies – can identify the causal relationships between lone motherhood and poverty. Moreover, this study also provides novel empirical insights into composition effects and lone motherhood effects on poverty. Finally, the differentiation between routes to lone motherhood improves our understanding of the heterogeneous life circumstances and challenges faced by lone mothers. This heterogeneity also has important implications for social policies aimed at alleviating lone mothers' financial situation.

The empirical analyses are based on data from the German Socio-Economic Panel Study (1984–2016). To identify the effect of lone motherhood on poverty, a quasi-experimental design is applied: Difference-in-differences models are estimated for all lone mothers and separately for each route to lone motherhood. To control for underlying selection processes into lone motherhood, these models are combined with Entropy Balancing, a non-parametric reweighting procedure.

LONE PARENTHOOD IN THE GERMAN CONTEXT

Like in most other Western countries, lone parenthood has been rising over the last three decades in Germany: The proportion of lone parent families on all families with dependent children quadrupled between the late 1970s (5%) and 2010 (20%) and remained stable afterwards (Nieuwenhuis and Maldonado, 2018). At the same time, lone parenthood is more

spread in eastern Germany (25%) than in western Germany (18%) (Federal Statistical Office Germany, 2018a). Furthermore, lone parenthood in Germany is highly gendered: 88% of lone parent households are headed by mothers in 2017 (ebd. 2018a).

Traditionally, lone mothers were considered as labour market pioneers in Germany (Jaehrling et al., 2015) and their employment rates exceeded those of partnered mothers. This pattern can also be found in other European countries like Switzerland, France and Sweden (Jaehrling et al., 2015; Milewski et al., 2018). Although their employment rates remained quite stable since the 1980s, their full-time employment rates decreased and they lost this pioneering role in the course of the 1990s: Female labour force participation in general rose rapidly, but also a high number of partnered mothers entered the labour market – even though predominantly in (short) part-time (Botsch, 2015). According to Boehle (2019), especially the rise of so called ‘DINK’² households resulted in an increased median household income and thus, also in a relatively worse financial position and higher poverty rates for lone mothers.

The German welfare state has traditionally been classified as a conservative welfare state with moderate levels of de-commodification, strong unions and a pronounced male breadwinner model (Esping-Andersen, 1990). However, after some major reforms in labour market and family policy, it is moving towards a hybrid model with both liberal and social-democratic elements (Hinrichs, 2010). There is some empirical evidence that lone mothers did not benefit from the neo-liberal labour market reforms in the early 2000s: In contrast, they face disadvantages regarding qualification measures offered by job centers (Betzelt and Bothfeld, 2011) and they are highly overrepresented in low pay jobs and thus heavily dependent on wage top-ups (Achatz et al., 2013; Heimer et al., 2009).

² DINK is an acronym for: double incomes, no kids.

Besides these neo-liberal elements, there are also more social-democratic elements reflected in current family and reconciliation policy. On the one hand, public childcare provision has been remarkably expanded since the mid-2000s and an income-related parental leave benefit up to 12³ months has been introduced in 2007 – both aiming at increasing mothers’ labour market attachment (Blome, 2017; Spieß and Wrohlich, 2005). On the other hand, a gendered division of labour is still de facto incentivized by joint taxation and family insurance for married couples (Andreß et al., 2006; Lewis et al., 2008). The fact that mothers still tend to interrupt their employment more often and for a longer time period than fathers mirrors the long shadow of the male breadwinner model. As a result, mothers – and especially lone mothers – face systematic disadvantages regarding working hours, wages and prestige in the highly sex segregated German labour market (Dressel and Wanger, 2010; Hausmann and Kleinert, 2014; Hausmann et al., 2015). To what extent lone mothers are affected by these contextual factors depends considerably on their marital status, age of children and employment trajectories – thus their route to lone motherhood. This will be further explained in the next section.

THEORETICAL FRAMEWORK AND PREVIOUS RESEARCH

Lone motherhood and poverty can be understood as two related processes of cumulative disadvantages (DiPrete and Eirich, 2006; DiPrete and McManus, 2000). Lone motherhood is not only a trigger of poverty, but reversely, poverty or financial hardship may also increase the likelihood of becoming a lone mother. Hence, for a better understanding of lone mothers’ poverty, we need to consider and disentangle both selection processes into lone motherhood (composition effects) and the effects of lone motherhood as a family phase. For this purpose, DiPrete’s concept of ‘trigger events’ (2002) offers a systematic and dynamic approach: The

³ There are two additional months reserved for fathers or lone mothers.

starting point is the life course event initiating the life passage under investigation – the so-called ‘trigger event’ (e.g. job loss, union dissolution, etc.). DiPrete identifies two different sets of mechanisms that correspond to the differentiation between the effects of composition and of lone motherhood on poverty: The *first* set of mechanisms examines the reasons for the trigger event to occur. That means we need to analyse the selection processes regarding women’s relationship and parenthood status before they become lone mothers and how they relate to poverty.

We know from existing research that individuals from lower social classes are more likely to experience critical life course events like unemployment or union dissolution (Ehlert, 2016; Rowlingson and McKay, 2005; Sayer et al., 2011; Zagel, 2013). Moreover, critical life course events in one sphere have an impact on other spheres, thus cumulating over the life course: For instance, couples where the male partner loses his job are also more likely to dissolve than couples where unemployment does not occur (Sayer et al., 2011). Hence, economic disadvantages like unemployment or poverty should be regarded as both consequences and triggers of lone motherhood.

Results from the US and the UK indicate the strong relevance of selection effects for the relationship between lone motherhood and poverty (Jenkins et al., 1990; Tach and Edin, 2013). For instance, Harkness and colleagues (2012:8) find that ‘[...] groups such as lone parents or teenage mothers may have a greater risk of being in poverty not because of their family status per se but because they are more likely to have other characteristics, such as low educational attainment, which raise the risk of poverty’. For Germany, no study has yet examined the extent to which the total effect of lone motherhood on poverty can be attributed to the social composition of lone mothers (Pailhé et al., 2014).

DiPrete’s *second* set of mechanisms, in contrast, focuses on the economic consequences of these trigger events during lone motherhood (lone motherhood effect on poverty). The income

losses related to a family break-up are different from those after childbirth or widowhood. Furthermore, these events are treated differently by welfare states' risk management (i.e. alimony payments, child benefits, etc.).

Social composition, routes to lone motherhood, and poverty

To understand lone mothers' high poverty rates in Germany, we need to examine the different selection processes into lone motherhood. Zagel (2018) differentiates four different routes to lone motherhood: divorce for a married mother, separation for a cohabiting mother, widowhood, and childbirth/ adoption for an unpartnered woman. These life course events differ not only in terms of mothers' prior status (partner and marital status on the one hand and parenthood on the other) but also in terms of their timing and social selectivity. Moreover, the salience of these events in Germany has changed over time: Whereas widowhood during the child-rearing phase has declined significantly since the 1950s, the other routes have become more prevalent (Konietzka and Kreyenfeld, 2005). Today, the major route to lone motherhood is divorce (58%), whereas another 36% are never-married women (dissolved cohabitation or unpartnered childbirth) and only 6% are widowed (Federal Ministry of Family Affairs, 2012) .

Despite the increase of cohabitation, we can still observe pronounced selection processes into different family forms: In most western countries, we observe a positive self-selection into marriage resulting in higher union stability for marriages than for cohabitations (Barg and Beblo, 2012; Bastin et al., 2012; Lyngstad and Jalovaara, 2010; McLanahan and Percheski, 2008; Thomson and McLanahan, 2012). Furthermore, many German couples marry when their first child is born, although this association is stronger in western Germany than in eastern Germany (Huinink et al., 2012). Consequently, married couples with children who divorce may be a selective group (Pailhé et al., 2014). Similarly, for Norway, Naess et al. (2015) found that individuals with lower levels of life satisfaction are more likely to get

divorced. Hence, three major routes to lone motherhood can be identified in today's Germany: divorce⁴, separation, and the birth of a first child outside of a stable relationship⁵.

Most existing research focused on the determinants of *union dissolution* and mainly on divorce. Regarding a social class effect in Germany, the empirical evidence is contested. Some studies support the 'independence hypothesis' that divorced mothers are better educated, more likely to be employed, and more likely to earn higher incomes than married mothers (Lyngstad Jalovaara, 2010; Wagner and Weiß, 2003). However, Cooke et al. (2013) find a wife's education and employment to have a negative effect or no effect on divorce in Germany. Similarly, Härkönen (2017, 2018) shows that since the 1980s, lone motherhood has become more prevalent among medium- and low-educated women in many European countries, including Germany. Other research suggests that the educational gradient is changing over time and may even lose importance (Bernardi and Martínez-Pastor, 2011; Pelletier, 2016).

This change over time can also be observed for cohabitation, which has become more common and, as a consequence, less selective (Pelletier, 2016; Schnor, 2014). For instance, in Germany, a considerable share of well-situated couples chooses to cohabit permanently (Konietzka and Kreyenfeld, 2005). However, cohabitation with children is much more common and more stable in eastern Germany than in western Germany (Bastin et al., 2012; Schnor, 2014). Overall, to-be divorced mothers have higher educational attainment, higher labour force participation and higher individual earnings than cohabiting mothers who will eventually separate (Radenacker, 2016). Moreover, the former tend to be older and have older children when becoming lone mothers than the latter (Ott et al., 2011). This contrasts with

⁴ The terms 'divorce' and 'separation' are used here to distinguish between formerly married and formerly cohabiting mothers, even though divorce is normally preceded by separation.

⁵ 'Stable relationship' here refers to couples either living together in the same household or being committed to each other as partners without sharing the same household. 'Birth lone mothers' are not in a stable relationship two years before or after having their first child.

countries like the UK or the US, where cohabitation is more short-lived and associated with socio-economic disadvantages (Kiernan et al., 2011).

The third route to lone motherhood, *out-of-relationship childbirth*, has so far been studied much less for Germany. Two studies by Bastin (2012) and her colleagues (2012) suggest selectivity towards young, medium-educated, never-partnered, and eastern German women.

Previous research from the UK on these so-called ‘birth lone mothers’ indicates that compared to other lone mothers, they are more likely to be low educated, to still live with their parents and to show lower labour force participation (Harkness, 2016, 2018).

Consequently, they have less income at their disposal than separated lone mothers had before becoming lone mothers. Building on these considerations about the selection processes into lone motherhood, we can derive two theoretical expectations:

H1: Women who become lone mothers already show higher poverty rates two years before the transition than women who do not experience lone motherhood.

H2: Among to-be lone mothers, married women about to divorce show the lowest poverty rate, whereas unpartnered women show the highest poverty rates.

The direct and indirect effects of lone motherhood on poverty

The actual ‘lone motherhood effect’ on lone mothers’ poverty corresponds to the second set of mechanisms in DiPrete’s concept (2002): the mechanisms for the economic consequences of life course events initiating lone motherhood. Previous research has mainly focused on the economic consequences of divorce. Compared to other countries, mothers in Germany seem to have the highest immediate income losses due to divorce (Andreß et al., 2003; Andreß and Lohmann, 2000; Bröckel and Andreß, 2015; DiPrete and McManus, 2000; Kohler et al., 2012; Page and Stevens, 2004; Vandecasteele, 2010). However, they recover more quickly over time than their counterparts in other western countries (Andreß et al., 2006; Kohler et al., 2012). DiPrete and McManus (2000:362) argue that in contrast to the US, where most married

mothers already work full-time, mothers in Germany have a greater potential to extend their working hours after separation, thereby preventing further income losses. Compared to divorced mothers, formerly cohabiting mothers in Germany seem to face higher immediate income losses but recover more quickly over time (Radenacker, 2016). The economic consequences of first childbirth for unpartnered women in Germany have not been studied yet. However, research on the UK points to the fact that income losses after childbirth are lower for birth lone mothers than for separated lone mothers, resulting in similar income positions for these two groups during lone motherhood (Harkness, 2018).

From this empirical evidence, we can derive two different mechanisms of how the transition to lone motherhood shapes lone mothers' poverty. On the one hand, the transition to lone motherhood results in *direct* income losses due to the life course event (union dissolution or childbirth). On the other hand, these life course events further shape the degree of childcare intensity (number and age of children) and mothers' employment behaviour during lone motherhood, thereby also exerting an *indirect* influence on poverty. This explicit distinction between direct and indirect effects of lone motherhood on lone mothers' poverty is theoretically important for two reasons: First, it improves our understanding of how different family trajectories and routes to lone motherhood influence life circumstances during lone motherhood. Second, it allows for a more systematic analysis of how welfare states shape the various risks related to lone motherhood.

Direct effects of lone motherhood on lone mothers' poverty refer mainly to the loss of the male partner's income in the case of separation and to the household's increased financial needs in the case of having a child outside of a relationship. As individuals with higher earnings tend to select into marriage, we can expect a greater poverty-enhancing effect for divorced lone mothers than for separated mothers.

The financial risks of family break-up and childbirth are treated differently by welfare states. In Germany, the financial risks of childbirth and child-raising are well covered by the welfare state, although the child benefit system overall is higher for two-parent families than for one-parent families (van Lancker et al., 2015). If the biological parents do not share a household, the non-resident parent has to pay income-related child support. If the non-resident parent has insufficient financial means, a maintenance advance payment scheme steps in (Hartmann, 2014; Skinner et al., 2007). Separation and divorce are governed by German Family Law, which determines whether and how much child support must be paid by the non-resident parent. The legal privilege of marriage over cohabitation persists after family dissolution (Böhmer et al., 2014; Sánchez Gassen and Perelli-Harris, 2015): In contrast to formerly cohabiting mothers, to-be divorced lone mothers are entitled to separation support (*Trennungsunterhalt*) and still benefit from the tax split during the period between separation and divorce. After divorce, they usually receive lower spousal alimony payments (*Ehegattenunterhalt*) (Brügmann et al., 2018).

Indirect effects of lone motherhood on lone mothers' poverty are more complex, because they involve changes in childcare intensity and employment behaviour. Both are strongly shaped by predominant work-family reconciliation policies. Lone mothers' childcare intensity and employment patterns strongly depend on their prior family trajectories (Zagel, 2014, 2015). Although the vast majority of lone mothers maintain or increase their labour force participation (for Germany: Hancioglu and Hartmann, 2014; for Switzerland: Struffolino et al., 2018), there are differences in labour market opportunities depending on the specific family trajectory: On average, a gendered division of labour is more common among married couples than among cohabiting couples, resulting in lower employment rates and more fragmented employment biographies for the former (Barg and Beblo, 2012). Nonetheless,

married mothers have higher educational qualifications and older children than cohabiting mothers (Radenacker, 2016).

Hence, divorced lone mothers may face greater problems (re-)entering the labour market and finding jobs that pay enough to avoid poverty. At the same time, formerly cohabiting mothers may be worse off financially in the long run, as their potential to further extend their already higher working hours is limited. Birth lone mothers' employment patterns are quite different: Compared to separated mothers, they have higher employment rates before becoming lone mothers. However, due to their younger age and lower education, they may earn lower wages than other lone mothers. For these women, lone motherhood begins with the birth of their first child, meaning they face the highest childcare intensity and lowest employment potential during the first years of lone motherhood. Building on these considerations, we can formulate three further hypotheses:

H3: Overall, lone mothers' high poverty rates in Germany are primarily the result of a high poverty-enhancing effect of lone motherhood and only to a lesser extent of adverse selection.

H4a: Direct effects of lone motherhood on lone mothers' poverty risks are highest for divorced lone mothers.

H4b: Indirect effects of lone motherhood on lone mothers' poverty risks are highest for birth lone mothers.

H5: The welfare state buffer is the least effective for separated lone mothers.

DATA, MEASURES AND ANALYTICAL STRATEGY

Data and measures

To test these four hypotheses empirically, we use a longitudinal study design allowing the simultaneous modelling of the complex relationships between lone motherhood and poverty.

The analyses are based on data from the German Socio-Economic Panel (GSOEP). The GSOEP, as a multi-cohort panel study, provides representative longitudinal data on a yearly

basis since 1984. It covers a broad range of individual and household socio-economic variables as well as detailed information on family structure and dynamics (Wagner et al., 2007).

The central theoretical concepts are measured as follows: *Lone mothers* are defined as unpartnered mothers living together with at least one dependent child below the age of 18. This broader definition allows capturing living arrangements of lone mothers where adults other than partners are present (e.g. adult children or parents). This applies particularly to young women who moved back to their parents or were still living with their families when transitioning into lone motherhood. Mothers who report to have a so-called in living-apart-together relationship (LAT) are excluded from the analysis⁶ because LAT relationships differ considerably from lone parenthood regarding emotional and financial commitment between parents.

The binary outcome *being poor* (yes/no) is measured according to the official EU definition: A household is at risk of poverty if the total net household income amounts to less than 60% of the median net equivalised⁷ household income. For most analyses net household income is measured as monthly income in the month of the interview matching with the measurement of socio-demographic characteristics. This income definition ensures the precise measurement of poverty before and after the transition to lone motherhood.

For additional analyses on lone mothers' income packages and the welfare state buffer an annual income measure is used. Thus, we can capture the effectiveness of tax deductions and annually paid benefits. In the GSOEP we can differentiate four different income sources: Labour income (own and household), social benefits (e.g. child benefit, housing benefit,

⁶ LAT relationships with children are quite rare, as partners usually move in together when the first child is born at the latest (Asendorpf, 2008).

⁷ According to the modified OECD Equivalence Scale: a weight of 1.0 for the household head, a weight of 0.5 for other household members aged 15 years or older and a weight of 0.3 for household members up to the age of 15.

social assistance, etc.), private transfers (e.g. alimony and child maintenance) and private revenues (e.g. rent). The GSOEP also provides information on a households' tax burden (income taxes and payroll taxes), which is estimated for all individuals (aged 16 years or older) in the household (Grabka, 2016). While *hypothetical market income poverty* is solely based on annual household income from labour and private revenues (excluding transfers and taxes), *actual poverty* is based on disposable annual household income, which also considers the above mentioned transfers and taxes.

For the analysis of selection processes into lone motherhood and potential composition effects on poverty, a wide range of socio-demographic characteristics are considered. To rule out post-treatment or anticipation effects (Cooke and Gash, 2010; Lucas, 2007), all characteristics are measured two years before the transition to lone motherhood.

Employment status and working hours are measured in four categories: full-time employed, part time employed, unemployed or inactive (including being on parental leave). Social class is approximated by *level of education* based on the ISCED-classification: low (no secondary schooling completed), medium (completed secondary schooling and/or vocational training), and high education (completed tertiary education). This measure is supplemented by the *monthly net equivalised household income* as a proxy of the relative position in the income distribution. To quantify the potential of economic independence of to-be lone mothers within the household, *the share of their individual labour income on the total household labour income* is included. Additionally, a relative measure of *work experience*, the percentage of the time being employed since entering the first job, and a measure of job security (*fixed-term job*) are taken into account. Moreover, *partners' unemployment status* is included where applicable. Household structure is captured using the *number of dependent children* (1, 2, 3 and more), and the *age of the youngest child* (0-2, 3-5, 6-17 years) in the case of married or cohabiting mothers. For unpartnered childless women, it is considered whether they live in a

one-person or *multiple-person household*. Control variables include living in East or West Germany, age (<25, 25-34, 35-59), birth cohort (before 1960, 1960-1969, 1970-1979-1980-1989), overall life satisfaction⁸ (0=low; 10=high) and migration background (yes⁹/no).

Analytical strategy

In line with the theoretical framework, the empirical analyses are structured as follows: The *first set of analyses* involves a ‘thick’ description of selection processes into lone motherhood and poverty rates around the transition to lone motherhood. The extent to which poverty is endogenous to lone motherhood can be shown by comparing to-be lone mothers’ poverty rates before the transition to lone motherhood to poverty rates of women who do not experience lone motherhood. Furthermore, lone mothers’ pre- and post-transition poverty rates are compared to approximate the consequences of becoming a lone mother.

The *second set of analyses* is designed to identify the lone motherhood effect on lone mothers’ poverty – net of potential composition effects. To this end, difference-in-differences estimation (DiD) is employed as a quasi-experimental framework with observational data (Morgan and Winship, 2007). This estimation strategy proved to be very useful for identifying the economic consequences of critical life course (Ehlert, 2016; Heisig, 2015; Kohler et al., 2012; Radenacker, 2016). DiD simultaneously accounts for time-varying observed and time-constant unobserved factors within individuals and for common shocks to the treatment and control group. The model involves an intra-individual comparison of the outcome of the treated (T=1) before (Y₀) and after (Y₁) receiving the treatment – just as in standard fixed effects models. In addition, in DiD this first difference is also calculated for the control group (T = 0) and then subtracted from the first difference of the treatment group:

$$\text{DiD} = E(Y_1 - Y_0 \mid T = 1) - E(Y_1 - Y_0 \mid T = 0)$$

⁸ Previous research shows that individuals with lower overall life satisfaction are more likely to experience union dissolution than individuals with higher life satisfaction (Naess et al., 2015).

⁹ This category comprises 1st generation immigrants and 2nd generation migrants (at least one parent was born outside of Germany).

The underlying assumption is that the control group identifies the time path of outcomes that would have happened without the treatment. The DiD identifies the Average Treatment Effect on the Treated (ATT). Applied to the present study, family break-up and out-of-relationship childbirth are the treatments, and the three groups of lone mothers (based on routes) are the treatment groups. The respective control groups consist of women potentially ‘at risk’ of becoming lone mothers without actually experiencing lone motherhood. For the formerly married or cohabiting lone mothers, the control group is married (or cohabiting) mothers who do not separate; for birth lone mothers, the control group includes childless unpartnered women.

However, DiD estimation only produces unbiased results if the assignment to treatment and control group is random and if the parallel trends assumption holds. As discussed above, these preconditions are not met in the case of lone motherhood due to selection processes. Hence, a so-called ‘conditional’ DiD is employed, where a matching or reweighting technique is used to control for observable non-random differences in treatment assignment.¹⁰ The present study uses Entropy Balancing (EB), a non-parametric reweighting procedure introduced by Hainmüller (2012), which is particularly useful for studies with small samples (Giesecke et al., 2015). In contrast to matching techniques (e.g. propensity score matching or coarsened exact matching), EB reweights the control cases according to the distribution (mean and higher order moments) of a certain characteristic in the treatment group (e.g. age, gender, etc.). Where applicable, all of the above-mentioned socio-demographic characteristics are considered in the reweighting procedure. Despite the overall reduction of case loss, some treatment cases may still be excluded from the reweighting procedure due to missingness.

¹⁰ There is no optimal solution to this problem of applying DiD models in the absence of random assignment and parallel time trends (Lechner, 2010). Conditional DiD models represent a way to minimize potential biases (Gangl, 2015; Heisig, 2015). Potential alternatives would be running a Heckman selection model or using an instrumental variable approach. Heckman selection models are not a superior option in this case, as these models rely on the assumption of joint normality of the errors. This assumption is quite strong and probably not met in this application. Instrumental variables, in contrast, are more flexible regarding the structure of the error terms. However, so far there has not been introduced a valid instrument that meets the exogeneity assumption (instrument is correlated with lone motherhood but uncorrelated with poverty).

Hence, the conditional DiD provides a ‘feasible’ ATT (FATT). Table A.1 in the Appendix provides an overview for each route on the considered characteristics and shows an overall low level of selectivity for the resulting analysis sample.

The distinction between direct and indirect effects of lone motherhood on lone mothers’ poverty is realized empirically as follows: First, the total effect is estimated by only including the treatment variable (divorce, separation, or child birth), the time variable and the interaction of the two in the model. Then, in order to identify the direct effects, we control for post-treatment time-variant employment behaviour and household constellation. The indirect effects logically correspond to the difference between total and direct effects of lone motherhood on lone mothers’ poverty.

Study design and sample

Owing to the paper’s main focus on the transition to lone motherhood, the observation window is centred on the event of becoming a lone mother. The transition to lone motherhood (t_0) can be derived from biography and calendar data sets in the GSOEP. The observation period starts approximately two years before becoming a lone mother (t_{-2}) to avoid anticipation effects (Cooke and Gash, 2010; Lucas, 2007). Then the first two years after the transition into lone motherhood (t_1 and t_2) are taken into account. This design helps ensure the observation of lone motherhood and exclude shorter transition phases caused by fast re-partnering or LAT couples finally moving in together a few months after childbirth (Bastin, 2012; Kraus, 2014; Ott et al., 2011). This procedure does not constitute a selection problem, as only 48 lone mothers in the sample repartner within the first two years of lone motherhood. If women experience more than one episode of lone motherhood, all episodes that match the

abovementioned criteria are considered. Clustered standard errors take care of the non-independence of episodes¹¹.

The equivalent observation window for the control group is obtained as follows: First, the control observations are divided into different episodes according to their relationship and parenthood status. Then, owing to the absence of an anchor event, an algorithm splits up the relevant control episodes (married/ cohabiting with children, childless unpartnered) into all possible consecutive four waves-intervals. The t_{-1} - wave is also omitted to match the three-wave design in the treatment group. As a result, one woman can contribute multiple and distinct episodes to the sample of control groups.

To obtain decent sample sizes, all waves from 1984 to 2016 and respondents from East and West Germany are pooled¹². The sample is restricted to women aged 18 to 45 for the unpartnered sample (i.e. those who are at ‘risk’ of a first birth) and 18 to 59 for (formerly) married and cohabiting women. From the 2,231 women ever observed as lone mothers, left-censored episodes of lone motherhood (750) and episodes with gaps (151) are excluded. The final sample comprises 955 lone motherhood episodes from 880 lone mothers (divorced lone mothers: 538; separated lone mothers: 203; birth lone mothers: 139) and 11,887 control episodes and 11,089 control cases (married mothers: 7,037; cohabiting mothers: 580; unpartnered childless women: 4,270). To ensure that control cases with longer episodes do not bias the descriptive results, an algorithm randomly chooses four consecutive waves per episode. Furthermore, on the basis of the GSOEP weights, episode weights are constructed multiplying the cross-sectional survey weight of the first wave and the inversed staying probability of subsequent waves (Kroh, 2010).

¹¹ 92% of the lone mothers contribute one episode to the sample and only 8% of them multiple episodes. Although it is highly unlikely that these multiple episodes affect the results, the DiD models are run with clustered standard errors.

¹² Pooling over 30 years comes along with potential problems of comparability due to changes in lone motherhood, income distributions and thus, poverty thresholds. For that reason, incomes are adjusted by consumer price index and expressed by 2010 Euro. Furthermore, I control for the year of the transition to lone motherhood, birth cohort and region in the EB procedure.

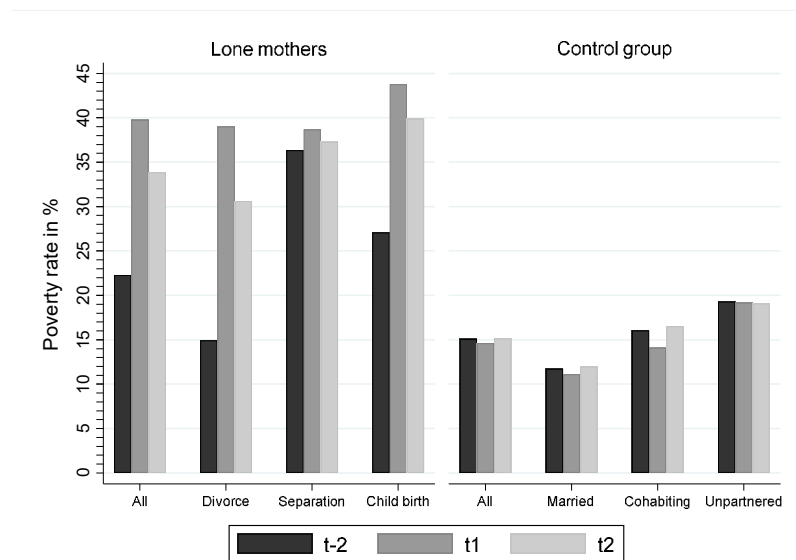
RESULTS

Selection into lone motherhood and lone mothers' poverty risks

The first set of analyses starts with the description of poverty rates before and after the transition to lone motherhood – also in comparison to poverty rates in the respective control groups. In the left panel of *Figure 1*, lone mothers' poverty rates are presented at three time points ($t-2$, t_1 , t_2) by route to lone motherhood; the right panel presents the equivalent poverty rates of the control groups. In line with *hypothesis 1*, two years before the transition ($t-2$), poverty rates are already considerably higher for to-be lone mothers than for the control groups – irrespective of the route to lone motherhood: 22% of all to-be lone mothers are affected by poverty at $t-2$, compared to only 15% in the control groups. However, there are considerable differences across the three routes to lone motherhood. As expected, poverty rates at t_2 are lowest for to-be divorced mothers (15%), but surprisingly higher for to-be separated mothers (36%) than for to-be birth lone mothers (27%). Hence, *hypothesis 2* can only be confirmed partly. The poverty gap compared to the control group is less pronounced for to-be divorced mothers (4 percentage points), and to-be birth lone mothers (8 ppt.), while it is strikingly high for to-be separated cohabiting mothers (20 ppt.).

The picture changes completely when looking at poverty rates in the first two years of lone motherhood (t_1/t_2): After becoming a lone mother, poverty rates increase only slightly for formerly cohabiting mothers (2 ppt.) but considerably for birth (17 ppt.) and divorced (24 ppt.) lone mothers. During the first two years of lone motherhood, birth lone mothers have the highest poverty rates, followed by separated and divorced lone mothers. Although poverty rates are still lowest for formerly married mothers, the differences between routes have clearly decreased. As these aggregated poverty rates at different time points do not provide information on individual poverty trajectories, *Figure 2* illustrates possible poverty trajectories between $t-2$ and t_1 across routes to lone motherhood. We can identify four

Figure 1: Poverty rates of (to-be) lone mothers and control groups at different time points



Data: GSOEP (1984-2016), weighted with episode weight.

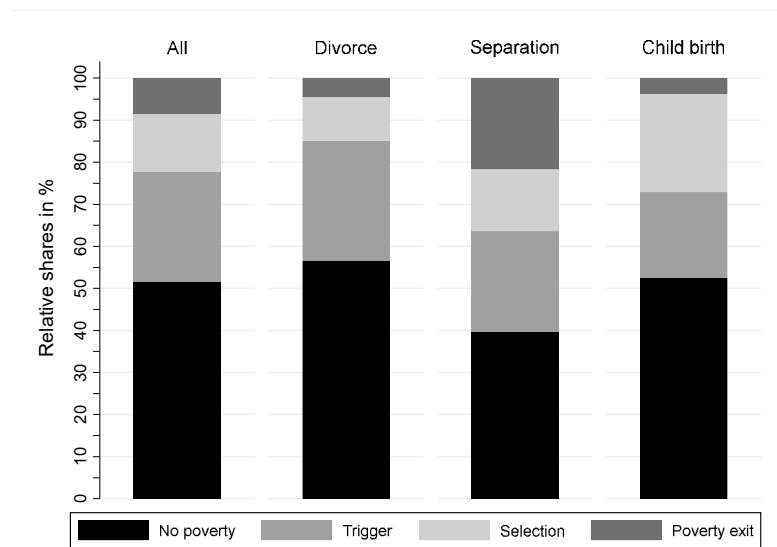
Notes: Income reference period: Monthly income. Unmatched cases, own calculations.

trajectory patterns: ‘No poverty’ applies if a woman is neither affected by poverty at t-2 nor at t1. In contrast, a ‘Selection’ pattern emerges if she is poor before and after the transition to lone motherhood. If a woman was not poor at t-2, but is poor at t1, lone motherhood is a ‘Trigger’ of poverty. Finally, it is also possible that she was poor before becoming a lone mother but is no longer poor during lone motherhood (‘Poverty exit’).

Among divorced lone mothers, the patterns ‘No poverty’ (56%) and ‘Trigger’ (28%) are predominant. In contrast, among separated lone mothers, the share of ‘No poverty’ is lowest (40%), whereas the patterns ‘Selection’ (14%) and especially ‘Poverty exit’ (22%) play a greater role. The latter result may be explained by higher unemployment rates among male cohabitants, which presented a financial burden before separation¹³ (see Table 1). Yet among birth lone mothers, the comparatively high shares of the patterns ‘Selection’ (23%) and ‘Trigger’ (20%) are notable.

¹³ This speaks to the existing literature that unemployment increases the risk of union instability (Cooke and Gash, 2010; Sayer et al., 2011).

Figure 2: Patterns of poverty trajectories before and after becoming a lone mother (in %)

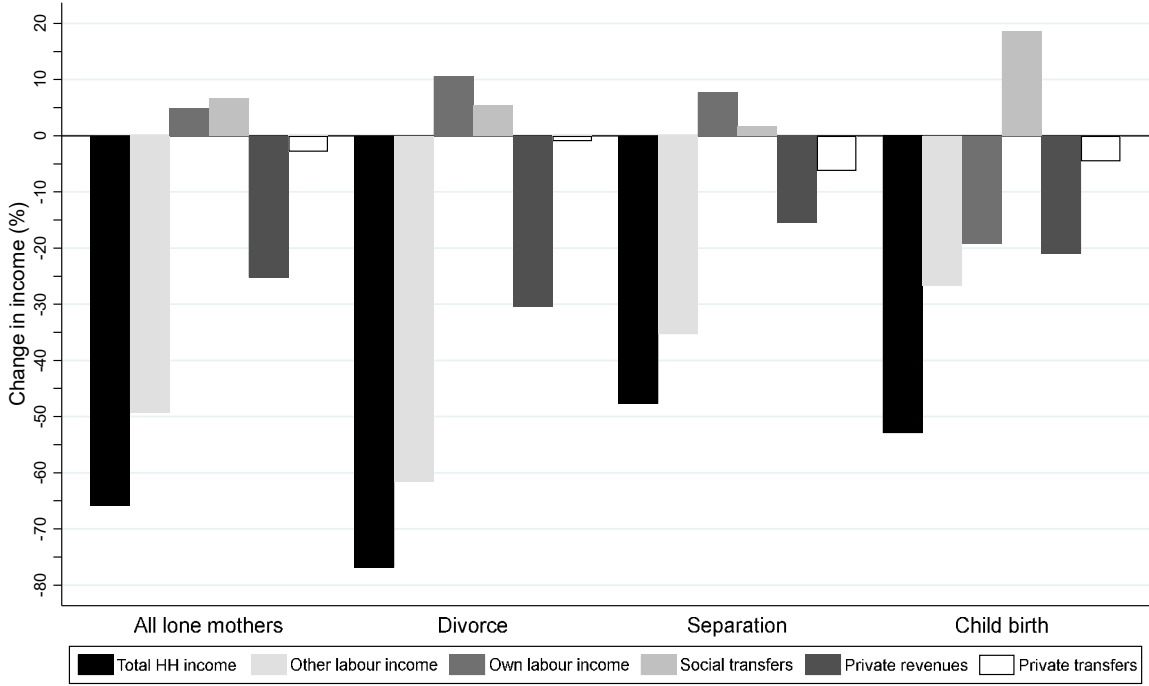


Data: GSOEP (1984-2016), weighted with episode weight.

Notes: Income reference period: Monthly income. Unmatched cases, own calculations.

As we have seen, the transition to lone motherhood comes along with substantial income losses for many lone mothers. *Figure 3* presents now lone mothers' income packages and illustrates where income losses and gains occur: We see that, on average, lone mothers lose 66% of their household income in the first two years after the transition into lone motherhood. Unsurprisingly, losses in total household income are highest among divorced lone mothers (-77%) reflecting the highest increase in poverty in this group. Despite their comparatively higher increases in own labour earnings (+11%), they face by far the highest losses in other labour income (-51%) and private revenues (-30%) – probably their ex-partner's income. Separated lone mothers show the same but less pronounced pattern: Overall, they lose 48% of their household income, whereof 28% are losses in other labour income and 16% losses in private revenues. These descriptive results impressively show the high latent risk of poverty for women in couple households that turns in manifest poverty for many of them after family break-up.

Figure 3: Income losses after becoming a lone mother by income source



Data: GSOEP (1984-2016), own calculations.
 Notes: Income losses are calculated as the change between t-2 and the mean of t1 and t2. Income reference period: Disposable annual income. Income at t1 might still include income of pre-lone motherhood months.

For both divorced and separated mothers the marginal increase in social benefits cannot substantially mitigate their high income losses. Although birth lone mothers’ losses in own labour earnings (-19%) are well mitigated by social benefits (+18%), they still lose 53% of their former household income. This applies particularly to those birth lone mothers who moved out of the family household after child birth. Private transfers do not seem to play a substantial role for lone mothers’ income packages in the first two years.

These first descriptive insights point to the importance of selection processes and resulting composition effects on the one hand and the importance of differentiating between the routes to lone motherhood on the other. Therefore, in a next step, the social composition of to-be lone mothers and control groups at t-2 is examined. *Table 1* presents relevant socio-demographic characteristics. First, each route to lone motherhood is compared to the respective control group to assess the level of selectivity. In line with previous research, the

Table 1: The social composition of *to-be* lone mothers and respective control groups

Composition at t ₂ (means, column %)	Lone Mothers			Control Group		
	Separation Marriage	Separation Cohabitation	Unpartnered childbirth	Married mothers	Cohabiting mothers	Unpartnered childless
<i>Employment</i>						
Full time	17.4	18.3	45.8	16.6	26.9	32.5
Part time	42.0	29.5	9.5	38.2	36.1	12.4
Unemployed	4.8	12.1	10.7	4.7	8.0	4.6
Inactive	35.8	40.1	34.0	40.5	29.0	50.5
Full-time education	1.2	1.0	15.9	1.0	0.7	23.5
<i>Work experience</i>	59.1	52.7	49.0	58.2	64.8	39.7
<i>Fixed-term contract</i>	26.2	27.2	32.5	12.2	12.0	41.8
<i>Net HH income</i>	1,307€	1,052€	1,194€	1,377€	1,313€	1,354€
<i>Share HH labour income</i>	25.6	41.9	48.3	18.3	31.5	45.3
<i>Partner's unemployment</i>	6.1	12.9	-	4.5	9.9	-
<i>Home ownership</i>	35.2	17.5	21.7	51.9	26.4	38.7
<i>Education</i>						
Low	20.2	24.2	49.7	19.3	20.5	44.2
Medium	59.9	58.5	38.2	58.3	56.7	43.3
High	19.9	17.3	12.1	22.4	22.8	12.5
<i>Number of children</i>						
None	-	-	100.0	-	-	100.0
1	37.5	56.7	-	39.8	65.2	-
2	46.7	32.9	-	44.9	25.1	-
3 or more	15.8	10.4	-	15.3	9.7	-
<i>Age of youngest child</i>						
0-2 years	30.6	37.0	-	22.0	37.1	-
3-5 years	20.6	16.9	-	16.8	18.2	-
6-17years	48.8	46.1	-	61.2	44.7	-
<i>Household constellation</i>						
1-Person HH	-	-	42.9	-	-	31.5
<i>Age</i>						
Below 25	6.9	16.2	56.9	3.4	12.8	64.0
25-34 years	45.8	49.1	35.5	30.0	50.4	21.2
35 and older	47.3	34.7	7.6	66.6	36.8	14.8
<i>Age at first birth</i>	24.5	23.5	25.7	25.6	24.9	29.1
<i>Birth cohort</i>						
Before 1960	29.2	15.1	3.6	41.5	12.9	5.6
1960s	43.0	42.5	36.2	33.5	34.6	22.7
1970s	21.1	28.7	35.0	18.9	39.1	27.1
1980s and later	6.7	13.7	25.2	6.1	13.4	44.6
<i>Migration background</i>	18.1	13.5	18.7	24.7	8.9	21.0
<i>East Germany</i>	15.0	39.0	21.4	12.5	29.7	13.8
<i>Life satisfaction</i>	6.8	6.2	6.5	7.4	7.0	7.2
<i>N(episodes)</i>	533	243	134	6,172	470	3,994
<i>N(persons)</i>	513	204	134	6,134	466	3,935

Data: GSOEP (1984-2016), weighted with episode weight.

Notes: Unmatched cases, own calculations. Time of measurement: Roughly two years before becoming a lone mother (t-2).

findings show considerable social selectivity into lone motherhood, but the extent varies noticeably by route. Whereas to-be divorced mothers differ only slightly from non-separating married mothers, adverse selection is quite pronounced for to-be separated cohabiting mothers. In both routes to lone motherhood (and even more for the cohabiting), the shares of women with an unemployed partner, a fixed-term job, and rented housing are considerably higher than those in the control group. In the case of to-be separated cohabiting mothers, labour force participation and educational qualifications are lower than in the control group. In contrast, to-be birth lone mothers form a special case: 45% of them work full time, compared to only 32% in the control group. However, their unemployment rate is twice as high as that of unpartnered women who remain childless. Furthermore, a higher share of to-be birth lone mothers forms their own households and lives in eastern Germany.

At the same time, there is considerable heterogeneity among to-be lone mothers: First, the timing of lone motherhood in the life course appears to be rather different. Whereas 92% of married mothers experience lone motherhood in their mid-thirties or later, 17% of cohabiting mothers and 55% of unpartnered women do so in their early twenties. Consequently, to-be divorced mothers have on average older children and more work experience than other to-be lone mothers. In terms of education, they are the least socially disadvantaged (20% low educated, compared to 24% of the to-be separated cohabiting mothers and even 50% of the future birth lone mothers).

Based on these first results, we find, on the one hand, clear descriptive evidence of a substantial selection of socially disadvantaged women into lone motherhood. On the other hand, we also find heterogeneity among lone mothers regarding both their poverty rates and their social composition due to different prior life stages and the different events initiating lone motherhood.

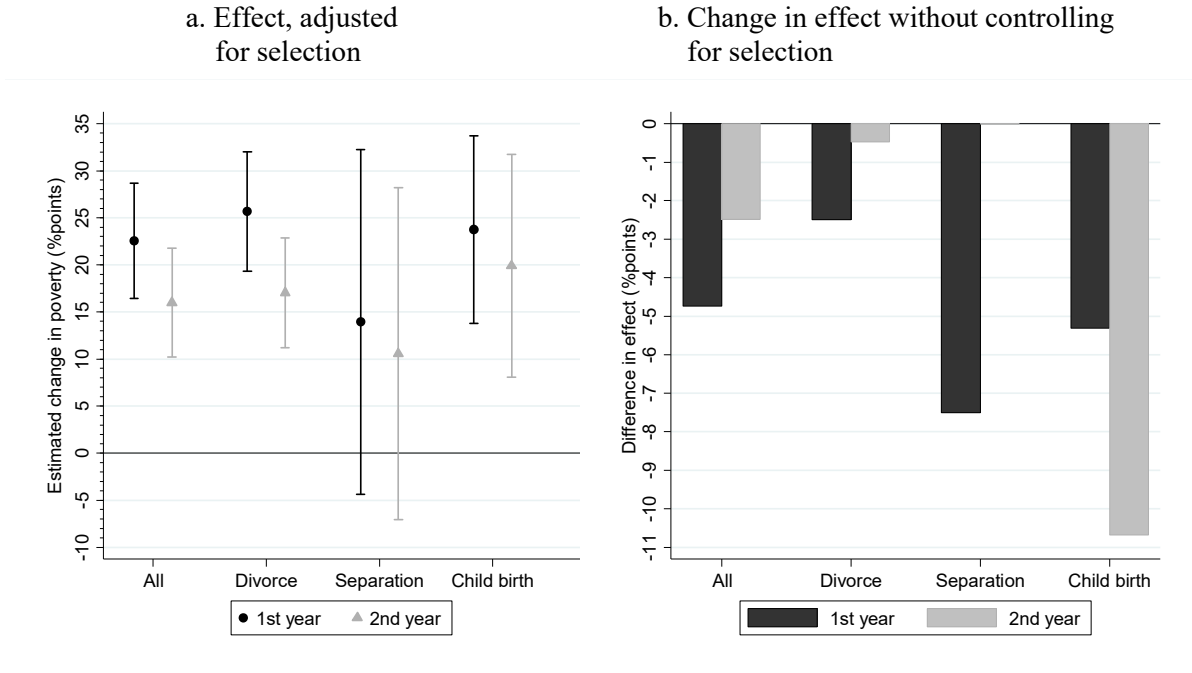
The lone motherhood effect on lone mothers' poverty

Building on these descriptive results, the second set of analyses aims at identifying the effect of lone motherhood on lone mothers' poverty—net of composition effects. To this end, different conditional DiD models addressing non-random selection into treatment by applying EB were run. All analyses were conducted for the whole sample and separately for each route. The presented coefficients are the Feasible Average Treatment Effects on the Treated (FATT) at t_1 and t_2 . Due to limited case numbers for formerly cohabiting and birth lone mothers, these results are rather explorative in nature and need to be interpreted with caution.

The left panel of *Figure 4* illustrates the *total* effect of lone motherhood on lone mothers' poverty. When all lone mothers are examined together, the poverty-enhancing effect of becoming a lone mother is 22.6 ppt. in the first year of lone motherhood and 16 ppt. in the second year. These statistically highly significant effects are mainly driven by divorced lone mothers, who constitute the biggest subgroup. For these lone mothers, the transition to lone motherhood has the greatest immediate poverty-enhancing effect (25.6 ppt.)—an effect that already drops considerably in the second year. For birth lone mothers, in contrast, and particularly for separated mothers, the immediate effect is lower (23.7 ppt. and 13.9 ppt., respectively) but decreases to a lesser extent in the second year than for the divorced mothers. The poverty-enhancing effect of lone motherhood on separated lone mothers' poverty is not statistically significant, which is probably due to the small sample size. Nevertheless, the differentiation by route reveals a certain degree of heterogeneity among lone mothers, which is obscured in the pooled sample.

The right panel of *Figure 4* additionally shows the extent to which these estimated poverty-enhancing effects of lone motherhood are underestimated without controlling for selection into lone motherhood. According to these analyses, the effect of lone motherhood on lone mothers' poverty are underestimated by 5 ppt. in the whole sample and even by 7.5 ppt. in the case of separated mothers. Although this figure clearly shows the existence of substantial

Figure 4: The poverty-enhancing effect of becoming a lone mother, by route



Data: GSOEP (1984-2016), own calculations.
 Notes: Results of conditional DiD estimations based on linear probability models with robust standard errors. Standard errors are reported in *Table 2*. Income reference period: Monthly income.

selection effects, as expected, the poverty-enhancing effect of becoming a lone mother turns out to be the main driver for lone mothers’ high poverty rates (*hypothesis 3*).

These results do not change substantially if poverty thresholds of 40% or 50% are used (see *Figure A.1* in the Appendix). Furthermore, the short-term effects on the differences in poverty trajectories across routes are empirically confirmed by the sensitivity analysis shown in *Figure A.2* in the Appendix, which uses a longer observation window ($t-2 - t5$). According to that figure, the poverty-enhancing effect of becoming a lone mother seems to be most persistent for birth lone mothers than for other lone mothers. However, it is also quite obvious that this longer observation window comes at the very high cost of insupportably uncertain estimations for the separated lone mothers.

This total effect of lone motherhood on lone mothers’ poverty has been decomposed into direct effects of the event initiating lone motherhood and indirect effects of changes in

Table 2: Total and direct poverty-enhancing effect of lone motherhood

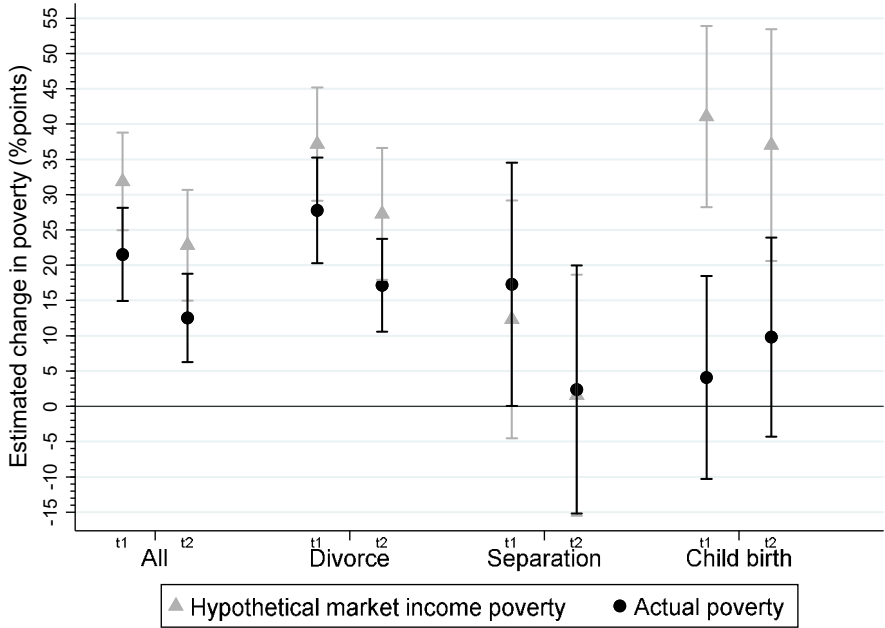
	All lone mothers		Separation marriage		Separation cohabitation		Unpartnered child birth	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Total effect	22.6*** (7.22)	16.0*** (5.41)	25.7*** (7.94)	17.0*** (5.74)	13.9 (1.49)	10.6 (1.18)	23.7*** (4.67)	19.9** (3.29)
Direct effect	22.9** (6.61)	16.4** (5.22)	25.4*** (7.46)	17.2*** (5.54)	14.6+ (1.67)	12.2 (1.54)	14.7*** (2.82)	10.0 (1.55)
N (person-years)	142,688		92,720		4,695		45,273	
N (persons)	10,607		6,171		601		4,108	

Significance level: ***: $p < 0.001$, **: $p < 0.01$, *: $p < 0.05$, +: $p < 0.1$. Data: GSOEP (1984-2016), own calculations. Notes: Results of conditional DiD estimations based on linear probability models with robust standard errors (in brackets). Income reference period: Monthly income.

employment behaviour and care intensity (see *Table 2*). Regarding the two routes of union dissolution, the total poverty-enhancing effect of becoming a lone mother consists almost completely in the direct effect of losing the ex-partner's income. Divorce has the greatest direct poverty-enhancing effect of lone motherhood (*hypothesis 4a*), whereas indirect poverty-enhancing effects seem to play a significant role only for birth lone mothers (*hypothesis 4b*).

In the final analysis, we want to quantify the *buffering effect of the welfare state* on lone mothers' risk of poverty. To this end, the total poverty-enhancing effect of lone motherhood on lone mothers' actual poverty is contrasted with the corresponding effect based on a hypothetical measure of 'market income poverty' (annual net household income excluding social benefits and taxes). This hypothetical market income poverty presents a rough measure for how lone mothers' poverty would look like in the absence of monetary social benefits. The black coefficients in *Figure 5* basically reproduce the conditional DiD estimations in *Figure 4* reflecting the actual change in the probability of being poor after becoming a lone mother. The grey coefficients show the respective change in hypothetical market income poverty.

Figure 5: The hypothetical welfare state buffer after the transition to lone motherhood, by route



Data: GSOEP (1984-2016), own calculations.
 Notes: Results of conditional DiD estimations based on linear probability models with robust standard errors. Income reference period: Annual income. Income at t1 might still include income of pre-lone motherhood months.

For divorced and birth lone mothers, the poverty-enhancing effect of lone motherhood would be higher in the absence of social benefits and taxes. However, this buffering effect is only statistically significant for birth lone mothers who heavily rely on social benefits in the first two years after child birth. For separated lone mothers, in contrast, there does not seem to be such a buffering effect at all. This result lends some empirical evidence to *hypothesis 5*, which assumed the lowest welfare state buffer for separated mothers who cannot benefit from the long shadow of marriage privileges.

CONCLUSION

The aim of this study was to provide a comprehensive framework to explain lone mothers’ high poverty rates and some innovative empirical insights for Germany. To this end, at first, a

theoretical model was developed that considers both selective family processes preceding lone motherhood and the poverty-enhancing effect of the life course events initiating lone motherhood. This framework allows for taking into account more systematically the existing heterogeneity among lone mothers depending on their route to lone motherhood and to linking it to poverty outcomes. This more fine-grained picture on lone motherhood also enables us to make assumptions on the welfare state's effectiveness in buffering lone mothers' risk of poverty depending on the life course risk (family break-up and child birth) and the mothers' marital status. Second, these elaborated mechanisms were tested empirically for Germany, providing a 'thick' description of selection processes to lone motherhood and less biased estimates of the poverty-enhancing effect of lone motherhood.

The findings indicate that selection into lone motherhood plays a substantial role for explaining lone mothers' high poverty, albeit the lone motherhood effect on poverty is overall more decisive. The longitudinal perspective revealed that poverty is notably higher among to-be lone mothers (at t_2) than among women who do not experience lone motherhood. This is particularly true of cohabiting to-be lone mothers. In contrast, to-be divorced lone mothers have only slightly higher poverty rates than mothers who remain married. However, lone motherhood presents the greatest trigger of (temporary) poverty for divorced lone mothers. Yet around one half of them are neither affected by poverty two years before the transition to lone motherhood nor during the first two years of lone motherhood.

In view of these obvious composition effects, it is important to assess the effect of lone motherhood on poverty in a least biased manner. To this end, conditional DiD estimation with Entropy Balancing (as a matching approach) accounted for the selective transition into lone motherhood, cohort and period effects. Overall, these multivariate results confirm findings from the descriptive results: Becoming a lone mother increases poverty significantly (by 23 percentage points). This effect is mainly driven by divorced and birth lone mothers; for

separated lone mothers, composition effects seem to play a more important role. As a consequence, the differences in poverty rates before the transition to lone motherhood decrease during the first two years of lone motherhood. Nevertheless, the decline of the poverty-enhancing effect of lone motherhood in the second year is more pronounced for divorced lone mothers, while the effect is more stable for the other lone mothers.

This finding could be partly owing to the fact that the total poverty-enhancing effect of divorce is basically the direct effect of divorce, that is, the loss of the ex-husband's income. In the German welfare state, this risk is mitigated comparatively well through alimony payments, privileging divorced mothers over never-married separated mothers. Moreover, compared to other lone mothers, divorced lone mothers are better educated and have better access to decent jobs, which further enables them to avoid or rapidly overcome poverty. In contrast, birth lone mothers face greater indirect effects of lone motherhood, because lone motherhood here comes along with employment interruption. Although child benefits and parental leave benefits are relatively high in Germany compared to other countries, birth lone mothers lose a considerable share of their income. Furthermore, they face difficulties returning to the labour market because of high childcare intensity.

Besides these contributions, this study also has some limitations, which might fuel future research in this field. First, despite pooling all available years in the GSOEP, the case numbers for separated and birth lone mothers are still quite small. As a consequence, the results of the conditional DiD present first explorative insights that need to be replicated with larger samples. Future research with larger longitudinal samples could improve this study in at least two ways: We could estimate more trustworthy estimations for the medium and long-term effects of lone motherhood on poverty. Further, we could also examine whether the three routes to lone motherhood also differ in the duration of lone motherhood or the route out of lone motherhood (re-partnering, children growing up or leaving the household).

Second, the focus on differentiating routes to lone motherhood rendered it impossible to also investigate change over time (period effects) or differences between eastern and western Germany. Particularly the latter could produce novel insights on how the different gender regimes and legacies in the former East and West Germany (Rosenfeld et al., 2004) shaped and still shape lone motherhood: we might expect substantial differences in the prevalence of the three routes to lone motherhood and in women's employment behaviour before and during lone motherhood.

Finally, the results clearly show the importance of considering selectivity more thoroughly than is commonly the case. However, the present study can only correct for selection-on-observables, while other important dimensions cannot be considered. For instance, the GSOEP does not provide sufficient information on non-residential fathers' involvement. Prior research finds that the father's reliability regarding negotiated childcare arrangements and maintenance payments is a crucial precondition for lone mothers to accomplish their dual roles as main carers and main earners (Struffolino et al. 2018). Hence, a certain bias may remain due to time-varying unobservable characteristics influencing both the likelihood of becoming a lone mother and of being poor (e.g. sense of responsibility, conscientiousness, etc.). One could argue, however, that some of this potential bias may actually already be picked up by the observable characteristics such as education, on which the reweighting algorithm is based.

In terms of policy implications, the present study and its distinction between composition effects and the effect of lone motherhood on lone mothers' poverty helps better understand the concrete mechanisms at work. This approach further enables us to assess more systematically how social policies can mitigate lone mothers' poverty. On the one hand, the German law could do a better job reducing lone mothers' massive income losses by strengthening the financial and childcare responsibilities of the non-residential fathers.

Moreover, most lone mothers in Germany have children of school age. Therefore, the welfare state should invest more in the afternoon care infrastructure for school-aged children, enabling lone mothers to extend their working hours, thus reducing the indirect effects of lone motherhood. On the other hand, these massive income losses could also be prevented if couples shared more equally their role as care givers and bread winners. However, this would mean not only a change in couples' decisions, but also in the institutional setting surrounding them. As long as the German welfare state incentivizes a gendered division of labour and mothers face great disadvantages and discrimination on the labour market, their latent risk of poverty will persist. Moreover, remaining privileges of marriage over cohabitation (e.g. taxation and alimony payments) could be abolished to guarantee cohabiting mothers the same level of social and security.

In general, the findings of this study call for more attention to the heterogeneous life circumstances of lone mothers before but also during lone motherhood. If we want to better understand differences in lone mothers' poverty outcomes across countries or over time, we need to systematically assess differences in selection processes, the heterogeneous direct and indirect poverty-enhancing effects of lone motherhood and how they are moderated by the institutional context.

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APPENDIX

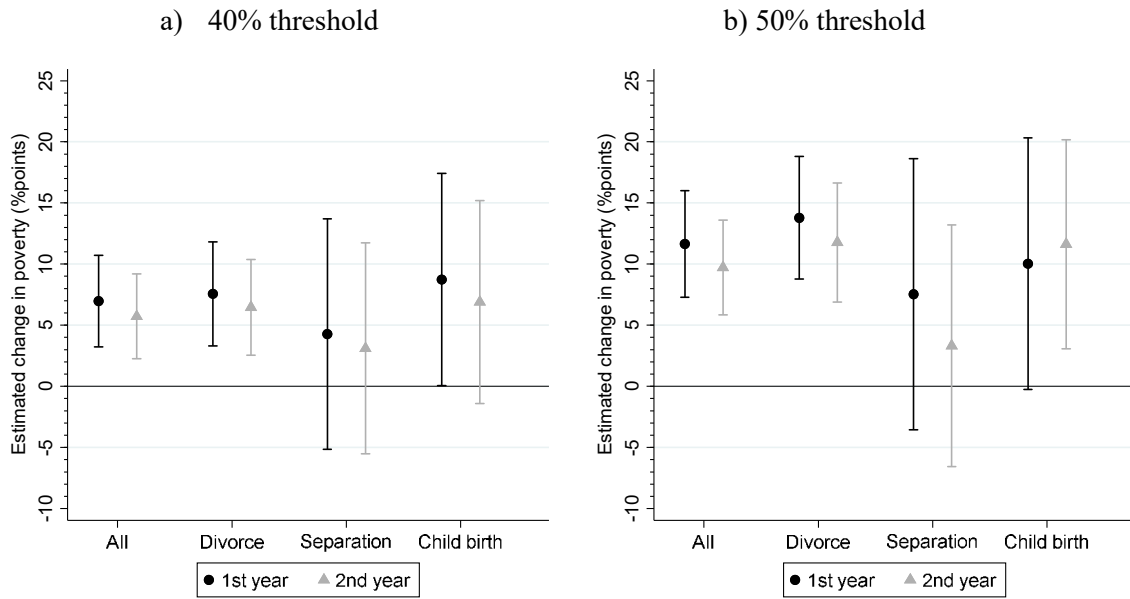
Table A.1: Individual characteristics included in the entropy valancing procedure

Characteristics at t ₂	To-be divorced lone mothers		Married mothers	To-be separated lone mothers		Cohabiting mothers	To-be birth lone mothers		Unpartnered childless women
	unmatched	matched	matched	unmatched	matched	matched	unmatched	matched	matched
Poor	14.7	14.4	14.4	36.7	35.9	35.9	27.5	28.6	28.6
Full-time employed	17.4	17.5	17.5	18.3	19.3	19.3	45.8	45.0	45.0
Part-time employed	42.0	42.0	42.0	29.5	28.2	28.2	9.5	10.1	10.1
Unemployed	4.8	4.9	4.9	12.1	12.5	12.5	10.7	11.3	11.3
Inactive	35.8	35.6	35.6	40.1	40.0	40.0	34.0	33.6	33.6
∅ net equivalent HH income	1,307€	1,305€	1,305€	1,052€	1068€	1068€	1,194€	1,185€	1,185€
Share on HH labour income	25.6	25.4	25.4	41.9	41.4	41.4	48.3	47.5	47.5
Partner's unemployment	6.1	6.0	6.0	12.9	11.9	11.9	-	-	-
Low educated	20.2	20.3	20.3	24.2	24.8	24.8	49.7	49.5	49.5
Medium educated	59.9	59.8	59.8	58.5	57.2	57.2	38.2	38.4	38.4
High educated	19.9	19.9	19.9	17.3	18.0	18.0	12.1	12.1	12.1
No children	-	-	-	-	-	-	100.0	100.0	100.0
1 child	37.5	37.3	37.3	56.7	59.0	59.0	-	-	-
2 children	46.7	46.9	46.9	32.9	30.9	30.9	-	-	-
3 or more children	15.8	15.8	15.8	10.4	10.1	10.1	-	-	-
Age of youngest child: 0–2	30.6	30.4	30.4	37.0	37.0	37.0	-	-	-
Age of youngest child: 3–5	20.6	20.6	20.6	16.9	17.0	17.0	-	-	-
Age of youngest child: 6–17	48.8	49.0	49.0	46.1	46.0	46.0	-	-	-
1-Person HH	-	-	-	-	-	-	42.9	41.9	41.9
Age in years	34.0	34.0	34.0	31.9	31.9	31.9	-	-	-
Age at first birth	24.5	24.4	24.4	23.5	23.5	23.5	25.7	24.0	24.0

Table A.1 continued...

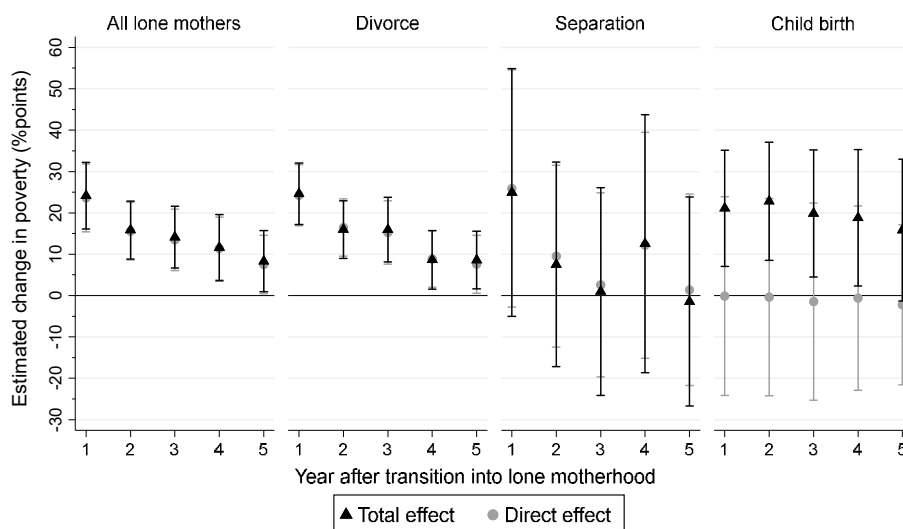
Characteristics at t ₂	To-be divorced lone mothers		Married mothers	To-be separated lone mothers		Cohabiting mothers	To-be birth lone mothers		Unpartnered childless women
	unmatched	matched	matched	unmatched	matched	matched	unmatched	matched	matched
Home ownership	35.2	35.2	35.2	17.5	18.1	18.1	21.7	21.6	21.6
East Germany	15.0	14.7	14.7	39.0	30.4	30.4	21.4	22.9	22.9
Birth cohort: Before 1960	29.2	29.4	29.4	15.1	16.0	16.0	3.6	3.8	3.8
1960s	43.0	42.8	42.8	42.5	41.3	41.3	36.2	34.8	34.8
1970s	21.1	21.0	21.0	28.7	28.5	28.5	35.0	37.1	37.1
1980s and later	6.7	6.8	6.8	13.7	14.2	14.2	25.2	24.3	24.3
Migration background	18.1	18.0	18.0	13.5	13.6	13.6	18.7	19.8	19.8
Life satisfaction	6.8	6.8	6.8	6.2	6.3	6.3	6.5	6.6	6.6
<i>N(matched cases)</i>	533	524	31,465	243	230	1,477	134	130	16,385
<i>Drop out</i>		2%			5%			3%	

Figure A.1: Results from DiD estimation based on a 40% and 50% poverty threshold



Notes: Results of conditional DiD estimations based on linear probability models with robust standard errors. Data: GSOEP (1984-2016), own calculations.

Figure A.2: Results from DiD estimation for the first 5 years after becoming a lone mother



Notes: Results of conditional DiD estimations based on linear probability models with robust standard errors. Data: GSOEP (1984-2016), own calculations.