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The Wished-For Children: Do Mothers Carry the Burden While Fathers Reap the Joy?

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ABSTRACT

The Wished-For Children: Do Mothers Carry the Burden While Fathers Reap the Joy?*

We assess the gendered effects of having children on well-being, careers, and the division of domestic work. As exogenous variation in parenthood, we exploit the quasi-random success of in-vitro fertilisation (IVF) treatments. Children increase mothers' well-being only in the short term, while fathers experience longer-lasting gains. However, only mothers show a persistent decline in labor supply and a rise in domestic work. Their satisfaction with the division of work declines, and they are more likely to perceive it as unfair, implying that the new equilibrium deviates from mothers' preferences.

JEL Classification: I31, J13, J16, J22

Keywords: parenthood, well-being, gender inequality, IVF treatment, child penalty

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1. Introduction

The decision to become a parent has broad consequences for people's lives. Children are the primary explanation for gender gaps in the labor market observed in many countries (e.g., Cortés and Pan 2023, Kleven et al. 2023). Outside the labor market, children affect home production and the intra-household allocation of time, generally increasing the traditional housework gender gap (Altintas and Sullivan, 2016, de la Vega, 2022, Koopmans et al., 2024). However, how these child-related changes in market and non-market outcomes affect individual welfare and whether they translate into systematic gender differences remains debated, although they can be crucial for a better understanding of declining birth numbers in ageing societies (e.g., Bhattacharjee et al., 2024).

In the present study, we assess the gendered effects of parenthood on a broad set of market and non-market outcomes, following the quasi-random success of in-vitro fertilisation (IVF) treatments. We use data from the German Family Demography Panel Study (FReDA) that includes information regarding applied fertility treatments. Conditional on having applied fertility treatment, we compare the outcomes of those with biological children to those without. Thus, individuals who have a strong preference for children but whose fertility treatments were not successful serve as our control group. We assess the welfare consequences of planned parenthood by using subjective well-being as a proxy measure for individual welfare in combination with different measures regarding involvement in professional and domestic work. These measures allow us to study how the allocation of work changes with parenthood and the extent to which these changes are perceived as fair or not.

Assessing the causal effects of parenthood on well-being is challenging, as it is obviously not possible to assign parenthood randomly. Parenthood and its timing are endogenous to various factors such as individual and societal norms, changes in income, health, marital status, and well-being itself, as happier couples are more likely to choose to become parents (Parr, 2010, Le Moglie et al., 2015, Aassve et al., 2016, Cetre et al., 2016). Even in panel data analyses and event study designs tracing the evolution of outcomes before and after childbirth, some of the time-varying characteristics that determine the decision (when) to become parents are usually not observed, such as career aspirations, partner stability, or sexual activity. This aligns with the challenge in event studies to define a clean baseline or reference period. As the birth of a first child is typically corre-

lated with other life circumstances (e.g., stability of partnership), the reference years in estimates with individual fixed effects might be confounded with time-varying characteristics (e.g., Krämer et al. 2023 for evidence on observable confounders around the birth of a child or Bensnes et al. 2023 on biases arising from selection in the timing of the birth). In addition, the previous literature is generally not able to differentiate between intended and unintended births, masking (unobserved) heterogeneity with different implications regarding the welfare effects of having children.

Using IVF treatments as a source of exogenous variation in being parents is inspired by Lundborg et al. (2017, 2024)[1] and brings new advantages over empirical strategies that were previously applied to address endogeneity of parenthood. Conditioning our sample on having applied a fertility treatment, and relying on the exogenous variation created by IVF treatment success, our treatment and control group are much more comparable with regard to the potentially endogenous aspects, such as the desired timing and preferences for children.[2] By focusing on those who undergo IVF treatments, we are looking at a population where everyone has shown a clear intention to have a child.

Our findings highlight an unequal distribution of the welfare effects of parenthood between men and women. In our analyses, we find that having children initially has a positive, but short-lived effect on women's life satisfaction in the first year after childbirth. Men experience a longer-lasting and overall significantly stronger positive effect on their life satisfaction. In line with previous literature, we find that women experience significant reductions in working hours and full-time employment that persist throughout the first 12 years of children's lives. This is in stark contrast to men, whose labor market outcomes are barely affected. Gender disparities also increase in men's and women's contributions to domestic work. With parenthood, the share of women who are mainly responsible for

[1]Based on IVF register data, Lundborg et al. (2017, 2024) use IVF treatment success of the first treatment as an instrument to estimate the effects of having children on labor supply and earnings in Denmark. As our data does not provide information on the treatment sequences, we cannot replicate the instrumental variable approach. We discuss and address remaining concerns regarding the selection of couples into treatment success empirically in Sections 4.3 and 5.2.

[2]While perceived infertility and IVF treatments with potential side effects of the medical procedures tend to have their own negative impact on well-being (see, e.g., Greil et al., 2011, Ying et al., 2016, McQuillan et al., 2022, Bögl et al., 2024), such effects should be similar across our treatment and control groups – even if such effects differ between men and women – and are thus controlled for by our design. However, we are not able to isolate potential disappointment from not having children, which might be particularly relevant for those who went through fertility treatments (see, e.g., Gameiro and Finnigan, 2017, for a systematic review and meta-analysis). But one could debate whether this biases our results upwards or if it should be considered part of the effect.

household chores significantly increases. To better understand the welfare implications of the new division of market and non-market work, we study individuals' satisfaction with the division of domestic and professional work, their perceived fairness, partnership conflicts and satisfaction with their partnership. After the arrival of children, women are less satisfied with the division of domestic and professional work and are more likely to perceive the new division of work as unfair. This result suggests that the housework gender gap is bigger than an efficient allocation based on differences in preferences would suggest. Lastly, with the arrival of children, conflicts about housework increase and satisfaction with the relationship declines. Overall, our findings suggest that women bear a burden in the adjustments to parenthood in both domestic and market work, while the gains in well-being primarily accrue to men.

Focusing on couples who underwent IVF allows us to examine the effects of parenthood among those who actively desired children. However, as the parents in the IVF sample went through an emotionally and financially stressful path to have the desired child, it could be that this group also derives relatively high levels of satisfaction from children. In this case, the effects on well-being would be upper-bound estimates for the effects of children. This would also be the implication if those who persistently continue treatments until a successful outcome are a selection of people who expect particularly high well-being from children. Similarly if IVF treatment success is endogenous to positive behavioral changes such as adopting a healthier diet, quitting smoking, reducing alcohol consumption, or engaging in regular exercise. In the light of these arguments, it is even more surprising that we do not find well-being gains in the long run for mothers.

The remainder of this paper is structured as follows: Section 2 summarises the literature on the consequences of parenthood for well-being, labor market outcomes and domestic work, highlighting our main contributions therein. Section 3 describes the general institutional context in which we estimate the effects of children, and we provide background information on IVF treatments in Germany. Section 4 introduces the data and the empirical strategy. Section 5 describes the results and Section 6 discusses our findings and concludes.

2. Previous Literature and Contributions

2.1. Parenthood and Well-Being

There is already a large body of literature about the question of whether children increase or decrease well-being.[3] However, establishing causality in answering this question remains particularly difficult. Accordingly, the question has not been resolved, and results range from positive to negative changes (Arpino and Aassve, 2013, Cetre et al., 2016, Herbst and Ifcher, 2016, Kohler and Mencarini, 2016, Preisner et al., 2018, Nomaguchi and Milkie, 2020).

Studies that rely on cross-sectional and pooled analyses where the control group for parents is represented by childless adults come to mixed conclusions, but most of them report null to negative effects, which tend to be less negative for fathers compared to mothers (Margolis and Myrskylä, 2011, Aassve et al., 2012, Stanca, 2012, Vanassche et al., 2013, Deaton and Stone, 2014, Blanchflower and Clark, 2021). However, when looking at longitudinal evidence in which the childless past serves as the comparison period in fixed effects approaches, the relationship between having children and well-being ranges from neutral to positive (Angeles, 2010, Baranowska-Rataj et al., 2014, Pollmann-Schult, 2014). Particularly, studies that apply event study designs show pronounced positive effects in the years around the birth of the first child, with no clear effects for the years thereafter, indicating that parents adapt to their new situation (Frijters et al., 2011, Clark and Georgellis, 2013, Myrskylä and Margolis, 2014, Mikucka and Rizzi, 2020, Metzger and Gracia, 2023). While the differences in the effects for mothers and fathers are not pronounced, these studies tend to find stronger positive short-term effects for mothers and stronger satisfaction gains for parents with a higher age at first birth.

[3]For an overview of the general application of subjective well-being measures, see, e.g., Kahneman and Krueger (2006), Dolan et al. (2008), Odermatt and Stutzer (2018), or Benjamin et al. (2023). There is a recent critical discussion in the literature regarding the validity of subjective well-being measures. For example, Bond and Lang (2019) highlight the challenges in using and interpreting subjective ordinal scales, noting the need to assume a linear relationship between reported and actual well-being. However, Kaiser and Oswald (2022) highlight the validity of well-being measures by demonstrating that a single integer for feelings predicts outcomes better than combined economic and social variables. Additionally, there is an inverse relationship between feelings integers and subsequent actions (like changing neighbourhoods, partners, jobs, and hospital visits). This feelings-to-actions relationship is generic, replicable, and almost linear, suggesting effective operationalisation of an integer scale for feelings despite the absence of a true inner scale. For a further discussion of cardinal use of ordinal scales and evidence which suggests approximately linear scale use, at least for 0–10 response scales, see Bloem (2022) or Kaiser and Vendrik (2023).

Some studies have extended the longitudinal analysis by using matching estimates, which involve including groups of individuals with very similar socioeconomic characteristics and family orientations before having children. Based on the matching approach, Baetschmann et al. (2016) find sustained well-being gains for mothers in Germany and Balbo and Arpino (2016) find positive effects of parenthood in the UK, especially for males. However, recent evidence on mental health and antidepressant prescriptions suggests negative effects of parenthood on mental health, particularly for mothers compared to fathers (Ahammer et al., 2023), and these effects accumulate in the long-term (Dehos et al., 2024). Evidence based on exogenous variation of having children, as created by IVF treatments, is so far lacking and extends this broad literature by a new approach.[4] Importantly, having applied IVF treatments expresses a clear intention to become parents and helps reduce unobserved heterogeneity in the preference for children. Previous literature has not been able to differentiate between intended and unintended births.

There might be different channels for negative effects related to parenthood that may counterbalance some of the positive aspects of having children. One prevalent finding is that parents experience higher levels of stress and anxiety (Deaton and Stone, 2014, Buddelmeyer et al., 2018), reduced sleep (Costa-Font and Flèche, 2020), increased conflict and reduced relationship satisfaction (Twenge et al., 2003, Huss and Pollmann-Schult, 2020, Aassve et al., 2021), and suffer from an increase in financial burden (Cáceres-Delpiano and Simonsen, 2012, Stanca, 2012, Le Moglie et al., 2019, Blanchflower and Clark, 2021). Moreover, some of the positive effects are mediated by the switch of mothers into part-time employment (Keldenich, 2022), and moderated by social relationships (Glass et al., 2016) or the institutional level of support after birth (Bütikofer et al., 2021, Nordenmark, 2021, Chuard, 2023). When looking at the well-being effects of parenthood, it is thus crucial to also consider different dimensions and potential channels, and how they potentially differ for mothers and fathers. We will focus on the multifaceted consequences of parenthood in the labor market, as well as on the division of domestic work along with

[4]There are very few studies that exploit exogenous variation at the intensive margin of parenthood. Priebe (2020) applies a same-sex instrument, i.e., the gender mix of existing children as an instrument for having a third child to capture the causal effects of fertility on well-being at the intensive margin (an additional child) in developing countries. While OLS estimates suggest a negative link, IV estimates indicate positive effects of a third child. Exceptions at the extensive margin are Ugur (2020) and Milovanska-Farrington and Farrington (2021) who exploit time and country-level variation in family policies as instruments for having children. They also find positive effects.

the corresponding domain satisfaction and perceived fairness.

2.2. Parenthood and labor Market Outcomes

In the economics literature, most of the papers that look at the effects of parenthood focus on the labor market consequences of having children. This literature is constantly growing, and the mentioned papers serve as examples for this much broader literature. What stands out is that this literature is now mainly based on event study designs (see, e.g., Angelov et al. 2016, Kleven et al. 2019b, Bergsvik et al. 2020, de la Vega 2022 or Andresen and Nix 2022). All papers find much larger child penalties for mothers compared to fathers, an effect that explains more than two thirds of the overall gender pay gap (Cortés and Pan 2023). Evidence based on quasi-experimental approaches is very rare, however.

Those that employ quasi-experimental approaches were mostly bound to identify effects on the intensive margin of having *another* child. Prominent examples are studies exploiting same-sex instruments (e.g. Angrist and Evans, 1998, Maurin and Moschion, 2009), and twin births (e.g. Farbmacher et al., 2018). Exceptions for studies at the extensive margin of having children are Lundborg et al. (2017, 2024). They use quasi-experimental variation in fertility after in-vitro fertilisation (IVF) treatment to address endogeneity in the decision and timing of children. In particular, based on IVF register data providing information on IVF treatments, they apply the success of the first treatment as an instrument to estimate the effects of having children on labor supply and earnings in Denmark. They also find large negative effects of children on earnings but only in the first 10 years after the first birth. However, based on this approach, no subjective outcomes have been analyzed, which are important to assess the welfare implications of having children. Bensnes et al. (2023) compare and combine an instrumental variable approach based on IVF treatments with an event study design for Norway. They find a long-term impact of children on the earnings gap between mothers and their partners amounting to 15 %. They argue, however, that with an event study design the decline in mothers' earnings tends to be overestimated because women time fertility as their earnings profile flattens. [5]

[5] Adda et al. (2017) take an alternative approach to quasi-experimental designs and event studies. They build a structural dynamic life cycle model to estimate the consequences of the endogenous fertility decision.

2.3. Parenthood and the Division of Housework

Lastly, aside from changes in labor market outcomes, parenthood might also affect home production and thus intra-household time allocation. Given that the amount of housework rises with family size, the question arises as to how the housework is allocated across fathers and mothers. In an event study design for Denmark, Koopmans et al. (2024) find an increase in home production for mothers roughly similar to the decline in paid work. This suggests that women do not substitute paid work for leisure after the arrival of children, consequently increasing the traditionally documented housework gender gap (Altintas and Sullivan, 2016). This might be the result of an efficient allocation, suggested by collective models of household behavior, which assume that household members differ in their preferences and comparative advantage, and take Pareto-efficient decisions that result from an intra-household bargaining process (Chiappori, 1992, Blundell et al., 2005, Cherchye et al., 2012).

However, there is evidence that women do more housework at every percentile of the relative wage distribution, suggesting that comparative advantage cannot be the main driver of the housework gender gap (Siminski and Yetsenga, 2022, Ciasullo and Uccioli, 2024, Hancock et al., 2025). This has also been observed with respect to parenthood, as mother's long-term increase in housework is independent of income and pre-birth resources (Kühhirt, 2012, de la Vega, 2022). Moreover, the literature documents that the gender housework gap remains as children grow (Craig and Sawrikar, 2009) and even persists in institutional contexts with very supportive work–family policies (Zoch and Heyne, 2023). Jessen (2022) also finds that not within-household optimisation but socialisation is a main driver of the higher female share of housework and child care. Importantly, there is evidence that this housework gender inequality is greater than an efficient allocation would suggest. Flèche et al. (2018, 2020) show that women's stronger involvement in household chores is so pronounced that it is not perceived as fair and results in lower levels of women's well-being. This effect is over and above the fact that unequal divisions of household labor are often regarded as fair up until a certain point (Braun et al., 2008). Research thereby shows that for people's well-being, not the actual division of household labor is decisive, but rather the perceived fairness of the division (Koster et al., 2022). However, previous studies were not able to show the extent to which the housework gender gap increases as a consequence of parenthood and

how fair the change is perceived. Thus, measures for the perceived fairness of the work arrangements can reveal how the burden of having children is allocated across mothers and fathers. It can also be considered an empirical test for the underlying bargaining power within couples in the transition to parenthood.

3. Background

In this section, we first provide the institutional context in which we examine the effects of having children. Then, we will provide details on the procedures of IVF treatment and how they create arguably exogenous variation in having biological children.

3.1. Institutional Context

As of 2016, 70.8 % of women aged 15 to 65 in Germany were participating in the labor force, ranking the country third within the European Union. However, maternal labor force participation is only slightly above the European average (OECD, 2019). In 2015, approximately 63 % of mothers with children aged between three and five were part of the labor force, of which only 30 % worked full-time. Paternal labor supply remains consistently high, with most fathers working full-time.

Germany has implemented intensive policies over the past two decades to support mothers in the labor market, moving towards the family-friendly policies of the Nordic countries. The most significant policy instruments include paid and job-protected leave and publicly subsidised child care.

All expecting mothers are entitled to paid maternity leave, which lasts from six weeks before the expected delivery date to eight weeks after childbirth. During this period, mothers receive full replacement of net earnings and are not allowed to work after childbirth. After maternity leave, parents can claim job-protected parental leave (*Elternzeit*) for a maximum of 36 months. Within this period, parents can claim a total of 14 months of publicly funded parental leave benefits (*Elterngeld*), paid to either parent for a duration of two to twelve months. For children born from 2007 onwards, these benefits replace approximately two-thirds of the average net labor income, with a cap of 1,800 euro per month.

In terms of child care policies, parents are entitled to publicly subsidised child care starting from the age of one. Enrollment in daycare is almost universal for children

above the age of three. Below the age of three, the proportion of children in daycare has significantly increased, particularly in West Germany, from about 15 % in 2005 to approximately 29.4 % in 2018 (Destatis, 2020). However, especially for children below the age of three, the number of available daycare slots falls significantly short of parental demand. Daycare is heavily subsidised by the states, municipalities, and federal government. The remaining daycare fees covered by parents amount to about 5 to 9 % of net family income (Huebener et al., 2020).

3.2. IVF Treatments in Germany

For one in six couples, the journey to having a child involves seeking medical assistance (WHO, 2023). In-vitro fertilisation (IVF) treatment is often considered a last resort after other forms of fertility interventions have been explored. Couples experiencing fertility issues typically seek medical advice and undergo fertility testing with their general practitioner. If they have been actively trying to conceive for more than 12 months without success, they are diagnosed as infertile and may be referred for additional fertility treatments.

IVF is a reproductive technique that involves fertilisation taking place outside of a woman's body in a laboratory setting. This procedure is carried out by specialized medical practitioners in fertility centers, clinics, and practices that specialize in reproductive medicine. The IVF treatment procedure consists of four phases. The first phase involves administering fertility medications to stimulate the ovaries and increase egg production. This aims to improve the quantity and quality of eggs. In the second phase, the eggs are retrieved from the woman's body. The third phase is the actual IVF procedure, where the retrieved eggs are combined with sperm in a laboratory environment to facilitate fertilisation and support early embryo development. The fourth phase involves selecting and transferring the most viable embryos for implantation. Each phase of IVF treatment carries the risk of treatment failure, such as ineffective fertility medications, inability to retrieve viable eggs, a shortage of suitable embryos for transfer, or inadequate growth of transferred embryos.[6]

[6]In cases where IVF cannot result in a pregnancy or when sperm quality is limited, intracytoplasmic sperm injection (ICSI) is an alternative, more complex treatment procedure. ICSI involves selecting the best sperm under a microscope and injecting it into the egg. The other phases of ICSI treatments are essentially the same as for IVF. Our data do not differentiate between ICSI and IVF treatments. For the sake of brevity, we use the term "IVF treatment" throughout this paper to encompass both IVF and

Generally, the success rates of IVF treatments increase with repeated attempts. However, the effectiveness of IVF decreases with advancing age, similar to natural pregnancies. For women aged 30-34, the chance of pregnancy per embryo transfer is 40 %, with a birth rate of 32 %. Approximately 70 to 80 % of women achieve pregnancy after undergoing four or more IVF treatments. For women aged 41-44, the pregnancy rates per embryo transfer drop to around 17 %, with a birth rate of 8 %. After four or more IVF treatments, the pregnancy rate increases to 35 % (Deutsches IVF-Register e.V. (DIR), 2023).[7] In 2021, more than 69,000 women underwent IVF treatments, resulting in 13,252 births. IVF children account for 1.7 % of all live births in Germany.

The cost of an IVF cycle typically ranges between 3,000 and 3,500 euro per treatment cycle. For ICSI, the cost is approximately 5,000 euro. In addition, there are additional expenses for necessary medication, which vary depending on factors such as the available egg reserve and the woman's age. The medication costs range from 700 to 1,600 euro. Statutory health insurance companies usually cover around 50 % of the costs for up to three treatments, with some insurance companies even covering up to 100 %.[8] Couples can also apply for state support for fertility treatment, although the specific conditions vary in each federal state. Out of the 16 federal states, 12 provide some form of support, with the potential subsidy being up to 25 % of the remaining personal contribution.

4. Data and Empirical Strategy

4.1. Data: FReDA – The German Family Demography Panel Study

This study uses data from the German Family Demography Panel Study (FReDA, Bujard et al., 2023).[9] FReDA is a biannual large-scale panel survey conducted in Germany. It aims to be nationally representative of individuals between the ages of 18 and 49. The survey is administered through both a self-administered web-based and a paper-based

ICSI procedures.

[7]Not all women pursue additional treatment after unsuccessful previous attempts, so the decision to continue treatment is endogenous. However, when comparing individuals with biological children to childless individuals after IVF treatment, no significant differences are found in a large set of predetermined individual characteristics. We elaborate on this aspect in Section 4.2.

[8]However, there are certain criteria that may affect insurance coverage. Costs may not be covered if the couple is not married, if the woman is over 40 years old, if the man is over 50 years old, if it is the 4th IVF or ICSI cycle, if a medically unindicated sterilisation has been performed in the past, or if a sperm donation is required.

[9]For a detailed study description, please see Schneider et al. (2021).

mode. It began in early 2021, initially recruiting about 38,000 individuals.

The data comprise a comprehensive set of socio-economic and socio-demographic variables, as well as detailed information on family background, family-related attitudes, work-family reconciliation, division of domestic work and childcare, and other family-related topics. It also includes information on fertility intentions, fertility problems, and fertility treatments. Of particular interest for our analysis is the information regarding individuals who received IVF treatment and whether they have biological children or not.[10] In our analyses, we utilize the cross-sectional information from the surveys conducted in 2021 and 2022. This allows us to focus our analyses on 1,174 observations from 722 individuals who received at least one IVF treatment.

The descriptive statistics of our main sample are reported in Appendix Table A.1. Among the women in our sample, 34 % reported not having any biological children, whereas the corresponding percentage for men was 28 %. On average, women in our sample have 1.16 biological children, 0.06 adopted children, and 0.19 stepchildren. Men have an average of 1.25 biological children, 0.03 adopted children, and 0.12 stepchildren. Approximately 14 % of the sample consists of individuals with twins.[11]

With respect to the outcomes of individuals, our first area of interest is well-being. In our data, we measure well-being with overall life satisfaction. In later parts of the analysis, we also consider satisfaction with the relationship, and satisfaction with the division of domestic work. Participants rate their own satisfaction in these different areas on an 11-point Likert scale, ranging from 0 (not satisfied at all) to 10 (very satisfied). The mean life satisfaction score for women is 7.3, while for men it is 7.4.

Our second interest is in labor market outcomes. We measure individual employment and count individuals as employed if they have been in paid employment in the past week before the interview. We also have information on their weekly working hours. The average working hours are 25.4 hours for women and 40.8 hours for men. The data do not include information on individual earnings, only on net household income which is

[10]The survey participants are asked the following question: "Have you ever engaged in any of the following practices to help you get pregnant?". We classify a woman as having received "IVF treatment" if she indicates IVF or ICSI procedures in response to this question.

[11]Table A.2 provides an additional overview of the difference in observed characteristics across the IVF treatment sample and the full population with biological children. As previous literature suggests (e.g. Passet-Wittig and Greil, 2021a), the sample of people who have tried IVF treatments systematically differs from the general population, for example in terms of age, education, or income.

not the key interest for the purpose of our analysis.

Our third primary focus is on the division of domestic work. Participants are asked who primarily handles the following tasks: preparing meals, vacuuming, cleaning, laundry, small repairs, finances, and social contacts. Tasks can be performed solely by the respondent, mainly by the respondent, equally by both partners, mainly by the partner, or solely by the partner. An additional option is someone else performing the task. For each task, we create a dummy variable indicating whether the task is mainly or solely done by the respondent. These dummies are averaged across the seven domains to generate an unweighted index representing the share of tasks primarily or exclusively handled by the respondent. The mean score on the domestic work shared equally between partners is 0.29 for both women and men. Similarly, we construct such an index for tasks mainly or exclusively done by the respondent. The mean score on the domestic work mainly or only done by the respondents is 0.47 for women and 0.3 for men. For the perceived fairness of the division of work, survey respondents answer the following question: "If you consider everything together, i.e., housework and professional work, how would you assess the overall fairness of the division of labor between you and your partner?". This is answered on a five-point scale ranging from "I do much more than my fair share" to "I do much less than my fair share". An advantage of these subjective outcomes is that they do not simply reflect mechanical changes occurring with the arrival of children in the household but also encompass the individual perception of the situation.

4.2. Empirical Strategy

In our analysis, we compare individuals who all received IVF treatment but differ in whether they have biological children or not. We argue that, given that they received the fertility treatment, the success of the IVF therapy resulting in a child can be considered as good as random.

To investigate the impact of having a child on our set of outcomes, we run an OLS regression of the outcome on an indicator for having at least one biological child. Specifically, we estimate the following model:

$$y_i = \beta_0 + \beta_1 \text{children}_i + \mathrm{X}_i' \beta_2 + \varepsilon_i \tag{1}$$

where y represents the outcome of individual i, and *children* is the treatment indicator

(1 if the individual has at least one biological child, 0 otherwise). X is a vector of individual control variables, including age, age squared, education level, municipality size indicators, East German indicator, migration background, an indicator for being religious, and indicators for missing data on control variables. The i.i.d. error term is denoted by ε. To account for potential heteroscedasticity and correlation of errors within the data, we employ robust standard errors in our estimation and cluster at the individual level.

The coefficient of main interest is β_1. A causal interpretation assumes that having biological children —, conditional on receiving IVF treatment and the included set of control variables—, can be considered as good as random. We discuss this assumption in detail below.

To trace the dynamic effects of children over time in a supplementary analysis in Section 5.3, we follow the idea of a pseudo-panel approach proposed by (Kleven, 2023). This approach is useful when long panel data are not available. The original idea is to apply matching techniques to transform cross-sectional data into a pseudo-panel for men and women at various event times to be able to implement event study specifications. In our setting, parenthood is assigned quasi-randomly. Therefore, we can draw our counterfactual from the childless IVF-treated individuals. The event times are determined by the age of the oldest child, $childage^{oldest}$.

Specifically, we interact the indicator *children* with a set of child age dummies for the oldest biological child and estimate the following model:

$$y_i = \gamma_0 + \sum_{j=0}^{11+} \gamma_{1j} \cdot \text{children}_i \cdot \mathbb{1}_{\{childage^{oldest}=j\}} + \mathrm{X}_i'\gamma_2 + \epsilon_i \tag{2}$$

As above, y represents the outcome. $children_i$ denotes whether the person has biological children, which we interact with a set of indicators for the age of the oldest biological child (1 if i's oldest child is j years old, 0 otherwise). γ_{1j} represents the coefficients that capture the effect of having children at each child age compared to childless IVF-treated individuals. The model also includes the above-mentioned set of predetermined control variables X and the error term ϵ. By examining the coefficients associated with each child age, we can analyze how the impact of children varies across different stages of childhood, from age 0 to 11.

4.3. Validation of the Identifying Assumption

The lack of information on the treatment sequence might raise concerns that the number of treatments and the success rate could be endogenous and impact our results. Due to the high costs associated with IVF treatments in social, psychological, and financial terms, it is possible that women who decide to continue treatment after several unsuccessful attempts are more likely to have greater resources or a stronger desire to have children.[12]

We assess these concerns empirically with the following checks. First, we perform t-tests to detect statistical differences between IVF-treated women and men with and without children. The results are reported in Appendix Table A.3. Treated individuals differ in their probability of having biological children. They have approximately 1.76 biological children and significantly fewer adopted children. For predetermined characteristics, no substantial differences are observed between IVF-treated individuals with and without biological children. Specifically, IVF-treated men and women with biological children are statistically similar to their counterparts without biological children. Marginally significant differences are found among women with biological children, such as a higher proportion living in cities and having a migration background. IVF-treated fathers of biological children are slightly older compared to those without children. However, an F-test for the joint significance of pre-determined characteristics (based on Oberfichtner and Tauchmann, 2021, using stacked linear regressions of our main model in eq. 1) indicates no statistically significant differences between IVF-treated women with and without biological children. For men, the joint test suggests some statistical differences, which disappear when the control variables from our main specification are included in the balancing tests. These findings support a causal interpretation of the differences in our main outcomes between these groups.

Second, we assess the relevance of remaining potential endogeneity in our treatment using the coefficient stability approach proposed by Oster (2019). In general, our main findings remain highly robust regardless of the set of control variables included. The

[12]Evidence for the influence of latent ability and psychological costs on IVF success is discussed in Groes et al. (2024), and Gameiro and Finnigan (2017) reviews reported reasons for discontinuation of IVF treatments. Note that the missing information on the sequence and success of the IVF treatments does not allow us to use the strategy applied by Lundborg et al. (2017, 2024). They use success in the first IVF treatment as an instrumental variable and only include childless women who have successfully reached the fourth stage and have had embryos implanted.

checks suggest that unobserved selection into the treatment is not a major threat to our results. More details about these empirical checks can be found in Section 5.2.

5. Results

5.1. Main Effects on Well-Being, labor Market Outcomes and Domestic Work

Table 1 summarises the regression results for well-being (panel A), labor market outcomes (panel B), and the division of domestic work separately for females (column 1) and males (column 2). These columns report the effects of having biological children on these outcomes in the sample of IVF-treated females and males. Column (3) indicates the size and significance of the difference in coefficients between females and males.

The results in panel A show that having children has a small and statistically insignificant effect on life satisfaction for women. However, for men, having children has a sizable and positive effect on life satisfaction of 0.561 points on the 11-point scale, which is an increase of about 35 % of a standard deviation. Column (3) highlights the gender difference in the impact of children on the life satisfaction of mothers and fathers, with a significant difference of 0.4 points. This difference is sizable, which compares, for example, to estimates of the positive effect of getting married on life satisfaction or the difference in life satisfaction between becoming unemployed and remaining employed (Odermatt and Stutzer, 2019). This result suggests significant gender disparities in how parenthood affects the well-being of women and men.

Turning to labor market outcomes in panel B, we observe economically and statistically significant effects of having children for women. Employment is 10.8 percentage points lower for women with children compared to women without children. There are also substantial effects on working hours, with mothers working about 12.3 hours per week less compared to childless women who have undergone IVF treatment. This corresponds to a reduction of around 36 % from the average of 33.8 working hours for women without children in the IVF sample. The patterns for men are quite different. The estimates show small negative differences, but there are no statistically significant differences in the labor market participation of fathers compared to childless men. Column (3) again reveals strong and significant gender disparities in the effect of children on labor market outcomes. These findings align with previous literature that documents a child penalty in the labor market for women but not for men. However, the size of the effects is somewhat

Table 1: Effects of children on labor market outcomes and well-being

	(1)	(2)	(3)
			Gender Difference
	Females	Males	(1)-(2)
Panel A: Well-Being			
Life satisfaction	0.135	0.561***	-0.424*
	(0.161)	(0.182)	(0.203)
Panel B: Labor Market Outcomes			
Employed	-0.108***	-0.015	-0.089**
	(0.033)	(0.018)	(0.035)
Working hours	-12.322***	-0.631	-11.499***
	(1.429)	(1.211)	(1.665)
Panel C: Division of Domestic Work			
Domestic work: Shared equally	-0.064***	-0.103***	0.039
	(0.020)	(0.024)	(0.027)
Domestic work: Mainly or only me	0.089***	0.004	0.083***
	(0.020)	(0.023)	(0.025)
N_{max}	697	477	1174

Notes: The table reports the coefficients on having biological children on labor market outcomes and well-being in the sample of IVF treated females and males based on eq. 1. Control variables include individuals' age, age squared, education, municipality size, East Germany, number of siblings, migration background, religion. labor market outcomes available for 676 (470) females (males). Outcomes on domestic work available for 621 (446) females (males). Robust standard errors clustered at person-level in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on FReDA.

smaller compared to previous event study estimates (Cortés and Pan 2023). We discuss the short, medium, and longer-term consequences of parenthood in more detail in Section 5.3, where we examine differences in the effects across children's ages.

We also examine the effects on the division of domestic work to understand the extent to which parents differ in terms of how they share responsibilities for household chores compared to couples without children. Panel C shows that, on average, the proportion of couples that share domestic work equally declines significantly by 6.4 percentage points for women and 10.3 percentage points for men. The gender difference is not statistically significant, however. When looking at the share of men and women who are mainly responsible for the household chores, we see that women are 8.9 percentage points more likely to be primarily or solely responsible for domestic work after the arrival of children. Starting from a baseline of 0.47, this increase corresponds to 19 % or 0.43 standard deviations, which is substantial. For men, we do not find any effects on domestic work

primarily carried out by them. Column (3) indicates that the increase in responsibility for domestic work is significantly larger for women compared to men after the arrival of children.[13]

In summary, the findings demonstrate that women bear the primary work-life balance adjustments when having children. Parenthood reinforces the traditional division of market and domestic work. Probably most importantly, it shows that the effects of children on well-being are unevenly distributed.

5.2. Sensitivity Checks

In this section, we conduct several robustness checks to assess the sensitivity of our findings to different analytical limitations.

One data limitation is that we lack detailed information on the sequence of IVF treatments and their success. Thus, we do not observe how many treatments individuals have received and whether any of the attempts eventually resulted in a biological child. Consequently, as mentioned in Section 4.3, we could be concerned that the number of treatments and, eventually, the success rate are related to potential outcomes and bias our results. While we control for some critical variables such as age and education, the problem of potential bias through selection on unobservable characteristics remains. Therefore, we first conduct sensitivity checks regarding the inclusion and exclusion of control variables. Tables A.5 and A.6 for females and males, respectively, show the results when excluding all control variables in column 2 The results appear very similar to the main results in column 1. In column 3, we extend the set of control variables of the main specification. We now include dummies for individuals' age and also include the age at first sexual intercourse, the birth year of the mother and father, their education, and their employment status when the individuals in our sample were age 15. Reassuringly, we observe very stable effect estimates between the different specifications, although the R^2 varies substantially between the different specifications.

While the previous checks support the exogeneity of our treatment intuitively, we formally assess the scope for omitted variable bias in our estimates using an approach

[13]Appendix Table A.4 provides a detailed breakdown of the specific tasks and their division within couples. Overall, our findings indicate that tasks that were previously shared are now more likely to be performed by women, with some tasks that were previously done by men also being transferred to women (such as vacuum cleaning).

introduced by Oster (2019). This method provides bounds for the magnitude of selection on unobservables. It compares the coefficient estimates and R^2 values from baseline regressions without controls to those from regressions with the extended set of control variables. The results are shown in columns 4-7 of Tables A.5 and A.6 for females and males, respectively. The test compares the co-movements in coefficients and R^2 in models with and without controls. The idea is that if we assume that selection on unobservable factors is equally important as selection on observable factors, we can use the differences in coefficients and R^2 between models with and without controls to estimate the change in the coefficient that would occur if we included controls for the remaining unobservables. This bias-adjusted coefficient provides an upper bound on the magnitude of selection on unobservables.[14] Across our set of outcomes, the bias-adjusted lower bound estimates are very similar to the main results and fall within the 95 % confidence interval of our main estimates. Consequently, the potential biases from unobservables are small.[15]

A second closely related approach examines the degree of proportionality, represented by δ in column 6, to assess how much more important unobserved variables would have to be compared to the extended set of observable characteristics in order to nullify the estimated treatment effects. If $|\delta| > 1$, we consider the results to be robust, as the impact of unobservables would have to be at least as strong as that of the extended set of observable characteristics. Indeed, $|\delta|$ is larger than one for all main results. In sum, the sensitivity checks proposed by Oster (2019) suggest that selection on unobservables into treatment does not pose a major threat to our findings.

A second set of robustness checks examines the specifics of our treatment assignment and sample composition. One concern is that parents may have more than one child

[14]The bias adjusted coefficient is defined as:

$$\beta^* = \beta_{\text{ext}} - (\beta_{\text{without}} - \beta_{\text{ext}}) \frac{R^2_{\text{max}} - R^2_{\text{ext}}}{R^2_{\text{ext}} - R^2_{\text{without}}}$$

where β is the bias-adjusted coefficient, β_{ext} and R^2_{ext} are the coefficient and R^2_{ext} from the regression with the extended set of controls in column 3, β_{without} and R^2_{without} are the coefficient and R^2 from the regression without controls in column 2, and $R^2_{\text{max}} = \max\{2.2 \times R^2_{\text{ext}}; 2.2\}$. While Oster (2019) suggests an $R^2_{max} = \max\{1.3 \times R^2_{\text{ext}}; 1\}$, we chose the more conservative threshold value of factor 2.2 as proposed in the working paper (Oster, 2013).

[15]One could still speculate about the direction of potential biases: Gameiro and Finnigan (2017) report that stress and arguments in the partnership are mentioned as reasons, among others, to stop treatment. This could imply that people in our control group are more stressed and have lower partnership quality, which could bias the positive effects of children on overall well-being upwards and the negative effects on satisfaction with the relationship downwards.

after IVF treatment. Families with more children might have different characteristics or preferences compared to those with fewer children, which could lead to effect heterogeneity and selection bias. Therefore, we assess how our results vary based on the number of children and restrict our sample to parents with up to three, two, and single children (columns 2-4 and 8-10 of Appendix Table A.7). The results remain highly consistent when we limit the maximum number of children, indicating that the main adjustments in market and domestic work occur upon the arrival of the first child. Additionally, the effects on parental well-being are very similar regardless of the maximum number of children.

In additional checks (columns 5 and 11), we acknowledge that IVF treatments increase the likelihood of twin births compared to naturally conceived children. In our IVF sample, there is a higher prevalence of twins compared to parents who have not undergone IVF. Twins often lead to greater immediate demands on parental time, resources, and emotional energy. This could result in different labor market outcomes and well-being effects, which might not be representative of the average effect of having a child.[16] Twin pregnancies and births are also associated with higher risks of medical complications for both mothers and babies (Blondel et al., 2002). These health issues could have a lasting impact on parental well-being and labor market participation, introducing additional effect heterogeneity that was not present with singleton births. When we exclude parents of twins from our analysis, we find that the impact on the main findings is small and reach the same conclusions. The unique challenges associated with raising twins thus do not disproportionately affect our results.

Finally, we exclude parents with adopted children from the sample. Adopting parents often go through extensive screening and preparation, and adopted children may come from diverse backgrounds with varying health, emotional, and developmental needs. These factors can be linked to parents' investments in their children and, consequently, their subsequent labor market behavior and well-being (Hamilton et al., 2007). Parents of adopted children entering the control group of our analysis might bias the effects of biological parenthood towards zero. By excluding parents of adoptees, we ensure that the

[16]For instance, studies examining twin births compared to singleton births often find that mothers with twins work fewer hours than mothers with only one child when the twins are young. However, as the twins grow older, mothers of twins work just as much as mothers of singleton births (e.g. Rosenzweig and Wolpin, 1980, Jacobsen et al., 1999, Vere, 2011).

analysis focuses on a more homogeneous experience of biological parenthood; however, this has only a minimal impact on our point estimates (columns 6 and 12).

5.3. Dynamic Patterns: Heterogeneity Regarding Age of the First Child

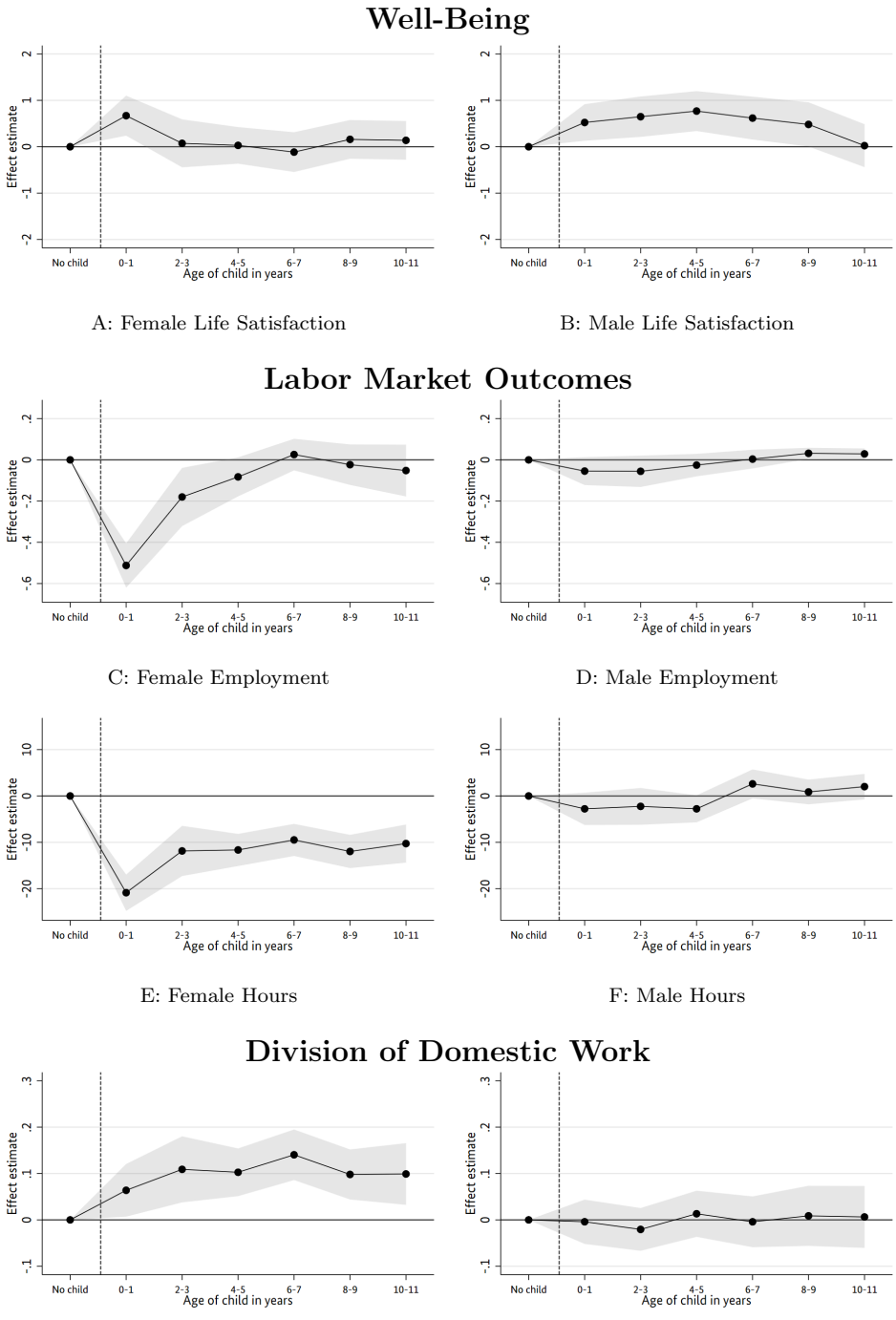
In this subsection, we also consider dynamic patterns across time by looking at heterogeneity regarding the age of the first child. It seems very likely that some of the effects change over time as the offspring grows older and thus their needs change. The estimates based on eq. 2 are summarised in Figure 1. The child age categories range from 0-1 years to 10-11 years, with no child as the reference category.[17]

Figure 1 first shows the dynamic effects of having children on well-being. While we have not identified a significant average effect of children on life satisfaction for women in Table 1, panel A in Figure 1 shows a significant positive short-term effect in the first year after the birth of the first child, when women are typically on paid parental leave. This positive initial effect and the return to baseline afterwards are very much in line with the literature based on event studies. Thereafter, changes in life satisfaction are close to zero. We can rule out reductions of -0.28 (16 % of a standard deviation) and increases larger than 0.35 points (20 % of a standard deviation) on the life satisfaction scale based on the 95 % confidence intervals. For males, the positive effect shown in panel B is more persistent, lasting until the first child is nine years old. On average, the score increases by 0.58 points for men, or 37 % of a standard deviation.

Maternal employment, as shown in panel C, decreases the most when the child is up to one year old and then gradually increases until the child is 4 to 5 years old. This pattern is consistent with the availability of subsidised childcare for children aged 3 and above. Working hours also decrease significantly during the first year of the child's life (panel E). However, even after this initial decrease, there is a persistent negative impact on working hours, with a difference of 10.8 hours compared to women without children between the ages of 6 and 11. This "child penalty" in working hours is estimated to be 32 %, which is similar to the child penalties in earnings estimated in event studies for the US (Kleven et al., 2019a). However, our estimates are smaller than previous estimates in Kleven et al. (2019a) of a long-run child penalty of 61 % in Germany, which might result from differences in socio-demographic characteristics of the IVF-sample compared

[17]Note for completeness that the regression also includes a bundled category for children aged 12 years and older, which only contains a few observations and is not displayed.

Figure 1: Effects of Children



Notes: The figure reports the coefficients on having biological children of age j on labor supply outcomes in the sample of IVF treated females and males based on eq. 2. Control variables as described in Table 1. The grey-shaded area is the 90 % confidence interval. Robust standard errors clustered at person-level.
Source: Own calculations based on FReDA.

to the full population, such as older age at first birth or a higher share of parents having a single child.

In the case of males, we see a slight decrease in employment in the first two years after their children are born. This corresponds to the time when approximately 50 % of fathers take parental leave, typically for a period of two months. Additionally, we observe a small decrease in males' working hours over the first five years of their children's lives, resulting in a reduction of 3.2 hours or approximately 8 %. However, once the children reach the age of 6, we do not find any long-term impact on men's employment or working hours.

When it comes to the division of domestic work, women consistently report that they are primarily responsible for it from the time they give birth onwards (panel G). These effects persist even 11 years after childbirth. On the other hand, there is no change for men in reporting that they mainly or only conduct domestic work (panel H). Summarising the findings on labor market outcomes and the division of domestic work, the results indicate that couples adhere more often to traditional gender roles after having children, and these effects perpetuate in the long term.

5.4. Potential Mechanisms: Perceived Fairness of Division, Conflicts in Partnership and Domain-Specific Well-Being

So far, we have documented that mothers decrease their labor supply and specialize in domestic work, but barely gain in life satisfaction from the arrival of children. Koopmans et al. (2024) suggest that the decrease in labor supply is in accordance with the increase in domestic work after the arrival of children, such that women do not gain in leisure time. The substitution of tasks per se does not have to have welfare implications; the question remains why women are not benefitting from the planned and wished-for child in terms of well-being, as men do. In further analyses, we consider additional outcomes that could shed more light on the mechanisms for the observed distribution of well-being effects of children between women and men.

One explanation could be that the way the couple re-allocates work after childbirth does not necessarily reflect the preferences of each parent. The new equilibrium could be suboptimal for the mother. To empirically shed light on this potential explanation, we look at the perceived fairness of the division of work, satisfaction with the relationship, and the division of market and domestic work. Table 2 shows the results separately for

Table 2: Effects of children on fairness of the division of work and conflicts in the partnership

	(1)	(2)	(3)	(4)
	Females		Males	
	coeff.	s.e.	coeff.	s.e.
A: Perceived fairness of division of domestic and professional work				
I do much more than fair part (D)	0.081**	(0.037)	0.009	(0.023)
I do more than fair part (D)	-0.013	(0.052)	-0.022	(0.048)
I do about my fair part (D)	-0.054	(0.056)	-0.015	(0.068)
B: Conflicts in partnership				
Arguments about housework (1-5, never-very often)	0.277***	(0.101)	0.195	(0.132)
Arguments about money (1-5, never-very often)	0.145	(0.103)	0.106	(0.115)
Arguments about leisure (1-5, never-very often)	0.101	(0.093)	-0.067	(0.140)
C: Domain-specific well-being				
Satisfaction with relationship	-0.608***	(0.152)	-0.242	(0.177)
Satisfaction with division of domestic work	-0.503**	(0.243)	0.022	(0.256)
N_{max}	696	475		

Notes: The table reports the coefficients on having biological children on the different measures in the sample of IVF-treated females and males based on eq. 1. (D) indicates a dummy variable. Control variables include individual's age, age squared, education, municipality size, East Germany, number of siblings, migration background, religion. Robust standard errors clustered at person-level in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on FReDA.

females and males.

The results indicate that the answers of women with children systematically shift towards doing more than their fair share. In particular, they state significantly more often that they do *much more* than their fair part compared to women who remain childless after IVF. For men, however, we find much smaller changes, even pointing in the opposite direction, but these changes are not significantly different from zero. This also implies that men are not mirroring that they would do less than their fair share and less than they did before the arrival of children.

Looking at conflicts in the partnership in panel B of Table 2, we find a sizeable increase in arguments about housework. While the estimated coefficients are similar in size for women and men, the estimate is statistically significant only for women. Women also have positive point estimates for arguments about money and leisure, but they are not precisely estimated. The results for men also point towards more arguments about money, though fewer arguments about leisure, but these effect estimates are also not statistically significant.

Lastly, Panel C considers domain-specific measures of well-being. We see a strong

negative effect of children on women's satisfaction with the relationship, with a highly significant coefficient of -0.608, or about 40 % of a standard deviation. Moreover, there is a negative effect on the satisfaction with the division of market work and domestic work. For men, however, we do not find significant effects on satisfaction with the relationship or the division of work.

Overall, we observe strongly gendered effects on the perceived fairness of the division of work and on domain-specific well-being, together with increased conflicts in the partnership. The results suggest that the new equilibrium in the division of work deviates from women's preferences. This might be one reason why the positive effects of children on women's life satisfaction are only short-lived, while they are larger and more persistent for men.

6. Conclusion

Our study provides insights into the joint consequences of parenthood on women's and men's labor market outcomes, the division of housework, and life satisfaction. We use in-vitro fertilisation (IVF) success as a source of exogenous variation in having children. Distinct from the predominant perspective of event studies in the previous literature, focusing on IVF-treated individuals allows us to compare individuals with and without children who are otherwise very similar, including their typically unobserved strong preferences for children. Moreover, the rich information in the data on different well-being measures, as well as subjective assessments of the fairness of the division of domestic work, adds a comprehensive perspective on how children impact the lives of mothers and fathers.

Our results show that gender disparities in the effects of having children are evident not only in the results of the labor market and domestic work, but also in well-being. While the positive effects on women's well-being are only temporary, they are more persistent for men. In contrast, we find a significant and lasting impact of parenthood on women's labor supply and household chores. This primarily manifests as a reduction in working hours and a shift away from full-time employment. In contrast, men's labor supply does not show systematic effects, except for a short-lived reduction in full-time employment. These findings support the notion that despite some convergence in gender norms, which include attitudes towards parental employment, there is still a significant gender gap in

labor market outcomes (Goldin, 2014, Kleven, 2023, Gambaro et al., 2023).

Importantly, the new equilibrium in the division of work cannot be explained solely by differences in preferences between mothers and fathers, as our evidence based on measures of perceived fairness of the division of domestic work indicates that the new equilibrium deviates from women's preferences. This suggests that women have a disadvantage in intra-household bargaining processes, consistent with studies pointing to a gender gap in household bargaining power (Gu et al., 2024). Similarly, recent findings indicate that Women dislike domestic chores as much as (or even more than) men do and that it is female gender norms that shape households' decisions on chores allocations (Cavapozzi et al., 2024), in line with 'doing gender' due to social norms (West and Zimmerman, 1987, Akerlof and Kranton, 2000, 2010, Cooke, 2006, Christopher, 2024). Overall, our results show that women undergo the primary adjustments in the labor market and domestic work, while men benefit from increased life satisfaction.

Although IVF children make up only a small proportion of all live births and their parents tend to have higher incomes, older ages, and higher education levels (e.g. Passet-Wittig and Greil, 2021a), insights from the IVF sample have implications that are relevant to the broader population. The experience of parenting, including sleep disruption, the need for child care, and changes in professional priorities, is common to all parents and should have similar effects on individuals' labor supply and overall well-being, regardless of how the children were conceived. In addition, IVF has become increasingly common as a method of conception in developed countries, as fertility problems are a common and growing phenomenon (Passet-Wittig and Greil, 2021b). It is estimated that globally, approximately one in six individuals of reproductive age will experience infertility at some point in their lives (WHO, 2023). As such, the experiences and outcomes of IVF parents are increasingly relevant to those of parents in general.

By exploiting a rich set of outcome variables in a sample of people who underwent IVF treatments, our research contributes to a more comprehensive understanding of the multifaceted implications of parenthood. Overall, our findings underscore the persistent influence of parenthood on general gender inequality that goes beyond women's labor supply, highlighting gender disparities in both market and non-market outcomes. That women take up a higher share of domestic and professional work than they perceive as fair might be one explanation for the gender disparities in the effect of children on parental

well-being. However, answering the question of why mothers end up in an equilibrium where they take up a share of work that is not perceived as fair remains a question for future research.

Our findings help to understand declining birth rates in Western, ageing societies. Without unambiguous positive welfare effects of having children for women, their desire to have another child, or even children at all, may be limited. Policymakers' efforts for a better reconciliation of work and family life may have also increased the double burden on women, reducing the welfare gains of children. Future policies could focus more on enhancing maternal well-being.

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Appendix

Table A.1: Descriptive statistics

	Females		Males	
	Mean	SD	Mean	SD
Fertility				
In-vitro fertilization treatment (%)	1.00	(0.00)	1.00	(0.00)
No biological children (%)	33.86	(47.36)	27.67	(44.79)
# biological children	1.16	(1.07)	1.25	(1.04)
# adopted children	0.06	(0.29)	0.03	(0.19)
# stepchildren	0.19	(0.59)	0.12	(0.48)
Twins (%)	14.06	(34.79)	14.05	(34.78)
Main outcome variables				
Life satisfaction (0-10)	7.29	(1.58)	7.43	(1.41)
Employed (%)	81.51	(38.85)	96.17	(19.21)
Working hours	25.35	(15.76)	40.80	(10.80)
Domestic work: Shared equally	0.29	(0.20)	0.29	(0.18)
Domestic work: Mainly or only me	0.47	(0.20)	0.30	(0.16)
Background characteristics				
Age	40.89	(5.26)	41.99	(5.06)
Partner's age	43.51	(6.92)	39.55	(5.44)
Years of education	15.23	(2.75)	15.28	(2.88)
Partner's years of education	15.00	(2.89)	15.24	(2.83)
# previous partners	2.43	(1.57)	2.89	(2.60)
Married (%)	82.78	(37.78)	82.39	(38.13)
Lives in city (%)	37.88	(48.54)	37.11	(48.36)
Lives in small city (%)	38.16	(48.61)	40.25	(49.09)
Lives in country side (%)	23.82	(42.63)	22.43	(41.76)
East Germany (%)	12.48	(33.08)	15.72	(36.44)
# older siblings	0.51	(0.85)	0.53	(0.99)
Age at first sex	17.74	(3.25)	18.34	(3.37)
Age at first menstruation (f)/voicebreak (m)	12.97	(1.45)	13.51	(1.25)
Migration background (%)	25.08	(43.38)	19.52	(39.68)
Religious (%)	69.62	(46.03)	58.59	(49.31)
Father's birthyear	1951.40	(7.26)	1949.54	(7.78)
Father's years of education	12.99	(2.59)	12.96	(2.44)
Mother's birthyear	1954.07	(7.03)	1952.48	(7.64)
Mother's years of education	12.18	(2.29)	12.35	(2.36)
Mother's status at age 15: employee (%)	43.47	(49.61)	39.41	(48.92)
Mother's status at age 15: civil servant (%)	5.60	(23.00)	7.97	(27.11)
Mother's status at age 15: academic (%)	3.87	(19.31)	5.45	(22.73)
Father's status at age 15: employee (%)	44.62	(49.75)	36.06	(48.07)
Father's status at age 15: civil servant (%)	10.62	(30.83)	13.63	(34.34)
Father's status at age 15: academic (%)	9.61	(29.50)	13.21	(33.89)
Number of person-year observations	697		477	
Number of individuals	430		292	

Notes: Table reports descriptive statistics for the main sample of women and men who received IVF treatment.
Source: FReDA, own calculations.

Table A.2: Comparing IVF treatment sample to full population with biological children

	(1) No IVF, with biol. children	(2) IVF treatment, with and without biol. children	(3) Difference (2)-(1)	(4)
	Mean	Mean	coeff.	s.e.
Age	39.70	41.34	1.64***	(0.187)
Partner's age	39.95	41.90	1.95***	(0.217)
Years of education	14.66	15.25	0.59***	(0.087)
Partner's years of education	14.49	15.10	0.61***	(0.085)
# previous partners	2.55	2.61	0.07	(0.059)
Married (%)	74.44	82.62	8.19***	(1.306)
Household net income (euro)	3986.01	4542.53	556.53***	(88.173)
Lives in city (%)	33.99	37.56	3.57*	(1.432)
Lives in small city (%)	41.84	39.01	-2.83	(1.488)
Lives in country side (%)	24.06	23.25	-0.80	(1.289)
East Germany (%)	17.15	13.80	-3.35**	(1.295)
# older siblings	0.52	0.52	-0.01	(0.027)
Age at first sex	17.50	17.99	0.49***	(0.086)
Age at first menstruation (f)/voicebreak (m)	13.32	13.19	-0.13*	(0.053)
Migration background (%)	21.55	22.86	1.31	(1.321)
Religious (%)	60.87	65.18	4.31**	(1.551)
Father's birthyear	1952.10	1950.64	-1.45***	(0.234)
Father's years of education	13.05	12.98	-0.08	(0.077)
Mother's birthyear	1955.05	1953.43	-1.62***	(0.222)
Mother's years of education	12.30	12.25	-0.06	(0.070)
Mother's status at age 15: employee (%)	43.29	41.82	-1.47	(1.495)
Mother's status at age 15: civil servant (%)	6.03	6.56	0.53	(0.720)
Mother's status at age 15: academic (%)	4.05	4.51	0.46	(0.597)
Father's status at age 15: employee (%)	40.58	41.14	0.56	(1.482)
Father's status at age 15: civil servant (%)	12.68	11.84	-0.84	(1.003)
Father's status at age 15: academic (%)	9.19	11.07	1.89*	(0.877)
N	16906	1174	18080	

Notes: Table reports descriptive statistics for full sample of individuals with biological children and the IVF treatment sample with and without biological children. Group differences tested with simple t-test.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: FReDA, own calculations.

Table A.3: Balancing checks

	IVF-sample			
	Females		Males	
	Coeff.	s.e.	Coeff.	s.e.
Fertility				
No biological children	-1.000***	(0.000)	-1.000***	(0.000)
# biol. children	1.748***	(0.051)	1.725***	(0.059)
# adopted children	-0.110***	(0.036)	-0.046	(0.036)
# stepchildren	-0.008	(0.060)	-0.133	(0.087)
Pre-determined characteristics				
Age	-0.165	(0.561)	1.295*	(0.671)
Year of education	-0.267	(0.284)	0.497	(0.388)
Lives in city	-0.087*	(0.050)	-0.042	(0.063)
Lives in small city	0.058	(0.048)	0.064	(0.062)
Lives in country side	0.027	(0.043)	-0.025	(0.054)
East Germany	0.022	(0.032)	0.050	(0.045)
# older siblings	-0.031	(0.062)	0.107	(0.078)
Age at first sex	-0.501	(0.372)	-0.492	(0.523)
Age at first menstruation (f)/voicebreak (m)	-0.161	(0.153)	-0.055	(0.152)
Migration background	-0.042*	(0.025)	0.004	(0.027)
Religious	0.025	(0.030)	0.045	(0.040)
Father's birthyear	0.303	(0.781)	-1.839*	(0.950)
Father's education	-0.277	(0.271)	-0.425	(0.322)
Mother's birthyear	0.186	(0.744)	-0.744	(0.986)
Mother's education	-0.117	(0.238)	-0.360	(0.314)
Mother's occupational status at age 15: employee	0.042	(0.051)	0.053	(0.064)
Mother's status at age 15: civil servant	-0.018	(0.026)	-0.005	(0.037)
Mother's status at age 15: academic	0.020	(0.017)	-0.029	(0.034)
Mother's status at age 15: farmer	0.002	(0.010)	0.006	(0.006)
Mother's status at age 15: other	-0.032	(0.032)	0.032	(0.028)
Father's occupational status at age 15: employee	0.047	(0.051)	0.069	(0.062)
Father's status at age 15: civil servant	0.000	(0.032)	-0.032	(0.048)
Father's status at age 15: academic	0.011	(0.030)	-0.037	(0.046)
Father's status at age 15: farmer	-0.019	(0.014)	0.014	(0.019)
Father's status at age 15: other	-0.033	(0.037)	0.052	(0.041)
Observations	697		477	
Test for joint orthogonality of pre-determined characteristics				
without control variables X, Prob>F	0.771		0.0443	
with control variables X, Prob>F	0.414		0.277	

Notes: Table reports t-test differences between individuals who ever participated in IVF treatments with and without biological children. The test for joint orthogonality of pre-determined characteristics is based on eq. 1 without controls and with control variables X (age, age squared, education, municipality size, East Germany, number of siblings, migration background, religion) and stacked linear regressions and an F-test testing for the joint significance of the characteristics (Oberfichtner and Tauchmann, 2021).
Source: FReDA, own calculations.

Table A.4: Effects of children on separate tasks in the division of domestic work

	(1)	(2)	(3)	(4)
	Females		Males	
	coeff.	s.e.	coeff.	s.e.
Preparing meals				
Only or mainly me	0.184***	(0.048)	-0.069	(0.052)
Shared equally	-0.158***	(0.044)	-0.128**	(0.061)
Mainly or only my partner	-0.022	(0.032)	0.188***	(0.063)
Vacuum cleaning				
Only or mainly me	0.180***	(0.051)	-0.066	(0.058)
Shared equally	-0.062	(0.046)	-0.073	(0.057)
Mainly or only my partner	-0.124***	(0.036)	0.096	(0.062)
Cleaning:				
Only or mainly me	0.054	(0.048)	-0.022	(0.040)
Shared equally	-0.065	(0.041)	-0.098*	(0.054)
Mainly or only my partner	0.016	(0.020)	0.057	(0.061)
Laundry				
Only or mainly me	0.185***	(0.048)	-0.007	(0.041)
Shared equally	-0.135***	(0.041)	-0.171***	(0.057)
Mainly or only my partner	-0.051	(0.033)	0.183***	(0.061)
Small repairs				
Only or mainly me	-0.045	(0.027)	0.061	(0.044)
Shared equally	-0.017	(0.036)	-0.053	(0.037)
Mainly or only my partner	0.081*	(0.044)	-0.007	(0.023)
Finances				
Only or mainly me	-0.003	(0.045)	0.122**	(0.061)
Shared equally	0.058	(0.052)	-0.146**	(0.058)
Mainly or only my partner	-0.060	(0.050)	0.023	(0.048)
Social activities				
Only or mainly me	0.089*	(0.051)	0.015	(0.032)
Shared equally	-0.081	(0.051)	-0.052	(0.057)
Mainly or only my partner	-0.013	(0.020)	0.038	(0.055)
N	625		449	

Notes: The table reports the coefficient on having biological children in the sample of IVF treated females and males based on eq. 1. Control variables include individual's age, age squared, education, municipality size, East Germany, number of siblings, migration background, religion. Robust standard errors clustered at person-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on FReDA.

Table A.5: Assessing the potential bias from selection on unobservables for females

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Bounds of β		Proportionality	
	Main specification	Without controls	With extended controls	Lower bound β^*	In 95 % CI interval	δ	$\lvert\delta\rvert > 1$
Panel A: Well-Being							
Life satisfaction	0.561***	0.562***	0.501***	[0.371]	✓	2.275	✓
	(0.182)	(0.181)	(0.187)				
R^2	0.06	0.03	0.16				
Panel B: Labor Market Outcomes							
Employed	-0.015	-0.010	-0.021	[-0.040]	✓	-1.822	✓
	(0.018)	(0.019)	(0.019)				
R^2	0.03	0.00	0.12				
Working hours	-0.631	-0.380	-1.211	[-2.571]	✓	-1.270	✓
	(1.211)	(1.241)	(1.200)				
R^2	0.03	0.00	0.16				
Panel C: Division of Domestic Work							
Domestic work: Shared equally	-0.103***	-0.102***	-0.096***	[-0.078]	✓	2.052	✓
	(0.024)	(0.024)	(0.025)				
R^2	0.10	0.06	0.15				
Domestic work: Mainly or only me	0.004	0.001	0.008	[0.019]	✓	-1.030	✓
	(0.023)	(0.022)	(0.024)				
R^2	0.04	0.00	0.10				

Notes: The first column reports the main results for comparison. The second and third columns report the effect estimates of having children in the sample of IVF treated females of a baseline specification without controls and a specification with an extended set of control variables. The baseline model only contains an indicator for having children, the extended model includes individual's age dummies, education, municipality size, East Germany, number of siblings, age at first sexual intercourse, migration background, religion, birth year of mother and father, employment status of mother and father at age 15. Based on the approach outlined in Oster (2019), columns 4 and 5 show the lower bound of β and whether this value is within the 95 % confidence interval of the main treatment effect. Column 6 reports the value of proportionality δ and shows how strong the influence of unobserved factors has to be compared to the observed factors to pull the treatment effect to zero. The last column checks whether $|\delta| > 1$. Robust standard errors clustered at person-level in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Source:* FReDA, own calculations.

Table A.6: Assessing the potential bias from selection on unobservables for males

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Bounds of β		Proportionality	
	Main specification	Without controls	With extended controls	Lower bound β^*	In 95% CI interval	δ	$\lvert\delta\rvert > 1$
Panel A: Well-Being							
Life satisfaction	0.525***	0.546***	0.486***	[0.346]	✓	2.213	✓
	(0.180)	(0.182)	(0.186)				
R^2	0.06	0.03	0.10				
Panel B: Labor Market Outcomes							
Employed	-0.023	-0.016	-0.019	[-0.023]	✓	-13.165	✓
	(0.020)	(0.019)	(0.020)				
R^2	0.03	0.00	0.08				
Working hours	-1.260	-0.687	-1.425	[-2.558]	✓	-1.705	✓
	(1.258)	(1.270)	(1.264)				
R^2	0.04	0.00	0.10				
Panel C: Division of Domestic Work							
Domestic work: Shared equally	-0.100***	-0.100***	-0.098***	[-0.088]	✓	2.282	✓
	(0.024)	(0.024)	(0.025)				
R^2	0.10	0.06	0.11				
Domestic work: Mainly or only me	0.010	0.005	0.016	[0.034]	✓	-1.198	✓
	(0.023)	(0.023)	(0.024)				
R^2	0.05	0.00	0.10				

Notes: The first column reports the main results for comparison. The second and third columns report the effect estimates of having children in the sample of IVF treated males of a baseline specification without controls and a specification with an extended set of control variables. The baseline model only contains an indicator for having children, the extended model includes individual's age, age squared, education, municipality size, East Germany, number of siblings, age at first sexual intercourse, migration background, religion, birth year of mother and father, employment status of mother and father at age 15. Based on the approach outlined in Oster (2019), columns 4 and 5 show the lower bound of β and whether this value is within the 95% confidence interval of the main treatment effect. Column 6 reports the value of proportionality δ and shows how strong the influence of unobserved factors has to be compared to the observed factors to pull the treatment effect to zero. The last column checks whether $|\delta| > 1$. Robust standard errors clustered at person-level in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Source:* FReDA, own calculations.

Table A.7: Robustness of results by max. # of biological children, w/o twins, w/o adoptees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Females						Males					
	# biological children						# biological children					
	Main: all	≤3	≤2	=1	No twins	No adoptees	Main: all	≤3	≤2	≤1	No twins	No adoptees
Panel A: Well-Being												
Life satisfaction	0.135	0.130	0.212	0.184	0.190	0.208	0.561***	0.562***	0.555***	0.599***	0.575***	0.536***
	(0.161)	(0.162)	(0.163)	(0.175)	(0.163)	(0.169)	(0.182)	(0.183)	(0.184)	(0.193)	(0.182)	(0.183)
Panel B: Labor Market Outcomes												
Employed	-0.108***	-0.110***	-0.105***	-0.127***	-0.112***	-0.122***	-0.015	-0.015	-0.012	-0.003	-0.020	-0.015
	(0.033)	(0.033)	(0.034)	(0.041)	(0.035)	(0.034)	(0.018)	(0.018)	(0.019)	(0.020)	(0.020)	(0.019)
Working hours	-12.322***	-12.206***	-11.913***	-12.001***	-12.226***	-12.742***	-0.631	-0.671	-0.557	-0.361	-0.631	-0.591
	(1.429)	(1.437)	(1.437)	(1.640)	(1.489)	(1.462)	(1.211)	(1.220)	(1.232)	(1.328)	(1.266)	(1.251)
Panel C: Division of Domestic Work												
Domestic work: Shared equally	-0.064***	-0.061***	-0.058***	-0.037	-0.054**	-0.071***	-0.103***	-0.102***	-0.099***	-0.087***	-0.108***	-0.105***
	(0.020)	(0.020)	(0.020)	(0.025)	(0.021)	(0.021)	(0.024)	(0.024)	(0.024)	(0.026)	(0.024)	(0.024)
Domestic work: Mainly or only me	0.089***	0.086***	0.085***	0.063**	0.077***	0.093***	0.004	0.007	0.010	0.002	0.007	0.007
	(0.020)	(0.020)	(0.021)	(0.025)	(0.021)	(0.020)	(0.023)	(0.023)	(0.023)	(0.025)	(0.023)	(0.023)
N	697	680	620	447	599	665	477	464	428	291	410	466

Notes: Columns 1 and 6 report the main effect of children in the sample of IVF treated females and males. All models include individual control variables. Robust standard errors clustered at person-level in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Source:* FReDA, own calculations.