Fathers' and mothers' joint longitudinal employment patterns around first birth in Germany, 1990-2020

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Abstract

This paper analyzes joint employment trajectories of first-time parents in Germany from one year before to six years after the birth of their first child. Using monthly employment data from the German Socio-Economic Panel, I apply group-based multi-trajectory modeling to identify typical combinations of mothers' and fathers' full- and part-time employment over time (Nagin et al., 2016). I find eight distinct multi-trajectory groups. Five reflect traditional specialization, in which mothers partially or fully reduce their paid work for an extended period following childbirth, while fathers remain consistently employed full-time or increase their likelihood of full-time employment. The remaining three reflect less gendered patterns, including *dual full-time*, *female full-time*, and *dual part-time* groups. I examine how couples' baseline characteristics are associated with multi-trajectory membership. Findings indicate that couples are more likely to specialize when only he holds tertiary education, whereas non-traditional patterns are more likely when only she or both partners are highly educated. The patterns differ across two periods marked by distinct policy contexts and between couples with mothers of East and West German background, even after 2007. The study contributes to our understanding how institutions, absolute and relative resources shape joint parental employment trajectories from a dynamic dyadic perspective.

1. Introduction

The transition to parenthood is a key turning point in the life course. It triggers a sharp increase in care needs within the household (Kühhirt, 2012; Vargha et al., 2017) and fundamentally reshapes couple dynamics. This transformation highlights the principle of linked lives: partners' decisions are deeply intertwined and evolve over time (Elder and Caspi, 1990; Elder et al., 2003). This paper asks: How do new parents adjust their work arrangements, and what factors shape their joint employment patterns?

Existing research provides valuable insights into how mothers and fathers individually adjust employment after birth, but it often examines these processes in isolation. Many studies focus on individual-level employment transitions of only mothers: for example, maternal employment interruptions or returns to work (Aisenbrey et al., 2009; Gangl and Ziefle, 2009; Begall and Grunow, 2015; Ehrlich et al., 2020; Makay, 2024), or longer-term patterns (Hynes and Clarkberg, 2005; Lu et al., 2017; Killewald and Zhuo, 2020,

Schattuck, 2022; Fauser and Kim, 2023; Huber and Rolvering, 2023). Similarly, studies of fathers tend to focus on parental leave uptake or working hours (Bünning, 2015; Bünning and Pollmann-Schult, 2016) or compare fathers and mothers in general (Kleven et al., 2019). These studies, however, often overlook joint decision-making and the interlinked nature of partners' employment trajectories. While some research adopts a couple-based perspective, most remain cross-sectional (Steiber et al., 2016; Deuflhard, 2022; Pessin, 2024) or focus only on women's employment in relation to household context (Ehrlich 2023). Most studies, moreover, have only two time point comparisons (Schober 2013; Killewald and Garcia-Manglano 2016; Dunatchik, 2023) or focus on one transition at a time (Drobnic et al., 1999; Blossfeld, Drobnic, Rohwer 2001, O'Reilly and Bothfeld, 2002; Ehrlich et al., 2020; Ehrlich, 2023).

A few studies follow a more dynamic approach but focus on relative measures of labor division between partners (Wood et al. 2018; Fan 2024; Bian et al. 2024), which overlook key absolute differences. For instance, relative measures cannot distinguish between couples where both partners work full-time and those where both work part-time. Truly dyadic longitudinal studies that consider both relative and absolute differences over time are rare and rely only on annual indicators of the time worked (Kühhirt, 2012; Langner, 2015; Qian, 2017). Yearly data miss many short-term dynamics, such as temporary exits or changes in working hours, that cluster around childbirth. Monthly data align more precisely with the timing of birth, reveal short-lived or gradual adjustments and make visible patterns that annual data would obscure (Kühhirt, 2012; Lu et al., 2017; Killewald and Zhou, 2020).

To address these gaps, this paper examines the typical joint employment patterns of German different-sex couples from one year before to six years after the birth of their first child. Using monthly SOEP data from 1990 to 2020 and applying group-based multi-trajectory modeling, I simultaneously model multiple outcomes, the mothers' and fathers' employment patterns. This perspective overcomes the problem of focusing only on the relative distribution of work within couples. In addition, group identification is inherently probabilistic rather than deterministic using this approach (Nagin, 2005; Nagin et al., 2016). Guided by the life course framework and the principle of linked lives (Elder et al., 2003; Moen and Hernandez, 2009), I adopt an exploratory-descriptive approach to identify typical employment patterns of

parents from a longitudinal dyadic perspective. According to this framework, not only lives, but also events in major life domains, such as childbearing and employment, are closely interconnected (Elder, 1977; Bernardi, Huinink, and Settersten, 2019; Budig, 2003; Fasang and Aisenbrey, 2022). Decisions about having additional children are thus intertwined with couples' employment trajectories: parity progression is endogenous to their work patterns, and I analyze how it unfolds across the groups.

The decision-making process surrounding care and paid work is typically gendered, both in the short and long term. After childbirth, women are more likely to interrupt their employment, take extended leave, or reduce their working hours. These patterns are to some extent shaped by lower bargaining power (Blood and Wolfe, 1960; Lundberg and Pollak, 1993; Kulic and Dotti Sani, 2020), lower pre-birth earnings (Dunatchik, 2023, Wood et al., 2018), mothers' absolute earnings before birth (Schober, 2013) as well as couple's total earnings and resources (Oppenheimer 1994, Gerstel and Clawson, 2014; Usdansky, 2011, Dunatchik, 2023). They are also shaped by institutional constraints, and gender norms that emphasize women's comparative advantage in unpaid, and disadvantage in paid labour (Kühhirt, 2012; Wood et al., 2018; Bian et al., 2024). Couples nevertheless differ considerably in how they organize paid and unpaid work after childbirth, particularly over time. I analyze how the joint employment patterns differ across two periods marked by distinct policy contexts (1990–2006 and 2007–2020) and between couples with East and West German backgrounds. Furthermore, I investigate how couples' absolute and relative resources, in terms of educational differences, relate to their joint employment trajectories.

Germany is an interesting case due to persisting differences between East and West Germany, but also a major parental-leave reform in 2007 (Elterngeld reform) that shifted the country to more egalitarian gender regime. Using monthly employment data on first-time parents from the SOEP, I focus on paid employment only, as comparable monthly data on unpaid care and domestic work are unavailable. I identify eight distinct joint parental employment trajectories. Five of these reflect traditional specialization, with mothers reducing their paid work either fully or partially after childbirth, while fathers are constantly full-time employed or

increase their probability to do so following first birth. The remaining three represent more gender-equal patterns: dual full-time, female full-time, and dual part-time employment. An interesting new group highlighted is the dual part-time group, often comprising tertiary-educated couples who reduce work hours to balance high opportunity costs and pursue more egalitarian ideals. This strategy is supported by their greater resources and aligns with Oppenheimer's (1988) theory of pooling resources. By focusing on couple-level educational composition, the analysis highlights the role of absolute and relative resources within and between households. Continuous specialization is more likely when only the male partner holds tertiary education, while non-traditional trajectories are more prevalent when the female partner or both partners are highly educated. These effects are only partially explained by differences in the likelihood of higher-order births across educational groups. The findings also highlight the influence of norms, institutions and the societal context (West and Zimmerman, 1987). Specialization is less prevalent among mothers with East German background, while the dual full-time group is more common, even after 2007. This longitudinal, dyadic perspective advances our understanding of how mothers' and fathers' employment patterns develop in tandem following the transition to parenthood, and how dynamics within and between couples shape these trajectories over time.

2. Background

2.1. Specialization and the opportunity cost of childbearing

Classic economic theories of the family, most prominently Becker's (1965, 1991) model of household specialization, view couples as rational actors who maximize household utility by allocating paid and unpaid work according to comparative advantage. In this framework, one partner invests primarily in paid employment, while the other specializes in unpaid care. This division hinges on opportunity costs (Mincer, 1963): the partner with higher earnings potential remains attached to the labor market, while the other withdraws or scales back paid work after childbirth, to minimize the household's overall income loss. Bargaining or relative resource theories shift the analytical focus from household-level utility maximization to the distribution of power within couples (Blood and Wolfe, 1960; Lundberg and Pollak, 1993, 1996;

Kulic and Dotti Sani, 2020). These theories suggest that each partner's education, earnings, and labor market prospects shape their bargaining position: the partner with greater resources can negotiate a stronger focus on their own career and a reduced share of unpaid care.

Oppenheimer (1988, 1994, 1997) expanded these frameworks by introducing the pooling of resources perspective, which highlights the role of absolute rather than relative resources. Couples with limited economic means may not be able to "afford" a single-earner model, as they rely on two incomes to meet basic needs and minimize risk. Conversely, couples with high joint resources may buy one partner's exit from employment or a reduction in one or both partners' hours. While parents with higher earnings potential are more motivated to participate in the labor market due to the higher opportunity cost of staying out, their partner's income can lessen this motivation by providing financial security, a dynamic known as the income effect (Mincer, 1963, Killingsworth and Heckman, 1986, Steiber et al., 2016). For example, O'Reilly and Bothfeld (2002) show that Western German women were less likely to transit to full-time employment from part-time employment when household income was high. In the UK, Dunatchik (2023) found that the effect of relative resources on the division of paid and housework after first birth varies by household income and argues that mothers in low-income households face greater constraints and higher reduction of paid work.

In principle, the economic models are gender neutral. In practice, however, they work in a gendered social context: even when women have equal or greater resources, male-oriented employment strategies often persist after first births, even among female main earner couples (Kühhirt, 2012; Wood et al., 2018). Women often continue to shoulder the bulk of unpaid work (Bittman et al., 2003; Lyonette and Crompton, 2015; Vargha et al., 2017), suggesting that gender norms can shape and sometimes override bargaining dynamics. Economic frameworks alone, therefore, cannot fully explain couples' employment arrangements. Norms and institutions play a crucial role in shaping how paid and unpaid work are divided. West and Zimmerman's (1987) "doing gender" approach conceptualizes these arrangements not simply as utility-maximizing choices but as performances of socially expected roles of motherhood and fatherhood. Policies and institutional designs, such as joint taxation, health insurance rules, parental leave entitlements, and the

availability of affordable childcare, interact with these norms, either reinforcing a traditional male-breadwinner model or creating incentives for more egalitarian arrangements (O'Reilly and Bothfeld, 2002; Steiber et al., 2016).

2.2. Couple level education and employment patterns

Education is a key mechanism connecting these theoretical frameworks. Higher education raises earnings potential and thus the opportunity cost of exiting employment (England et al. 2012). For fathers, tertiary education is typically associated with secure, full-time employment, which reinforces the breadwinner role, especially in countries such as Germany (Brynin and Schupp, 2000) or Austria (Steiber et al., 2025). For mothers, tertiary education is associated with faster returns to work, stronger labor market attachment, and a greater likelihood of pursuing non-traditional employment patterns (Stier et al., 2001, England, 2010, Stier et al., 2018; Pessin, 2024). Women with higher levels of education are more likely to benefit from policies aimed at facilitating the balance between paid and unpaid work, whereas those with lower education levels may respond less to such measures, also because of the behavior of their partners. Consequently, patterns of maternal employment may become more polarized (Konietzka and Kreyenfeld, 2010; Thévenon, 2009) and thus education not only shapes couples' resources but also stratifies mothers' employment patterns (Trappe et al., 2015, Steiber et al., 2016). Educational expansion and increasing share of women with tertiary education facilitated gender equality at the higher end of the educational spectrum but simultaneously reinforced social inequalities between families (Blossfeld, 2007). Over time, a growing educational divide has emerged among mothers in West Germany: less-educated mothers have become increasingly likely to work part-time or to be marginally employed, while better-educated mothers are more likely to maintain stronger labor market attachment (Konietzka and Kreyenfeld, 2010; Drasch, 2013).

The impact of education is both relative and absolute. Within couples, relative education affects bargaining power: if only the father has tertiary education, specialization is more likely; if only the mother or both partners are highly educated, dual-employment patterns are more common (Brynin and Schupp, 2000; Langner, 2015; Pessin, 2024). Absolute education also matters for resource pooling: highly educated

couples may have enough joint resources to afford work reductions or outsourcing domestic and care work while maintaining financial security.

2.3. Parity progression and employment patterns

Events in major life domains, such as childbearing and employment, are closely interconnected (Elder, 1977; Bernardi, Huinink, and Settersten, 2019; Budig, 2003, Fasang and Aisenbrey, 2022). Education is also intertwined with fertility: it shapes employment behavior before and after the first birth, subsequent childbearing decisions, and employment behavior after higher-order births. Angrist and Evans 1998 explored heterogeneity in labor supply responses, finding that the negative effects of additional children are more pronounced among less educated women and those with lower-income husbands in the United States. In contrast, more educated women and those with higher-income husbands experience smaller or negligible effects. Other studies highlighted the dynamic process behind employment and fertility decisions (Budig, 2003; Steiber and Haas, 2012) and the importance of the family life cycle when studying education effects on couples' employment arrangements (Steiber et al., 2016). In West Germany having more than one child was linked to women dropping out of the workforce in the 1990s (Trappe et al., 2015), and in the 2000s, the presence of a child aged 0-3, regardless of education, showed similar patterns (Steiber et al., 2016). As of 2021, Germany still exhibits one of the largest differences in employment rates among OECD countries, with 78% of mothers employed with one dependent child compared to only 52.3% for those with three or more children (OECD Family Database 2025, Adame et al., 2009).

Considering couples as the unit of analysis, and examining joint educational pairings, is crucial for understanding not only the dynamics of education on employment but also how these dynamics relate to fertility and the link between fertility and employment (Kreyenfeld, 2002; Nitsche, 2024). Following the pooled resources theory, homogamous tertiary-educated couples are often positioned to combine dual careers with family formation by leveraging joint resources, whereas couples with mixed or lower educational attainment may face more trade-offs between income security and care needs. Evidence from many countries, including Germany, indicates that homogamous tertiary-educated couples experience higher transition rates to second and third births, than couples with mixed educational attainment or couples

where neither partner has tertiary education (Bueno and García-Román, 2021; Dribe and Stanfors, 2010; Nitsche, 2017; Nitsche et al., 2018; Nitsche et al., 2022; Trimarchi and Van Bavel, 2020). This interdependence complicates the relationship between education and employment, as employment and fertility are mutually shaping processes. Therefore, a life course perspective is essential to understand how these dynamics evolve over time, especially when considering the role of social context (Mayer 2000).

2.4. Life course approach understanding how parental employment trajectories evolve within and across couples

The transition to parenthood is not a single event but a turning point that reshapes couples' life courses. Life course theory (Elder and Caspi, 1990; Elder et al., 2003, Mayer, 2000) emphasizes that (1) lives are linked, partners' employment and care decisions are deeply interdependent; (2) transitions are embedded in historical time and policy regimes; (3) the timing of events such as first and subsequent births affects later trajectories; and (4) individuals exercise agency within the constraints of norms, structures, and institutions.

This perspective implies that paid and unpaid work arrangements are not static choices made at a single moment or even before and after an event, but processes that evolve over time. Couples may gradually shift from dual full-time employment into specialization or, conversely, move back toward more equal arrangements, as children age, another child is born, policies change, or household resources shift. Therefore, a life course approach to conceptualizing couples' dynamic divisions of breadwinning would be necessary (Qian, 2017). Monthly data and a trajectory approach are uniquely suited to capturing this dynamic process, revealing short-term transitions and gradual shifts, while also accounting for not only the relative distribution of work but also absolute differences between couples.

2.5. The German context

The societal context in Germany is particularly interesting due to the historically divergent institutional traditions of former East and West Germany. Prior to reunification in 1990, East Germany followed a "universal employment model" that promoted dual-earner families, supported by full-time public childcare

and strong gender-egalitarian norms. In contrast, West Germany adhered to a traditional male breadwinner model, marked by limited public childcare and expectations of maternal caregiving (Kleinschrot, 2024). Although there has been convergence in maternal employment patterns (Trappe et al., 2015, Fauser et al., 2024), significant differences persist to this day. Mothers in the former East continue to take shorter parental leaves and are more likely to return to full-time employment, whereas longer parental leaves and part-time maternal employment remain more common in the former West (Putz 2019; Barth et al. 2020, Zoch and Heyne 2023). Public childcare provision also continues to differ, with more extensive services available in East Germany (Statistisches Bundesamt, 2018; Zoch, 2020, Huber and Rolvering, 2023).

Employment and care policies in Germany have changed considerably since reunification (for an overview see Trappe et al., 2015, Zoch and Heyne, 2023). Early policies largely supported the male breadwinner model and reinforced a familialist care regime centered on maternal care. In 1992, parental leave was extended to 36 months (with 24 months partially paid), supporting prolonged maternal absences from the labour market. In 1995, a legal entitlement to childcare from age three was introduced, but childcare for younger children remained scarce, especially in West Germany. Maternal employment rose steadily in West Germany, mainly through part-time jobs, while in East Germany, labour force participation, especially among mothers, declined due to the economic disruptions of reunification (Trappe et al., 2015). In early 2000s, policy changes further encouraged maternal part-time employment and there was an extension of public childcare starting from 2005 in multiple waves (Huber and Rolvering, 2023). According to Kreyenfeld and Geisler (2006), only 19.2% of mothers with children aged three to six were employed full-time in 2002. Additionally, they observed significant differences between East and West Germany, with 50.5% of mothers in the East working full-time compared to only 14.5% in the West. For mothers with children under three years old, the full-time employment rate was even lower, at 11.8%. In East Germany, 31% of these mothers worked full-time, whereas only 8.9% did so in West Germany.

A major shift occurred in 2007 with the introduction of Elterngeld, marking the beginning of a new policy period focused on gender equality and defamilialization. The reform replaced flat-rate benefits with earnings-related compensation, 67% of previous net income (up to €1600 and later €1800) for 12 months,

plus two additional months if both parents shared leave. This significantly shortened the leave duration typically taken by mothers and aimed to encourage greater paternal involvement (Bünning, 2015) encouraging a female worker model (Trappe et al., 2015). Although the uptake of paternal leave has increased, it remains limited overall (Frodermann et al., 2024). In 2013, a legal right to childcare from age two was introduced, further supporting earlier returns to employment. In 2015, ElterngeldPlus increased the flexibility of leave arrangements, allowing extended benefits for parents working part-time and enabling more tailored leave-sharing between mothers and fathers. These developments signal a gradual transition from a conservative male breadwinner model toward a more gender-egalitarian regime, albeit one still characterized by high rates of maternal part-time work.

While several studies have examined parental employment patterns in Germany, most focus on West German parents (Drobnic, 2000; Kühhirt, 2012; Drasch 2013, Langner 2015) or do not differentiate between East and West (Fan 2024). By explicitly differentiating between two periods: before and after the 2007 parental leave reform, and comparing couples with mothers having East or West German background, this study brings into focus how long-standing institutional legacies and more recent policy changes interact in shaping gendered employment trajectories after first birth.

2.6. This study

Building on the theoretical frameworks outlined above, this study examines how couples in Germany organize their employment from one year before to six years after the birth of their first child. Using a dynamic dyadic approach, I identify typical joint maternal and paternal employment trajectories and assess how pre-birth characteristics, especially relative and absolute educational differences within and between couples, birth period and East vs West German background shape the likelihood of following these trajectories.

Following the relative resources perspective, I expect that long-term specialization will be most common in couples where there is an educational imbalance favoring the father. Fathers who are more highly educated

are assumed to hold greater bargaining power and resources, making it more likely that couples will follow a traditional male breadwinner model, with mothers reducing their paid work for an extended period after childbirth. In contrast, when mothers also hold tertiary education, I expect couples to follow less traditional divisions of labour. I also expect that absolute resources matter alongside relative ones. Couples with neither partner holding tertiary education may be less able to "afford" a single-earner model. Instead, I expect them to remain more attached to the labour market out of financial necessity, resulting in less specialization overall. Couples on the other hand with both partners highly educated may have sufficient joint resources to "buy time" by scaling back paid work for one or both partners, while still maintaining economic security.

Finally, I expect that policy context and institutions shape these trajectories. Given the persisting divide in norms and maternal employment patterns between East and West Germany, I expect that couples with East German mothers will be less likely to specialize in the long term and more likely to follow dual-worker arrangements, even decades after reunification. I further expect that couples whose first child was born before the 2007 Elterngeld reform will more often follow longer term specialization, while couples giving birth in 2007 or later will be less likely to specialize, reflecting the reform's shift toward a more gender-egalitarian female worker model.

3. Data and methods

Longitudinal data is used from the German Socio-Economic Panel Study (SOEP v37, Liebig et al., 2022). The SOEP is a representative household panel study with around 20,000 respondents from 11,000 households (Goebel et al., 2019). I use the regular yearly panel data, birth histories (Zimmermann et al., 2022) as well as the activity biography data that contains monthly employment spells (Schmelzer et al., 2020). The SOEP is an exceptional database, since it includes the year and month of the participants' birth of children as well as monthly employment spells. Using the monthly employment data and the year and month of first births I create a database in which the months are ordered according to first birth. I consider the first 11 months before birth with the birth in the 12th month and follow couples till their first child is 6

years old, at the 84th month. Thus, all together, I have employment trajectories for both parents spanning for 84 months (7 years * 12 months * 2 parents).

I consider first births between 1991 and 2014 for parents, who were born in Germany. Couples are followed for 6 years starting from 1990 until 2020, the latest. 1990 is the first year when East German households are also included in SOEP. The reason why I do not extend the analysis till 2023 is that I would not like to have trajectories influenced by COVID-19 and the extension of part-time work (Kurzarbeit) during this period. The main association for coupling parents is the child. Thus, I identify different-sex parents based on the identification of their child using the SOEP birth history database. These are couples that have their first child together and they do not have children from previous relationships.

3.1 Sample

Altogether, 5,119 first births to German different-sex parents were identified in the SOEP birth history database. I exclude twin births at first birth (N=52) and one case where a second child was present very early, as these cases may result in different parental employment trajectories, but the numbers are too small to be analyzed separately. I further restrict the sample to couples with education data available around first birth for both partners, excluding 1,312 couples who entered the panel several years after first birth and therefore lack education information. Among the remaining 3,754 couples, 500 (13.3%) have no employment data over the 84 months, and 806 (21.5%) have complete employment data for both partners. Moreover, most parents (around 60%) have missing employment data at the beginning of the observation window. After careful investigation of missingness patterns and robustness checks (see Supplementary Section 1), I retain couples with a maximum of 35 missing months of employment data for either parent, resulting in an analytical sample of 1,646 couples (3,292 individuals; 1,646 × 2 × 84 = 276,528 couple-months). Missing data are assumed to be missing at random. Missing employment data are mainly concentrated before panel entry and attrition, patterns typical for household panel data. As shown in Supplementary Section 1, socio-demographic characteristics are highly similar across different missingness thresholds, and the main results remain robust when restricting the sample more narrowly.

3.2. Analytical strategy

I identify latent groups of joint maternal and paternal employment trajectories and analyze how parental employment trajectories evolve jointly using group based multi-trajectory modeling (GBMTM) (Nagin et al., 2016). This method is designed to explicitly model multiple typical trajectories across a large population. The aim of the modeling technique is to summarize key features of long-term longitudinal behavior. It is a finite mixture model, an exploratory method that uses maximum likelihood estimation to estimate the trajectory shapes of multiple outcomes jointly and the proportions of the latent populations for a predetermined number of clusters/groups. The trajectories are summarized by a set of different polynomial functions of time. Group identification in group based multi-trajectory modeling is probabilistic and not certain (Nagin, 2005; see Nagin et al. 2016 for a detailed explanation and relevant equations). These employment trajectory groups can be thought of as describing the population distribution of propensity for such parental employment behavior over time. Following Nagin and Tremblay (2005) my aim is to identify a simple model that displays the distinctive features of the population distribution of parental employment trajectories. Moreover, I describe these groups and extend the model with baseline predictors to see which independent variables are associated with the identified couple types. Using group-based multi-trajectory modeling has several advantages over other methods. I summarize these advantages in Supplementary Section 2.

3.3. Outcome variables

I model four binary dependent variables jointly: (1) mother full-time employed / not full-time employed (2) mother part-time employed / not part-time employed (3) father full-time employed / not full-time employed (4) father part-time employed / not part-time employed, respectively. Each outcome is measured monthly, 11 months before birth till 72 months afterwards (all together 84 months). Since the outcome variables are binary, I use the binary logistic distributions in the group-based trajectory models for the outcomes. Focusing on monthly employment spells around birth allows for a more accurate depiction of how couples share paid work during the transition to parenthood. Monthly data are better aligned with the exact birth

date, offer greater detail, and capture shorter time segments, which makes it easier to observe gradual or temporary shifts in employment.

3.4. Base model

In the base model trajectory shapes and probabilities are estimated for the latent populations and each couple dyad is probabilistically assigned to each one of the latent groups based on model parameters. These probabilities are usually referred to as posterior probabilities. The posterior probabilities are an application of Bayes rule, measuring specific couple's likelihood of belonging to each of the model's eight trajectory groups. According to the maximum probability group assignment rule, the couple is assigned to the group with the highest posterior probability. The final multi-trajectory model described in the paper is selected following the steps detailed by Nagin (2006), Nagin et al (2016), Burckhardt et al. 2017, van der Nest et al. (2020) and Nagin et al. (2024) using the traj plugin to Stata (Jones and Nagin 2013). These steps and the robustness tests, varying the number of missing months, are detailed in Supplementary Section 3 and 6.

3.5. Multi-trajectory membership and time varying variables

In longitudinal research such as trajectory analysis or sequence analysis there are covariates that overlap with the outcome variables. These variables could be analyzed as time varying covariates within the model only if they are not endogenous with the outcomes that result in the latent clustering or grouping (Nagin, 2005). Moreover, because of endogeneity they cannot be used as baseline covariates (independent variables) estimating association with group membership in the model (Killewald and Zhou, 2020). In my case the most important endogenous time varying variable that effects couple's employment trajectories is parity progression: the birth of second, third or even fourth children during the period of observation. While this variable could be also included as an outcome variable in multi-trajectory modeling (for example see Schattuck, 2022), according to robustness checks the resulting latent groups would be the same if parity progression is included as a fifth outcome in the base model (See Supplementary Section 7). As a result, I chose not to include parity progression as an outcome in the group-based multi-trajectory model. Instead, I focus on describing how fertility patterns evolve across different employment trajectories.

3.6. Association of baseline characteristics with multi-trajectory membership

After identifying and describing the distinctive parental employment trajectories I extend the model to examine how baseline characteristics are associated with multi-trajectory group membership. In this extended model, the parameters that define the shape of each trajectory and the parameters that link baseline covariates to group membership probabilities are estimated simultaneously within a maximum likelihood framework. Specifically, the probability of belonging to each multi-trajectory group is modeled as a function of the couples' baseline characteristics using a multinomial logistic function. The model also enables prediction of group membership probabilities for different values of baseline covariates (Nagin, 2005). The joint estimation strategy has important advantages. By modeling covariate effects and group membership probabilities together, it accounts for uncertainty in group classification and avoids biases that arise when group membership is treated as fixed (Helske et al., 2024, Warren et al., 2015). For a detailed explanation see Supplementary Section 2.

The covariates are the following: the period of first birth (pre- vs. post-Elterngeld reform in 2007); East German vs. West German background (based on where the mother resided in 1989 or if this was missing using (1) the place of birth of the mother or (2) the place of birth of the parents, both variables are time-constant and also include East and West Berlin); couple-level education (categorized as only he has tertiary education, only she has tertiary education, both have tertiary education, or neither, the reference category); the mother's age at first birth; and the age gap between partners. I use parameter estimates from the base model as starting values when estimating the extended models, therefore the estimated trajectory shapes in the extended models remain consistent with those in the base model, and all polynomial terms remain statistically significant. I tested for interactions between East vs. West German background and education, period of birth and education as well as East vs. West German background and period of birth. None of these interactions were statistically significant and were therefore excluded from the final model specifications (Nagin et al. 2018). Using the extended model, I estimate predicted probabilities of trajectory group membership for three illustrative scenarios: (1) couples with each of the four educational

combinations; (2) couples whose first child was born in different periods (pre- and post-Elterngeld reform), with East vs. West German maternal background, in both cases holding other covariates at their means.

To assess the robustness of these results, I estimate multiple extended models with more baseline covariates on reduced samples using parameter estimates from the base model as starting values to have consistent trajectory groups. Specifically, I incorporate the log-transformed, deflated gross wage income of both parents and the mother's share of total couple income and the mother's marital status before birth. Due to the higher levels of missingness and misalignment with the exact month of birth, these models serve as a robustness test rather than part of the main analysis. To ensure that any observed differences are not driven by sample composition alone, I also re-estimate the base model and the first extended model on the reduced samples (For more details see Supplementary Section 5).

To better understand the selection mechanisms into parental employment trajectories, and to address potential endogeneity between baseline characteristics and family expansion, I estimate two additional logistic regression models. The outcomes are (1) having two or more children, and (2) having three or more children using the same set of baseline covariates as in the extended multi-trajectory model as well as the extra controls. These regressions help assess whether the characteristics associated with subsequent fertility are also associated with the particular joint employment trajectories. I also estimate predicted probabilities for similar illustrative scenarios as described above to enable comparability.

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4. Results

4.1. Typical patterns of maternal and paternal joint employment trajectories

After model selection (Supplementary Section 3), I identify eight distinct joint employment trajectories of parents surrounding first birth. The eight-group solution captures the main patterns from the univariate models and performs well across fit criteria. Average posterior probabilities exceed 0.985, and all odds of correct classification are above 5. Even the smallest group (4.3%, N=70) is well represented. Robustness tests also show that the main patterns and associations with covariates remain consistent across different number of groups (see Supplementary Section 5).

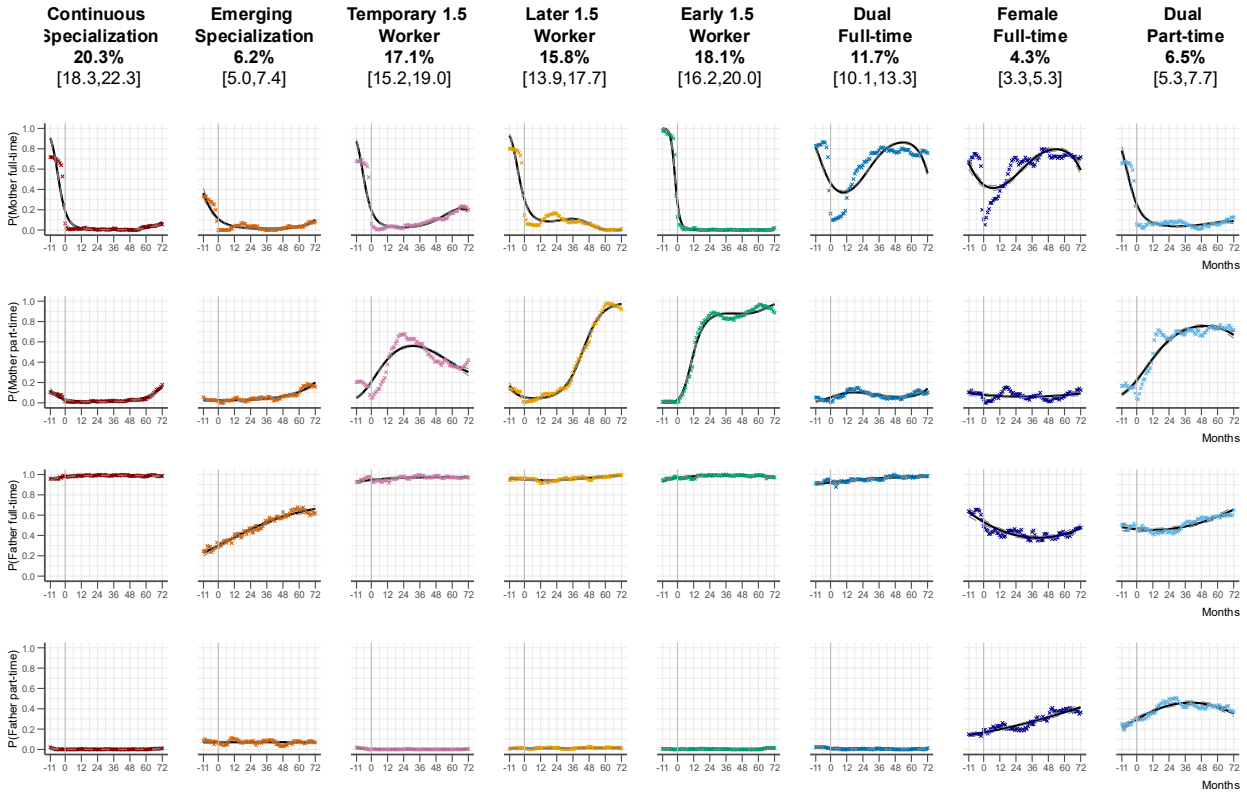

Figure 1: Multi-trajectory model of parental employment patterns (first births at month 0, 1991-2014, Data: SOEP, N=1646, 8 group model): Probability of the mothers and fathers being full-time and part-time employed during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample, dashed gray lines are the 95% confidence intervals. The numbers under each group name are the predicted percentages of the respective groups and their 95% confidence intervals.

Figure 1 displays the predicted probabilities of mothers' and fathers' full-time and part-time employment across 84 months (from 11 months pre- to 72 months post-birth). Colored points show observed group averages; dashed lines show 95% confidence intervals. Sequence index plots in the Supplementary Section 4 and a longer description provide additional details. The trajectories reveal substantial gender asymmetry. Mothers' full-time employment drops steeply after childbirth, while fathers' patterns remain largely unchanged. Yet, joint employment patterns are heterogeneous: some groups show prolonged specialization (often maternal withdrawal), others display more egalitarian patterns including shared part-time or dual full-time work. The multi-trajectory groups could be described as follows:

1. Continuous specialization (20.3%): Fathers remain in full-time employment; mothers exit the labor market almost entirely after birth. This group has the highest average number of children 6 years after first birth (2.02), and 17.5% of couples have only one child.

2. Emerging specialization (6.2%): Both parents have low and unstable employment around birth. Mothers remain inactive; fathers gradually increase full-time employment from low initial levels. The average number of children is also high 6 years after first birth: 1.95 and 28.7% of couples have one child.

3. Temporary 1.5 worker (17.1%): Fathers stay full-time employed; mothers quickly transition to part-time work but often interrupt it again due to mostly second births. The average number of children is high 6 years after first birth: 1.88 and 23.8% of couples have one child.

4. Later 1.5 worker (15.8%): Fathers stay full-time employed; mothers return to stable part-time employment 3 years post-birth or later and do not return to full-time. The average number of children is 1.61 and 42.5% remain with one child.

5. Early 1.5 worker (18.1%): Fathers stay full-time employed; mothers return to stable part-time employment within 1-2 years post-birth and do not return to full-time. Average number of children is 1.52, with 50.3% having one child by the 6th year.

6. Dual full-time (11.7): Both parents work mainly full-time. Mothers return to work relatively quickly, reaching 0.64 probability of full-time and 0.11 of part-time employment after two years. This group has the lowest average number of children by the 6th year (1.48). 55% remain with one child.

7. Female full-time (4.3%): Mothers return to full-time work after short leave; fathers show longer part-time or non-employment periods. This is the only group where mothers' employment exceeds fathers'. The average number of children is 1.65. 42.7% remain with one child.

8. Dual part-time (6.5%): Both parents have part-time work after birth. Fathers' full-time employment declines from 0.51 to 0.41 in the first two years, part-time peaks at 0.5. Average number of children is 1.71 by the 6th year and 39.2% remain with one child.

4.2. Joint employment trajectories and parity progression

A joint model including parity progression confirms the eight-group solution. It has the same results with a maximum difference of 0.3 percentage points Supplementary Section x). On average 36% of the couples remained with only one child, 54.7% progressed to two children and 9.3% have three or more children. Figure 2 shows the average number of children by group by time. Two significantly different main patterns emerge: (1) Higher Fertility Groups: Continuous specialization, emerging specialization, and temporary 1.5 worker couples have the highest average number of children and include almost all families with three or four children (73.8% of such cases). At least 71.3% of couples in these groups have two or more children. (2) Lower Fertility Groups: Dual full-time, female full-time, early and later 1.5 worker couples have fewer children on average. The majority have only one or two children, with lower rates of higher-order births (only 45–57.5% have two or more children). The dual part-time group falls between these clusters, with 1.71 children on average. Though a small group, its fertility overlaps with both higher and lower fertility patterns.

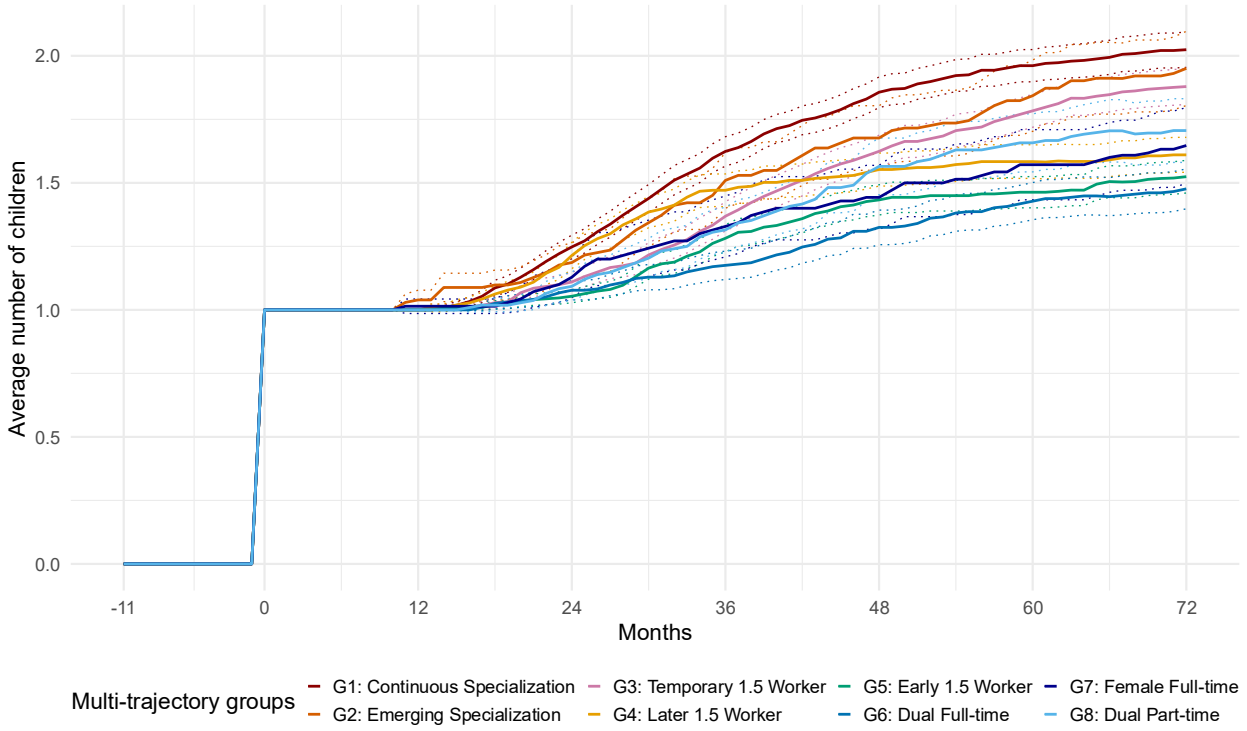

Figure 2: Average number of children by multi-trajectory groups 1 year before first birth and 6 years after (first births at month 0, 1991-2014, Data: SOEP, N=1646, 8 group multi-trajectory model). The solid lines are the group averages, and the dashed lines are the 95% confidence intervals in each month.

4.3 Association of baseline characteristics with multi-trajectory membership

In the third step, I extend the base model by including baseline characteristics to examine how they relate to the probability of multi-trajectory group membership. The largest group, continuous specialization after birth, serves as the reference category, in line with my interest in factors associated with specialization vs. non-specialization.

Ref: Continuous Specialization	**Emerging Specialization**	**Temporary 1.5 worker**	**Later 1.5 worker**	**Earlier 1.5 worker**	**Dual Full-time**	**Female Full-time**	**Dual Part-time**
Perio of birth dummy (in 2007 or later)	0.95***	0.89***	0.43*	1.19***	0.87***	1.14***	1.59***
	(0.27)	(0.19)	(0.2)	(0.18)	(0.21)	(0.29)	(0.25)
Background dummy (mother from East Germany)	0.81**	0.86***	0.87***	0.49*	2.20***	1.67***	1.03***
	(0.27)	(0.21)	(0.22)	(0.22)	(0.23)	(0.30)	(0.27)
Age of mother	-0.26***	0	0.09***	0.11***	0.07**	0.03	-0.01
	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)

Age gap between parents (father older)	-0.18***	0	-0.04	0.02	0.02	-0.05	-0.02
	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)
Education: Neither has tertiary education (ref)							
Only she has tertiary	0.04	0.81	0.7	1.00*	1.61***	1.77***	1.04*
	(0.81)	(0.43)	(0.43)	(0.40)	(0.41)	(0.48)	(0.51)
Only he has tertiary	-0.8	-0.19	-0.72**	-0.62**	-0.54	-1.88*	-0.61
	(0.50)	(0.23)	(0.26)	(0.24)	(0.30)	(0.75)	(0.39)
Both have tertiary	-0.06	0.2	-0.33	-0.21	0.13	0.2	0.79*
	(0.56)	(0.27)	(0.28)	(0.26)	(0.30)	(0.75)	(0.39)
Constant	5.69	-0.56	-3.03	-3.91	-3.62	-3.18	-1.74
N couples	1646	1646	1646	1646	1646	1646	1646
Standard errors in parentheses							
="* p<0.05	** p<0.01	*** p<0.001"					

Table 1: Coefficient estimates of the extended Group Based Multi Trajectory Model with baseline covariates, reference Group: Continuous Specialization (dyadic employment trajectories of parents: first births, 1991-2014, Data: SOEP, N=1646)

As shown in Table 1, couples who had their first child in 2007 or later (after the Elterngeld reform) are significantly more likely to be in all other groups, especially the dual part-time group, compared to the reference group. These associations remain robust after controlling for marital status. After further controlling for total household income and the mother's income share, the association remains significant for the female full-time, dual part-time, earlier 1.5 worker, dual full-time, and temporary 1.5 worker groups.

A mother's East German background is also positively associated with membership in all non-reference groups. These associations persist after introducing the extra controls of marital status and income, except in the emerging specialization group. The strongest associations are observed for the dual full-time and female full-time groups. Older maternal age is associated with a higher likelihood of being in the dual full-time, later 1.5 worker, and earlier 1.5 worker groups, and a lower likelihood of being in the emerging specialization group. After extra controls, only the latter remains significant. A larger age gap slightly

reduces the likelihood of being in the emerging specialization group, though this association is not robust to controls.

Education is a strongly and consistently associated with the trajectory groups. When only the mother has tertiary education, couples are more likely to belong to all groups (vs. continuous specialization), with associations remaining significant for the dual full-time, female full-time, and dual part-time groups after the extra controls of marital status and income. In contrast, when only the father has tertiary education, couples are less likely to be in any other group, with significant effects for the earlier and later 1.5 worker groups after controls. Couples where both partners have tertiary education are more likely to be in the dual part-time group. These patterns suggest that relative educational resources within the couple matter for post-birth employment specialization.

4.4. Predicted probabilities of selected characteristics of the couples

While the coefficients reveal statistically significant associations, predicted probabilities help assess how strongly characteristics are associated with the likelihood of group membership. Figures 3 and 4 present predicted probabilities by birth period and maternal region of origin (Figure 3), and by educational combinations (Figure 4), holding other covariates at their mean values and taking classification error of group assignments into account.

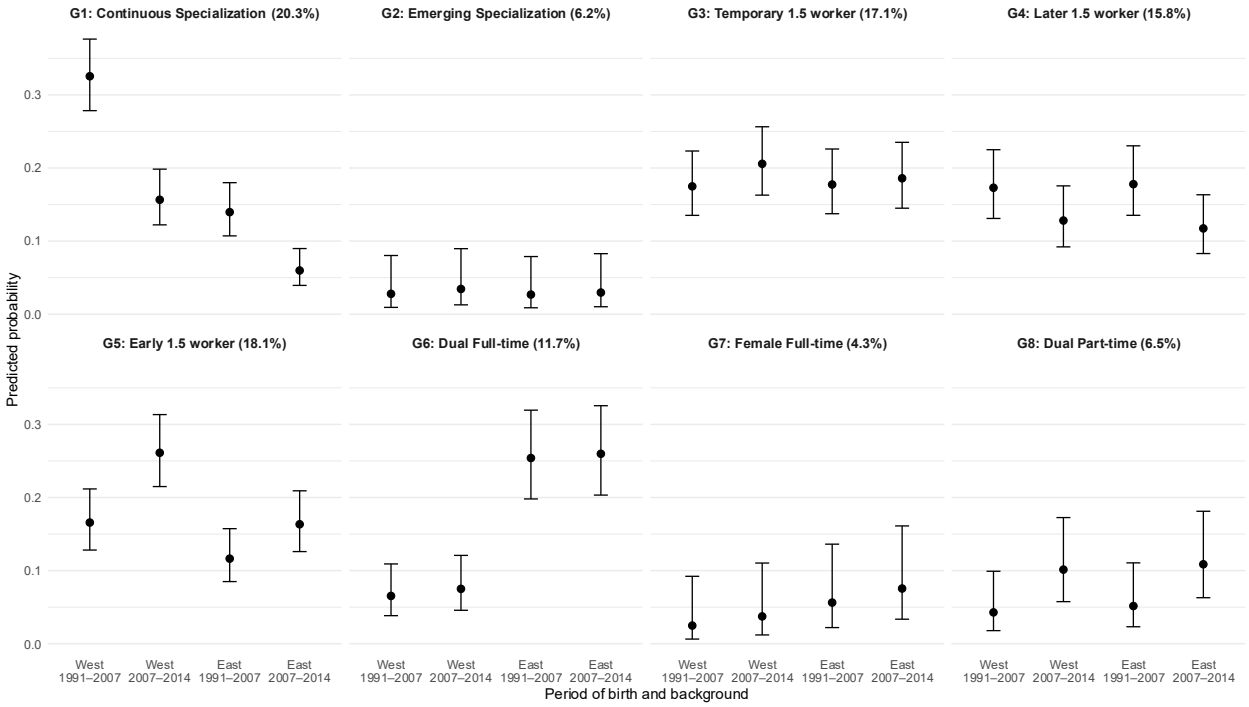

Figure 3: Predicted Probabilities of the different multi-trajectory groups by period and East vs. West German background. The model specifications are from the extended model using start values of the base model. Other variables (mother's age, age gap and education) are kept at average when the predicted probabilities are estimated. The black lines represent 95% confidence intervals. (First births, 1991-2014, Data: SOEP, N=1646)

The continuous specialization group is most likely for couples with West German mothers before 2007 (0.33), declining to 0.16 in the second period. For East German mothers, the probability drops from 0.14 to 0.06. Across both periods, couples with East German mothers are significantly less likely to be in this group. Education is also important: couples where only the father has tertiary education are most likely to follow continuous specialization, while those where only the mother has, are least likely.

For the smaller group emerging specialization as well as the temporary 1.5 worker, confidence intervals overlap substantially, and no clear patterns emerge. For the later 1.5 worker group, predicted probabilities decrease post-2007 and are slightly higher among couples with no tertiary education. These trends, however, are not statistically significant. The earlier 1.5 worker group shows a marked increase after 2007, especially among couples with West German mothers, whose probability reaches 0.26. Couples where only the mother or neither partner has tertiary education are more likely to fall into this group.

The dual full-time group is most likely among couples with East German mothers, reaching a probability of 0.26 even after 2007. This is significantly higher than for couples with West German mothers, whose probability remains below 0.1. The probability is also highest among couples where only the mother has tertiary education, and lowest when only the father does. The female full-time group follows similar patterns, though smaller group size means confidence intervals overlap. The dual part-time group becomes more common after 2007 for both East and West German mothers, especially among couples with dual tertiary education.

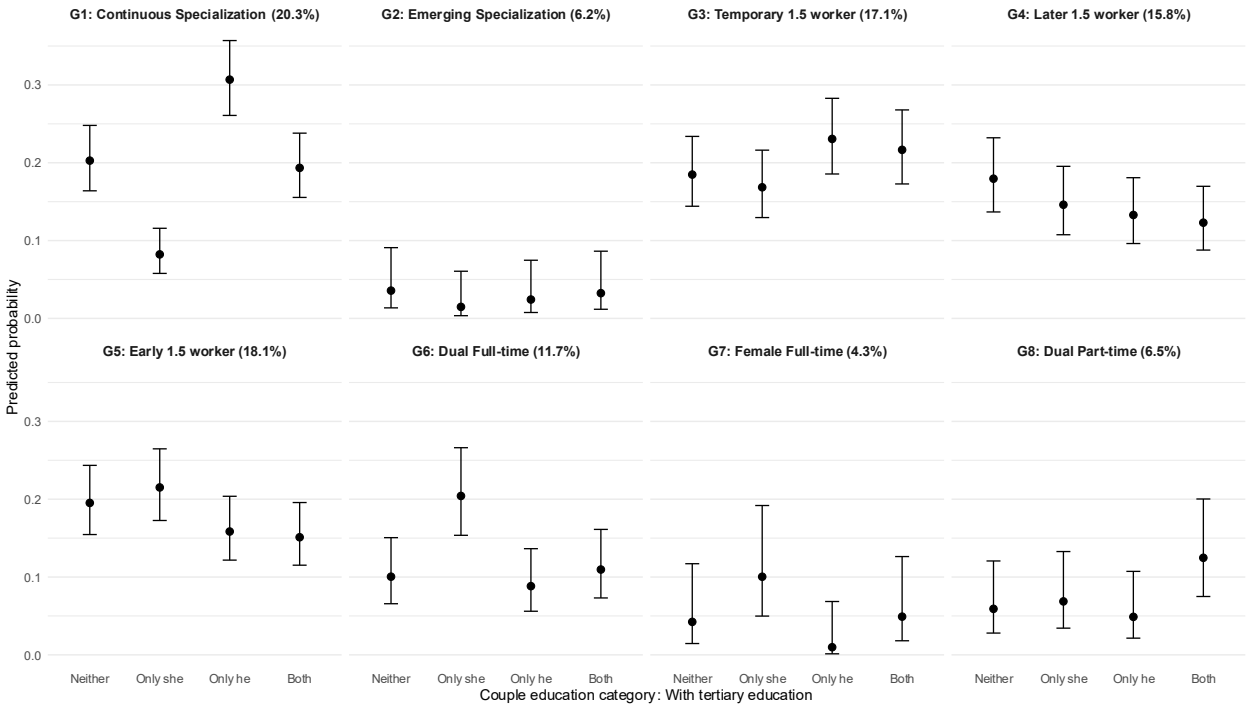

Figure 4: Predicted Probabilities of the different multi-trajectory groups by couple level education categories. The model specifications are from Extended Model 1 using Start values of the Base model. Other variables are kept at average in the scenarios. The black lines represent 95% confidence intervals. (First births, 1991-2014, Data: SOEP, N=1646)

To better interpret the association between baseline characteristics and joint employment trajectories, it is important to consider how these characteristics relate to parity progression during the observation period. Figure 5 presents predicted probabilities of having a second or third child, based on the same baseline

covariates used in the multi-trajectory model. Couples with mothers of West German background are more likely to have additional children than those of East German background in both periods. However, while fertility increased slightly over time, the probability of continuous specialization declined and the temporary 1.5 worker and the dual-part time increased. Predicted probabilities of having additional children are highest when both partners or only the father has tertiary education. Yet, confidence intervals overlap with the "only she" category, suggesting no statistically significant difference. This is notable because couples where only the mother has tertiary education are significantly more likely to follow a dual full-time trajectory and less likely to continuously specialize. Overall, the association between employment trajectories and baseline characteristics cannot be explained by parity progression alone. Instead, couples appear to make complex decisions about work, care, and family expansion jointly.

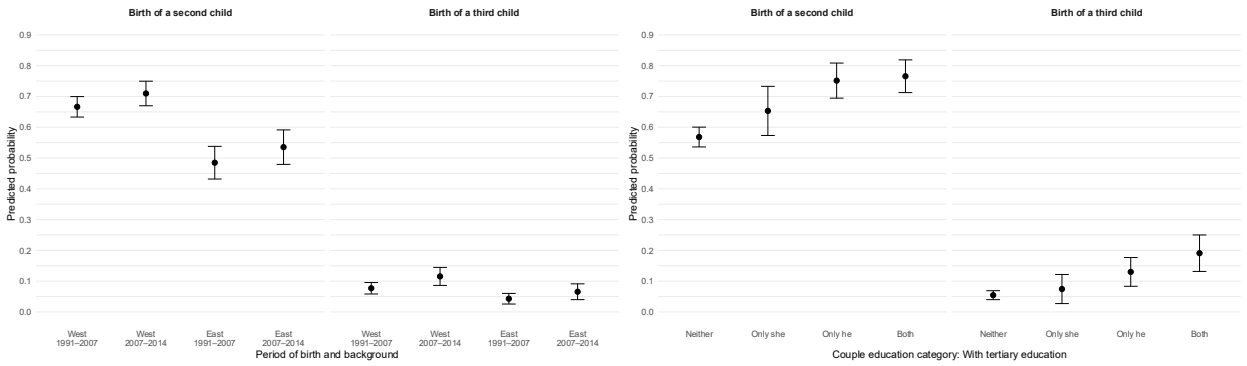

Figure 5: Predicted Probabilities of the different multi-trajectory groups by couple level education categories. The model specifications are from logistic regression models with the same covariates as the extended group-based trajectory models. Marginal effects, other variables are kept at average in the scenarios. The black lines represent 95% confidence intervals. (First births, 1991-2014, Data: SOEP, N=1646)

5. Discussion and Conclusion

This study contributes to existing literature by offering a dynamic, couple-level perspective that has often been absent in previous research on parental employment. Unlike prior studies that typically examine mothers' or fathers' employment separately, this paper highlights the complex, joint nature of parental employment and its evolution over time. By applying group based multi-trajectory modeling I identified eight distinct joint trajectories, ranging from traditional specialization, where mothers reduce their paid work

in the longer term, while fathers remain in full-time employment, to more gender-equal constellations, such as dual full-time, female full-time and dual part-time employment. Most fathers remain continuously employed full-time across trajectories or increase full-time employment probability, reflecting a strong gendered pattern in post-birth employment. However, variation in fathers' trajectories, particularly in groups such as female full-time, dual part-time, and emerging specialization, shows that paternal employment is not static and can shift under certain conditions (Frech et al., 2023). More aggregated approaches would fail to capture these dynamics.

To understand how couples sort into these patterns, I examined the role of pre-birth characteristics and used extended group based multi-trajectory modeling that accounts for uncertainty in group classification and avoids biases that arise when group membership is treated as fixed. Consistent with Becker's (1965, 1991) theory of household specialization, couples appear to sort into employment roles based on education and opportunity cost. The findings also support resource-based and bargaining perspectives: when only the father has tertiary education, couples are more likely to follow traditional continuous specialization, suggesting that higher male relative resources tilt within-couple negotiations toward traditional roles (Blood and Wolfe, 1960; Kulic and Dotti Sani, 2020). In contrast, couples where only the mother has tertiary education are more likely to follow non-traditional patterns, such as dual or female full-time employment. Dual part-time employment appears to be a strategy adopted by highly educated couples pursuing more egalitarian ideals while managing high opportunity costs. These couples also have sufficient resources to scale back paid work simultaneously, an arrangement that aligns with Oppenheimer's (1988) pooling of resources theory. Either for couples with one child or more children, the average number of months of paternity leave is significantly higher in the dual part-time group than in the groups with full or partial specialization, further indicating their commitment to egalitarian ideals. On the other hand, couples with neither partner having tertiary education follow 1.5 worker patterns with somewhat elevated probabilities.

I also investigated whether fertility patterns drive these associations by estimating predicted probabilities for second and third births, since groups differ in the average number of children born during the period, and the continuous specialization, emerging specialization, the temporary 1.5 worker groups have the highest average number of children followed by the dual part-time couples. Couples with higher male or joint education are slightly more likely to have additional children. These differences are related to the employment patterns, but do not fully explain the observed employment patterns: the link between educational composition and employment trajectories is not merely a function of fertility differences. Rather, employment, care, and family expansion decisions evolve in tandem, shaped by couple-level dynamics and broader structural forces.

In line with theories emphasizing the role of policy context and societal norms (West and Zimmerman, 1987; O'Reilly and Bothfeld, 2002), norms and institutions play a key role in shaping these trajectories. There is a bigger decline in continuous specialization and a smaller decline in the later 1.5 worker groups, while the temporary 1.5 worker, the early 1.5 worker and dual part-time employment pattern increased after 2007 and the Elterngeld reform, which supported the female worker model and opened space for new employment arrangements. Interestingly the changes across periods are similar for couples with mothers from East and West Germany, while longstanding East-West differences persist. Even after the reform, East German mothers are more likely to follow dual full-time patterns and less likely to specialize in the longer term. Female full-time employment was also somewhat more common among East German mothers, though the small size of this group (4.3%) limits the statistical significance of this finding. In contrast, the early 1.5 worker pattern remains more prevalent among couples with West German mothers.

This study has a few limitations. The SOEP lacks monthly data on exact working hours or marginal employment, which are key dimensions of gendered specialization. Marginal employment is included under part-time work, as the SOEP does not allow for separate identification of marginal employment in the employment history data prior to 2005 (Schmelzer et al., 2020). Future research should incorporate measures

of care and domestic work to capture a fuller picture of work arrangements. While SOEP collects some data on these activities, they are available only on an annual basis and rely on stylized self-reports that are not precisely aligned with the birth month. Access to harmonized monthly income data prior to pregnancy, such as register data (Steiber et al., 2025; Vargha et al., 2025), would allow for a deeper understanding of how relative and absolute resources shape sorting into trajectory groups. Register data could also support a more dynamic, couple-level differentiation of East and West German backgrounds, enabling analyses with larger case numbers.

Extending the observation period would further clarify whether the 1.5 worker and dual part-time solutions are temporary transitional arrangements or more permanent patterns (O'Reilly and Bothfeld, 2002; Langner 2015; Killewald and Zhou, 2020). Moreover, attitudes toward gender roles (Schober and Scott, 2012; Nietsche and Grunow, 2016), as well as access to outsourced care services, likely influence these trajectories and deserve closer investigation. The new employment patterns identified here, such as the dual part-time group, present opportunities for more targeted research on smaller, emerging arrangements that may become increasingly relevant in the future. Unobserved factors, such as cultural norms and workplace flexibility, may also play a role in shaping couples' decisions. Future research could explore these factors to further understand the mechanisms behind fertility and employment trajectories.

Overall, the findings underscore the value of a dynamic, couple-level perspective in understanding how work and care are organized after childbirth. By jointly modeling mothers' and fathers' employment trajectories based on monthly data, this study reveals patterns that more aggregated or individual-level approaches would obscure. The results demonstrate how gender, resources, and institutions interact to structure the evolving organization of paid work in early parenthood, and how these patterns continue to shift as policies, norms, and couple-level resources change. Findings highlight the importance of gendered roles within the family and employment. They suggest that education not only influences employment

patterns but also plays a critical role in shaping family dynamics and gender equality in post-birth employment arrangements.

Data availability

The data used in this publication were made available to us by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin. The SOEP data can be ordered here: https://www.diw.de/en/diw_01.c.601584.en/data_access.html

Replication files (Stata do-files) will be publicly available on OSF.

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Supplementary Material for the paper 'Fathers' and mothers' joint longitudinal employment patterns around first birth in Germany, 1990-2020'

Supplementary Section 1: Missing patterns and main descriptives of the longitudinal data

I construct a monthly database from the SOEP panel, aligning months relative to first birth. The observation window covers the 11 months prior to birth, with birth itself set at month 12, and follows couples until the child's sixth birthday at month 84. This yields employment trajectories for both parents over 84 months (7 years × 12 months × 2 parents). The analytical sample includes only German-born different-sex parents with no missing baseline covariates (education, East/West background, birth year, and child's birth year/month).

Missing data are concentrated at the beginning of the observation window, largely because many parents entered the SOEP panel after their first birth. In months where one parent's employment status is missing, the other parent is usually also missing, reflecting joint panel entry. Fathers show slightly higher rates of missingness, but differences are small. The lowest missingness occurs in the middle of the observation window, while attrition explains the moderate rise at the end. These patterns are typical for long-running household panels and are not strongly selective.

	All mothers (N=3754)	**All fathers (N=3754)**	**Mothers in the analytical sample (N=1664)**	**Fathers in the analytical sample (N=1664)**
Missing employment data 11 months before first birth (beginning of the observation period)	2221 59%	2257 60%	507 31%	525 32%
Missing employment data in the month of birth	1961 44%	2021 54%	328 20%	351 21%
Missing employment data 12 months after first birth	1840 49%	1908 51%	163 10%	172 10%
Missing employment data 24 months after first birth	1687 45%	1759 47%	5 0%	3 0%
Missing employment data 36 months after first birth	1615 43%	1692 45%	6 0%	4 0%
Missing employment data 48 months after first birth	1515 40%	1622 43%	41 3%	47 3%
Missing employment data 60 months after first birth	1454 39%	1574 42%	104 6%	126 8%
Missing employment data 72 months after first birth (end of the observation period)	1445 38%	1567 42%	205 12%	226 14%

Table S.1: Number of missing employment data at different months during the observation period

Table S.1 documents the share of parents with missing employment data at selected months across the observation window. At the start of the window (11 months before birth), around 60% of mothers and fathers

lack employment information, around 32% of the analytical sample. This share declines rapidly after panel entry, falling to below 10% in the analytical sample one to three years after birth. Missingness then rises moderately toward the end of the window due to attrition.

	Mothers	**Fathers**
Full employment data over 84 months	26%	25%
Missing data less than 13 months	35%	32%
Missing data less than 25 months	43%	40%
Missing data less than 36 months	48%	46%
Missing data between 36-60 months	20%	20%
Missing data between 61-83 months	18%	20%
No employment data over 84 months	14%	14%

Table S.2: Number of missing employment data (N=3754 couples)

Table S.2 summarizes the overall distribution of missing employment data across the 84-month window. About one quarter of mothers and fathers have full employment histories, while around half have fewer than 36 missing months. Only a small share (14%) lack employment data for the entire period.

Table S.3 compares socio-demographic characteristics across samples defined by increasingly restrictive thresholds on missing employment months (≤36, ≤25, ≤13). The distributions are highly stable: couples' education, East/West background, birth cohort, and parental ages vary only marginally across these sub-samples. This supports the assumption that missingness is largely at random and suggests that restricting the sample does not induce strong selectivity.

	All couples (N=3754)	**Couples with missing data less than 36 months for either the mother and the father (N=1646)**	**Couples with missing data less than 25 months for either the mother and the father (N=1430)**	**Couples with missing data less than 13 months for either the mother and the father (N=1153)**
Couples with mothers of East German background	26.4%	29.3%	30.3%	29.1%
Birth year 2007 or after	35.4%	38.9%	36.2%	31.3%
Tertiary education: only she	8.4%	8.4%	7.9%	8.2%
Tertiary education: only he	13.4%	13.4%	13.3%	13.0%
Tertiary education: both	16.5%	14.6%	14.7%	14.8%
Average age of fathers	31.3	31.4	31.4	31.3
Average age of mothers	28.6	28.8	28.7	28.7

Table S.3: Main descriptives of the data with different number of missing months

In summary, missing employment data in the SOEP are concentrated around panel entry and attrition, as is common in household panels. Most couples contribute long stretches of employment histories, and socio-demographic characteristics remain stable across missingness thresholds. Together with robustness checks using stricter thresholds (12 and 24 months), this supports the assumption that missingness does not bias the trajectory models.

Supplementary Section 2: Advantages of using group-based multi-trajectory modeling

Using group-based multi-trajectory modeling has several advantages over other methods. It is a more dynamic approach than using event history analysis and it also enables using a dyadic perspective. The application of group-based multi-trajectory modeling instead of multichannel sequence analysis or sequence analysis using extended alphabet has several advantages. First, trajectory modeling can handle missing data and estimate models assuming that missing cases are at random. In the case of sequence analysis data with similar missing episodes would be grouped together (for example cases dropping out from the sample, or cases with missing monthly episodes at the beginning of the observation period) or couples with any missing monthly missing data would have to be dropped from the sample and reduce the sample extensively. Secondly, group-based multi-trajectory modeling is probabilistic; it is therefore also possible to estimate confidence intervals for the multi-trajectory groups themselves.

Moreover, the extended models examining the association between baseline characteristics and trajectory group membership take into account the representativeness of group membership and do not consider the trajectory groups as fixed characteristics that can result in biased estimations. The model treats group membership as a latent variable and uses observed covariates to estimate the probability of membership in each trajectory group. This approach better captures population heterogeneity and reflects the probabilistic nature of group assignment. Crucially, estimating the trajectory and group membership parameters jointly avoids classification error inherent in two-step approaches, where individuals are first assigned to their most likely group and covariates are modeled afterward with fixed group assignment (Roeder et al. 1999).

Group-based trajectory models, along with other finite-mixture approaches, have recently faced criticism for yielding inconsistent findings across different methods and for lacking clear standards in determining the optimal number of groups (van der Nest et al. 2020; Warren et al. 2015). Using months as the shortest possible intervals enhances the reliability of the results of this study. A series of robustness checks have

been also run with varying number of groups to make sure that the results are robust (for more details see the Supplementary Section 3).

Supplementary Section 3: Model Search

Following Nagin et al. 2024 I choose a model that includes the fewest groups necessary to capture distinctive trajectory groups. I detail all the steps of finding the model that best represents the data and displays the distinctive features of the population distribution of parental employment trajectories. The final multi-trajectory model is selected based on a specification in which all polynomial terms were statistically significant across the four outcomes. It is also important that the main patterns observed in the univariate earnings trajectories are preserved in the multi-trajectory groups.

The final multi-trajectory model described in the paper is selected following the steps detailed by Nagin (2006), Nagin et al (2016), Burckhardt et al. 2017 and van der Nest et al. (2020). First, single univariate group-based trajectory models are run for each of the outcomes separately for a predetermined number of groups (1-8). Since the outcome variables are binary, I use the binary logistic distributions in the group-based trajectory models. Each outcome is measured monthly, 11 months before birth till 72 months afterwards (all together 84 months). The number of latent groups and the order of the trajectory polynomials (linear, quadratic, cubic) are not known a priori. Rather, I have estimated a series of model specifications, first varying the number of groups, then the polynomial order, to identify the model that best balanced statistical fit, parsimony, and interpretability (Nagin 2006, Klijn et al. 2015, Van de Schoot et al. 2017).

The model fit is based on Bayesian information criteria (BIC for N = couples and BIC for N= couple-months) and Akaike information criterion (AIC). Other model adequacy measures are also calculated for each group in each model (such as average posterior probability after assignment, odds of correct classification, observed and predicted probability of group membership) and reported here for only the final models selected. In the code a function is provided that calculates these adequacy measures for all the other models as well. Additional trajectory groups are also inspected visually and qualitatively, whether they revealed additional behavioral differences compared to the already existing groups. My main aim has been to identify the simplest possible model that captures the key features of the couple's employment trajectories around first birth.

Based on the results from the univariate group-based trajectory models, I determine the minimum number of groups for the multi-trajectory model (6 groups). I then search for the best-fitting specification by first varying the number of groups (from 6 to 8 groups) and subsequently the polynomial order. The final multi-trajectory model is selected based on a specification in which all polynomial terms were statistically significant across the four outcomes. It is also important that the main patterns observed in the univariate earnings trajectories are preserved in the multi-trajectory groups. Robustness tests have been also run for samples with maximum 24 months and 12 months of missing employment data for the mothers and the fathers (see Supplementary Section). Since each model runs for 4-8 hours, it was impossible to run all possibilities with a higher number of samples. Across all the models run, the findings reported here are robust.

Table B.1- B.4 shows the main fit statistics for the univariate (single) group-based trajectory models varying the number of trajectory groups in each model from one to eight for the following binary outcomes: (1) mother full-time employed / not full-time employed (2) mother part-time employed / not part-time employed (3) father full-time employed / not full-time employed (4) father part-time employed / not part-time employed, respectively.

All initial univariate group-based trajectory models assumed that the employment trajectories are cubic functions of months. After selecting the number of the groups, models with different polynomial functions are run to find the best fit based on the statistical significance of the parameter estimates (Nagin 2005). The final univariate group-based trajectory models for the four outcomes are highlighted with bold letters in Table S.4-S.7. Models with greater BIC and AIC statistics indicate better fit for the data. However, adding more groups does not necessarily mean additional substantiative insights. Sometimes existing groups are duplicated, or the new groups are too small as detailed in the Note columns in the tables. The final selected univariate models are plotted on Figures S1-S4. The parameter estimates and SEs are not included here for all the models, but the codes are replicable and Stata logs are also available upon request.

Number of groups	BIC (N=couples)	BIC (N=person months)	AIC	Note
1 (3)	-54462.40	-54471.08	-54451.59	
2 (3 3)	-35703.38	-35722.91	-35679.05	
3 (3 3 3)	-31261.22	-31291.61	-31223.38	
4 (3 3 3 3)	-27760.02	-27801.27	-27708.66	
5 (3 3 3 3 3)	-30003.56	-30055.66	-29938.68	False convergence: Variance matrix is nonsymmetric or highly singular
5 (2 3 3 3 3)	**-26014.60**	**-26064.53**	**-25952.43**	**Selected final univariate model (minimum N of groups for the multi-trajectory model)**
6 (3 3 3 3 3 3)	-24720.66	-24783.62	-24642.27	One group is 4.8%
7 (3 3 3 3 3 3 3)	-25897.93	-25971.74	-25806.03	False convergence: Variance matrix is nonsymmetric or highly singular
8 (3 3 3 3 3 3 3 3)	-23449.36	-23534.02	-23343.94	False convergence Variance matrix is nonsymmetric or highly singular

Table S.4: Goodness of Fit Statistics for the Univariate Group Based Trajectory Model of outcome 1: mothers' full-time employment (N=1646 couples N=126476 couple-months).

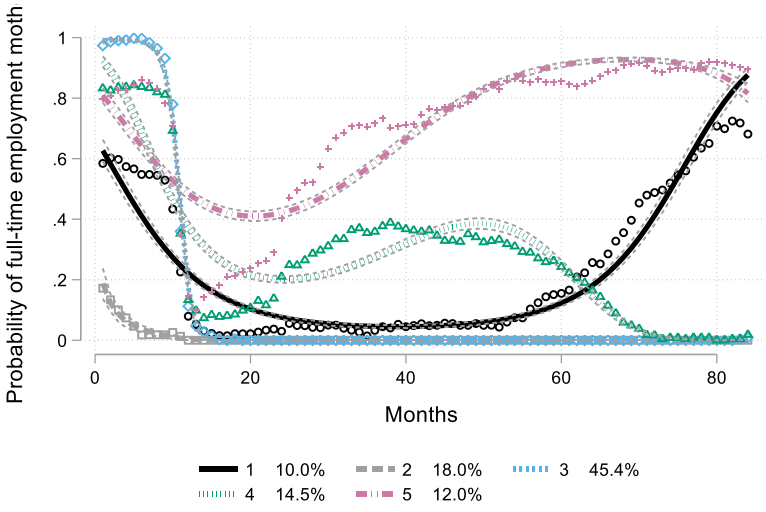

Figure S.1: Univariate group-based trajectory model for mothers' full-time employment 11 months before and 72 months after first birth (N=1646 mothers). Predicted and average values by trajectory groups.

Number of groups	BIC (N=couples)	BIC (N=person months)	AIC	Note

1 (3)	-72833.30	-72841.99	-72822.49	
2 (3 3)	-52806.07	-52825.61	-52781.75	
3 (3 3 3)	-48006.00	-48036.39	-47968.16	
4 (3 3 3 3)	-43627.85	-43669.10	-43576.49	
5 (3 3 3 3 3)	-41714.93	-41767.03	-41650.05	
6 (3 3 3 3 3 3) **6 (3 3 3 3 2 3)**	-39624.20 **-39621.07**	-39687.16 **-39681.85**	-39545.82 **-39545.38**	**Selected final univariate model (minimum N of groups for the multi-trajectory model)**
7 (3 3 3 3 3 3 3)	-38051.51	-38125.32	-37959.60	False convergence: Variance matrix is nonsymmetric or highly singular when finalizing the polynomials
8 (3 3 3 3 3 3 3 3)	-37518.60	-37603.26	-37413.18	Duplicated trajectories

Table S.5: Goodness of Fit Statistics for the Univariate Group Based Trajectory Model of outcome 2: mothers' part-time employment (N=1646 couples N=126476 couple-months)

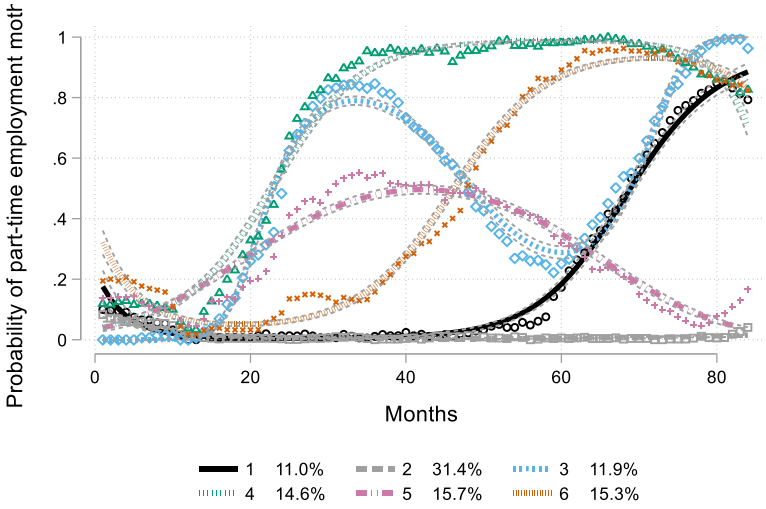

Figure S.2: Univariate group-based trajectory model for mothers' part-time employment 11 months before and 72 months after first birth (N=1646 mothers). Predicted and average values by trajectory groups.

Number of groups	BIC (N=couples)	BIC (N=person months)	AIC	Note
1 (3)	-43722.90	-43714.23	-43703.41	
2 (3 3)	-26569.73	-26589.24	-26545.40	
3 (3 3 3)	-23528.55	-23498.20	-23460.36	
4 (3 3 3 3)	-21634.46	-21675.64	-21583.10	False convergence, Variance matrix is nonsymmetric or highly singular

5 (3 3 3 3 3)	-20545.83	-20493.81	-20428.94	False convergence, Variance matrix is nonsymmetric or highly singular
5 (3 3 2 3 2)	**-20764.73**	**-20812.42**	**-20705.27**	**Selected final univariate model with all polynomials significant (minimum N of groups for the multi-trajectory model)**
6 (3 3 3 3 3 3)	-19788.18	-19851.04	-19709.79	Three groups under 5%
7 (3 3 3 3 3 3 3)				False convergence, Variance matrix is nonsymmetric or highly singular
8 (3 3 3 3 3 3 3 3)				Variance matrix is nonsymmetric or highly singular

Table S.6: Goodness of Fit Statistics for the Univariate Group Based Trajectory Model of outcome 3: fathers' full-time employment (N=1646 couples N=126476 couple-months)

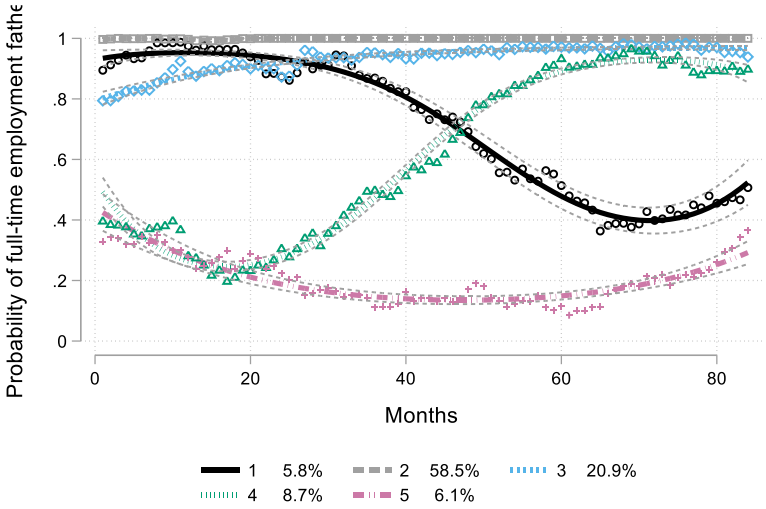

Figure S.3: Univariate group-based trajectory model for fathers' full-time employment 11 months before and 72 months after first birth (N=1646 fathers). Predicted and average values by trajectory groups.

Number of groups	BIC (N=couples)	BIC (N=person months)	AIC	Note
1 (3)	-23329.86	-23338.53	-23319.05	
2 (3 3)	-11734.33	-11753.84	-11710.00	
3 (3 3 3)	-10182.67	-10213.01	-10144.83	
3 (2 2 2)	**-10188.01**	**-10211.86**	**-10158.28**	**Selected final univariate model (minimum N of groups for the multi-trajectory model)**

4 (3 3 3 3)	-9255.72	-9296.90	-9204.36	Small group size: 3.2%, two groups under 4%
5 (3 3 3 3 3)	-10394.93	-10446.95	-10330.06	False convergence, Variance matrix is nonsymmetric or highly singular
6 (3 3 3 3 3 3)	-8382.55	-8445.41	-8304.17	Small group sizes: 0.8%, 2.8%, 2.6%, 2.7%
7 (3 3 3 3 3 3 3)	-8875.09	-8948.79	-8783.19	False convergence, Variance matrix is nonsymmetric or highly singular
8 (3 3 3 3 3 3 3 3)	-8373.19	-8457.72	-8267.77	False convergence, Variance matrix is nonsymmetric or highly singular, Small group sizes: 2.4%, 2.2%, 2.7%

Table S.7: Goodness of Fit Statistics for the Univariate Group Based Trajectory Model of outcome 4: fathers' part-time employment (N=1646 couples N=126476 couple months).

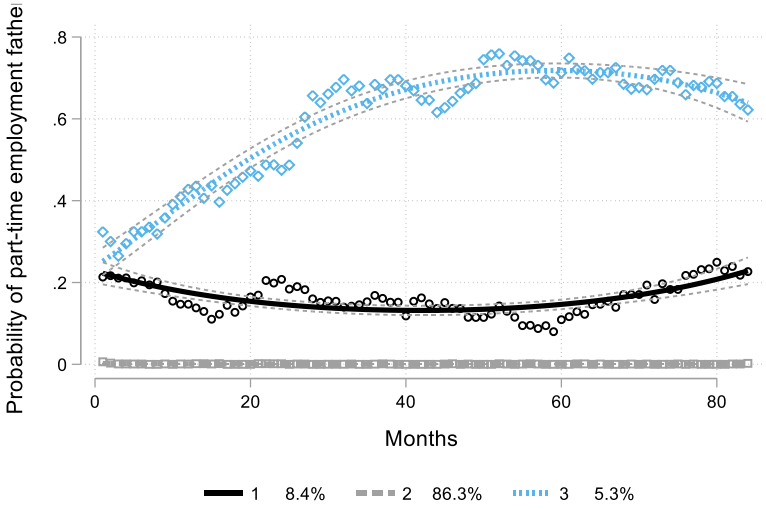

Figure S.4: Univariate group-based trajectory model for fathers' part-time employment 11 months before and 72 months after first birth (N=1646 fathers). Predicted and average values by trajectory groups.

The group-based multi-trajectory model including all the four outcomes are run afterwards again for a predetermined numbers of groups and the final model is selected. After the univariate group-based trajectory models, the minimum number of groups are 6, so I ran models using 6, 7 and 8 groups. The first round of multi-trajectory models assumed that both paternal and maternal employment trajectories are cubic functions of months. The second round of models assumed that the maternal employment trajectories are

cubic functions of months, while the paternal employment trajectories are quadratic functions of months, following the trajectory shape of the univariate group-based trajectories of paternal full-time and part-time employment.

Altogether over 60 multi trajectory models are run to see the robustness of the results following different number of groups and specifications and the final model was chosen carefully with all polynomials significant. While the main patterns observed in the univariate earnings trajectories are preserved in the 8 multi-trajectory groups, they are not preserved in the 6- or 7-group solution, since the temporary part-time employment group pattern is missing. The BICs and AIC are also better for the 8-group solution.

The following five groups are almost identical in the 6-, 7 and 8-group models (see Figures S.5-S.7): Continuous Specialization, Emerging Specialization, Dual Full-time, Female Full-time, Dual Part-time and instead of one large Emerging 1.5 worker group for the 6-group model, the 7-group model differentiates among two different patterns, and the 8-group model differentiates among three different patterns of 1.5 worker couples. The 8-group model is the only one that captures a temporary part-time employment that is also important for the univariate group-based trajectory model (see Figure B.2). Moreover, the 8-group model is robust among different specifications, has the lowest BICs and AIC and the results are robust for samples with 12 and 24 months of missing employment data. The smallest group is 4.3% and all the others are larger in size. All these results as well as the model adequacy indicators (Table S.9) show that these results are robust.

Number of groups	**BIC (N=couples)**	**BIC (N=person months)**	**AIC**	**Note**
6 (all cubic)	-130274.21	-130563.31	-130001.20	
6 (maternal cubic, paternal quadratic)	-129117.02	-129371.76	-128876.44	
6 (Specification with significant polynomials: 3 3 3 3 3 3	-130252.32	-130507.07	-130011.75	Model on Figure S.5 For details on the other models run see the replication code

3 3 3 3 2 2 3 3 2 3 2 3 1 2 2 2 1 2)				
7 (all cubic)	-161302.35	-161640.11	-160983.39	False convergence
7 (maternal cubic, paternal quadratic)	-126283.30	-126580.98	-126002.18	Model on Figure S.6
8 (all cubic)	-147604.67	-147991.09	-147239.76	False convergence
8 (maternal cubic, paternal quadratic)	-123983.83	-124324.45	-123662.17	**Figure S.7**
8 (Final specification with significant polynomials: 2 3 3 3 3 3 3 3 2 3 3 3 3 3 2 2 2 2 2 1 2 2 2 2 0 1 2 2 2 2 2 1)	**-122525.85**	**-122840.71**	**-122228.52**	**Final model described in the main text For details on the other models run see the replication code**

Table S.8: Goodness of Fit Statistics for the Group Based Multi Trajectory Model of the four outcomes jointly (N=1646 couples N=126476 couple months).

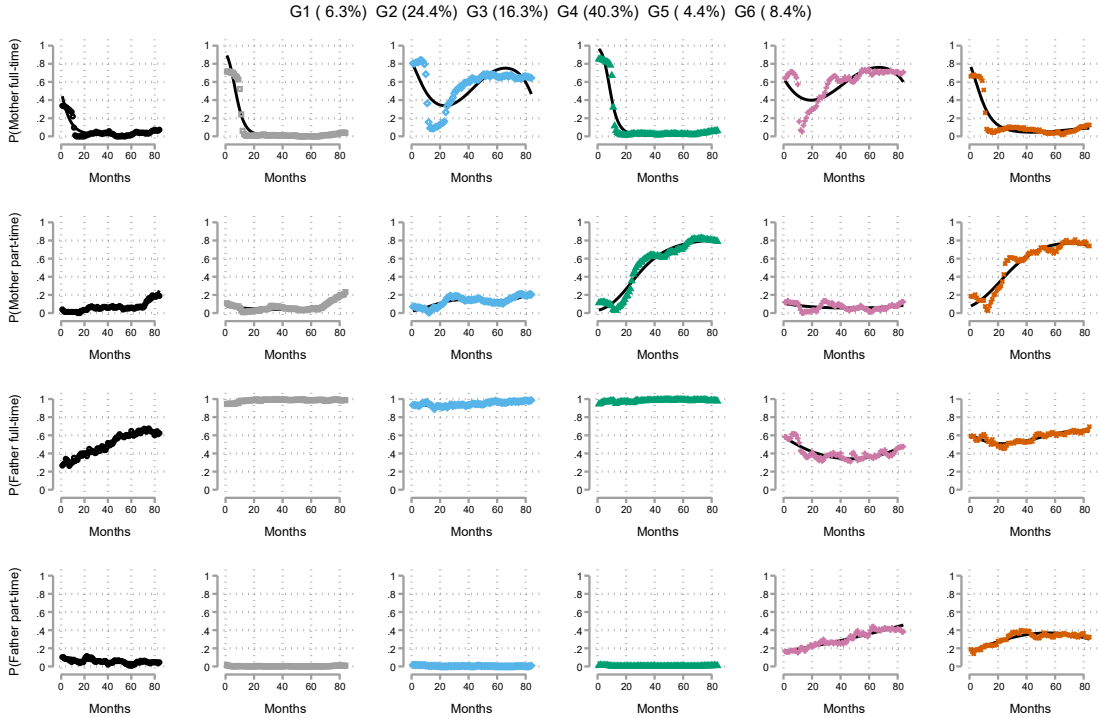

Figure S.5: 6 group multi trajectory model of parental employment patterns (first births at month 0, 1991-2014, Data: SOEP, N=1646): Probability of the mothers and fathers being full-time and part-time

employed during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample.

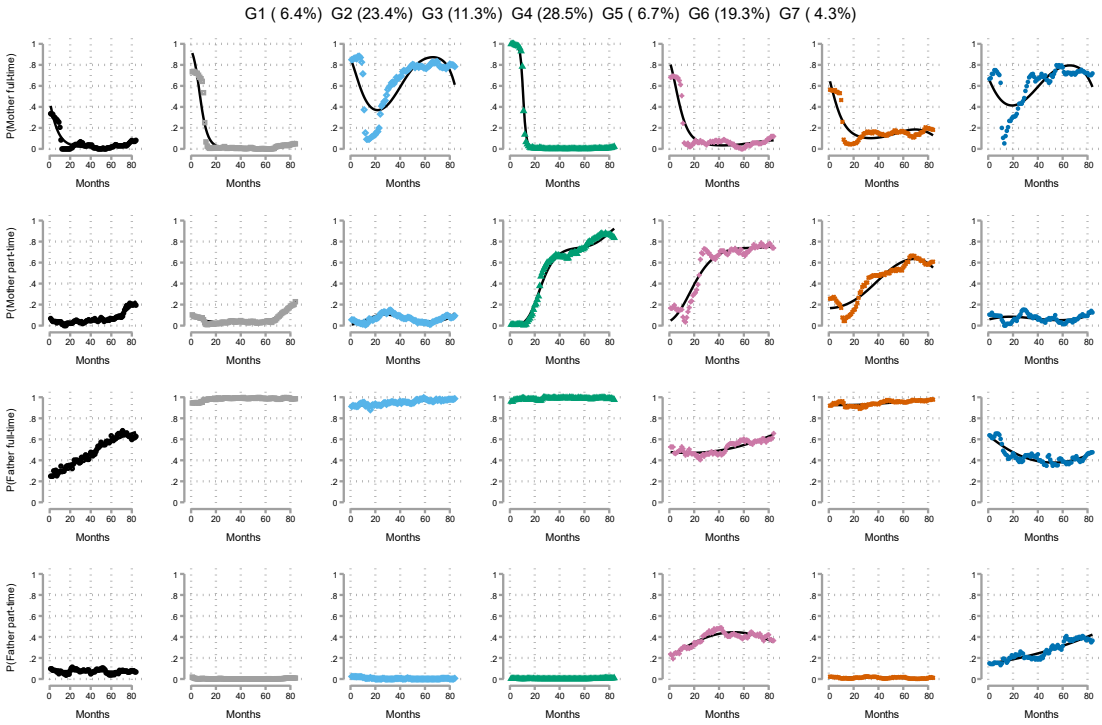

Figure S.6: 7 group multi trajectory model of parental employment patterns (first births at month 0, 1991-2014, Data: SOEP, N=1646): Probability of the mothers and fathers being full-time and part-time employed during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample.

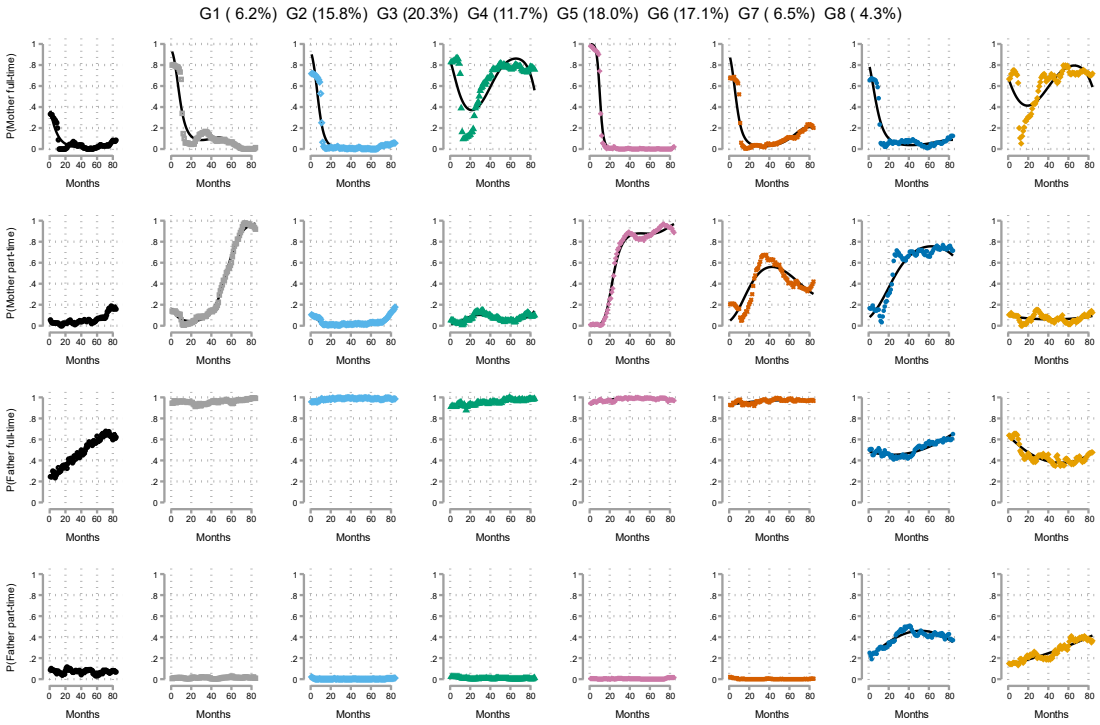

Figure S.7: 8 group multi trajectory model of parental employment patterns (first births at month 0, 1991-2014, Data: SOEP, N=1646): Probability of the mothers and fathers being full-time and part-time employed during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample.

Multi trajectory group	Number (using the maximum rule of assigning groups based on Posterior probabilities)	Average Posterior Probability	Odds of Correct Classification	Observed probability of group membership	Predicted probability of group membership
1	102	0.998	7105	0.062	0.062
2	257	0.986	375	0.156	0.158
3	335	0.993	583	0.204	0.203
4	194	0.995	1588	0.118	0.117
5	298	0.990	449	0.181	0.180
6	282	0.986	342	0.171	0.171
7	108	0.997	4937	0.066	0.065
8	70	0.999	255170	0.043	0.043

Table S.9: Model adequacy measures for the final 8-group model using the numbering from figure S.7. Function coded in Stata by Andrew P. Wheeler. For more details on the measures see Nagin 2005.

Supplementary Section 4: Description of multi-trajectory groups using sequence index plots

Figure S.8 visualizes the different groups from a sequence perspective: it is the sequence index plot of the trajectories for N=70 random sample of the respective groups. Each line represents the mother and the father from the couple having different monthly states: they are either full-time employed, part-time employed, on parental leave, inactive (not employed or unemployed) or they have missing employment data in a particular month. Parental leave was not included as an outcome in the model, since I chose a more parsimonious solution focusing on full-time and part-time employment of the parents. However, it is possible to differentiate this state via the sequence index plot. Couple sequences are sorted according to their posterior probability in the group they are put into by the maximum posterior probability rule: Cases that have slightly lower posterior probabilities and therefore not so representative of the groups are on the top of each plot. On the sequence index plot it is also possible to look at the missing patterns by multi-trajectory groups.

The multi-trajectory groups differ in the initial probability of mothers and fathers being employed full-time or part-time before the birth of their first child and trace the development of their employment trajectories from one year before to six years after childbirth (with birth occurring in month 0 and trajectories observed through month 72). The figure here and in the main text illustrate how caregiving after childbirth remains highly gendered: while mothers' full-time employment drops sharply around the time of birth, a comparable change is largely absent from fathers' typical employment patterns. At the same time, there is clear heterogeneity in joint employment trajectories. Some groups are characterized by extended full or partial specialization, with mothers reducing their paid work over the long term but to varying degrees. Other groups show more egalitarian patterns, including cases where fathers take up part-time work or mothers return more quickly to part-time or even full-time employment.

The first group (20.3%, 95% CI [18.3, 22.3]) is a group of long-term continuous specialization after birth. Fathers continuously work full-time during the whole period in this group. Mothers, however, exit the labour market almost fully during the observation period. They have a high probability of being full-time employed

before the birth of their first child (0.72) and only a small probability of being part-time employed (0.11), but they leave their jobs after birth and are continuously inactive for a long period. Probability of maternal part-time employment starts to rise only at the end of the observation period. This group has the highest average number of children among the multi-trajectory groups by the end of the observation period, 2.02 (95% CI [1.95, 2.09]). Couples with 3 or 4 children have the highest probability of being in this group, while the share of couples with only 1 child in this group is only 17.5%.

The second group (6.2%, 95% CI [5.0, 7.4]) is characterized by emerging specialization and dual inactive periods. Mothers in this group have a low probability of being full-time or part-time employed, 0.33 and 0.06 respectively 11 months before first birth. They do not work after birth, or only for very short periods as indicated by the close to 0 probabilities of full-time or part-time employment. Maternal employment only increases at the end of the observation period. Fathers in the emerging specialization group have a growing probability of being full-time employed over the 7-year window, from a probability of 0.24 to 0.62 and a close to 0 probability of part-time employment. These paternal trajectories are mostly characterized by non-stable employment patterns: longer and shorter periods of being inactive and employed, mostly full-time employed and more rarely part-time employed with a growing probability of being full-time employed. The average number of children is also high for this group 72 months after the birth of the first child: 1.95 (95% CI [1.80, 2.10]). The share of couples with only 1 child in this group is only 28.7%.

The third, fourth and fifth group are all emerging 1.5 worker families, where fathers have undisturbed full-time employment (with only maximum a few months parental leave) and the mothers very likely work full-time before work and transit to part-time work after first birth, but with different timing and permanency: there is a temporary, later and early 1.5 worker couple-type among the multi-trajectory groups. In the third group, temporary 1.5 worker (17.1%, 95% CI [15.2, 19.0]), mothers become part-time employed relatively fast after their first birth. This state is, however, not permanent. Most mothers in the group have a second child and therefore go on parental leave again, only 23.8% of mothers have only one 6 years after first birth.

Like in the two previous groups, the average number of children is also high for this group 72 months after the birth of the first child: 1.88 (95% CI [1.81, 1.95]). A minority of them become full-time employed again at the end of the observation period.

In the later 1.5 worker group (15.8%, 95% CI [13.9, 17.7]), mothers start part-time work relatively later, mostly at month 36 when their first child turns 3-year-old, or even later. This employment is more permanent, by the end of the observation period, 97% of the mothers work part-time. The probability of having a second or third child is lower in this group, the average number of children is 1.61 (95% CI [1.54, 1.68]) 6 years after the birth of the first child. 42.5% couples in the group remain with only 1 child and 54% have two children. Mothers in the early 1.5 worker group (18.1%, 95% CI [16.2, 20.0]) reenter the labour market earlier become part-time employed between 12 and 24 months after first birth. Their probability of part-time employment at the end of the observation period is 0.97, full-time employment is 0, so the transition to part-time employment after birth is stable. The average number of children is 1.52 (95% CI [1.46, 1.59]) in this group and 50.3% of these couples do not progress to higher order births.

The sixth group (11.7%, 95% CI [10.1, 13.3]), represents a dual full-time group, where fathers continuously work full-time with only a few months of inactive periods. Mothers in this group go back to work after taking a shorter break after first birth, their probability of being employed is 0.75 2 years after the first birth, the sum of their probability of being full-time employed (0.64) and part-time employed (0.11). Mothers mostly work full-time with shorter periods of part-time employment or inactive periods. The average number of children also remains the lowest in this group 6 years after first birth: 1.48 (95% CI [1.40, 1.56]). So only 45% of mothers who transit back to full-time employment after their first birth have a second birth during the observation period and 55% remain with a single child.

The seventh group is the smallest one: 4.3% (95% CI [3.3, 5.3]). Mothers in this group go back to full-time employment after taking a relatively shorter career break after their first birth, while fathers have an increasing probability of being part-time employed and a first decreasing then slightly increasing probability of being full-time employed. This is the only group where the probability of mothers to be employed after

the first birth is higher than that of the fathers, and their probability of being full-time employed is much higher. Therefore, I call this group the female full-time group. The average number of children is low in this group 6 years after first birth: 1.65 (95% CI [1.50, 1.80]). The probability of a second birth is higher than in the dual full-time group but lower compared to the other groups with full or partial specialization: 42.7% of couples in the group remain with a single child.

In the last group (6.5%, 95% CI [5.3, 7.7] mothers have an increasing probability of being part-time employed after first birth even though they were more likely to be full-time employed before birth. The probability of full-time employment of the fathers decreases from 0.51 to 0.41 in the first two years, and it is the lowest 1 year after first birth (0.41). Part-time probabilities increases from 0.25 in month t(-11) to 0.5 at month t(24). Afterwards part-time employment slightly decreases and full-time employment probability starts to increase again. The fathers are employed with a higher probability of full-time, but also some probability of part-time employment during the observation period, meaning that they have longer periods of part-time employment, therefore I call this group dual part-time after birth. The yellow color for both the mothers and fathers of the sequence index plot in the Supplementary Material also highlights this group. 39.2% of couples in this group remain with a single child. The average number of children by the 6th year is 1.71 (95% CI [1.58, 1.83]).

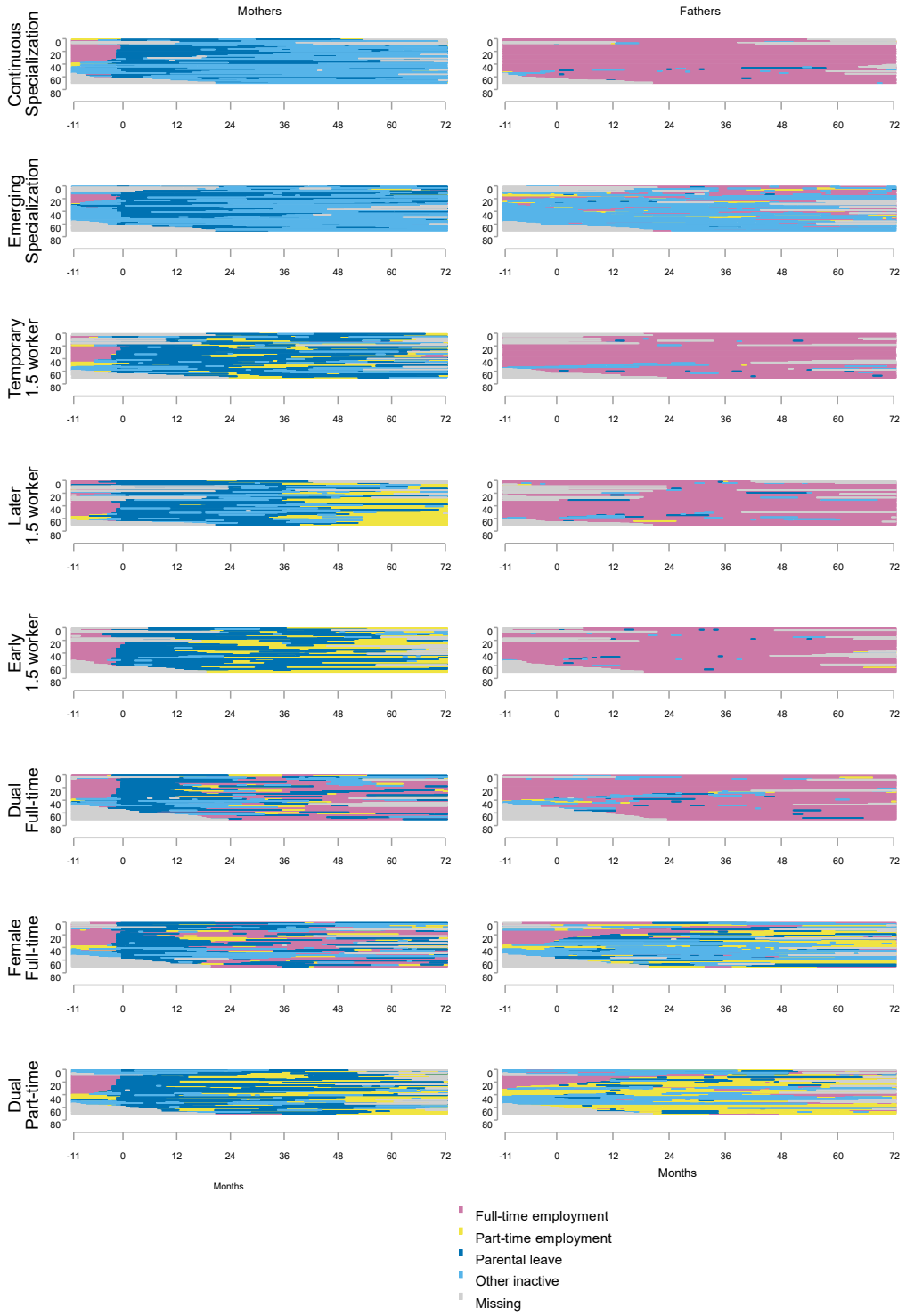

Figure S.8: Sequence index plots of N=70 random samples eight multi -trajectory groups

For the groups and their share see the main text. The sequences are ordered according to the posterior probability of the couples in the respective groups (first births at month 0, 1991-2014, Data: SOEP, N=1646)

Supplementary Section 5: Overview of models run as robustness tests

The baseline model is selected after running over 120 models and looking for the best specification. The model search is also performed on several smaller samples with maximum 24 and 12 missing months for each parent (N=1430 and N=1153 respectively) as well as on a smaller sample with all covariates (N=1070) with and without details on the iterations. Models are also tested with parity progression as a fifth outcome next to the binary employment variables. Moreover, the extended group based multi-trajectory models with baseline covariates are tested with adding covariates one-by-one and with interaction effects. In the results section I highlight the findings from these robustness tests, and report more details in the following Supplementary Sections. Additional Stata log files are also available upon request.

Model	Sample	Outcomes included	Predictors included	Note
BASE MODEL				
Base group-based multi-trajectory model with 4 outcomes to identify latent groups of joint maternal and paternal employment trajectories	Sample with maximum 35 months of missing on monthly employment variables N=1646	Binary logistic distribution of four dummy variables: 1. mother full-time employed / not full-time employed (1/0) 2. mother part-time employed / not part-time employed (1/0) 3. father full-time / not full-time employed (1/0) 4. father part-time employed / not part-time employed (1/0)	----	Multiple models are run looking for the best specification. For the model search see Supplementary Section 2
EXTENDED MODELS WITH BASELINE INDEPENDENT VARIABLES				
Extended group-based multi-trajectory model to see how baseline predictors are related to multi-trajectory group membership, Extended model version 1	Sample with maximum 35 months of missing on monthly employment variables N=1646	Similar as in the base model	- Year of birth period dummy: birth in 2006 or earlier (0) or 2007 and later (1) - Mother born in East-Germany dummy (1/0) - Couple-level education dummy variables: 1. Only she has tertiary education (1/0) 2. Only he has tertiary education (1/0) 3. Both have tertiary education (1/0) 4. Neither has tertiary education (1/0) (reference) - Age of mother - Age gap between parents	Parameter estimates (start values) for adding risk factors are used from the base model.
Extended group-based multi-trajectory model in order to see how baseline predictors are	Base sample with maximum 35 months of missing on	Similar as in the base model	- Similar as in the first extended model +	Parameter estimates (start values) are used from the base model

related to multi-trajectory group membership, Extended model version 2	monthly employment variables, only with mothers having data on marital status before birth and only with both partners having data on income before birth N=1070		- Income of the household before birth - Income share of the mother before birth - Marital status of female partner before birth	8 multi-trajectory groups are the same Predicted probabilities are calculated for three different scenarios: - Four different types of education and all other covariates kept at their mean - Different periods and East/West Germany and all other covariates kept at their mean - Varying mother's income share and all other covariates kept at their mean - Robustness tests are described in detail in Supplementary Section x
ROBUSTNESS CHECKS				
Base group-based multi-trajectory model in order to identify latent groups of joint maternal and paternal employment trajectories	Base sample with maximum 24 months of missing on monthly employment variables N=1430	Similar as in the base model	----	Multiple models are run (with and without start values). For the model search see the replication package 8 multi-trajectory groups are the same
Base group-based multi-trajectory model with 4 outcomes to identify latent groups of joint maternal and paternal employment trajectories	Base sample with maximum 12 months of missing on monthly employment variables N=1153	Similar as in the base model	----	Multiple models are run (with and without start values). For the model search see the replication package 8 multi-trajectory groups are the same
Base group-based multi-trajectory model with 5 outcomes to identify latent groups of joint maternal and paternal employment trajectories along with parity progression	Base sample with maximum 35 months of missing on monthly employment variables N=1646	Outcomes used in the base model and the number of children over the 84 months modelled as a Poisson distribution with zip model	----	Multiple models are run (without start values). For the model search see Appendix D 8 multi-trajectory groups are the same
Extended group-based multi-trajectory model to see how baseline predictors are related to multi-trajectory group membership	Base sample with maximum 35 months of missing on monthly employment variables, only with couples having data on marital status N=1117	Similar as in the base model	- Similar as in the first extended model + - Marital status of female partner before birth	Parameter estimates (start values) are used from the base model. 8 multi-trajectory groups are the same
Extended group-based multi-trajectory model to see how baseline predictors are related to multi-trajectory group membership	Base sample with maximum 35 months of missing on monthly employment variables, only with couples having data on marital status N=1070	Similar as in the base model	- Similar as in the first extended model + - Income of the household before birth - Income share of the mother before birth	Parameter estimates (start values) are used from the base model. 8 multi-trajectory groups are the same
Extended models with interaction effects	Multiple samples	Similar as in the base model	Independent variables listed before and interaction effects between education*period or	Parameter estimates (start values) are used from the base model 8 multi-trajectory groups are the same.

			education*East German background dummy	Interactions are not significant
Extended models with 6 groups	Multiple samples	Similar as in the base model	Independent variables listed before and interaction effects between education*period or education*East German background dummy	Models run without parameter estimates in order to see basic covariates and results with 6 groups

Table S.10: The different base group-based multi-trajectory models run as robustness checks

Supplementary Section 6: Robustness tests with different number of missing cases

Group-based multi-trajectory models incorporate missing data and assumes that the data are missing at random, i.e., they are not systematically related to the response variable of interest. As detailed before in the main text, I use a maximum of 35 months of missing cases for either the mother and the father among the 84 months. To investigate the robustness of the findings, I run models with a maximum of 24 months and 12 months of missing employment data for the mothers and the fathers. According to these results, the groups and share of the different groups are very similar for these reduced samples and always remain within the initial confidence intervals (Figure S.9 and S.10). More results and Stata log files about these models are available upon request.

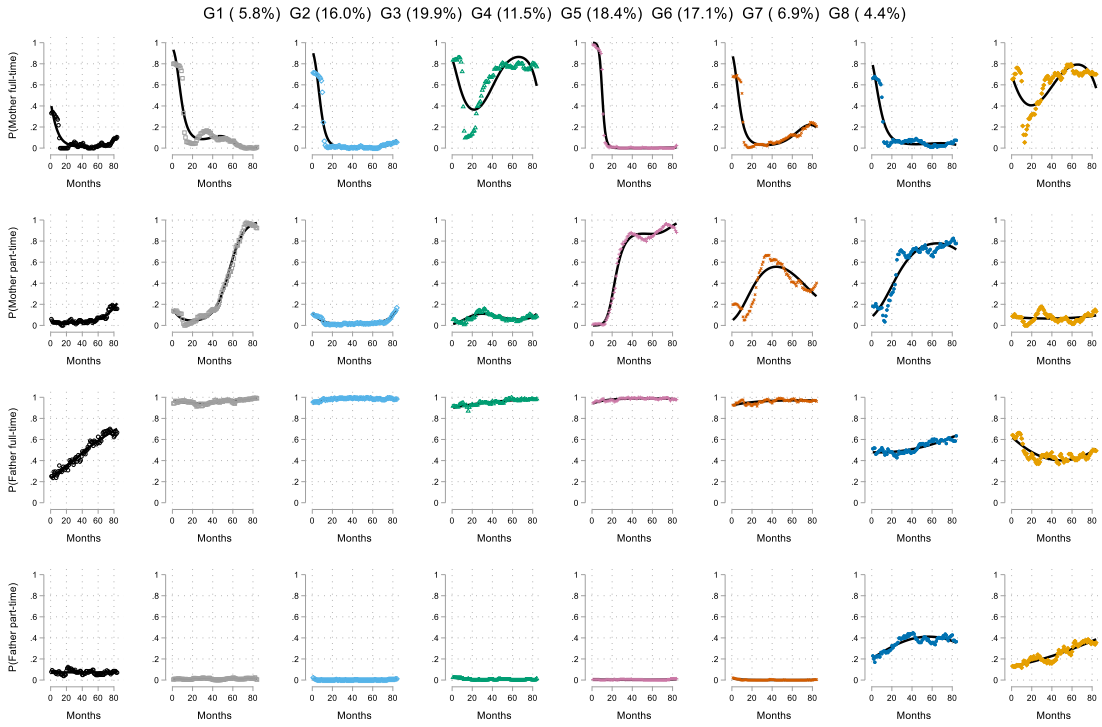

Figure S.9: 8 group multi trajectory model of parental employment patterns with maximum 24 missing months per parent and using start values from the original model (first births at month 0, 1991-2014, Data: SOEP, N=1430). Probability of the mothers and fathers being full-time and part-time employed during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample. Additional models are available upon request.

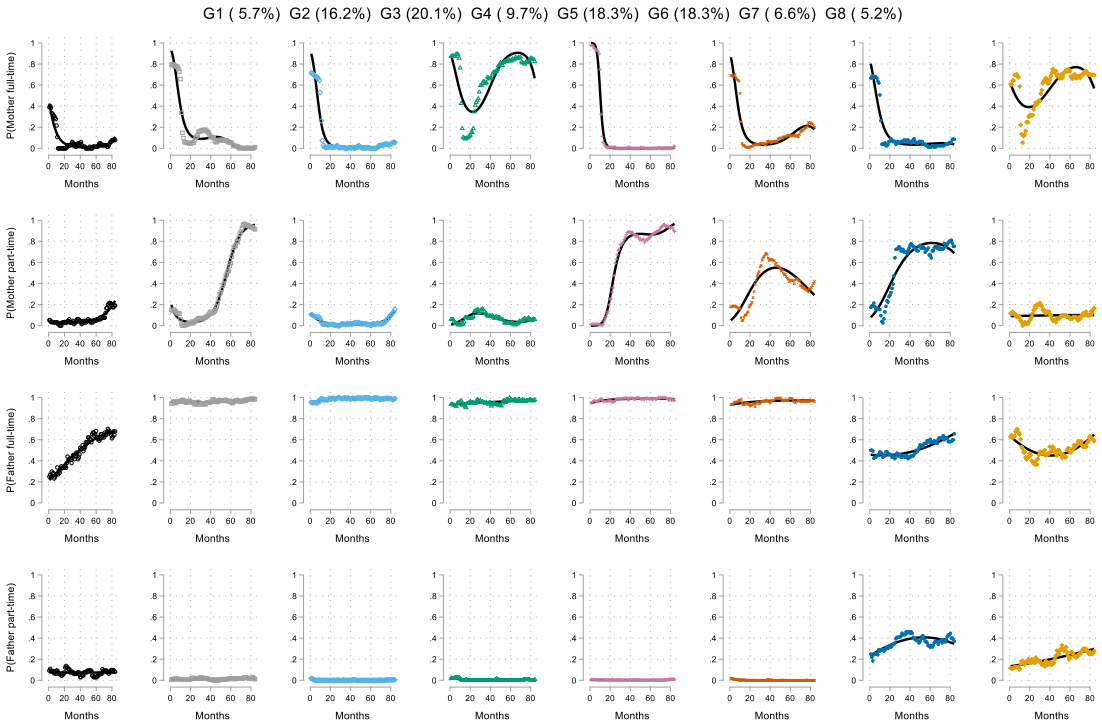

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Figure S.10: 8 group multi trajectory model of parental employment patterns with maximum 12 missing months per parent and using start values from the original model (first births at month 0, 1991-2014, Data: SOEP, N=1153). Probability of the mothers and fathers being full-time and part-time employed during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample. Additional models are available upon request.

Supplementary Section 7: Group based multi-trajectory model with number of children over time

The most important endogenous time varying variable that effects couple's employment trajectories is parity progression: the birth of second, third or even fourth children during the period of observation. This variable could be also included as an outcome variable in multi-trajectory modeling (for example see Schattuck 2022). In my analysis I ran a robustness test with number of children as the fifth outcome in the group-based multi-trajectory model, modelled using zero inflated Poisson distribution. The resulting latent groups are the same if parity progression is included as a fifth outcome in the base model (see Figure S.11). As a result, I chose not to include parity progression as an outcome in the group-based multi-trajectory model. Table S.11. includes row and column percentages of number of children by the final trajectory group described in the main text.

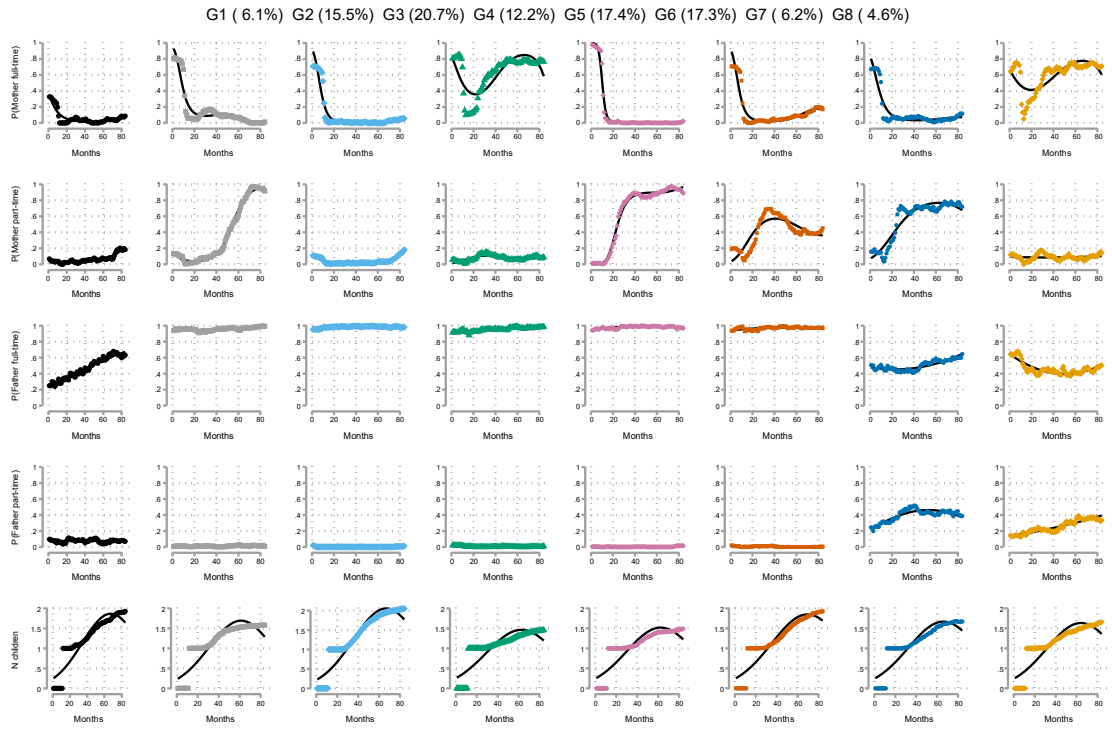

Figure S.11: 8 group multi trajectory model of parental employment patterns and parity progression (first births at month 0, 1991-2014, Data: SOEP, N=1646): Probability of the mothers and fathers being full-time and part-time employed and number of children during 11 months before and 72 months after birth. The black lines are the predicted lines for the different outcomes in each of the groups, the points in colour are the actual averages in the sample.

	Continuous Specialization	Emerging Specialization	Temporary 1.5 worker	Later 1.5 worker	Early 1.5 worker	Dual Full-time	Female Full-time	Dual Part-time	Total
1	17.5 *10.0*	28.7 *5.0*	23.8 *11.2*	42.5 *18.7*	50.3 *25.1*	55.0 *18.1*	42.7 *5*	39.2 *6.9*	**36.0**
2	64.8 *24.4*	48.5 *5.6*	64.8 *20.1*	54.0 *15.6*	46.9 *15.3*	42.4 *9.2*	50.0 *3.9*	51.0 *5.9*	**54.7**
3	15.6 *36.9*	21.8 *15.6*	11.0 *21.3*	3.5 *6.4*	2.8 *5.7*	2.6 *3.5*	7.3 *3.5*	9.8 *7.1*	**8.8**
4	2.1 *77.8*	1.0 *11.1*	0.4 *11.1*	0 *0*	0 *0*	0 *0*	0 *0*	0 *0*	**0.5**
Total	**20.3**	**6.2**	**17.1**	**15.8**	**18.1**	**11.7**	**4.3**	**6.5**	

Table S.11: Total number of children born 6 years after the birth of the first child by multi-trajectory groups (row and column %)

Supplementary Section 8: Extended group based multi trajectory models with additional baseline covariates

Ref: Continuous Specialization	**Emerging Specialization**	**Temporary 1.5 worker**	**Later 1.5 worker**	**Earlier 1.5 worker**	**Dual Full-time**	**Female Full-time**	**Dual Part-time**
Period dummy (in 2007 or later)	0.55	1.26***	0.40	1.59***	1.29***	2.15***	1.96***
	(0.42)	(0.27)	(0.31)	(0.27)	(0.30)	(0.46)	(0.36)
Background dummy (mother from East Germany)	0.61	0.84**	0.99***	0.65*	2.19***	1.56***	0.98***
	(0.37)	(0.27)	(0.29)	(0.29)	(0.23)	(0.30)	(0.27)
Age of mother	-0.15**	0	0.09***	0.11***	0.07**	0.03	-0.01
	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)
Age gap between parents (father older)	-0.18***	0	-0.04	0.02	0.02	-0.05	-0.02
	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)
Education: Neither has tertiary education (ref)							
Only she has tertiary	0.04	0.81	0.7	1.00*	1.61***	1.77***	1.04*
	(0.81)	(0.43)	(0.43)	(0.40)	(0.41)	(0.48)	(0.51)
Only he has tertiary	-0.8	-0.19	-0.72**	-0.62**	-0.54	-1.88*	-0.61
	(0.50)	(0.23)	(0.26)	(0.24)	(0.30)	(0.75)	(0.39)
Both have tertiary	-0.06	0.2	-0.33	-0.21	0.13	0.2	0.79*
	(0.56)	(0.27)	(0.28)	(0.26)	(0.30)	(0.75)	(0.39)
Married before birth	0.04	0.81	0.7	1.00*	1.61***	1.77***	1.04*
	(0.81)	(0.43)	(0.43)	(0.40)	(0.41)	(0.48)	(0.51)
Log income of the household	-0.8	-0.19	-0.72**	-0.62**	-0.54	-1.88*	-0.61
	(0.50)	(0.23)	(0.26)	(0.24)	(0.30)	(0.75)	(0.39)
Mother's income share (0-1)	-0.06	0.2	-0.33	-0.21	0.13	0.2	0.79*
	(0.56)	(0.27)	(0.28)	(0.26)	(0.30)	(0.75)	(0.39)
Constant	5.69	-0.56	-3.03	-3.91	-3.62	-3.18	-1.74
N couples	1070	1070	1070	1070	1070	1070	1070
Standard errors in parentheses							
="* p<0.05	** p<0.01	*** p<0.001"					

Table S.12: Coefficient estimates of the extended Group Based Multi Trajectory Model with baseline covariates, reference Group: Continuous Specialization (dyadic employment trajectories of parents: first births, 1991-2014, Data: SOEP, N=1070)