

Educational Pairings and Couples' Long-Run Joint Earnings Trajectories After First Birth

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This paper analyzes how couples' human capital, captured by the educational pairing of partners, shapes long-term joint earnings trajectories across the transition to parenthood in Austria. Using Group-Based Multi-Trajectory Modeling (Nagin et al. 2018) and longitudinal administrative data, we jointly model mothers' and fathers' typical earnings trajectories alongside parity progression. This dyadic perspective captures the simultaneous development of both parents' earnings, extending prior research that has largely focused on within-couple earnings inequality or mothers' relative income shares, often neglecting absolute income levels. Our dataset includes all first births in Austria between 1990 and 1997 (N=173,750), allowing a comprehensive analysis of within- and between-couple differences in earnings trajectories. After identifying distinct patterns of joint maternal and paternal earnings, we examine how these trajectory patterns relate to the educational pairing of partners. Results show that different breadwinner models are stratified: couples differ in their breadwinner model (dual earner, male breadwinner, female breadwinner, 1.5 earner) and similar breadwinner models can occur at different absolute earnings level. We further demonstrate that this stratification is closely tied to the educational pairing of the parents: Both relative and absolute pre-birth resources in terms of education are associated with parents' joint earnings trajectories. When the mother is more educated, couples have a higher probability of becoming dual earners. In contrast, when the father is more educated, couples are more likely to follow specialized patterns, such as male breadwinner and 1.5 earner model. Couples in which both partners have tertiary education follow less specialized earnings patterns than less-educated homogamous couples. The findings highlight the importance of jointly analyzing partners' earnings over time to better understand how household-level human capital shapes long-term economic outcomes after parenthood.

1. Introduction

The birth of the first child is a key demographic transition that strongly reshapes how couples' human capital translates into earnings. The decision-making process surrounding childcare is typically gendered, both in the short and long term. Women are more likely to interrupt their employment, take extended leave or reduce their working hours after childbirth, often due to lower bargaining power and lower pre-birth earnings, institutional constraints and gender norms that emphasize their comparative advantage in unpaid labor (Wood et al. 2018, Bian et al. 2024). Employment interruptions and the sustained care demand can lead to long-term decreasing effects on mothers' earnings and the relative economic advantage of fathers (Kleven et al. 2019). However, couples differ considerably in their responses to these challenges, particularly from a longitudinal perspective. In this paper, we analyze how mothers' and fathers' earnings trajectories evolve jointly over the long-term using Austrian register data, and how the likelihood of belonging to particular trajectory groups varies by the couple's educational pairing.

Our study extends previous literature in several ways. First, while most studies focus on child penalties (Evertsson 2016, Kleven et al. 2019), motherhood penalties and fatherhood premiums, they take an individual point of view without considering joint parental patterns or decision making. There are couple-level analyses, but these are either cross-sectional (Bianchi, Casper, & Peltola, 1999; Dotti Sani, 2015; Haupt & Strauß, 2022; Stier & Mandel, 2009) or consider only short-term economic consequences of

transitioning to parenthood (Killewald and Garcia-Mangano 2016, Bian et al. 2024). We contribute by following parents for 21 years after first birth, capturing long-term developments in both partners' earnings.

Second, longitudinal dyadic studies linking parental earnings patterns typically focus on either the *relative* division of labor (Fan 2024; Bian et al. 2024), mothers' income share as the sole outcome (Musick et al. 2020; Musick et al. 2022; Steiber et al. 2026), or different couple-level income constellations (Steiber et al. 2024), often overlooking important *absolute* differences between couples. For example, an increase in the mother's earnings share could result from increasing maternal earnings or from decreasing paternal earnings. Likewise, equal shares may reflect two high earners, two low earners, or two middle earners. Similar earnings share also mask differences among different growth curves. By jointly analyzing mothers' and fathers' earnings, we address both *within-couple* and *between-couple* inequalities. Recent work (Dunatchik, 2024; Kapelle et al., 2024) has taken similar steps by identifying joint longitudinal earnings trajectories of couples, but their analyses are aligned with marriage or relationship onset rather than the transition to parenthood. Our approach explicitly anchors trajectories to the timing of the first birth, a key turning point, especially in conservative welfare regimes such as Austria. We also follow mothers' parity progression, since earnings and parity progression are endogenous.

Third, by using large-scale Austrian register data, our study benefits from a balanced sample unaffected by attrition, unlike most panel surveys. Unlike other studies using similar data (Steiber et al. 2026, Kleven et al. 2024), we also include couples with missing earnings due to self-employment or civil service employment during the observation period.

Finally, we focus on the educational pairing of the parental dyad, differentiating not only between four basic types, depending on whether only she, only he, both, or neither has tertiary education, but also finer distinctions. Theoretically, we draw on bargaining perspectives that emphasize *relative* differences in resources within couples (Blood and Wolfe, 1960; Lundberg and Pollak), while also accounting for how *absolute* educational levels shape parents' long-term earnings development (Oppenheimer 1994).

2. Data

We use administrative register data on 173,750 Austrian couples who entered parenthood between 1990 and 1997. The data derive from the *Austrian Social Security Database* (ASSD; Zweimüller et al., 2009), which combines information on all births in Austria with detailed pre- and post-birth earnings records for both parents. The ASSD is a matched employer-employee dataset from Austrian social security records, enriched with information from tax authorities (pay slips) and birth registers.

Annual earnings capture gross wages from employment, excluding transfers such as unemployment benefits or maternity and parental leave benefits. Earnings are measured in 12-month periods centered around the exact date of the first birth (Steiber et al., 2024b), adjusted for inflation using the Consumer Price Index (base year 2015), and top-coded to account for high-income outliers. Zero earnings are retained to reflect employment interruptions. We follow parents for up to 21 years after the birth of their first child, until 2017 or earlier depending on the birth year. The sample is restricted to parents aged 20-40 at the time of first birth to ensure they are of working age throughout the observation window. We exclude couples in which one partner dies, retires, or emigrates for longer duration than 5 years during the observation period.

3. Analytical strategy

We identify latent groups of joint maternal and paternal earnings trajectories using Group-Based Multi-Trajectory Modeling (GBMTM) (Nagin et al. 2018). GBMTM is a finite mixture model and is designed to explicitly model multiple typical trajectories across a large population. It is 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. Each trajectory is summarized by a polynomial function of time, and group membership is estimated probabilistically rather than deterministically (Nagin, 2006; Nagin et al., 2018).

By modeling mothers' and fathers' earnings jointly, we make full use of the dyadic nature of the data. In cases where earnings are missing for one partner (e.g., due to self-employment or civil service), information on the other partner and parity progression still contribute to the estimation. Missing data are assumed to be missing at random. We also explore if imputing missing earnings provide similar results.

3.1. Outcome variables

We model three dependent variables over 21 years: (1) mother's annual earnings (2) father's annual earnings (3) and the number of children born to the mother. The first two outcomes are modelled with censored normal distribution and parity progression with a Poisson distribution. Model selection follows the procedures outlined in Nagin (2006, 2018) and van der Nest et al. (2020). We first estimate separate group-based trajectory models for each outcome with one to eight groups, comparing models based on the Bayesian Information Criterion (BIC), other fit statistics (Nagin, 2006; Klijn et al., 2015), and parsimony. We then estimate the joint multi-trajectory model, again testing different group numbers before selecting the final specification. All analyses are conducted in Stata using the *traj* plugin (Jones & Nagin, 2013). After model selection, we visualize the joint trajectories (Figure 1) and present complementary visualizations showing pre-birth earnings, absolute earnings levels of the parents, and mothers' earnings shares (Figure 2). Finally, we estimate multinomial logistic regressions to examine how couples' educational pairing predict membership in distinct long-term dyadic trajectory groups by also taking into account classification error of the estimation strategy (Bolck, Croon & Hagenars 2004; Vermunt 2010; Bakk et al. 2013, Helske et al. 2024).

1. Preliminary results

After a model selection process based on Bayesian information criteria (BIC) and other model adequacy and parsimony measures, we identify seven distinct parental earnings trajectory groups (Figures 1 and 2). Across all couple types, the employment interruption of mothers around first birth is clearly visible: most mothers' earnings drop to zero in the first 12 months after birth (year 0). However, the subsequent earnings recovery and the mothers' share of the couple's joint earnings differ substantially between the trajectory groups, indicating considerable heterogeneity in post-birth economic arrangements.

Two of the groups can be characterized as *male breadwinner* types: the **mid-income male breadwinner group**, comprising 16.0% of couples, and the **high-income male breadwinner group**, comprising 12%. In both groups, mothers contribute only a small share of total couple earnings after birth, indicating a strong traditional specialization, but the two groups differ considerably in the couples' overall earnings level and in fathers' earnings' growth curves. In the high-income male breadwinner group, fathers' earnings are substantially higher and continue to grow more strongly, whereas the mid-income male breadwinner group is marked by lower absolute earnings and a more moderate earnings profile.

The largest group are *one-and a half earner couples* (32.8%), who range at a medium earnings level. This group captures a very common post-birth earnings arrangement within Austrian couples in which fathers remain the main earners, while mothers gradually return to paid employment and contribute a secondary share of household earnings, typically from part-time employment.

We also identify several types *dual-earner couples*, that differ by couples' joint earnings level and by the relative earnings position of mothers and fathers: The **high-income male dominant dual earner** (12.8%) combines relatively high joint earnings with a persistent earnings advantage for fathers; the **high-income dual earner group** (5.8%) is characterized by high earnings for both parents and a more balanced contribution of mothers and fathers; and the **mid-income female dominant dual earner group** (12.8%) stands out because mothers become the stronger earners within the couple after the initial post-birth interruption, although the overall earnings level remains lower than in the high-income dual-earner groups.

Lastly, we identify a **low-income female breadwinner group** (7.8%), which differs from the female-dominant dual-earner group not only in the relative earnings position of mothers but also in its lower overall earnings level. The trajectory suggests that female breadwinning does not necessarily reflect economic advantage; rather, in this group it is associated with weak paternal earnings and comparatively constrained household resources.

Taken together, the trajectories show that similar maternal earnings shares can correspond to very different levels of maternal employment and household economic positions. This is particularly visible when comparing the two male breadwinner groups: in both, mothers contribute only a small share of total couple earnings, yet mothers' absolute earnings much lower in the mid-income male breadwinner group than in the high-income male breadwinner group, while father's earnings also differ. A similar point applies across the dual-earner groups. The low-income female breadwinner group further illustrates why maternal earnings shares should not be interpreted as a direct indicator of maternal employment strength or economic advantage. In this group, mothers account for a high share of couple earnings, but this occurs in the context of low absolute maternal earnings and very low paternal earnings.

To understand which couples are most likely to follow distinct long-term earnings trajectories, we estimate multinomial logistic regressions. Figure 3 presents average predicted probabilities of multi-trajectory membership by couples' educational pairings controlled for age of the mother and age difference between the parents. Results show that when the mother is more educated than the father (only she has tertiary education or she has higher non-tertiary education), couples have a higher probability of becoming high-income dual earners and mid-income female dominant dual earner. In contrast, when the father is more educated than the mother (only he has tertiary education or he has higher non-tertiary education), couples are more likely to select into the two male-breadwinner patterns. Tertiary-educated couples tend to follow less specialized earnings patterns than other homogamous couples.

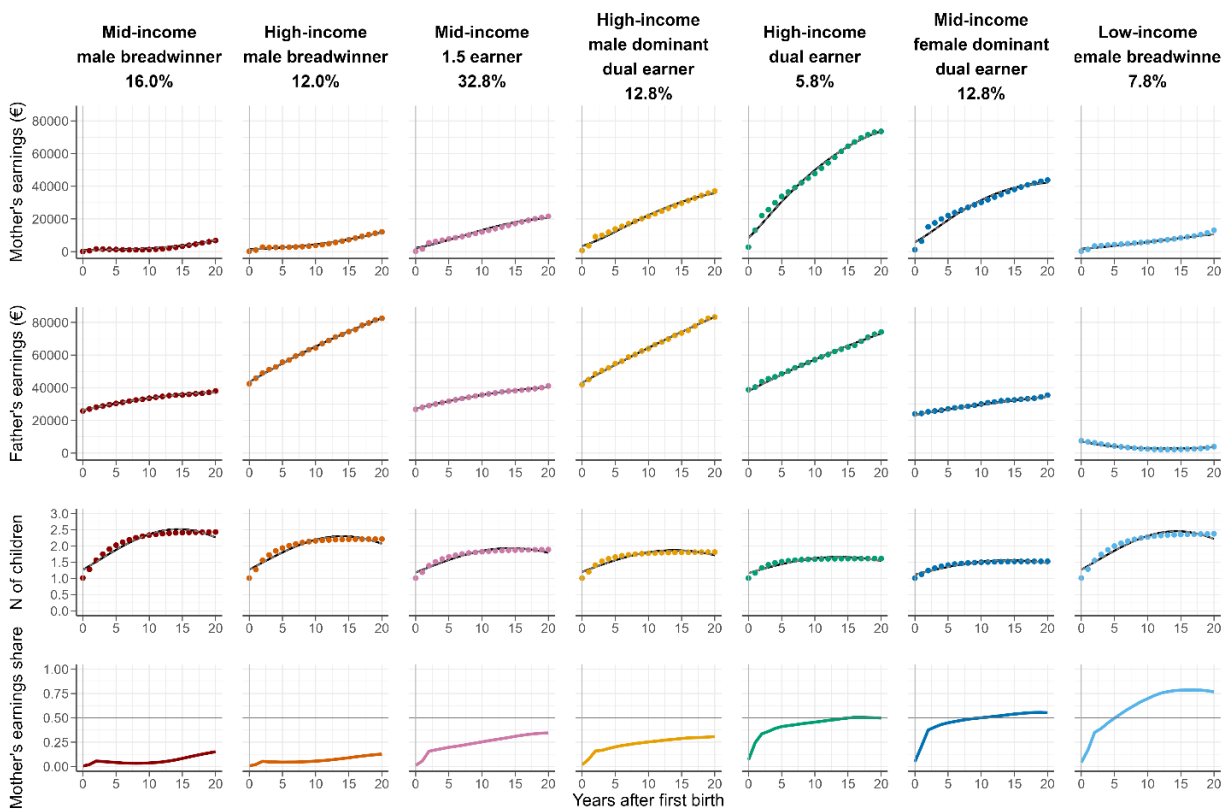


Figure 1: Couple types based on the group-based multi-trajectory model of mothers' and fathers' earnings and parity progression, N=173750 (Notes: Year 0: the first 12 months after first birth, 1990-1997, Data: ASSD. The black lines are the predicted lines for the different outcomes in each group, the points in colour are the actual averages in the sample. Mother's earnings share is calculated by groups after the final multi-trajectory model is estimated.



Figure 2: Parents' average earnings, parity and mother's earnings share by multi trajectory groups, N=173750
 (Notes: Year 0: the first 12 months after first birth, 1990-1997, Data: ASSD)

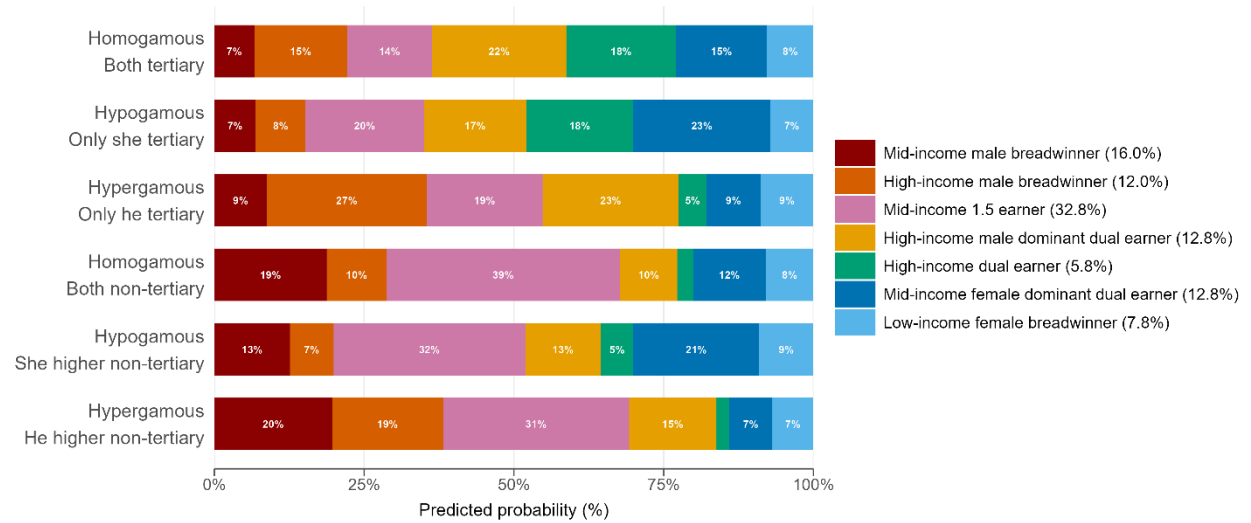


Figure 3: Predicted probabilities of multi-trajectory membership by couple's education, N=173750. Controls: Age of the mother, age difference of the parents, year of birth

Overall, the findings highlight the importance of examining relative and absolute earnings trajectories jointly. Maternal earnings shares capture within-couple economic specialization, but they can mask substantial differences in mothers' actual earnings levels, fathers' earnings levels, and total family resources. The long observation window is substantively important because several trajectories do not stabilize within the first decade after first birth. While the first 10 years capture the employment interruption around childbirth and the initial recovery of mothers' earnings, the second decade reveals continued divergence between groups (earnings inequality between families). Restricting the analysis to 10 years would miss part of the longer-term socioeconomic stratification