

Assortative mating and heterogeneity in the magnitude of the child penalty

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1 Introduction

Upon entry into parenthood, mothers' labour income tends to sharply drop without full recovery to pre-birth levels, while fathers' income is hardly affected. This *child penalty* is among the main drivers of the gender income gap (Cukrowska-Torzewska and Lovasz, 2020). The seminal research by Kleven, Landais, and Sogaard, 2019 established a methodology to study the dynamics of the child penalty after the birth of the first child and to estimate the long-term income penalty for mothers relative to fathers. The 'Kleven approach' is based on an event study design that exploits the sharp change in labour market outcomes after childbirth for mothers relative to fathers for a causal estimate of the child penalty. Evidence on differences in the magnitude of the child penalty across socioeconomic strata and types of couples is scarce. Kleven et al., 2021 assume null effects of parenthood on fathers' income — arguing that fatherhood premiums found in prior research are mere selection effects — and homogeneous effects on mothers regardless of their education.

This paper contributes to the literature on the *within-couple earnings gap* and how this couple inequality evolves upon entry into parenthood. Its core aim is to investigate heterogeneity in the magnitude of child penalties, and by that, to improve our understanding of the social mechanisms that cause child penalties. We take a couple-perspective and investigate the implications of assortative mating, and in particular of couple constellations, where the woman is higher educated than the man (*hypogamy*), on child penalties. This is important against the backdrop of the reversal of the gender gap in education, which has caused a rise in hypogamy at the expense of hypergamous couples, where the man is the higher-educated partner (Esteve et al., 2012). Recent research on the gender division of labour (Van Bavel, 2012) and income inequality (Qian, 2017; Van Bavel and Klesment, 2017) in educationally hypogamous couples shows that women in such unions are more likely to be the main household breadwinners and enjoy a more equitable division of domestic work than comparable women in homogamous couples (García Román, 2021; Miller, 2020). Yet, these effects are relative, i.e. in all couple types, gender inequalities persist. In educationally hypogamous couples, the man usually continues to out-earn the woman (Chudnovskaya and Kashyap, 2020; England, 2010; Qian, 2017) and carries out less unpaid work (García Román, 2021). Some studies have explored if the size of the child penalty varies according to the relative education or the relative earnings potential of the female within the household, with mixed findings: While Angelov et al., 2016 and Artmann et al., 2022 find smaller penalties for hypogamous couples, Kleven et al., 2021 do not find females' relative earnings potential prior to first birth to affect the penalty's size.

2 Theory and Hypotheses

Hypotheses about the impact of the educational *level* on the child penalty draw on classic income effect and opportunity cost theories (Steiber et al., 2016), while *hypogamy* effect hypotheses are based on bargaining models: The classic power rule suggests that women in hypogamous unions are more likely to achieve an egalitarian division of labour (Evertsson and Neramo, 2007) and will therefore face a smaller penalty (Artmann et al., 2022). The same behavioural outcome may result from economic constraints: When their lower qualified partners are unable to secure a family wage, women in hypogamous unions need to remain family breadwinners upon the arrival of children, leading to a smaller penalty (Steiber et al., 2016). Likewise, later family formation—assumed for hypogamous couples—may result in smaller penalties, given that later entry into parenthood makes women less vulnerable to motherhood career penalties (Taniguchi, 1999). The competing

hypothesis suggests that traditional gender norms cause couples to feel at unease when the woman earns more than the man, with behavioural consequences that result in larger wage penalties for the woman (Bertrand et al., 2015; Bittman et al., 2003).

3 Data and Methods

We use data from the Austrian Social Security Data Set (Zweimüller et al. 2009) that includes the universe of all first births that occurred in Austria in the period 1990-2007 and information on the parents’ age, education, marital status, and earnings trajectory from social security records, the public employment office, the birth register, and tax files. We focus on first births to mothers aged 18-45 and fathers aged 20 and older. The sample amounts to about 654,000 births. The education of the parents is recorded in four levels: 1-compulsory education or less, 2-apprenticeship training or vocational school, 3-high-school diploma, and 4-completion of tertiary education. Since education is less well recorded in the data for individuals with migrant background, we focus on native women and their partners. Pairing the attainment levels of the partners, we distinguish between homogamous couples (60%), hypergamous couples (19%), and hypogamous couples (21%).

We base our estimation sample on the exact birth date of the first child and organise our sample using 12-months periods before and after the birth to define event times, i.e. for a couple entering parenthood on June 1, 2000, event time t_{-1} starts on June 1, 1999 and ends May, 31, 2000. In the follow-up period, t_i denotes the 12-months period in which the child is age $i < i + 1$. For each of the event times t_{-5} to t_{10} , i.e. each 12-months period, we calculate the man’s and the woman’s pre-tax annual earnings (coded as zero in case of non-employment).¹

The classic ‘Kleven approach’ exploits variation in the timing of birth in a sample of couples who enter parenthood, rather than comparing parents with non-parents, thus avoiding endogeneity issues with respect to fertility. First, we replicate findings by Kleven, Landais, Posch, et al., 2019 on the average long-term child penalty in Austria of around 51%. Second, using the same event study approach for a stratified sample, we look at differences in the magnitude of the child penalty across educational pairings. Following the Kleven approach, the mother and father’s annual incomes are separately regressed on event time dummies, year dummies (control for business cycle), and age dummies (control for life-cycle trends), omitting the event time dummy relating to t_{-2} , which corresponds to period between 24 and 12 months prior to the birth. Third, taking a more sociological approach, we use an adapted Kleven approach that uses data on *actual* couples—with the woman’s share of couples’ joint income as the dependent variable—instead of running separate regressions for women and men (Musick et al., 2020). Fourth, we run OLS models with the woman’s share of couples’ joint income at t_{10} compared to t_{-2} as the dependent variable to more flexibly explore the determinants of the magnitude of the child penalty. Covariates include partners’ relative education (16 pairings), the year of birth, the woman’s age at first birth, the couples’ marital status, and the region (94 districts). In a second model, we additionally control for the occurrence of another birth until t_{10} . Last, we apply diagonal reference models (Kaiser, 2018) to disentangle the level effects of partners’ status from status-dissimilarity effects on the child penalty.

4 Results

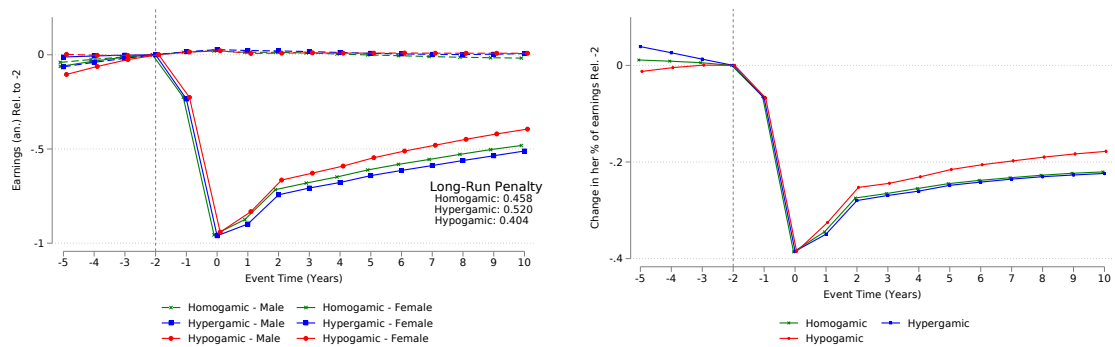
Estimating the ‘average’ gender-specific impacts of children at event times t_i relative to t_{-2} , controlled for age and time trends, using the Kleven approach, we see that, while the partners’ earnings evolve in similar fashion until parenthood, at the moment the first child arrives, the earnings paths diverge: Mothers face an immediate drop of earnings at t_0 and their gross earnings are still close to 50% lower at t_{10} compared to t_{-2} , whereas the earnings of fathers remain at the pre-birth level. The estimated ‘Kleven child penalty’ in the earnings of women relative to men is 42% after 10 years.² Based on a sample stratified by women’s education, we find that the Kleven penalty is smaller among more educated women (about 34% among tertiary educated women compared to 80% among women with only compulsory education, not shown). **Figure 1a** plots the Kleven penalty by partners’ relative education, showing that women in hypogamous couples face the

¹Earnings include wage incomes but not public transfers like unemployment or maternity leave benefits. Earnings are censored at the social security ceiling, which we correct, using the method proposed by Kleven (2020).

²Kleven et al.’s 2019 estimate of 51% for Austria refers to the average penalty between t_5 and t_{10} . While Kleven uses the year of birth as t_0 , we construct our event study around the actual day of birth and use 12-months periods instead of calendar years to define event times. Moreover, we exclude the migrant population.

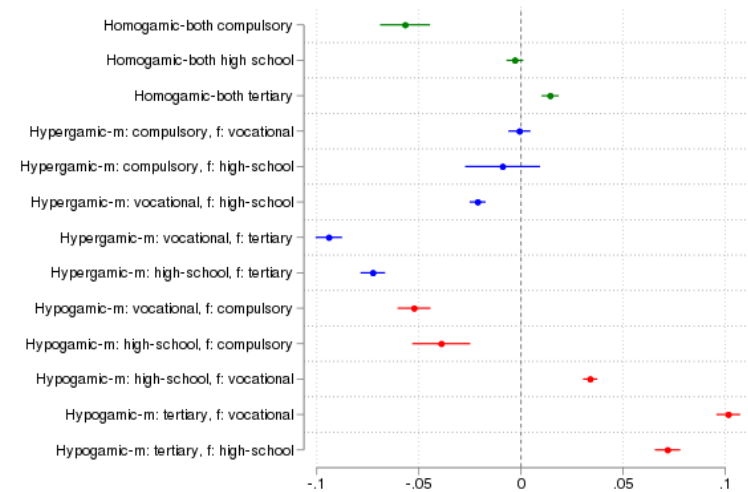
smallest penalty (40% at t_{10} compared to 46% among homogamous and 52% among hypergamous couples). **Figure 1b** shows the same analysis, but using the couple-level approach in the event study proposed by Musick et al., 2020. It shows that in educationally homogamous couples, the female’s share of the couples’ joint earnings is about 20%-points smaller at t_{10} compared to t_{-2} . This child penalty in females’ relative earnings is shown to be smaller - by about 5%-points - among hypogamous compared to homogamous couples. **Figure 1c** plots the results from a linear model that regresses the drop in the female’s share of the joint earnings between t_{-2} and t_{10} (the penalty in relative earnings) on 14 educational pairings³ and controls. Except for the small group of dual low-educated couples (<1% of couples), we find relatively small differences in the magnitude of the child penalty comparing homogamous couples at different levels of education (reference group: dual medium-educated couples). But, we find substantial differences between homogamous and different types of heterogamous couples: In hypergamous couples, women tend to face larger penalties, especially when the father is tertiary educated. In most hypogamous couples, women face smaller penalties compared to the reference group, especially when the woman is tertiary educated. However, women in hypogamous couples with low educated partners do not fit into this pattern. Their earnings share in the couple tends to shrink more strongly, which is shown to be due to a fatherhood earnings premium. In sum, we show that and discuss why the sociological approach of using partners’ relative income in actual couples rather than comparing women’s with men’s average trajectories (Kleven) may be preferable when studying child penalties in different groups. Moreover, the analyses show that hyper- and hypogamous couples need to be studied in detail (heterogeneity) and cannot be treated as homogeneous couple types.

Figure 1: Child penalties - heterogeneous effects of childbearing across couple types



(a) Kleven et al. child penalty

(b) Musick et al. child penalty



(c) Linear model of child penalties in female relative earnings at t_{10}

³From the 16 educational pairings based on 4 educational groups, we exclude those that involve one partner with compulsory education and one with tertiary education, shares of all couples in these two groups are <0.1%.

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