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From Leave to Life: How Does Fathers' Parental Leave Uptake Influence Continued Childbearing in Germany?

Quantitative analysis using the German Family Panel (pairfam)

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Foreword

First and foremost, I would like to express my deepest gratitude to Ester Rizzi, my supervisor, who provided unwavering support throughout the development and writing of this thesis. Her attentiveness, kindness, understanding, and availability enabled me to complete this work within a structured and healthy framework. I am grateful for the time she dedicated to me and for her trust in my abilities.

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Introduction

Globally, periodic fertility rates have consistently declined to near or below the replacement level of 2.1 children per woman, a threshold crucial for sustaining a stable population size. This phenomenon is evident in both the Western World and East Asia since the late 20th century (Skirbekk, 2022). In Europe, decreasing fertility rates have emerged as a prominent political concern, exacerbated by fears of depopulation and increasing prevalence of childlessness (Sobotka, 2008, 2017).

In response to falling fertility rates, European countries have significantly enhanced their family policies and welfare systems, particularly focusing on parental leave enhancements to promote childbearing (Gauthier, 2007; Gauthier & Philipov, 2008). Although these policies have not consistently prioritized fathers, the contemporary revaluation of gender norms and parenting roles has spurred the development of more gender-neutral policies. This substantial evolution of parental leave policies has stimulated inquiries into the determinants influencing parental leave uptake (Barcus et al., 2019; Duvander, 2014; Duvander, Halldén, et al., 2020; Geisler & Kreyenfeld, 2011; Haas et al., 2002; Marynissen et al., 2019; Meil et al., 2018; Mussino et al., 2019; Naz, 2010; Olsson et al., 2022; Reich, 2010; Sundström, 1996; Sundström & Duvander, 2002; Valentova et al., 2022). However, the effectiveness of parental leave usage in encouraging further childbearing remains an ongoing area of investigation, with much of the research focusing on Northern European countries like Norway, Sweden, and Iceland (Cools et al., 2015; Duvander et al., 2010, 2019; Duvander, Lappegård, et al., 2020; Duvander & Andersson, 2006).

Recently, Germany has come into focus, especially after its 2007 parental leave reform, which was inspired by Sweden's pioneering approach to parental leave. Given Germany's low fertility rates, understanding how parental leave use affects continued childbearing is crucial and represents a significant political issue. Moreover, the cultural contrast between East and West Germany, stemming from the country's post-World War II division,

provides a unique case study to explore the influence of distinct cultural and normative frameworks in these two regions.

This research endeavour thus contributes to the understanding of the relationship between parental leave uptake and continued childbearing by exploring this topic in an unexplored area. Additionally, it aims to provide new insights into the implication of male involvement in childcare and its potential influence on continued childbearing. At the dawn of the second gender revolution, witnessing the increasing involvement of men in the private sphere of home and family (Goldscheider et al., 2015), studying fertility behaviour in Western societies requires a focused examination of the role of fathers in shaping these behaviours. Furthermore, this study employs survey data, in contrast to previous research that primarily used administrative data (Cools et al., 2015; Duvander et al., 2010, 2019; Duvander, Lappegård, et al., 2020; Duvander & Andersson, 2006). The use of survey data in this investigation allows for the exploration of less frequently examined factors, such as employment characteristics and attitudes towards gender roles, thereby providing a more comprehensive analysis of determinants influencing continued childbearing.

The study is structured into six sections: the first outlines the contextual background in Germany; the second reviews the relevant literature and presents the research question; the third describes the data, sample criteria, and variables of interest; the fourth section discusses the methodological approach of the study; the fifth section reveals the findings; the sixth section is dedicated to robustness analysis; and the seventh explores the implications and limitations of the findings.

1 Contextual Framework

To comprehensively contextualize the research endeavour, this section outlines the demographic, normative, and institutional framework in Germany. It examines fertility trends, prevailing cultural norms, the evolution of parental leave policies, and current features of parental leave entitlements. By delving into these aspects, the section seeks to establish a foundational understanding of the societal landscape relevant to the study, thereby enabling a more informed exploration of the research topic.

1.1 Fertility Trends and Cultural Contrasts

Historically, fertility trends in Germany have been regionally analysed due to its division into two entities post-World War II. The Federal Republic of Germany (FRG), known as West Germany, adopted a liberal democratic regime and a market economy. In contrast, the German Democratic Republic (GDR), or East Germany, operated under a socialist regime with a centrally planned economy inherited from Soviet occupation (Davidov & Siegers, 2010).

As depicted in Figure 1 and Figure 2 below, significant fertility differentials were observed in the late 20th century. While both regions experienced a decline in fertility from the mid-1960, attributed in part to the feminization of education and labour, as well as to the adoption of non-traditional living arrangements, East Germany successfully elevated its fertility rates and sustained them at higher levels through the implementation of effective reconciliation policies (Buhr & Huinink, 2015). In contrast, it was common for women in West Germany to prioritize education and establishing their careers before considering starting a family (Huinink, 1989 as cited in Witte & Wagner, 1995). Following the reunification of Germany in 1990, the dissolution of the GDR resulted in unfavourable economic conditions in the East, leading to delayed childbirth and declining periodic fertility rates (Goldstein & Kreyenfeld, 2011).

Figure 1. Total Fertility Rate, Germany, 1956-2017

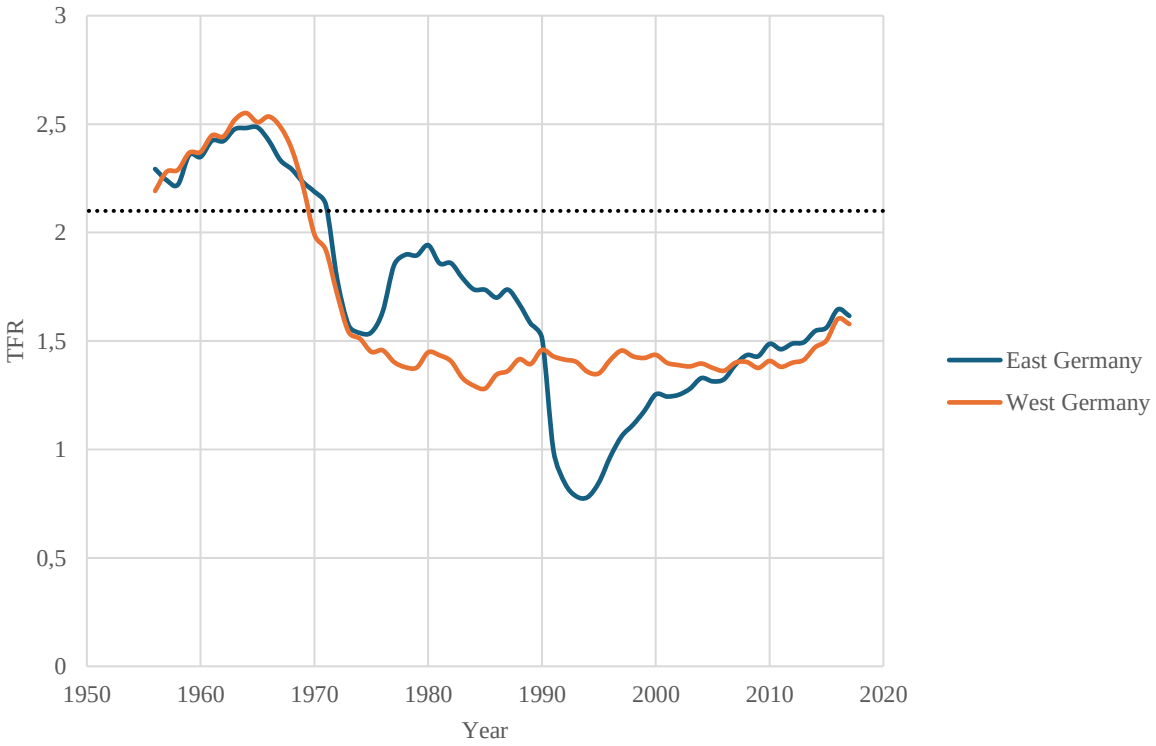
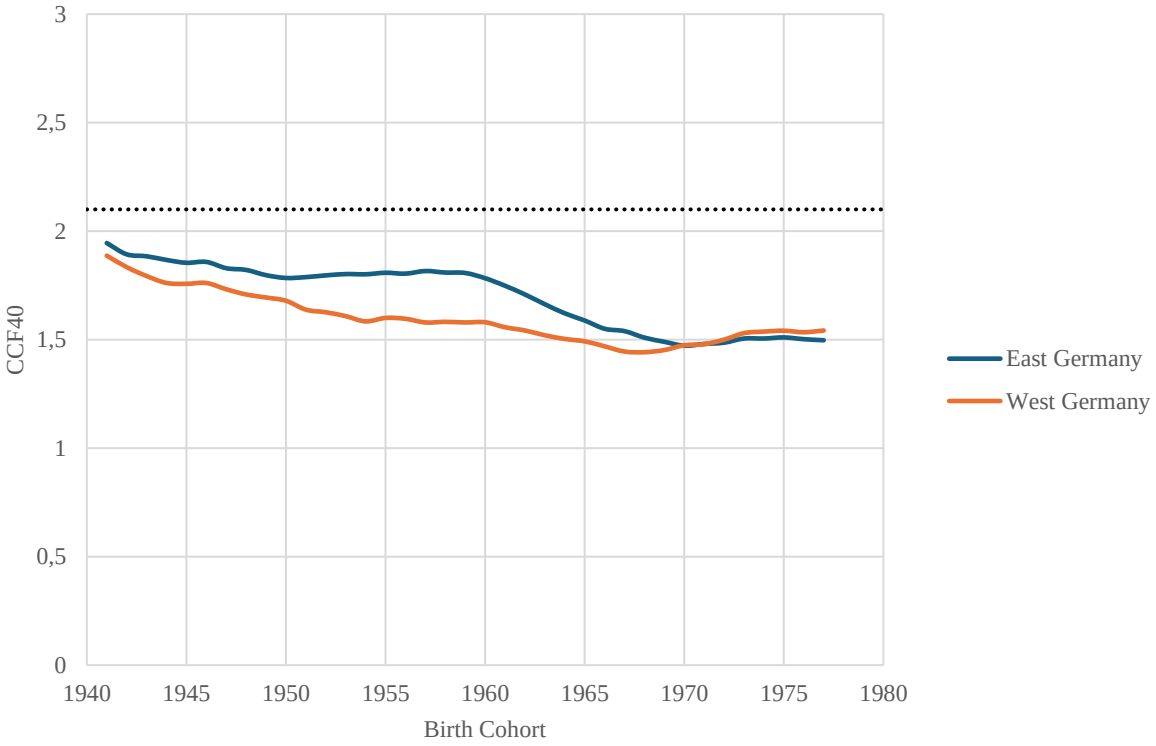


Figure 2. Completed Cohort Fertility by age 40, Germany, 1956-2017



Source: Author's own work, based on the Human Fertility Database (data for the period 1990-2017 do not include East Berlin)

Subsequently, fertility in the East began to increase in the mid-1990s and gradually approached the fertility level in the West. However, despite signs of fertility recovery in East Germany, the postponement of childbearing may have affected overall cohort fertility, which has declined over time (Goldstein & Kreyenfeld, 2011). Indeed, the rise in childlessness and the proportion of one-child families in the East suggest that not all postponed births were eventually realized (O. A. Becker et al., 2010; Goldstein & Kreyenfeld, 2011).

The fertility trends in East Germany following German reunification reveal a complex interplay between cultural heritage and societal structures. While initial analyses suggest a short-term impact of reunification on fertility rates, long-term patterns are deeply rooted in the cultural and structural disparities that distinguish East Germany (O. A. Becker et al., 2010). Influenced by its communist past and Soviet occupation, this region exhibits distinct characteristics such as low religiosity (Goldstein & Kreyenfeld, 2011) and a significant degree of secularization (Pollack, 2002). Despite these tendencies, East Germany maintained a stronger family orientation compared to the West, as motherhood remained a universal norm in the East (O. A. Becker et al., 2010; Goldstein & Kreyenfeld, 2011). The coexistence of secularisation and strong family values underscores a unique social structure within East Germany, one that advocates a more equitable balance between professional commitments and personal life, thereby fostering greater gender equality (Adserà, 2004; Buhr & Huinink, 2015; Goldstein & Kreyenfeld, 2011; McDonald, 2000b). This cultural framework has been significantly influenced by the policies of the former GDR, which actively promoted female employment and childcare access, thereby nurturing more egalitarian views towards gender roles among East Germans. Despite the reunification, these cultural divergences persist and continue to influence contemporary fertility patterns, with East Germans typically supporting more gender-equitable participation in both family and workplace environments (Bauernschuster & Rainer, 2012).

It is crucial to acknowledge that while regional fertility disparities persist, there has been a significant reduction in the gap in recent years and cohorts (Goldstein & Kreyenfeld, 2011). Moreover, it is relevant to emphasize that while East Germany historically exhibited higher period fertility rates, overall fertility in Germany has declined to low levels since the late 20th century, positioning it as one of the countries with the lowest fertility rates in Europe (Sobotka, 2011). Nevertheless, the case of East and West Germany underscores the significance of cultural background, family-friendly structures and policies in understanding fertility dynamics.

1.2 The German Parental Leave System

Under Directive (EU) 2019/1158, the Member States of the European Union are required to take the necessary measures to ensure the right to parental leave (European Parliament Council, 2019, arts. 3 & 5). In Germany, parental leave rights for both parents have been first implemented in 1986. Preceding this date, the country's policies only provided maternity leave with job protection and benefits, for which fathers were not eligible. The 1986 reform introduced ten months of job-protected leave for one parent after a child's birth, expanding the earlier four-month maternity-only provision. This period allowed either parent not working full-time to receive a child-rearing benefit, which was no longer dependent on prior employment and continued until the child was ten months old. Enhancements followed swiftly, with the leave and benefit period extending first to 12 months between 1988 and 1990, then to 15 months in 1989, and finally to 18 months in 1990. By 1992, parental leave could be taken until the child's third birthday, though the benefit period remained at 18 months.

Major reforms in 2001 raised the income thresholds for benefits and permitted parents to take leave simultaneously (Geisler & Kreyenfeld, 2019; Ondrich et al., 2002). In 2007, another key reform introduced a paid parental leave system, including a father quota, which provided 12 months of paid leave, with two months specifically reserved for each parent. The fundamental objective of this reform was to promote increased paternal involvement in childcare and domestic responsibilities, achieved through the

establishment of a non-transferable parental leave right (Schober et al., 2023; Tamm, 2018). Following policy reforms primarily focused on adjustments to income limits (c.f. Appendix 1).

Today, the parental leave system in Germany, known as “Elternzeit”, offers an unpaid break from work for up to three years per child. Parents may split this time into up to three segments, with part of the leave permissible between the child’s 3rd and 8th birthdays. However, part of the leave can only be taken before the child’s 8th birthday provided that part of the leave was taken before its 3rd birthday. During this period, parents are protected from dismissal and may work up to 30 hours per week, a limit increased to 32 hours per week in 2021. This entitlement applies to parents of biological, adopted, or foster children, or those seeking leave for a partner’s biological child. Parents may also apply for “Elterngeld”, a parental allowance to help offset lost wages during this time (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2024).

Since the introduction of maternity leave in the 1950s (c.f. Appendix 1), Germany’s parental leave policies have evolved significantly, increasingly focusing on gender equality, and encouraging fertility through innovative policy designs, as seen in the pivotal 2007 reform (Rocha, 2021). Understanding these policy shifts is crucial for analysing the political context surrounding fertility, as certain family policies aim to influence fertility behaviours.

2 Theoretical Background

Having outlined the contextual background of fertility behaviour in Germany, it is now crucial to explore the theoretical underpinnings that influence such behaviour. This section will discuss key theoretical milestones within the discipline, allowing us to select the most suitable theoretical framework for our study. From these theoretical considerations, we will derive our research question and formulate hypotheses.

2.1 Theories of Fertility Behaviour

Amid declining fertility rates in Western countries since the 20th century, various theoretical frameworks have been developed to explore the complexities of these trends. These theories, grounded in cultural, economic, and gender perspectives, serve as essential tools for understanding the diverse aspects of fertility behaviours. Key theoretical models in cultural and economic discussions include the Second Demographic Transition (Lesthaeghe & van de Kaa, 1986), Preference Theory (Hakim, 2000), and Rational Choice Theory (G. S. Becker, 1960, 1993). However, these frameworks have primarily focused on women's behaviour, often overlooking the role of men and social structures, an oversight that gender perspectives such as the Gender Equity Theory (McDonald, 2000a, 2000b) seek to address.

Cultural theories explore the impact of societal values, norms, and attitudes towards childbearing. Empirical research in this area often links lower fertility to specific demographics, such as highly educated women who are less religious and less tied to traditional gender roles (McDonald, 2000c). The Second Demographic Transition theory, rooted in the Post Materialist Values Theory (van de Kaa, 2001), posits that low fertility results from rising individualism, secularization, and anti-traditionalism. This shift prioritizes personal aspirations over familial or community roles, leading to delayed parenthood and smaller family sizes (Lesthaeghe, 2010; van de Kaa, 2001, 2002). Moreover, Hakim's Preference Theory (2000, 2003) further argues that fertility changes stem from women's evolving roles and choices, especially

with the advent of contraceptives, which have transformed societal views on women and given them greater autonomy in fertility decisions.

Despite their contributions, these theories often overstate women's role in declining fertility, overlooking the significant impact of structural conditions. They emphasize how transitions towards post-materialist values, like self-expression and quality of life, align with changes in women's roles and desires. However, these theories tend to neglect broader societal and institutional factors that influence reproductive decisions. While increased education, declining religiosity, and more liberal attitudes do affect women's fertility choices, focusing solely on individual women fails to account for overarching societal influences (Goldscheider et al., 2015; McDonald, 2000c).

Economic theories, particularly the Rational Choice Theory (G. S. Becker, 1960, 1993), also primarily focus on women, linking declining fertility to their increased labour market participation and the rising costs of child-rearing. As the opportunity costs associated with raising children climb, particularly for working women, fertility rates fall. However, these economic perspectives do not fully address fertility decline as a societal phenomenon influenced by social structures (McDonald, 2000c).

In response, McDonald's Gender Equity Theory provides a nuanced view of the relationship between fertility and gender equity, highlighting the crucial role of social structures. The discourse surrounding gender equity and its intricate interplay with fertility underscores the significant influence of social institutions on gender dynamics and reproductive behaviour. A fundamental distinction lies in distinguishing gender equity from gender equality: while the former concerns perceived fairness and opportunities regardless of outcomes, the latter pertains to disparities in outcomes across various domains (Esping-Andersen & Billari, 2015). However, operationalizing gender equity on a societal scale presents challenges, often leading researchers to employ gender equality metrics as proxies, thereby blurring the conceptual distinction (McDonald, 2013; Mills, 2010).

McDonald's conceptual framework (2000a) emphasizes the measurement of gender equity across two spheres: the private and public. Derived from Mason's formulation of the *gender system* (1998), McDonald asserts that gender inequity arises from institutionalized gender disparities in the public sphere (*gender stratification*) and the gendered division of labour in the private sphere (*gender roles*). Achieving gender equity, therefore, necessitates parity in both spheres, with social structures playing a pivotal role in fostering gender equity across public and private domains. Political institutions wield influence in shaping gender relationships at the public level, while familial norms and organizational arrangements significantly impact gender equity in the private sphere.

Central to McDonald's theory (2000a, 2000b) is the intertwining of fertility and gender equity, positing that declining fertility stems from imbalances in gender equity between the public and private spheres. Specifically, the theory underscores the gender disparity wherein women have achieved parity in labour market opportunities, while men remain comparatively less engaged in domestic responsibilities. Consequently, women encounter the "double burden", as they are assumed to take on domestic duties alongside formal employment, therefore exacerbating the childbearing cost and contributing to decreased fertility rates. Accordingly, men's involvement in the private sphere emerges as crucial in either sustaining or enhancing fertility rates.

Supporting this view, Goldscheider et al. (2015) argue for a gender-egalitarian division of housework to help complete the gender revolution and alleviate the burden of unpaid domestic work for women, thus aiding in fertility recovery. Additionally, Esping-Andersen and Billari (2015) suggest that the level of a society's fertility depends on its degree of gender egalitarianism, proposing a U-shaped relationship where high fertility is found in both gender-inegalitarian and gender-egalitarian societies due to stable normative standards. Conversely, societies undergoing transitions between these states experience instability, leading to a decrease in fertility

levels. From this viewpoint, the dissemination of gender egalitarianism should prompt an increase in fertility rates.

Several empirical studies have applied theoretical frameworks revolving around gender equity. Noteworthy among these is the examination of American data derived from the National Survey of Families and Households by Torr and Short (2004), which furnishes evidence corroborating McDonald's thesis that household gender equity is positively correlated with fertility. Similarly, Mills et al. (2008) conducted a comparative analysis of the Netherlands and Italy, using data from the European Social Survey (ESS) 2004-2005 and the Multipurpose Family and Social Actors Survey 2003, revealing that an asymmetrical division of household labour prompts women, especially employed women and mothers, to recalibrate their fertility intentions. Furthermore, an empirical investigation encompassing Italian and Spanish regions, using data from the European Value Surveys (EVS) and the Eurostat Database, lends support to the assertion that gender equity is imperative in both public and private spheres for fertility rates to ascend (Arpino & Tavares, 2013).

Moreover, other empirical inquiries have examined the allocation of household chores and childcare responsibilities, assessing their impact on fertility outcomes. Contrary to McDonald's expectation, these studies consistently observe either negligible or marginal effects of men's share of domestic responsibilities on fertility. This observation may be attributed to a nuanced understanding that men's relative share has augmented primarily due to women reallocating their time away from domestic work, rather than men substantially augmenting their temporal investments in such tasks. Miettinen et al. (2015), for instance, underscore the insignificance of men's housework contributions to fertility, while simultaneously noting a negative association between women's housework hours and subsequent childbearing across all parities. It is noteworthy, however, that while men's contributions to housework exhibit insignificance, their involvement in childcare activities enhances the likelihood of couples opting for an additional child, as evidenced by various studies taking place in Germany, Sweden, Hungary and Italy

(Cooke, 2004; Duvander & Andersson, 2006; Oláh, 2003; Pinnelli & Fiori, 2008). Another study in South Korea (Kim, 2017), noted the significant positive effect of husbands' time spent on domestic labour on second-birth intentions; however, no distinction was made between household and childcare tasks.

Another salient aspect within these theoretical deliberations pertains to their inherent political implications. Policies supporting gender neutrality and work-life balance, as highlighted by McDonald (2000c), are instrumental in promoting gender equity and mitigating childbearing costs. By promoting gender equity, policymaking endeavours to facilitate the adoption of gender-symmetric arrangements, consequently mitigating the childbearing cost (Esping-Andersen & Billari, 2015). Among such policies, parental leave has emerged as a key instrument in fostering gender equity both as a societal ideal and as a means to encourage childbearing (Rocha, 2021). The evolving landscape of parental leave policies in Europe, increasingly inclusive and advantageous, allows both parents to invest in the care and education of their child, thereby fostering a more equitable division of domestic labour (Drew, 2005).

To summarize, gender theories such as the Gender Equity Theory significantly contribute to the theoretical considerations surrounding fertility behaviour. As McDonald (2000a, 2000b) emphasizes the role of social institutions in shaping gender dynamics and reproductive behaviour, the Gender Equity Theory shifts the focus from exclusively considering women's preferences and characteristics to also incorporating the role of men. Although women's characteristics and preferences undeniably play a critical role in determining fertility outcomes, these outcomes are frequently the result of joint decisions made by couples (Bauer & Kneip, 2014; Duvander, Fahlén, et al., 2020; Matias & Fontaine, 2017). This reflects broader societal shifts towards more gender-egalitarian relationships and shared responsibilities within the household (Testa, 2007). Consequently, studying fertility behaviour necessitates examining the role of men and fathers, which is why this research places particular emphasis on men's involvement in

childcare, such as through parental leave uptake, and on men's characteristics, which are also determinants in shaping fertility among couples (Bauer & Kneip, 2014; Matias & Fontaine, 2017).

In considering fertility outcomes as a couple-based process, this research incorporates male and female characteristics, thereby enriching the analysis by drawing on earlier theoretical frameworks, such as cultural and economic perspectives, in conjunction with gender theories. This comprehensive approach acknowledges the multifaceted nature of fertility decisions, which are influenced by the interplay of both partners' attributes within the broader context of evolving gender dynamics. By adopting this inclusive perspective, the study acknowledges and addresses the complex, interdependent factors that shape reproductive choices in contemporary society.

Given the premise that men's engagement in the family sphere is pivotal for fertility, coupled with empirical evidence indicating that fathers' involvement in childcare correlates with increased fertility, our research inquiry seeks to examine the potential impact of fathers' use of parental leave – construed as a form of childcare involvement – on fostering continued childbearing. Accordingly, our research question is formulated as follows: What is the impact of parental leave uptake by fathers on subsequent childbearing decisions?

While extensively examined in Nordic countries (Cools et al., 2015; Duvander et al., 2010, 2019; Duvander, Lappegård, et al., 2020; Duvander & Andersson, 2006), the association between parental leave uptake and fertility remains unexplored in Germany. This area of investigation is particularly relevant due to the significant enhancements in Germany's parental leave policies in recent years, which emphasize gender neutrality and the promotion of work-life balance, factors assumed to encourage childbearing. Furthermore, the varied regional fertility behaviours and cultural backgrounds within Germany provide a unique context for this study, aiming to generate novel insights into the effects of paternal participation in parental leave on continued childbearing within a diverse cultural environment.

2.2 Research Question and Hypotheses

Specifically, this research will examine the influence of parental leave taken after the birth of a first child on the probability of having a second child. This focus is motivated by the observation that, in Germany, both the desired and actual family sizes have stabilized at approximately two children for several decades (Freedman et al., 1959; Keep, 1971; Sobotka & Beaujouan, 2014), while the proportion of families with more than two children has declined (Dorbritz, 2008; Frejka, 2008a; Kreyenfeld et al., 2010). Consequently, the research question is formulated as follows:

RQ. How does paternal use of parental leave for the first child affect the likelihood of a second-order birth among couples in Germany?

From the context provided by the German setting and the theoretical considerations combined with empirical evidence, two hypotheses are posited. The first hypothesis suggests that fathers' usage of parental leave for the first child is positively associated with the likelihood of a second-order birth, reflecting the potential of paternal involvement to enhance gender equity and support fertility recovery (Goldscheider et al., 2015; McDonald, 2000a, 2000b), as supported by prior empirical research (Arpino & Tavares, 2013; Cooke, 2004; Duvander & Andersson, 2006; Kim, 2017; Mills et al., 2008; Oláh, 2003; Pinnelli & Fiori, 2008).

H1. *Fathers using parental leave for the first child are more likely to have a second-order birth compared to those who did not take parental leave.*

The second hypothesis proposes that the effect of parental leave on the likelihood of a having a second child will be more pronounced in East Germany compared to West Germany. This assumption is based on regional differences in family norms and attitudes towards gender roles. Empirical evidence indicates that East Germany continues to benefit from better access to childcare and more favourable work-life balance environments compared to West Germany (Zoch & Schober, 2018). Moreover, East Germans are known to hold more egalitarian values compared to their Western counterparts (Adler & Brayfield, 1996; Bauernschuster & Rainer, 2012;

Braun, 2009; Sprengholz et al., 2022) and men with egalitarian values are more likely to take parental leave, particularly in environments where policies actively support paternal involvement through designated leave for fathers, such as in Germany (Kaufman et al., 2024). Additionally, these men tend to desire more children compared to those holding traditional values (Puur et al., 2008). Consequently, East Germany should present an environment supportive of parental leave uptake by fathers and more conducive to higher fertility.

H2. *The effect of parental leave usage on second-order birth is expected to be stronger in East Germany than in West Germany.*

3 Data

The research data employed in this thesis is derived from the German Family Panel (pairfam), release 14.0 (Brüderl, Drobnič, et al., 2023). This section aims to offer a comprehensive overview of the database, including its inherent characteristics and sampling design, along with an examination of the sample criterion and the selection of variables relevant to the current study. For a deeper understanding of the pairfam study and its data, interested readers are directed to Huinink et al. (2011) for comprehensive details.

3.1 Database Overview

The German Family Panel pairfam is a long-term project funded by the German Research Foundation (DFG) from 2004 to 2022 and coordinated by Josef Brüderl, Sonja Drobnič, Karsten Hank, Johannes Huinink, Bernhard Nauck, Franz J. Neyer, and Sabine Walper. The pairfam project serves as a comprehensive longitudinal study with the primary aim of examining partnership dynamics and family trajectories within Germany from a multidisciplinary standpoint. Integrating economic, sociological, and psychological frameworks, pairfam endeavours to shed light on individual behaviours and decision-making processes throughout the life course (Huinink et al., 2011). The dataset holds relevance in the context of this research due to its provision of pertinent information concerning family trajectories, particularly in terms of fertility outcomes and parental leave usage. Additionally, it offers valuable insights into the demographic and socio-economic characteristics of respondents, which will be instrumental for statistical control purposes.

Pairfam provides longitudinal data, enabling the monitoring of individuals' life trajectories across several years. Particularly noteworthy is the use of the dependent interviewing (DI) method, whereby information collected in previous waves is carried forward to the current interview. This allows respondents to verify and, if necessary, revise information provided in earlier waves. Moreover, this methodology is leveraged to collect data through retrospective questioning in each wave, focusing on aspects such as

partnership, employment, and residential histories (Brüderl, Schmiedeberg, et al., 2023). Consequently, this feature enhances the quality of the data and enables longitudinal analysis of fertility trajectories alongside evolving individual socio-demographic characteristics.

Over its 14 waves, from Wave 1 (2008/09) to Wave 14 (2021/22), pairfam annually compiles data from a nationally representative random sample of over 12,000 participants. As a multi-actor survey, interviews are conducted not only with the main respondent, referred to as the anchor, but also with various other family members. Initially, only the anchor respondents and their partners were included in Wave 1 (2008/09), with parents, stepparents, and children incorporated from Wave 2 (2009/10) onwards. Moreover, pairfam functions as a multi-cohort study, with anchor respondents drawn from three distinct birth cohorts: 1971-73, 1981-83, and 1991-93. The 2001-2003 cohort was introduced since Wave 11 (2018/19) to refresh the sample (Brüderl, Schmiedeberg, et al., 2023). These attributes are of great value to this research as they facilitate the exploration of demographic and socio-economic characteristics among respondents and their partners, while also allowing for the investigation of intergenerational differences.

Employing a two-stage sampling method, municipalities were initially chosen through stratified random sampling, followed by the random selection of individuals from population registers within these municipalities. The population of interest comprised individuals residing in private households in Germany with adequate proficiency in German to engage in the interview (Huinink et al., 2011). Interviews were conducted in person and lasted approximately 60 minutes. This approach enables a thorough exploration of participants' perspectives and experiences. Subsequently, participants who remained engaged across previous waves were contacted for subsequent waves. Temporary withdrawal was permitted, with respondents allowed to skip one wave; however, failure to participate in two consecutive waves led to their exclusion from the study. Additionally, other standardized measures were implemented to ensure panel stability (Brüderl, Schmiedeberg, et al.,

2023). These procedures collectively contribute to enhancing the overall quality of the data and maintaining the longitudinal nature of the study.

In conclusion, pairfam stands out as a relevant and valuable dataset for this research due to its comprehensive longitudinal design and multidisciplinary approach. Providing detailed insights into fertility outcomes, parental leave usage, and socio-demographic characteristics, this database enables thorough analysis. Furthermore, pairfam's longitudinal consistency ensures reliable data, facilitating longitudinal examinations of fertility trends and individual socio-demographic shifts over time. Additionally, its multi-actor and multi-cohort features broaden its utility, enabling the exploration of intergenerational disparities and demographic variances among respondents and their partners.

3.2 Sample Selection

The sample comprises data collected from Wave 1 (2008/09) to Wave 11 (2018/19) and includes observations of heterosexual men who have one biological child born in or after 2007 and who cohabit with the child's other parent.

The decision to exclude Waves 12 (2019/20) and 13 (2020/21) from the study is due to selectivity concerns arising from changes in data collection methodologies prompted by the Covid-19 pandemic. This shift from in-person to alternative interview methods affected data quality primarily due to increased panel attrition (Bozoyan et al., 2021). Additionally, Wave 14 (2021/22) was excluded because of modifications in the interview protocols associated with the transition to FReDA – The Family Demographic Panel, a continuation of the pairfam project. This transition resulted in a reduction of the anchor interview duration to 20 minutes and the shift away from face-to-face interviews for most participants, retaining only a small subset (1,200 respondents) to evaluate the effects of these changes on data quality (Brüderl, Schmiedeberg, et al., 2023). Consequently, only data from waves 1 (2008/09) to 11 (2018/19) were consolidated into a long-format database. This produced

a dataset comprising 83,132 observations[1] where each row represents an individual's observation at a specific wave.

This study focuses on examining how fathers taking parental leave for their first child influences the likelihood of having a second child within heterosexual couples. Therefore, our sample exclusively consists of men in heterosexual relationships who have at least one child. First, we restricted our dataset to male respondents using the "sex_gen" variable from pairfam, which records the respondent's gender across each wave. To ensure consistency in our analysis, we excluded any records showing variation in the respondent's gender identification across different waves, resulting in a study sample of 39,391 observations. Although the pairfam dataset's multi-actor feature offers the possibility of including female respondents to collect information about their male partners, we chose to limit our sample to male respondents only. This decision was driven by the fact that not all partners agreed to participate in the study, and certain variables available for the main respondent were not available for their partners.

We further narrowed our sample to include only men who reported having at least one biological child at the end of the survey. This focus on biological children is due to the significantly different dynamics between biological parenthood and adoption (Ceballo et al., 2004). To this end, we created the variable "nkidslast", which reflects the respondent's number of children at the time of the last wave they participated in. This variable is based on "nkidsbio", which records the number of biological children the respondent had at the time of each interview. Consequently, men who did not report having children in the last wave they participated in were removed from our sample, leaving us with 15,801 observations. Focusing on biological children, we verified the biological status of reported children using the

[1] As our research uses panel data, our sample size is measured in terms of observations rather than individual respondents.

variables “sd15kx” and “ehc9kx”[2], which classify children as biological, adopted, foster, or stepchildren (N = 15,143).

Additionally, to ensure a uniform context for parental leave policies, only children born from 2007 onwards were considered (N = 7,189), using the variable “kxdobygen” which indicates the birth year of the child. The “x” in this variable represents the child’s order. Further adjustments were made for twin births and inconsistencies in birth dates, such as cases where the birthdate of the first child was reported after that of the second child. These adjustments reduced our sample size to 7,076 observations.

Moreover, we controlled for the characteristics of the other parent for both the first and second child, creating “parentk1” and “parentk2” variables. These variables specify the identity of the other parent and are coded as follows: -3 for “Does Not Apply”[3], 1 for “ Partner 1”, 2 for “Partner 2”, and 10 for “Other person”. To this end, we used “sd16kx” for first-wave observations, a variable indicating which partner is the other biological parent of the child and where “x” represents the child’s order. For the subsequent waves, we used the variable “ehc12kx” also indicating which partner is the other parent[4]. For both “parentk1” and “parentk2”, men who reported either missing values or the code 10, indicating that the other parent was not a partner[5], were excluded from the sample (N = 6,748). Additionally, men with

[2] The variables “sd15kx” and “ehc9kx” respectively represent the status of the child in the first wave and all subsequent waves, with “x” denoting the child’s ordinal position.

[3] The variables “parentk1” and “parentk2” are coded as -3 “Does Not Apply” when the respondent has no children and one child, respectively.

[4] The variable “sd16kx” is specific to the first wave and uses the code 0 to denote “Current partner”, codes 1 through 20 to represent “Partner 1” to “Partner 20”, and 97 for “Another person”, which refers to ex-partners except for the partner labelled as “Current partner” during the first wave. This “Current partner” is later re-coded as 1 for “Partner 1” in subsequent waves, indicated by the variable “ehc12kx”. The coding for “ehc12kx” ranges from 1 for “Partner 1” to 9 for “Partner 9”, and includes 10 for “Other person”, referring to a different individual or an ex-partner from a previous wave. Therefore, if a record mentions “Partner x” and the code 10 appears either before or after it, it indicates that the person represented by code 10 was not the current partner during that specific wave. If the code 10 is not preceded or followed by any code from 1 to 9, it implies that the “Other person” was not a partner.

[5] In instances where the value 10 does not indicate an ex-partner but rather an individual who was never a partner, there is no available information about the other parent. Consequently, these observations were removed from the dataset.

two children had to report the same other parent for both variables to remain in the sample, as our study aims to explore how fathers' parental leave uptake for the first child influences the probability of having a second child with the same partner (N = 6,713). Furthermore, we identified heterosexual partnerships to align with the study's methodological framework that examines gender dynamics within these relationships. This required the verification of the other parent's sex using the variable "psex_gen". No observations were removed based on this criterion as all other parents identified as women.

Eventually, our sample was restricted to couples who lived together continuously over three consecutive waves starting from when the first child was reported. This methodological decision reflects the evolving nature of cohabitation in Western societies, where living together outside of marriage has become a common familial arrangement (Lesthaeghe, 2014; Lichter et al., 2014; Osborne, 2005). This shift is noticeable in Germany as well, though regional differences in marriage and family norms continue to exist (Klärner & Knabe, 2017). The contrast in fertility behaviours between cohabiting and non-cohabiting couples is significant, underscoring the importance of this factor in examining continued childbearing within relationships. Cohabitation often leads to higher sexual activity, which in turn increases the likelihood of pregnancy (Bachrach, 1987). Moreover, cohabitation creates an environment that can encourage childbearing due to increased stability and shared objectives between partners. Conversely, the end of such living arrangements can disrupt this stability and reduce daily intimate interactions, thereby affecting fertility intentions and outcomes (Mulder, 2003). Focusing on cohabiting couples is thus essential to provide a uniform context in this study. Therefore, we created the variable "cohab" which reports whether the respondent is cohabitating with the other parent for each wave. This is determined using the variables "sd7e1", which indicates whether respondents are currently cohabitating with their current partner during the first wave, and "ehc3px", which specifies whether respondents are currently cohabitating with partner x in subsequent waves, and where "x" denotes the partner's sequence number. In our sample, the other parent of the first or second child

is usually the respondent's first partner, though occasionally, it is the second partner. However, due to inconsistencies in the cohabitation variable for the second partner ("ehc3p2"), we have chosen to exclude cases where the other parent is the second partner (N = 6,688).

To study the fertility behaviour of heterosexual couples after the birth of the first child, we excluded men who already had one or more children at the first wave they participated in. This exclusion allows us to track the transition into parenthood between survey waves and to begin the observation period with the wave that records the birth of the first child. To determine the observation period between first and second-order births, we examined the birth spacing within the sample (c.f. Appendix 2). The data showed that among men with at least two children, the median was two years, indicating that half of these men had their second child two years after their first. Additionally, 75% of these fathers welcomed their second child within three years of their first, and 90% within four years. We considered sample sizes for the two-year, three-year, and four-year observation periods, finding that a two-year period yielded 4,007 observations, a three-year period counted 3,417, and four years, 2,328. To find a suitable balance between observation duration and loss of information, we decided to adopt the three-year observation period. Accordingly, we created the variable "cohab_3waves" based on "cohab" to identify individuals who continuously cohabitated with the other parent of their first child for three consecutive waves, starting with the wave that documented the birth of the first child. Men who did not meet this condition were excluded and eventually, only observations during the three years were kept, resulting in a sample size of 1,038 observations.

Ultimately, individuals who skipped a wave during the observation period were excluded from the sample. This adjustment resulted in a final sample size of 924 observations.

To summarize, this sample includes 954 observations from Wave 1 (2008/09) to Wave 11 (2018/19). It comprises heterosexual men who have one biological child born in or after 2007 and who have cohabited with the child's other parent for three consecutive waves. Each man is observed

throughout three consecutive waves, starting from the wave indicating the birth of their first child. This sample will be further refined by removing men with missing data for our variables of interest. Detailed specifications of these manipulations will be provided in the following section.

3.3 Variables Selection

3.3.1 Independent Variable

The independent variable of this research seeks to measure whether men have taken or not parental leave for their first child during the observation period. Not directly available in the pairfam dataset, this variable had to be generated. To this end, we developed two derived variables: "pl_last" and "pl_curr". The former indicates whether parental leave was taken since the previous wave, and the latter denotes current parental leave status. Using these two variables, we created the variable "pleave", which assigned the value of 1 only for observations where parental leave was or is being taken. This value of 1 is not applied to all observations/waves for the same individual if he took the leave for only one wave; only the wave in which the leave was taken indicates the value of 1. This feature allows us to track whether the individual's behaviour changes after taking parental leave.

The generation of "pl_last" was based on a set of 32 variables labelled "ehc19i17mz", where "z" represents the month since the last interview. These variables record the use of various forms of leave – parental, maternity, paternity, or other childcare-related leave – for each month since the previous interview. Given the sample exclusively consists of men and considering the legal context in Germany – where the implementation of paternity leave is scheduled for 2024 (Nebe et al., 2022; NWB Datenbank, 2023) – it is inferred that the reported leaves could neither be maternity nor paternity leaves. These variables likely represent another form of childcare leave. As parental leave – or at least one part of it – is mandated to be taken before the child reaches three years of age in Germany, it is reasonable to presume that any leave taken within this period is parental. Thus, we assume that a report of "1" in these variables reflects the use of parental leave during the observation period.

The variable “pl_curr” is based on “sd23i17” and “ehc19i17”, indicating current leave status – either parental, maternity, paternity, or other childcare-related leave – for the first survey wave and subsequent waves, respectively. As with “pl_last” these variables are assumed to reflect parental leave when they indicate the value “1”, following the rationale provided for “pl_last”.

Building on these generated variables, we formulated the independent variable “pleave”. A value of 1 is assigned to “pleave” if any of the following conditions are met:

a) The respondent is currently on parental leave and has one child at the time of the interview.
b) The respondent used parental leave in the preceding months since the last interview and currently has one child.
c) The respondent used parental leave in the preceding months since the last interview, had one child during the previous wave and has currently two children.

Conditions a) and b) are specifically designed to capture instances of men taking parental leave for their first child. Condition c) is included as parental leave uptake for the first child can also occur in such instances, although it may also cover parental leave uptake for the second child. This inclusion is justified by the fact that the decision to take parental leave generally precedes the birth of the child, as parents usually plan their leave in advance (Alsarve, 2021). Additionally, in Germany, parental leave must be registered at least seven weeks before the child’s due date (Referat Öffentlichkeitsarbeit, 2021). This ensures that even if the leave was used for the second child, the decision to take leave still precedes the birth of the child.

Furthermore, under conditions a) and b) alone, the uptake of parental leave for the first child by fathers was around 15% in our sample[6]. This is

[6] The share of fathers who took parental leave was calculated by measuring the proportion of individuals who took parental leave at least once during the observation period. This method is more representative than calculating the share based on the proportions of observations where fathers took parental leave.

notably lower than the national average; in Germany, approximately 32% of fathers took parental leave in 2013 (Karu & Tremblay, 2018). Although these statistics do not specify the leave distribution based on the birth order or child status, it is important to note that most German families consist of one to two children, and most only have biological children (Moorman & Hernandez, 1989). Consequently, it is reasonable to infer that a substantial proportion of all parental leaves are taken for first and biological children. Moreover, parental leave usage significantly differs between the first and subsequent children. Parents' first experiences often influence their future usage of parental leave, which can result in a decreased likelihood of taking leave for later children (Ginja et al., 2017). Further evidence supports that while first-time parents might fully exploit parental leave benefits, those with subsequent children often experience a shortened leave period or a lower likelihood of taking leave at all (Barnes, 2013). Given these dynamics, the inclusion of condition c) was deemed necessary, ultimately raising the share of parental leave uptake to 22% within our sample.

3.3.2 Dependent Variable

The dependent variable of this research seeks to measure whether men with one child end up having a second child in the three waves following the birth of their first child. Not directly available in the pairfam dataset, this variable had to be generated. To this end, we created the variable "sob" to verify whether a second child was reported during the observation period. If no second child is reported, meaning "nkidsbio" remains at 1 throughout all three waves, then "sob" is coded as 0. Conversely, if a second child is reported during any of the waves, meaning that "nkidsbio" reaches a maximum of at least two, then "sob" is coded as 1. Note that this variable was coded to indicate the wave in which the number of children transitioned from 1 to 2, so only this specific wave is coded as 1, rather than coding all observations of an individual who ended up having two children.

While previous research also looked at third births (Cools et al., 2015; Duvander et al., 2010, 2019; Duvander, Lappegård, et al., 2020), this study focuses exclusively on second births due to differing demographic trends in

Germany compared to the Nordic countries. The latter has traditionally seen a higher prevalence of families with three or more children (Frejka, 2008a; Shkolnikov et al., 2007), whereas in Germany, the ideal family size tends towards two children (Sobotka & Beaujouan, 2014), with declining rates of larger families (Dorbritz, 2008; Frejka, 2008a; Huinink, 1989; Kreyenfeld et al., 2010). This inclination towards smaller families is evident in the pairfam sample, where only 8.10% of the observations reported three or more children across the eleven waves of data collection (c.f. Appendix 3).

3.3.3 Control Variables

To fully understand how parental leave influences second-order fertility, it is essential to consider the factors that impact both variables. These factors, known as control variables, are vital for isolating the relationship between the independent variable (parental leave) and the dependent variable (second-order fertility). Some of these factors are observable and can be incorporated into the model, which will be discussed later. However, it is important to recognize that not all variables affecting both the independent and dependent variables are observable, leading to what is known as unobserved heterogeneity.

i. Age

Age significantly influences fertility behaviour. From a biological perspective, fertility declines with age for both men and women (Dunson et al., 2002; Madankumar et al., 2003; Stewart & Kim, 2011). Additionally, age influences parental leave usage. Research indicates that younger fathers are more likely to take parental leave, possibly due to greater alignment with contemporary family values and gender equality in parenting. This trend is particularly noted in Germany, where parental leave policies promoting father's leave uptake have increased younger fathers' participation in childcare and household duties (Bünning, 2015). Whereas older fathers, often more established in their careers, may view taking parental leave as a professional risk, younger fathers, who are generally earlier in their career paths, may see parental leave as a viable option with minimal career

repercussions (Tanaka & Waldfogel, 2007). Additionally, the literature suggests that the age of the partner influences leave uptake, with fathers more likely to take parental leave if their partners are older (Geisler & Kreyenfeld, 2011).

To account for these dynamics, our model controls for both the father's and the mother's age. For this purpose, the variables "age" and "page" have been recoded to represent two age groups for the respondent and their partner: 20-34 and 35+. Since the partner's age was missing for 9 observations, we removed those from the sample, resulting in a sample size of 945 observations. Additionally, we included a measure of age disparity to account for the influence of being with a partner of the same age, younger, or older. To this end, we created the categorical variable "age_diff" which identifies if the respondents and their partner are either both young, both old, young-old, or old-young. Individuals aged 20-34 are considered young while those aged 35+ are considered old.

ii. Marital Status

Traditionally, marriage has been a crucial factor in understanding fertility behaviour as it serves as a precursor for family formation. However, changing social norms have led to an increase in other living arrangements, such as cohabitation (Festy, 1980; Frejka, 2008b; Hiekel & Castro-Martín, 2014; Sobotka & Toulemon, 2008; van de Kaa, 1999). Although the link between marital status and fertility has weakened, marriage still influences fertility outcomes. For instance, a study investigating the association between cohabitation and fertility intentions across nine European countries, including Germany, demonstrated that individuals who perceive cohabitation as a precursor to marriage are more inclined to plan for children (Hiekel & Castro-Martín, 2014). Additionally, research conducted in the United States indicates that married couples tend to have higher fertility rates compared to cohabiting couples. This phenomenon can be attributed to the stronger incentives for household specialization prevalent among married couples, which increases fertility (Zhang & Song, 2008). Moreover, the higher fertility rates observed among married couples can be explained by the greater stability that marriage

fosters (Aarskaug Wiik et al., 2012). Empirical evidence suggests that cohabiting couples often report lower relationship stability relative to married couples, a factor that can significantly impact their fertility intentions and outcomes (Brown et al., 2017).

To control for the effect of marital status on fertility, we used the variables "sd11" and "ehc4p1". The first variable indicates whether respondents are married to their current partner during the first wave. The second variable reports whether respondents are married to their first partner – who is the current partner in the first wave – in all subsequent waves. Using these variables, we created a binary variable called "married", which is set to 0 for unmarried respondents and 1 for married respondents. We found no missing values.

iii. Education

Although the underlying dynamics may differ, the education levels of both men and women significantly impact fertility behaviour. Generally, higher education correlates with lower fertility rates, but in certain contexts, greater educational attainment may lead to higher fertility (Kravdal & Rindfuss, 2008; Sell, 1981). In Germany, men with higher education levels tend to have a higher likelihood of fatherhood, likely due to the socioeconomic stability that advanced education can provide, which supports family formation (Oppermann, 2013). Conversely, for women in Germany, higher educational attainment is associated with lower fertility rates and postponed parenthood (Cygan-Rehm & Maeder, 2013; Oppermann, 2017). Moreover, the field of education also significantly influences fertility; women in fields like teaching and healthcare typically exhibit higher fertility rates compared to those in fields dominated by men (Oppermann, 2013, 2017). However, since the educational field is not available in the dataset, it will be considered an omitted variable.

Furthermore, highly educated fathers are more likely to take parental leave as their educational level affects their attitudes towards gender equality and shared parenting responsibilities, which are often more progressive

among higher-educated individuals. Additionally, fathers are more inclined to take parental leave if their partners have higher education levels, which might reflect the career orientations of more educated mothers, soliciting fathers to assume greater domestic responsibilities during the early stages of parenthood (Geisler & Kreyenfeld, 2011).

To account for the effect of education on both fertility and parental leave, we generated variables based on the International Standard Classification of Education (ISCED-97) levels for both the respondent, labelled as "isced", and their partner, labelled as "pisced". Following Eurostat's guidelines (*International Standard Classification of Education (ISCED)*, 2023), these variables have been recategorized to represent three principal educational aggregates: low, medium, and high levels of education. We found one missing observation for the partner's education. Since we had other observations for the education of this partner in different waves, we performed a unit imputation by assigning the same educational level as recorded in those other waves. Moreover, we control for educational differences between the respondent and their partner, creating a categorical variable, "educ_diff", which indicates whether the respondents and their partner have both low education, high education, high-low, or low-high education. Low education includes primary and secondary education (i.e., low, and medium) while high education refers to tertiary education (i.e., high).

iv. Employment

In Germany, employment status is linked to fertility behaviour as job security tends to increase the likelihood of having a child. This effect is particularly pronounced among women, however, job security has mixed impacts on men's fertility (Klemm, 2012). Workplace characteristics however do affect men's fertility as precarious employment conditions such as fixed-term contracts tend to delay family formation (Schmitt, 2021). Moreover, employment characteristics influence parental leave decisions. Fathers employed in the public sector or with permanent contracts are more likely to take parental leave, whereas those in temporary contracts or self-employment are less likely to take parental leave. These factors highlight the importance

of job security in the decision to take parental leave (Auer & Danzer, 2016; Bygren & Duvander, 2006; Geisler & Kreyenfeld, 2019).

To control for occupational status within our analysis, we employ the variable "lfs" to indicate the labour force status of the respondent. Unlike most survey research, where individuals on parental leave are coded as either employed or inactive (Mikucka & Valentova, 2013), pairfam recognizes parental leave as a distinct form of occupational status. However, to accurately capture the effect of occupation, we decided to impute the occupation before the parental leave as the current occupation for cases where "lfs" indicated the value 2, "On parental leave"[7]. Additionally, we verified that individuals who reported being unemployed while also being on parental leave (when "pleave" equals 1) were indeed not working before taking the leave, as respondents might report themselves as inactive while on parental leave. We found no cases requiring recoding, which seems logical since respondent would more likely report their occupational status as "on parental leave" if they were. The respondent's occupation variable was then recoded into a condensed set of categories: 1 "Employed", including full-time, part-time, and marginal employment[8]; 2 "Self-Employed"; 3 "Inactive", encompassing those in education, homemakers, unemployed, retired, and other non-working statuses; and 4 "Other", which includes employment scenarios not captured in the other categories (e.g., vocational training). We found no missing values.

Furthermore, specific employment characteristics are considered using the variable "job3" which identifies whether the respondent is under a temporary employment contract, and "job4", which determines whether the respondent is employed in the public sector. "job3" was renamed "temp_emp" and recoded into 0 "Permanent", 1 "Temporary", and -3 "Does not apply". Similarly, "job4" was renamed "public" and recoded into 0 "Private", 1 "Public", and -3 "Does not apply". Since these variables are only

[7] These cases represent 23 observations, accounting for 2,24% of the total observations.
[8] The decision to include all three types of employment into one category arises from the low proportion of part-time and marginally employed fathers in the sample, respectively representing only 3.90% and 0.49% of the observations.

relevant for employed individuals, the category -3 was created to encompass all other occupational statuses. As with the occupation variable, the previous observation was imputed as the current one if the individual indicated the occupational status "parental leave", to correctly capture the effect of these variables. Eventually, we found two missing values for "temp_emp" and five for "public", which we handled by imputing the value -3 when the individual was not employed. The variable "public" had three remaining missing values, all corresponding to the same individual, who was subsequently removed from the sample (N = 942).

v. Country of Origin

The cultural background and fertility rates in immigrants' countries of origin significantly impact their fertility behaviour even after migrating. This impact is particularly pronounced among first-generation immigrants and gradually lessens, but remains significant, in second and 1.5 generation (those who migrated as children) immigrants. This suggests that cultural norms around family size and childbearing are imported and persist to some extent, even after migration (Yeter & Stichnoth, 2013). Similar results have also been found for the relationship between immigrants' countries of origin and parental leave uptake: immigrant parents tend to use parental leave differently than native parents, however, they tend to use the leave similarly after a time (Ma et al., 2020; Mussino & Duvander, 2016).

To this end, we included the variables "cob" and "pcob" which respectively indicate the country of origin of the respondent and of its partner. These variables were recoded to indicate a value of 1 if the individual was born in Germany and 2 if they were born in a foreign country. We found no missing values.

vi. Gender Attitudes

According to the theoretical frameworks previously discussed, egalitarian gender attitudes are expected to influence fertility behaviour. A study examining European men found that those with egalitarian gender attitudes both desired and had more children compared to those with

traditional gender attitudes (Puur et al., 2008). However, other research using alternate datasets found a negative association between men's egalitarian attitudes and fertility, not only in Europe but also in other developed countries (Westoff & Higgins, 2009). Although the direction of the relationship between egalitarian gender attitudes and fertility appears to vary across different socio-economic contexts, it is evidenced that a relationship exists. Moreover, fathers who hold egalitarian views about gender roles are more likely to take parental leave. This is particularly evident in environments where policies actively support paternal involvement through designated leave for fathers (Kaufman et al., 2024). Furthermore, gender attitudes significantly influence women's fertility decisions, and notably, the interaction between men's and women's gender attitudes is essential in shaping fertility outcomes (Arpino et al., 2015). As fathers who take parental leave may differ from other fathers in terms of gender norms and family orientation, controlling for this variable is crucial to mitigate selection bias (Cools et al., 2015).

To account for gender attitudes among respondents, we included four questions related to family values and gender roles, which were administered biennially starting from the first wave. As displayed in Table 1, respondents were asked to rate their agreement with each statement on a scale ranging from 1 for "Disagree completely", to 5 for "Agree completely". These measures have been employed in various studies to evaluate the degree to which respondents hold egalitarian versus traditional perspectives on gender roles (Horne & Johnson, 2018; Hudde & Engelhardt, 2020; Mensinger & Zimpelmann, 2024; Zoch & Schober, 2018). Although each of these items captures perceptions of gender roles within the couple and family life, these variables represent multiple aspects of gender attitudes rather than being alternative measures for the same underlying dimension (Hudde & Engelhardt, 2020). Whereas the first variable reflects perceptions regarding the role of women in society, the third value emphasizes the expectations associated with being a mother. Similarly, the second and the fourth variables capture the expectations associated with men and fathers. Therefore, we

believe that analysing them separately is more adapted as the creation of an index would not capture their distinct meaning.

Table 1. Measurement Variables for Egalitarian Gender Attitudes.

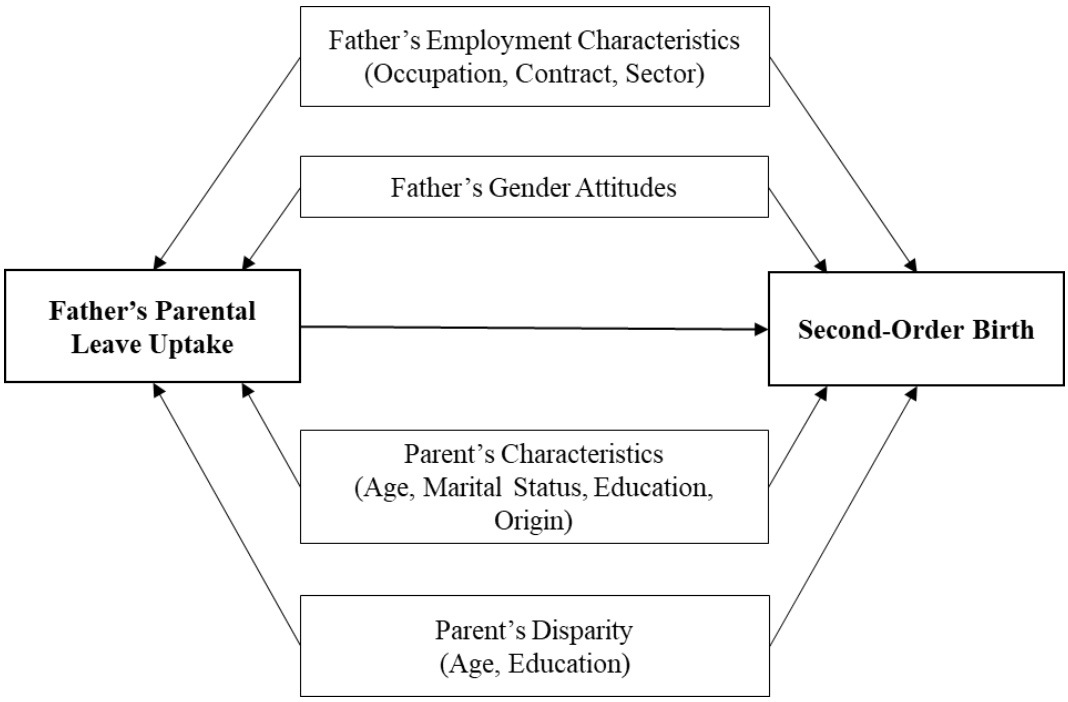
Variable	Label	Item
val1i3	Women should be more concerned about their family than about their career	Housewife
val1i4	Men should participate in the housework to the same extent as women	Housework
val1i5	A child under 6 will suffer from having a working mother	Mother
val1i6	Children often suffer because their fathers spend too much time at work	Father

To facilitate comparison, we recoded variables to share a consistent scale ranging from 1 to 5, where 1 represents the most traditional and 5 the most egalitarian gender attitudes. While variables related to men's and fathers' expectations were already suited for this scale, we had to recode the variables related to women's and mothers' roles. Consequently, the item "housewife" was relabelled as "Women should not be more concerned about their family than about their career", and the item "mother" as "A child under 6 will rarely suffer from having a working mother". Accordingly, the scales were inverted to accurately reflect the original responses. Furthermore, since the birth of the first child can influence parents' gender attitudes (Katz-Wise et al., 2010; Perales et al., 2018), we decided to set their respective values to the mean observed before the birth of the first child. This approach also allows us to control for family orientation and gender roles of fathers before taking (or not) parental leave, thereby addressing the selectivity bias highlighted by previous research (Cools et al., 2015; Duvander, Lappegård, et al., 2020). Regarding missing values, we excluded observations where at least one out of the four mean variables indicated a missing value. This exclusion reduced the sample size to 897 observations.

vii. Causal Diagram

For enhanced clarity and to facilitate a deeper understanding of the interrelationships among the variables, a causal diagram is provided in Figure 3, showing the connections between each variable described earlier.

Figure 3. Father's Parental Leave Uptake and Second Order-Birth Causal Diagram.



3.4 Summary of Variables

On the following pages, Table 2 and Table 3 display the distribution and summary statistics for each independent variable. As we intend to conduct a regional analysis (c.f. Section 4.3), these numbers are available for the national sample and the regional samples (i.e., East and West Germany).

Table 2. Data Description of Categorial Variables.

	Global level			Regional level					
				East			West		
	Freq.	%	2nd child %	Freq.	%	2nd child %	Freq.	%	2nd child %
Parental leave									
No	818	**91.2**	8.6	232	**91.3**	6.5	586	**91.1**	9.4
Yes	79	**8.8**	15.2	22	**8.7**	0.0	57	**8.9**	21.1
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Age father									
18-34	596	**66.4**	8.6	183	**72.1**	4.9	413	**64.2**	10.2
35+	301	**33.6**	10.3	71	**27.9**	8.5	230	**35.8**	10.9
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Age mother									
18-34	710	**79.2**	8.9	210	**82.7**	5.7	500	**77.8**	10.2
35+	187	**20.8**	10.2	44	**17.3**	6.8	143	**22.2**	11.2
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Age difference									
Y-Y	564	**62.9**	8.7	169	**66.5**	4.7	395	**61.4**	10.4
O-O	155	**17.3**	11.0	30	**11.8**	6.7	125	**19.5**	12.0
Y-O	32	**3.5**	6.3	14	**5.5**	7.1	18	**2.8**	5.6
O-Y	146	**16.3**	9.6	41	**16.2**	9.8	105	**16.3**	9.5
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Marital status									
Unmarried	264	**29.4**	5.7	156	**61.4**	5.1	108	**16.8**	6.5
Married	633	**70.6**	10.6	98	**38.6**	7.1	535	**83.2**	11.2
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Education father									
Low	57	**6.3**	10.5	15	**5.9**	13.3	42	**6.5**	9.5
Medium	312	**34.8**	7.4	125	**49.2**	3.2	187	**29.1**	10.2
High	528	**58.9**	10.0	114	**44.9**	7.9	414	**64.4**	10.6
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Education mother									
Low	44	**4.9**	9.1	12	**4.7**	16.7	32	**5.0**	6.3
Medium	291	**32.4**	8.9	95	**37.4**	6.3	196	**30.5**	10.2
High	562	**62.7**	9.3	147	**57.9**	4.8	415	**64.5**	10.8
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4

Table continued.

Education difference									
L-L	208	**23.2**	8.7	83	**32.7**	6.0	125	**19.4**	10.4
H-H	401	**44.7**	10.2	90	**35.4**	6.7	311	**48.4**	11.3
L-H	161	**17.9**	6.8	57	**22.4**	1.8	104	**16.2**	9.6
H-L	127	**14.2**	9.5	24	**9.5**	12.5	103	**16.0**	8.7
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Occupation father									
Employed	741	**82.6**	9.5	222	**87.4**	6.3	519	**80.7**	10.8
Self-employed	104	**11.6**	6.7	14	**5.5**	0.0	90	**14.0**	7.8
Inactive	44	**4.9**	9.1	17	**6.7**	5.9	27	**4.2**	11.1
Other	8	**0.9**	12.5	1	**0.4**	0.0	7	**1.1**	14.3
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Contract father									
Permanent	648	**72.2**	10.2	187	**73.6**	5.9	461	**71.7**	7.6
Temporary	97	**10.8**	6.2	34	**13.4**	8.8	63	**9.8**	11.9
N/A	152	**17.0**	6.6	33	**13.0**	3.0	119	**18.5**	4.8
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Sector father									
Private	579	**64.6**	10.2	180	**70.9**	6.7	399	**62.0**	11.8
Public	98	**10.9**	5.1	32	**12.6**	3.1	66	**10.3**	6.1
N/A	220	**24.5**	8.2	42	**16.5**	4.8	178	**27.7**	9.0
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Origin father									
Germany	825	**92.0**	9.2	251	**98.8**	5.6	574	**89.3**	10.8
Foreign	72	**8.0**	8.3	3	**1.2**	33.3	69	**10.7**	7.3
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4
Origin mother									
Germany	777	**86.6**	9.4	248	**97.6**	6.1	529	**82.3**	11.0
Foreign	120	**13.4**	7.5	6	**2.4**	0.0	114	**17.7**	7.9
Total	897	**100.0**	9.1	254	**100.0**	5.9	643	**100.0**	10.4

Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Table 3. Data Description of Numerical Variables.

	Global level		Regional level				
			East		West		
	N = 897		n = 254		n = 643		
	Mean	SD	Mean	SD	Mean	SD	Range
Housewife	3.31	0.95	3.31	0.97	3.31	0.94	1-5
Housework	4.15	0.89	4.12	0.86	4.16	0.91	1-5
Mother	3.27	1.09	3.60	1.05	3.14	1.09	1-5
Father	3.43	0.86	3.16	0.89	3.53	0.83	1-5

Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

4 Method

This section aims to outline the methodological framework employed in this research. First, it will review methodological approaches used in previous studies with similar research objectives to determine the most appropriate method for this research. Subsequently, the selected method and the analytical strategy will be described.

4.1 Methodological Literature Review

Within the scientific literature, several authors have previously endeavoured to analyse the relationship between the use of parental leave by both the father and/or the mother and higher-order births. Notably, Duvander and Andersson (2006) investigated how Swedish fathers' involvement in parental leave following the birth of their first and second children influenced the likelihood of having more children. They used data on the duration parents were exposed to the possibility of having another child and the subsequent birth records to estimate the relative risks of childbirth in different parental leave scenarios. They employed event-history analysis, which included controlling for other demographic and socio-economic factors that might affect both leave usage and childbearing decisions. Expanding on this methodology, Duvander et al. (2010) explored how both fathers' and mothers' use of parental leave affected the continuation of childbearing in Norway and Sweden. Later, Duvander et al. (2019) broadened their study to include data from Sweden, Norway, and Iceland, maintaining their focus on event-history analysis, suitable for examining time-dependent family dynamics data.

Another study by Cools et al. (2015) looked at the effects of paternity leave on childbearing outcomes in Norway, such as the total number of children a couple has, the likelihood of having more children, and the spacing between births. They noted that selection bias could be a concern, as families where fathers take leave might differ significantly from others. Indeed, fathers opting for leave might exhibit a higher orientation toward childcare, and continued childbearing, in such instances, might be more indicative of the fathers' norms regarding parenthood and fertility intentions rather than being

directly linked to the leave uptake itself. To control for this, their study treated the introduction of paternity leave as a natural experiment, comparing families with births just before and after the paternity leave reform date. Duvander et al. (2020) used a similar method to analyse the impact of paternity leave on sustained childbearing in Norway and Sweden. While previous analyses explored the association between parental leave uptake and continued childbearing, the studies conducted by Cools et al. (2015) and Duvander et al. (2020) aimed to distinguish causality from selection by using natural experiments.

Although these studies focussed on evaluating parental leave policy – a topic not addressed by the present research – this research shares a common objective: to determine whether parental leave uptake influences continued childbearing. Using similar methodological frameworks as these endeavours would be relevant; however, we opted to depart from them for two reasons. First, event history analysis is unsuitable for the variables selected since they are not dated. Second, the use of a natural experiment is unnecessary since we control for variables related to the selection of men into parental leave, such as family norms and gender attitudes.

In the field of social sciences, research methodologies that analyse outcomes represented by binary variables often employ logistic regression models. Nevertheless, logistic regression has exhibited limitations in effectively addressing such tasks due to the issue of unobserved heterogeneity. This term refers to the variance in the dependent variable attributable to variables omitted from the model. The influence of these unobserved variables on logistic regression coefficients leads to several significant complications (Mood, 2010):

1. **Interpretation of Coefficients**: The coefficients in logistic regression models are not solely indicative of the relationships between the observed variables and the outcomes. Instead, they also encapsulate the effects of the omitted variables, complicating their interpretation.

2. **Comparability Across Models**: Since unobserved heterogeneity may differ between models, comparing coefficients across different logistic regression models becomes problematic. This variance can distort the apparent strength and direction of relationships between variables.

3. **Comparisons Across Groups or Time**: Logistic regression models also face challenges in comparing coefficients across different groups or temporal periods. Variations in unobserved heterogeneity across these dimensions can lead to misleading conclusions about the consistency of relationships over time or between groups.

Considering these issues, Linear Probability Models (LPMs) are proposed as a viable alternative. Based on linear regression, LMPs are specifically tailored for scenarios involving binary dependent variables and yield results expressed as changes in probabilities. As noted by Mood (2010), this approach involves estimating the direct effects on the observed dependent variable, thereby ensuring that coefficients are consistent and comparable across different models and demographic groups. Although this method is not without issues, LMPs provide unbiased and consistent estimates for the average effects on the dependent variable (Wooldridge, 2002). This significantly helps in the interpretation and comparison of results across various contexts. By adopting LPMs, both the clarity and the reliability of the conclusions drawn from studies that examine binary outcome variables can thus be enhanced, improving the overall robustness of the analytical framework. Additionally, LPMs are increasingly used in social science research for analysing binary outcomes, as evidenced by their use in studies employing the pairfam data (Bauer & Kneip, 2013; Minkus et al., 2022; Minkus & Drobnič, 2021; Schmiedeberg & Schumann, 2019; Schröder & Schmiedeberg, 2023), making this methodological framework a relevant choice for this research project.

4.2 Model Specification

The Linear Probability Model (LPM) is an Ordinary Least Squares (OLS) regression used to analyse binary outcomes, where dependent variables are coded as 0 or 1, respectively indicating the non-occurrence and occurrence of an event. The LPM estimates the probability of an event's occurrence as a linear function of independent variables (Werth, 2022). This model was chosen for its simplicity and interpretability, suitable for binary dependent variables.

Contrasting with logistic regression, which models the log odds of the dependent variable, the LPM directly models the probability of occurrence. This direct modelling allows for a straightforward interpretation of the model parameters but comes with certain limitations, such as the possibility of predicting probabilities outside the [-1,1] interval. However, in practice, this issue is often manageable unless many values outside this range are predicted (Mood, 2010). The model is specified as follows:

$$P(Y_i = 1 \mid X_i) = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_k X_{ki} + \varepsilon_i$$

Where $P(Y_i = 1 \mid X_i)$ is the probability for the outcome Y_i to occur for observation i, X_{1i} to X_{ki} are the independent variables, β_0 to β_k are the coefficients to be estimated, and ε_i is the error term. Coefficients in the LPM represent the change in the probability of the outcome occurring and are often multiplied by 100 to express this change as a percentage points (Werth, 2022). In this research, the LPM is used to estimate the likelihood of a second child being born, considering whether the father took parental leave for the first child, along with other control variables, which are collectively referred to as "covariates". The model is represented as:

$$Second\_Order\_Birth = \beta_0 + \beta_1 Parental\_Leave + \beta_2 Covariates$$

To run the model, the Stata command "xtset" followed by "xtreg"[9] are employed to estimate the coefficients β_0, β_1, and β_2, providing insights into how independent variables influence the dependent variable (Werth, 2022). To evaluate the statistical significance of each coefficient, we test the hypotheses:

$$H_0 : \beta_k = 0$$

$$H_1 : \beta_k \neq 0$$

Under the null hypothesis, H_0, it is assumed that the independent variable corresponding to β_k does not significantly impact the dependent variable. In contrast, the alternative hypothesis, H_1, suggests that β_k does have a significant effect on the dependent variable. The decision to accept or reject H_0 is based on the p-value, which quantifies the probability of observing values as extreme as the values observed if H_0 were true. A high p-value thus indicates a greater likelihood that β_k is effectively equal to zero, implying that the independent variable has no significant effect on the dependent variable. Specifically, if the p-value exceeds the conventional threshold of 5%, H_0 is accepted, suggesting with 95% confidence that the variable is statistically insignificant. Conversely, a p-value below this threshold leads to the rejection of H_0, allowing us to assert with 95% confidence that the independent variable significantly influences the dependent variable. Moreover, to assess the strength of the relationship between an independent variable and the dependent variable, we must consider the magnitude of the coefficient. A coefficient close to 1 indicates a strong relationship, whereas a coefficient close to 0 suggests a weak relationship (Werth, 2022).

However, it is crucial to verify the model's assumptions before running it. The Linear Probability Model operates under the following assumptions (Mood, 2010):

[9] The xtset command in Stata is used to declare a dataset as longitudinal. By doing so, Stata recognizes the data's structure, enabling the use of various specialized commands like xtreg, which estimates linear regression models.

1. **Linearity**: The model assumes a linear relationship between the independent variable and the probability that the dependent variable equals 1.

2. **Homoscedasticity**: The variance of the error terms is assumed constant across values of the independent variables, which is typically violated in binary outcome models. This issue can be mitigated using the "robust" option in Stata to employ heteroscedasticity-robust standard errors.

3. **Independence of Errors**: Errors are assumed to be independent from one another and from the predictors, with any deviation potentially resulting in biased estimations.

4. **No Specification Error**: The model assumes no omitted variables, no measurement errors, and the correct form of the model is specified.

5. **Normality of Errors**: Errors are assumed to be normally distributed, which is less of a concern when large samples are used but critical in smaller samples.

The validity of the LPM is assessed through diagnostic checks for linearity and homoscedasticity, alongside tests for influential observations that could affect the robustness of the model. The fit of the model is evaluated through the R-squared value (Werth, 2022).

4.3 Analytical Strategy

In this sub-section, we outline the methodological decisions undertaken to address our research questions effectively, along with the rationale for these choices. We opted to develop three distinct models: a global model encompassing both East and West Germany, the East model including only individuals residing in East Germany, and a West model including those residing in West Germany. This decision stems from the traditional approach of studying fertility behaviour in Germany, which often

focuses on a regional scale due to the substantial cultural differences between the two regions (O. A. Becker et al., 2010). We hypothesize that the distinct contextual frameworks inherent to each region differently influence our variables of interest, thereby necessitating separate analyses. This methodological strategy facilitates a nuanced examination of the outcomes specific to East and West Germany, respectively. To enable such comparative analysis, we employ a linear probability regression model, which allows for the direct comparison of coefficients across the different models. This is a distinct advantage over logistic regression, which does not permit straightforward coefficient comparison (Mood, 2010).

Additionally, we used the Hausman test to determine whether to use a fixed effects or random effects model. The fixed effects model assumes that unobserved individual-specific effects (i.e., unobserved confounding factors) are correlated to the independent variables and controls for these effects. On the contrary, the random effects model assumes that these effects are uncorrelated to the independent variables. By running the model under both fixed and random effects, the Hausman test measures the difference between the coefficients from both models under the null hypothesis that individual-specific effects are uncorrelated with the explanatory variables. If the test indicates a p-value less than 0.05, the null hypothesis is rejected, and we conclude that a fixed effects model is more appropriate. Contrarily, if the p-value is above this threshold, we cannot reject the null hypothesis and conclude that using random effects is more appropriate (Brüderl & Ludwig, 2019). In our case, we obtained a p-value of 0.979 and concluded that using a random effects model would be more appropriate for this research endeavour.

Moreover, we tested the model assumptions to establish its validity and reliability. Although the linear probability model is theoretically designed to verify the assumptions mentioned earlier, this work will focus solely on examining the homoscedasticity assumption. This choice is based on the premise that the invalidity of other assumptions – such as normality or independence – does not significantly affect the interpretation of the results,

and that heteroscedasticity can be easily addressed by using heteroscedasticity-robust standard errors (Mood, 2010). To this end, we performed the Breusch-Pagan test, a standard procedure for detecting heteroscedasticity in panel data. The null hypothesis of the Breusch-Pagan test posits that the residual variance is constant (homoscedasticity) (Social Science Computing Cooperative, 2023). Our results indicated a p-value exceeding the 0.05 threshold, leading us to reject the null hypothesis and conclude that the model exhibits heteroscedasticity.

In the following section, we will present the results from the univariate models, where a regression analysis has been conducted separately for each explanatory variable within each of the three models. This methodological approach allows us to discern the interaction between each independent variable and the dependent variable, as well as to compare the coefficients obtained from the univariate analysis with those derived from the multivariate regression. Such comparison is crucial as it allows us to observe whether the impact of each explanatory variable changes when included in the multivariate model. To this end, we will also present the results from the multivariate regression which estimates the effect of parental leave on the likelihood to have a second child while accounting for all other independent variables. Specifically, if the effect of the primary independent variable diminishes with the inclusion of other explanatory variables, it would suggest that parental leave uptake influences continued childbearing through these other variables. Conversely, if the effect remains consistent, it indicates that the impact of parental leave uptake is robust and not mediated by the other explanatory variables (Ho, 2013).

These analyses were conducted using Stata. Initially, we informed Stata that the data was longitudinal by using the command “xtset”, specifying the individual identification number (id) and the time unit of analysis (wave). Subsequently, the regression analyses were performed using the “xtreg” command, followed by the dependent variable and the independent variables. For these regressions, we employed the “re” option to estimate random effects

and the “vce(cluster id)” option to obtain heteroscedasticity-robust and cluster-robust standard errors.

When interpreting the results of a linear probability model, the coefficient estimated for each independent variable represents a change in percentage points of the probability of having a second child. It is crucial to distinguish between categorical and numerical variables, as their interpretation differs. For numerical independent variables, Stata provides a coefficient, a p-value, and a confidence interval to evaluate the significance of the effect. The coefficient for a numerical variable represents the change in the probability of the dependent variable being 1 for a one-unit increase in the independent variable, holding all other explanatory variables constant. In contrast, when estimating the effect of a categorical independent variable, Stata provides coefficients, p-values, and confidence intervals for all categories except one, which serves as the reference category with its coefficient set to zero. To ensure the correct estimation of categorical variables by Stata, they must be preceded by “i.”. Thus, the coefficients for categorical variables represent the change in the probability of the dependent variable being 1 compared to the reference category, holding all other explanatory variables constant (Werth, 2022). For the categorical variables included in the model, we selected the following reference category: parental leave 0 (“No”); parent’s age group, 1 (“18-34”); age difference, 1 (“Young-Young”); marital status, 0 (“No”); parent’s educational level, 1 (“Low”); educational difference, 1 (“Low-Low”); father’s occupation, 1 (“Employed”); father’s contract, 0 (“Permanent”); father’s sector, 0 (“Private”); parent’s origin, 1 (“Germany”).

5 Results

5.1 Univariate Analysis

In Table 4, the results of the univariate regression analysis are displayed for each model, including the coefficient, p-value, and 95% confidence interval. Statistically significant results at the 90% and 95% confidence level are respectively underlined and in bold. This analysis aims to observe the effect of each independent variable on the dependent variable separately.

Table 4. Univariate Analysis of Predictors for Second Childbirth Probability.

	Global			**East**			**West**		
	Coef.	P>|z|	CI 95%	Coef.	P>|z|	CI	Coef.	P>|z|	CI
Parental leave									
No	0			0			0		
Yes	.07	.106	-.01; .15	**-.06**	**.000**	**-.09;-.03**	**.12**	**.030**	**.01;.22**
Age father									
18-34	0			0			0		
35+	.02	.383	-.02; .06	.04	.337	-.04;.11	.01	.768	-.04;.05
Age mother									
18-34	0			0			0		
35+	.01	.572	-.03; .06	.01	.778	-.07;.09	.01	.718	-.04;.06
Age difference									
Y-Y	0			0			0		
O-O	.02	.380	-.03;.07	.02	.677	-.07;.11	.02	.596	-.04;.08
Y-O	-.02	.542	-.10;.05	.02	.709	-.10;.15	-.05	.340	-.15;.05
O-Y	.01	.739	-.04;.06	.05	.330	-.05;.15	-.01	.788	-.07;.05
Marital status									
Unmarried	0			0			0		
Married	**.05**	**.005**	**.02;.08**	.02	.488	-.04;.08	<u>.05</u>	<u>.061</u>	<u>-.00;.10</u>
Education father									
Low	0			0			0		
Medium	-.03	.407	-.11;.04	-.10	.179	-.25;.05	.01	.887	-.08;.09
High	-.00	.896	-.08;.07	-.05	.482	-.21;.10	.01	.794	-.07;.09

Table continued on the next page.

Education mother									
Low	0			0			0		
Medium	-.00	.970	-.08;.08	-.10	.236	-.27;.07	.04	.366	-.05;.13
High	.00	.968	-.08;.08	-.12	.165	-.29;.05	.05	.274	-.04;.13
Education difference									
L-L	0			0			0		
H-H	.02	.478	-.03;.06	.01	.854	-.06;.07	.01	.766	-.05;.06
L-H	-.02	.477	-.07;.03	-.04	.156	-.10;.02	-.01	.825	-.08;.06
H-L	.01	.784	-.05;.06	.06	.302	-.06;.19	-.02	.631	-.08;.05
Occupation father									
Employed	0			0			0		
Self-employed	-.03	.284	-.08;.02	**-.06**	**.000**	**-.09-.03**	-.03	.304	-.09;.03
Inactive	-.00	.927	-.08;.07	-.00	.937	-.011;.10	.00	.952	-.10;.11
Other	.03	.725	-.14;.20	**-.06**	**.000**	**-.09;-.03**	.03	.707	-.15;.22
Contract father									
Permanent	0			0			0		
Temporary	-.04	.118	-.09;.01	.03	.555	-.07;.13	**-.07**	**.012**	**-.13;-.02**
N/A	-.04	.100	-.08;.01	-.03	.388	-.09;.04	-.04	0.102	-.10;.01
Sector father									
Private	0			0			0		
Public	**-.05**	**.033**	**-.10;-.00**	-.04	.304	-.10;.03	-.06	.065	-.12;.00
N/A	-.02	.320	-.06;.02	-.02	.598	-.09;.05	-.03	.244	-.07;.02
Origin father									
Germany	0			0			0		
Foreign	-.01	.776	-.07;.05	**.28**	**.000**	**.25;.30**	-.04	.250	-.10;.03
Origin mother									
Germany	0			0			0		
Foreign	-.02	.429	-.07;.03	**-.06**	**.000**	**-.09;-.03**	-.03	.236	-.08;.02
Gender attitudes									
Housewife	**-.02**	**.040**	**-.04;-.00**	-.01	.304	-.04;.01	-.02	.067	-.04;.00
Housework	**-.03**	**.010**	**-.05;-.01**	**-.04**	**.032**	**-.07;-.00**	-.02	.051	-.05;.00
Mother	**-.02**	**.039**	**-.03;-.00**	-.01	.557	-.03;.02	-.02	.117	-.04;.00
Father	.01	.343	-.01;.03	-.00	.764	-.03;.03	.01	.475	-.01;.03

Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Parental Leave

In the global model, couples where the father took parental leave for the first child exhibit a 7-percentage point increased probability of having a second child. However, this result is not statistically significant. In contrast, the East and West models reveal significant but opposite effects. In East Germany, the probability of having a second child decreases by 6 percentage points, while in West Germany, it increases by 12 percentage points. The inverse trend in East Germany is attributable to the absence of fathers taking parental leave for the first child within the sample. Notably, the confidence interval in the East model, though narrow, is close to zero, whereas the West model exhibits a broader confidence interval, indicating an increase in the probability of having a second child by between 1 and 22 percentage points. Despite statistical significance, the interpretation remains ambiguous due to the high variability of the estimate and the confidence interval encompassing the Specific Effect Size of Interest (SESOI)[10] of |0.10|.

Age and Marital Status

The age of the parents and the age difference between them do not significantly influence the probability of having a second child across all three models. The coefficients for these variables are close to zero, with small confidence intervals, indicating that these factors alone do not have a statistically significant impact on second-order births among German couples. In contrast, marital status plays a more pronounced role. Being married, as opposed to not being married, is associated with an increase in the probability of having another child by 5 percentage points in the global model, at the 95% confidence interval. Similarly, in the West model, the

[10] The Smallest Effect Size of Interest (SESOI) is defined as the minimum effect size that would warrant a change in practice or be of substantive significance in a real-world setting. This concept is essential for the interpretation of results and help distinguish between statistically significant findings that are trivial and those that are practically meaningful (Lakens, 2014). By focusing on the SESOI, researchers can address the challenges of statistical power and determine the sample size needed to detect a meaningful difference. A SESOI of 0.10, although relatively small, is considered meaningful in many contexts of social sciences (Gignac & Szodorai, 2016; Weinerová et al., 2022). When the confidence interval of an observed effect size encompasses the SESOI, it indicates that the effect size is not conclusively interpretable. This uncertainty arises because the statistical power may be insufficient to detect the specified 10% difference.

likelihood increases by a comparable margin, but at the 90% confidence interval. However, these results are complex to interpret due to the confidence interval being close to zero and encompassing 0.10, which indicates some level of uncertainty. In the East model, marital status also appears to positively influence the likelihood of continued childbearing, though the increase by a few percentage points is not statistically significant.

Education and Occupational Status

Factors related to education are not statistically significant across all three models. Interestingly, despite the insignificance, parents with medium and high educational levels are less likely to have a second child compared to those with low education. Additionally, the confidence intervals associated with higher educational levels are often larger in the global and West models, indicating greater variability in these estimates.

Regarding occupational status, self-employed fathers are less likely to have a second child compared to those who are employed. This effect is only significant in the East model, with a coefficient of -0.06, yet close to zero and associated with a small confidence interval below |0.10|, making the interpretation challenging. In the other models, self-employed fathers are more likely than employed fathers to have a second child, though these coefficients are statistically insignificant. Similarly, the effect of being inactive compared to being employed is null and statistically insignificant across all models.

Employment Characteristics

Fathers with a temporary contract are less likely to have a second child than those with a permanent contract in both the global and the West model, by 4 and 6 percentage points, respectively. This effect is only significant in the West model; however, the confidence interval remains close to zero and includes -0.10, complicating the interpretation. Fathers not concerned by this variable, typically inactive and self-employed individuals, are less likely to have a second child compared to those with a permanent contract across all models. Nevertheless, all coefficients are insignificant.

Moreover, couples in which fathers are employed in the public sector exhibit a lower likelihood of having a second child across all models. Specifically, public sector employment for fathers is associated with a decrease in the probability of having a second child by 5 percentage points at a 95% confidence interval in the global model. Similarly, in the West Germany model, this probability decreases by 6 percentage points, supported by a 90% confidence interval. Although these coefficients are statistically significant, their proximity to zero, coupled with confidence intervals encompassing |0.10|, suggests a nuanced impact. In the East model, while public sector employment for fathers also shows a negative association with the likelihood of having a second child, this influence is not statistically significant when compared to employment in the private sector. Additionally, fathers not concerned by the sector variable are generally less likely to have a second child across all models; however, none of these coefficients reach statistical significance.

Country of Origin

In the global and Western models, couples where the father was born abroad are less likely to have a second child compared to those where the father was born in Germany. These effects are not statistically significant. Contrarily, in the East model, being born abroad compared to being born in Germany positively influences the likelihood of having another child by 28 percentage points. This coefficient is significant and associated with a small confidence interval, indicating a 95% probability that being born abroad increases the likelihood of having another child by at least 25 percentage points and at most 30 percentage points. Moreover, couples where the mother was born abroad are less likely to have a second child than those born in Germany across all models. This result is significant only for the East model, with a small confidence interval close to zero and below |0.10|.

Attitudes Towards Gender Roles

Fathers' attitudes towards gender roles consistently exhibit negative coefficients across all indicators and models, suggesting that men with more

egalitarian views on gender roles are less likely to have a second child. In the global model, all indicators, except for the one concerning father norms, significantly influence the probability of having a second child. Similar results are observed in the East Germany model for the housework indicator, while other indicators do not show statistical significance. In the West Germany model, both the housewife and housework indicators are significant at a 90% confidence interval. However, these coefficients remain close to zero, with small confidence intervals below |0.10|.

5.2 Multivariate Analysis

The results of the multivariate regression for the three models are illustrated through coefficient plots, with the detailed table of results available in Appendix 4. Figure 4, Figure 5, Figure 6, and Figure 7 respectively depict the findings on the uptake of parental leave and demographic characteristics (age and origin), parents' educational level and difference, fathers' occupation and employment characteristics and fathers' attitudes towards gender attitudes. The coefficient plots display the coefficient estimates and the 95% confidence intervals, respectively represented by a dot and a horizontal line.

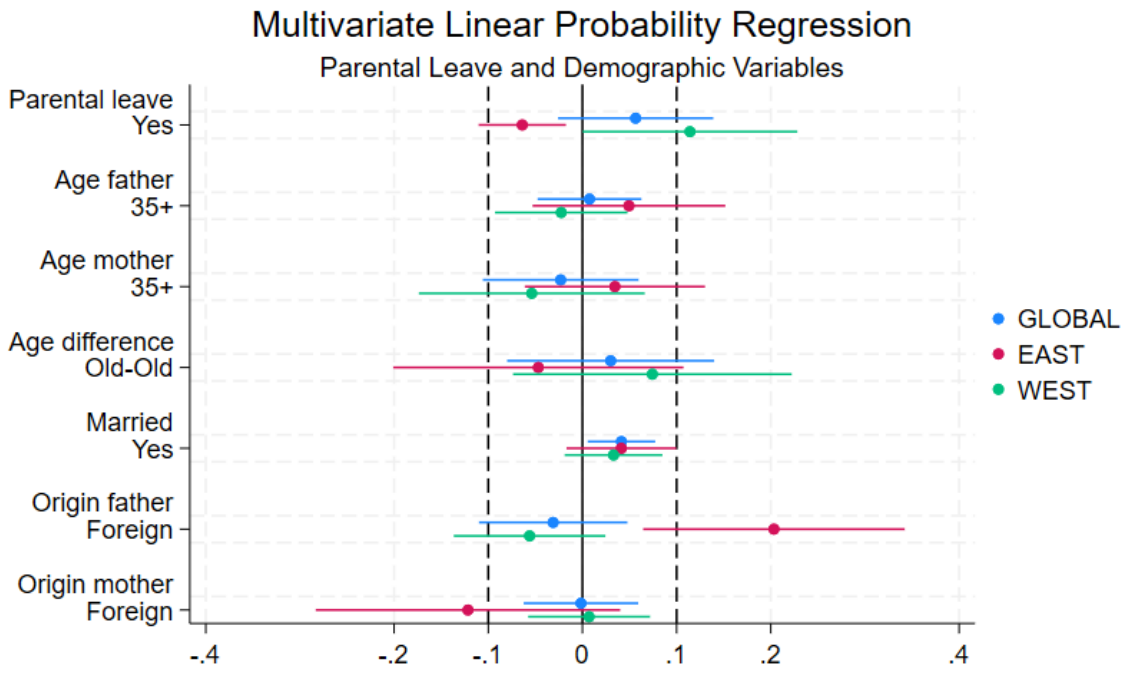
The interpretation of the results is as follows: if the line representing the confidence interval overlaps the value 0, the coefficient estimate is statistically insignificant. Conversely, if it does not overlap 0, the coefficient can be considered statistically significant. To detect a meaningful difference between the studied category and the reference category, the confidence interval must not overlap the value of |0.10|. Note that for categorical variables, the reference category is not represented in the coefficient plot to avoid overloading the figures and to enhance readability.

Parental Leave

Compared to couples where fathers did not take parental leave for the first child, those who did are more likely to have a second child in both the global and West models, holding all other explanatory variables constant. Conversely, in the East model, this category is less likely to have a second child. In West Germany, the mean effect is an increase of 11 percentage

points, a statistically significant result. However, the confidence interval overlaps the small effect size, indicating that the observed difference between fathers who took the leave and those who did not might not be meaningful. Additionally, the confidence interval for the West model ranges from 0.00 to 0.23, signifying high variability in the coefficient estimate. In the East model, parental leave uptake is expected to decrease the likelihood of having a second child by 6 percentage points. This result is significant but remains close to zero and overlaps the -0.10 small effect size. In the global model, the estimated effect is a 6-percentage point increase, though this result is statistically insignificant.

Figure 4. Multivariate Analysis: Parental Leave Uptake and Demographic Characteristics.



Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

The effect of the primary independent variable in the multivariate analysis is consistent with the results observed in the univariate analysis for the global, East, and West models, indicating that the effect of parental leave uptake for the first child is likely robust and not mediated by other explanatory variables.

Age and Marital Status

Variables indicative of the parents' age and the age difference present statistically insignificant estimates across all models. Compared to couples with older parents (aged 35+), younger parents (aged 18-34) are not significantly more or less likely to have a second child, holding all other variables constant. This finding aligns with the univariate analysis results. Similarly, couples where both parents have high education levels are not significantly different from those where both have low education levels. Note that categories considering couples with age differences are not represented, as they were omitted from the regression due to collinearity.

Consistent with the univariate analysis, couples in which the parents are married are generally more likely to have a second child compared to their unmarried counterparts, holding other variables constant. This effect remains significant in the global model, though it turns out to be insignificant in the West Germany model and remains insignificant in the East Germany model. However, the coefficient estimate in the global model remains below the |0.10| effect size, suggesting that the effect of marriage on the likelihood of having a second child might not be substantial.

Country of Origin

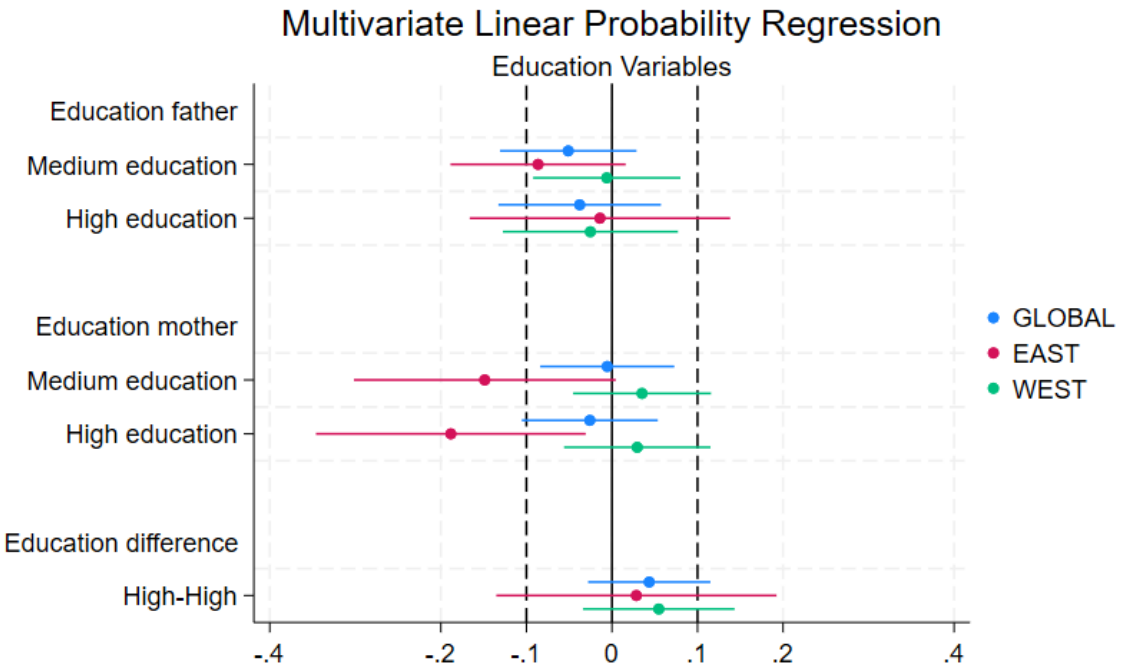
Couples where one of the parents was born abroad are generally not significantly different from those where both parents were born in Germany, holding other variables constant. An exception is observed in East Germany, where fathers born abroad are more likely to have a second child than native fathers. This effect, however, is highly variable, with the increase in the probability of having a second child expected to range between 6 and 34 percentage points. The confidence interval also includes 0.10, complicating the interpretation. Compared to the univariate analysis, the coefficient estimated for the father's origin in East Germany is lower in the multivariate analysis, and the associated confidence interval is wider. Conversely, the estimate for the mother's origin in the East model doubled in the multivariate analysis, but the estimate became statistically insignificant. This suggests that

the mother's origin does not have a meaningful impact on the likelihood of having a second child when other variables are considered, despite the apparent increase in the coefficient.

Educational Level

In comparing couples based on the father's education level, those where the father has a medium or high level of education are generally less likely to have a second child than those where the father has a low level of education, when controlling for all other variables. However, none of these estimates are statistically significant. Similarly, the estimates for mothers' education levels are also statistically insignificant and near zero, except in East Germany. In this region, medium and high levels of education among mothers, compared to low levels, decrease the probability of having a second child by 15 and 19 percentage points, respectively. Nevertheless, the effect for medium education is not statistically significant, and while the effect for high education is significant, it shows high variability and overlaps with the small effect size.

Figure 5. Multivariate Analysis: Parents' Education Level and Difference.



Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Regarding the educational differences between parents, we encountered similar issues as with age differences, where categories involving partners with different levels of education were omitted due to collinearity. The only available result pertains to couples where both parents have a high level of education compared to those with low education. These estimates are close to zero and lack statistical significance.

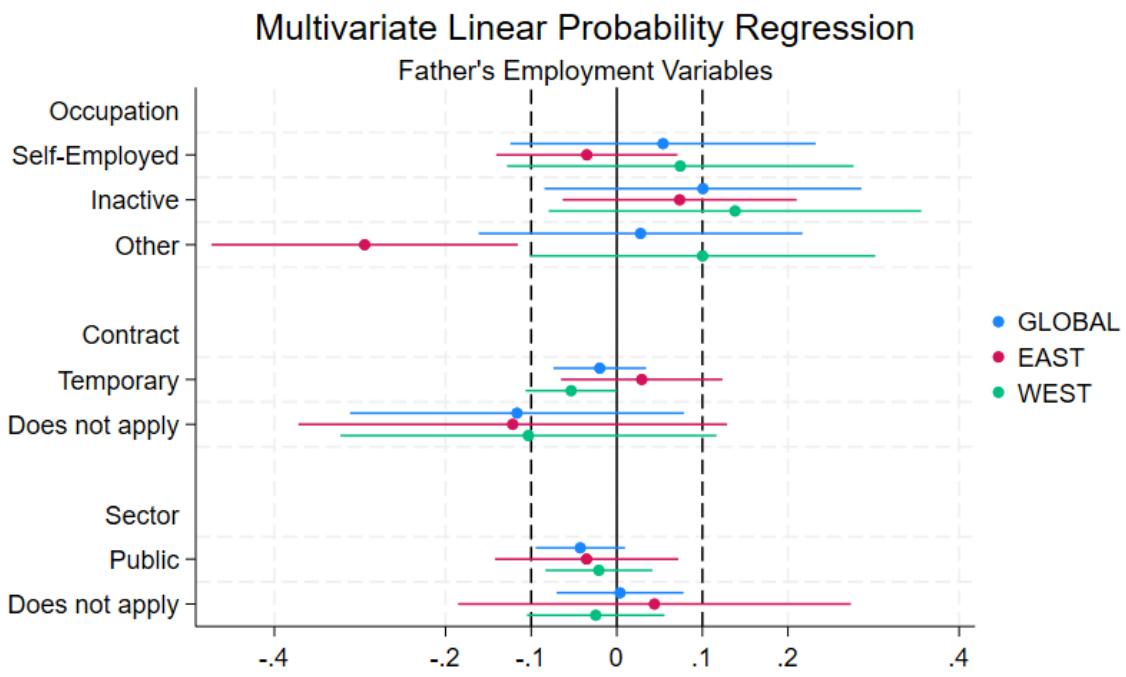
These results do not differ from the univariate analysis, suggesting that these educational factors do not significantly impact the likelihood of having a second child within our different models.

Occupational Status and Employment Characteristics

In analysing the father's occupational status, we find that the estimates derived from the multivariate analysis align closely with those from the univariate analysis. Estimates for both self-employed and inactive fathers remain statistically insignificant across all models. Notably, the significant effect observed for self-employed fathers in East Germany in the univariate analysis disappears in the multivariate analysis. Regarding the category encompassing other forms of activity, such as vocational training, the estimates are only significant in the East German model. Here, compared to employed fathers, those engaged in other forms of activity have a 29-percentage point lower likelihood of having a second child. This estimate is not only significant but also meaningful, given our small sample size of interest, as the confidence interval does not include the value of |0.10|. However, the effect of this category remains highly variable, with the likelihood of having a second child ranging from a 12 to 49 percentage point decrease. Regarding contract type, the results align with the univariate analysis, indicating a negative effect of temporary employment compared to permanent employment on continued childbearing in West Germany. The estimate thus remained significant although the p-value has increased, and the estimate has slightly changed from -0.07 to -0.06. However, the findings related to the employment sector are inconsistent with the univariate analysis. Specifically, the negative effect of working in the public sector observed in the univariate analysis disappears when integrated into the multivariate

regression model. This suggests that other variables included in the multivariate analysis may account for the apparent influence of the employment sector on the likelihood of having a second child.

Figure 6. Multivariate Analysis: Fathers' Occupation and Employment Characteristics.

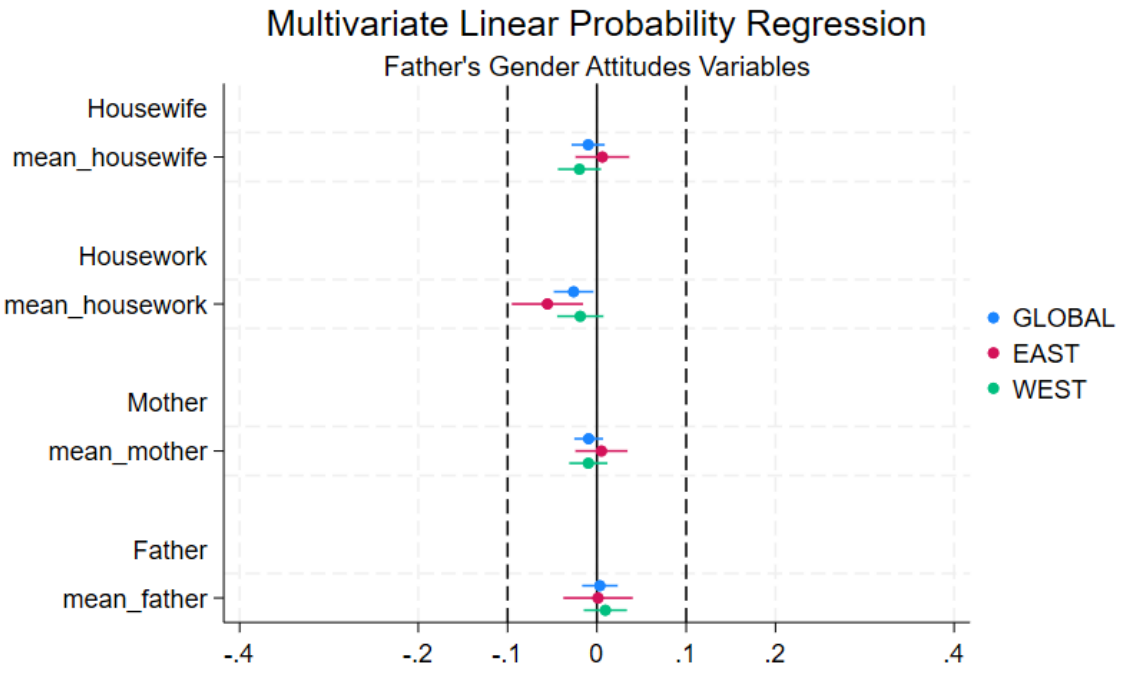


Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Attitudes Towards Gender Attitudes

Overall, most estimates for the gender attitudes indicators are statistically insignificant, with the notable exception of the housework indicator, which remains statistically significant across all three models. This consistency highlights the robust effect of the housework variable. However, the influence of other gender attitude indicators completely disappears when included in the multivariate model. Despite the statistical significance of the housework indicator, its confidence intervals are small and close to zero, suggesting that its impact on the likelihood of having a second child may not be substantial.

Figure 7. Multivariate Analysis: Fathers' Attitudes Towards Gender Roles.



Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

6 Robustness Analysis

6.1 Parental Leave

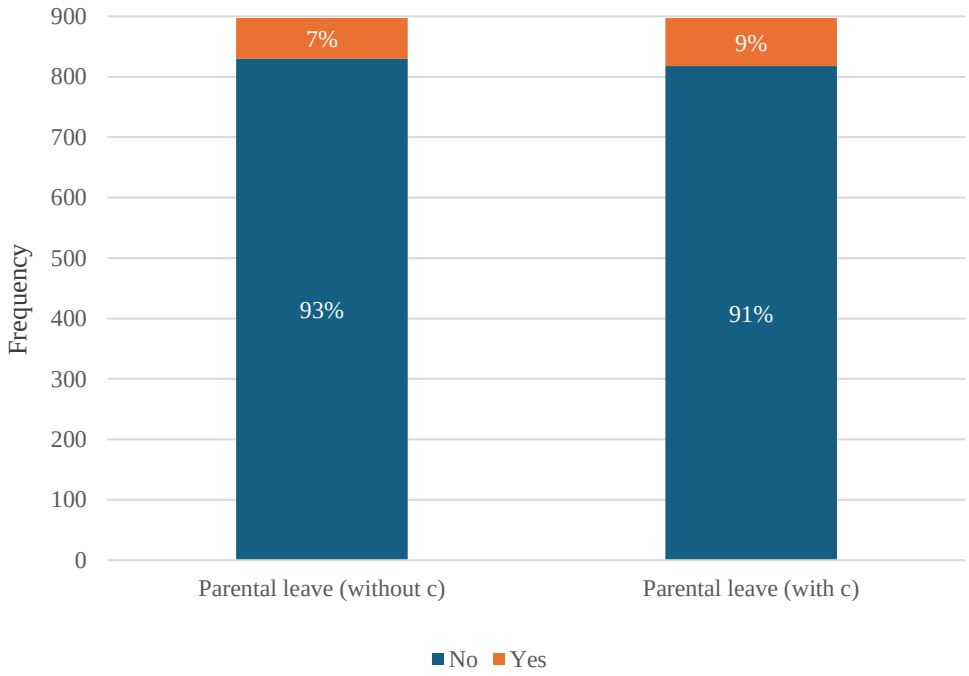
In Section 3.3.1, we described the construction of the independent variable, which measures parental leave uptake by fathers for their first child. The variable is binary, indicating a value of 1 when an individual meets at least one of the following conditions:

a) The respondent is currently on parental leave and has one child at the time of the interview.
b) The respondent used parental leave in the preceding months since the last interview and currently has one child.
c) The respondent used parental leave in the preceding months since the last interview, had one child during the previous wave and has currently two children.

In this section, we examine whether excluding condition c) alters our results. This condition may encompass fathers who took parental leave for their second child, making it essential to determine whether its exclusion significantly impacts our findings.

Figure 8 illustrates the distribution of the original and modified variables for parental leave. The exclusion of condition c) results in a 2-percentage point decrease in the share of observations of fathers taking parental leave for their first child – a relatively small decline. However, this reduction in the number of leaves taken eliminates all instances where the father took leave and had a second child, as shown in Table 5. Consequently, we can expect the exclusion to condition c) to alter the results.

Figure 8. Distribution of the Parental Leave Variables (with and without condition c).



Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Table 5. Distribution of Parental Leave Uptake by Fathers and the Birth of a Second Child.

Parental leave (without condition c)	**Had a second child**	
	No	**Yes**
No	748	82
Yes	67	0

Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Table 6 displays the results from the univariate analysis for both the parental leave variables including and excluding condition c). As expected, the estimates for parental leave, when excluding condition c), are negative and statistically significant across all models. This suggests that couples, where fathers took parental leave for their first child, are less likely to have a second child compared to couples where the father did not take parental leave.

In East Germany, the estimates remain unchanged when excluding condition c), as there were already no cases of fathers taking leave and having a second child within this sample.

Table 6. Univariate Analysis of Modified Parental Leave for Second Childbirth Probability

	Global			**East**			**West**		
	Coef.	P>|z|	CI 95%	Coef.	P>|z|	CI	Coef.	P>|z|	CI
Parental leave (with condition c)									
No	0			0			0		
Yes	.07	.106	-.01; .15	**-.06**	**.000**	**-.09;-.03**	**.12**	**.030**	**.01;.22**
Parental leave (without condition c)									
No	0			0			0		
Yes	**-.10**	**.000**	**-.12; -.08**	**-.06**	**.000**	**-.09;-.03**	**-.11**	**.000**	**-.13;-.09**

Source: Author's own work, based on data collected from pairfam (waves 1 to 11)

Furthermore, the results of the multivariate analysis indicate that only the findings relative to the effect of parental leave are altered by the exclusion of condition c). The other effects remain consistent with those observed in our initial multivariate analysis. Detailed results of the multivariate regression, incorporating the modified parental leave variable, are presented in Appendix 5. Additionally, coefficient plots illustrating the differences in estimates between the multivariate regressions, with and without the inclusion of condition c) in the parental leave variable, are provided for the global model in Appendix 6 and the West model in Appendix 7. The difference in estimates for the East model is not graphically represented, as both models are identical.

To summarize, the exclusion of condition c) in the construction of the primary independent variable significantly impacts the effect of parental leave usage on the probability of having a second child. However, it does not alter the effects of other explanatory variables.

7 Concluding Remarks

Discussion

In this thesis, we aimed to investigate the influence of fathers' use of parental leave for the first child on the likelihood of having a second child among couples in Germany. The key findings from this study reveal that the use of parental leave by fathers for the first child has a robust effect, as it remains unaffected after the inclusion of the control variables in the multivariate regression. Although parental leave does not significantly impact continued childbearing in Germany overall, we observed regional differences. Specifically, in West Germany, taking parental leave tends to increase the likelihood of having a second child by 11 points of percentage, whereas in East Germany, it tends to decrease this probability by 6 points of percentage.

The findings in West Germany confirm our first hypothesis, which posited that parental leave uptake would positively influence second childbirth, aligning with previous studies (Cools et al., 2015; Duvander et al., 2010, 2019; Duvander, Lappegård, et al., 2020; Duvander & Andersson, 2006). The results for East Germany, however, did not corroborate this hypothesis. Furthermore, our second hypothesis, which anticipated a stronger effect of parental leave uptake on continued childbearing in East Germany compared to West Germany, was not verified.

It is important to highlight that while the regional effects were statistically significant, the high variability and confidence intervals below or including the small effect size of interest necessitate a cautious interpretation of these results, especially in the case of East Germany. Indeed, the negative effect observed in this region can be attributable to the complete absence of cases where leave uptake coincides with a second childbirth. One possible reason for this absence might be an insufficient sample size, indicating that the East model may not be representative of the population residing in East Germany. Another explanation might be the lower number of eligible fathers residing in East Germany, consistent with evidence suggesting that stepfamilies are more widespread in East Germany than in West Germany.

Additionally, eastern Germans are more likely to have a second child with a new partner than their Western counterparts (Kreyenfeld & Heintz-Martin, 2015). Hence, the observed regional difference might reflect variations in family arrangements and family norms between the two regions rather than a negative effect of parental leave uptake on second childbirth.

Surprisingly, the age of the parents did not significantly influence the probability of having a second child across the univariate and multivariate analysis. These results might be attributable to the categorization of the age variables into two broad age groups, which might not have provided sufficient granularity to detect significant differences across various age groups. Marital status, however, shows that being married significantly increases the likelihood of having a second child in Germany overall and in West Germany on continued childbearing in the univariate model. This is in line with the evidence that non-marital cohabitation and non-marital fertility are less accepted and widespread in West Germany than in East Germany (Klärner & Knabe, 2017), where marriage and childbearing constitute separate decisions (Klärner, 2015). However, the effect of marriage in West Germany disappears when integrated into the multivariate model.

Regarding education, significant effects were observed when variables were integrated into the multivariate model in East Germany. Generally, higher educational levels compared to lower educational levels negatively impacted the likelihood of having a second child for both men and women. This effect was notably stronger for women than for men. This finding aligns with evidence that higher educational attainment among women in Germany is associated with lower fertility (Cygan-Rehm & Maeder, 2013; Oppermann, 2017). However, it contradicts the evidence that men with higher educational levels tend to have higher fertility in Germany (Oppermann, 2013).

Concerning occupation and employment characteristics, most effects detected in the univariate analysis disappeared when variables were integrated into the multivariate model. Robust and significant effects were observed in East Germany, where fathers with other forms of occupation (e.g.,

vocational training) had a 29-percentage point lower probability of having a second child compared to employed fathers. Moreover, in West Germany, fathers on temporary contracts were significantly less likely to have a second child compared to those on a permanent contract, in line with previous studies (Auer & Danzer, 2016; Schmitt, 2021; Sutela, 2012; Vignoli et al., 2020). However, we did not find any statistically significant difference between fathers working in different work sectors contrary to previous research (Sutela, 2012).

The mother's country of origin did not significantly affect continued childbearing. However, in East Germany, fathers born abroad were significantly less likely to have a second child compared to native fathers. Nevertheless, these results are difficult to interpret due to the low frequency of foreign individuals in the sample.

The effect of various indicators related to attitudes towards gender roles and family norms was significant across several models in the univariate analysis, consistently indicating the negative influence of gender-egalitarian attitudes on continued childbearing. Most of these effects disappeared when included in the multivariate model, except for the housework indicator, which remained significant for Germany and West Germany. This finding suggests that the more men agree with the statement that they should equally contribute to housework – reflecting more egalitarian values – the less likely they are to have a second child. While equal housework division usually does not significantly influence continued childbearing (Cooke, 2004; Craig & Siminski, 2011; Miettinen et al., 2015), this finding aligns with evidence that egalitarian attitudes among men are negatively associated with fertility in Europe (Westoff & Higgins, 2009).

Implications

Overall, our findings contribute to the understanding of the role of fathers in influencing fertility behaviour, particularly concerning the impact of parental leave uptake by fathers. This research supports the Gender Equity Theory by demonstrating the positive influence of paternal involvement on

fertility in Germany, except for East Germany. However, our findings partially contradict the hypothesis articulated by McDonald (2000a, 2000b) and Goldscheider et al. (2015) regarding gender-egalitarian housework division and increased fertility. Although this study did not directly address the relationship between gender-egalitarian housework division and fertility, we did observe that the preference for a gender-equal housework division among men was negatively associated with fertility in West Germany. This finding might reflect that men's convictions are not consistent with their actions; hence men stating that housework should be divided equally may not be acting accordingly in practice (Kjeldstad & Lappegård, 2014; van Hooff, 2011). This inconsistency may contribute to the continued burden of unpaid domestic labour on women, thereby negatively impacting fertility. Therefore, while gender-egalitarian attitudes among men could potentially foster higher fertility, the actual implementation of these beliefs in daily practices might be crucial for positively influencing fertility. This is in line with evidence that inconsistency between attitudes and actual housework division reduces the likelihood of continued childbearing, particularly regarding second births (Goldscheider et al., 2013). This nuanced understanding underscores the complexity of the relationship between gender equity and fertility, suggesting that both attitudinal and behavioural dimensions of gender equality must be addressed to observe increased fertility.

Since this research did not focus on evaluating parental leave policy, we were unable to assess its effect on fertility directly. However, the positive impact of fathers' involvement through parental leave uptake on continued childbearing in West Germany suggests that policies encouraging paternal involvement in childcare could promote higher fertility. Nonetheless, given the potential issues with sample size in East Germany, more refined analysis and comprehensive data collection efforts are necessary to ensure that policy decisions are based on robust and representative data. Additionally, the negative association between attitudes towards housework division and fertility might potentially suggest the need for gender-neutral policymaking. Eventually, policymakers might consider addressing specific family policies

regionally, taking into account the distinct cultural and family norms present in both regions.

Limitations

Reflecting on the outcomes of this study, it is essential to consider several limitations that could influence the conclusions drawn. One notable limitation is the sample size in East Germany and the presence of low-frequency categories. On the one hand, an insufficient sample size for East Germany would result in a lack of representativeness of the eastern population, on the other hand, low-frequency categories can lead to low statistical power for the categories concerned, biased effect size estimates, unstable coefficient estimates, inflated standard errors, and multicollinearity, thereby affecting the reliability of the regression model (Aguinis et al., 2005; Alkharusi, 2012). Additionally, the lack of verification for regional migration (i.e., individuals moving from one region to another during the three waves of observation) is an oversight that might bias our results in the regional models, as an individual's observations would be split between the East and West samples if they migrated. It could introduce bias in the global model as well since it would have been necessary to control for these migrations to ensure accurate analysis.

Moreover, limiting the period of observation to three waves constitutes a limitation as it excluded approximately 25% of individuals observed who had had a second child with the same partner. Although selecting a three-wave period was a justified methodological choice, it constrained our understanding of the influence of parental leave uptake on fertility to this specific time window. Consequently, the results may not fully capture long-term trends and patterns in parental leave uptake and its impact on fertility behaviour.

Eventually, our primary independent variable included a criterion that allowed men who took parental leave for their second child to qualify as men who took parental leave for their first child. This criterion assumes that the decision to take parental leave for the second child precedes its birth (Alsarve,

2021). While parental leave must be registered at least seven weeks before the child's due date (Referat Öffentlichkeitsarbeit, 2021), there is a large time window between the beginning of the pregnancy and this deadline. Hence, the decision to take parental leave may have not preceded the decision to have the child. Consequently, including men who took parental leave only for their second child as if they took it for their first could bias our results, as the decision to take leave may not precede the decision to have a second child.

Recommendations

Future research should focus on improving the methodological framework for studying the impact of parental leave on continued childbearing to yield more accurate and reliable results. For instance, studies could use similar methods while exploring different observation periods and controlling for regional migration. More refined analyses should include robustness checks to ensure that participation in specific waves does not bias the results. Additionally, future research could test various models, each focusing on a specific indicator of gender attitudes, to determine whether a particular indicator influences the outcomes more significantly than others. Furthermore, we suggest considering alternative family arrangements, particularly in East Germany where stepfamilies are more widespread (Kreyenfeld & Heintz-Martin, 2015). This approach would allow for an analysis of whether parental leave uptake continues to shape fertility behaviour in the context of union disruptions and entry into new partnerships. By incorporating these methodological improvements, future research can provide a more comprehensive understanding of the factors influencing continued childbearing in relation to parental leave uptake.

An alternative approach would be to use the event history calendar provided by pairfam, which is well-suited for event history analysis. This method would allow for the use of information in date format such as the first child's birthday (marking the start of the couple's period of exposure to having a second child), the start and end dates of parental leave (to ensure the leave was taken for the first child and not the second and to analyse the impact of different durations of parental leave on continued childbearing), the second

child's birthday (marking the end of the period of exposure to having a second child), and periods of cohabitation (enabling the conservation of the entire sample while censoring individuals when they are no longer living with their partner). This approach resolves the issue of choosing a fixed period of observation and avoids losing eligible fathers; however, it requires more intensive coding.

Moreover, to better capture the relationship between parental leave and continued childbearing, modifying current variables or adding other control variables could be beneficial. For instance, categorizing age into more specific groups would allow for greater granularity in the analysis. We also suggest incorporating the age at first birth, as having a first child at an older age reduces the likelihood of having a second biological child, particularly among women (Dunson et al., 2002; Madankumar et al., 2003; Stewart & Kim, 2011). Moreover, it is imperative to include mothers' occupational status and employment characteristics, as these are critical predictors of fertility in Germany (Fuchs, 2017; Klemm, 2012). Although coding these characteristics for women poses more challenges than for men – owing to the substantial proportion of mothers on parental leave in the sample – it is feasible to recode them similarly to the approach used for men, by considering their occupational status before parental leave. However, it is important to acknowledge the potential for a higher incidence of missing values due to partners possibly not participating in as many survey waves as the primary respondents. Another suggestion would be reclassifying parents' origin into more specific categories. For example, distinguishing between native individuals born in East or West Germany could be particularly informative, especially for those not residing in their birth region. This differentiation would allow for an analysis of whether growing up in a particular region influences fertility behaviour, even if individuals subsequently relocate. This approach could shed light on the cultural and regional factors that shape fertility decisions. Furthermore, including the mothers' gender norms is key in isolating the relationship between parental leave and continued childbearing, specifically the interaction between parents' gender norms is essential in shaping parental leave uptake and fertility (Arpino et al., 2015;

Stertz et al., 2017). Eventually, we also suggest controlling for the gender of the first-born, as fathers are more likely to extend their parental leave when the first-born is a son compared to a daughter (Lindström, 2013).

Finally, investigating new research areas would be valuable to expand the understanding of the relationship between parental leave uptake and fertility in other countries and regions.

Conclusion

In summary, this study has shown that fathers' use of parental leave for the first child has an influence on the likelihood of having a second child among couples in Germany, with significant regional differences. Specifically, while parental leave uptake by fathers tends to increase the likelihood of having a second child in West Germany, it appears to decrease this probability in East Germany. These findings suggest that policies encouraging paternal involvement in childcare could promote higher fertility, especially in West Germany. The implications of these findings are significant for family policy and demographic research, offering insights into the role of gender roles and regional differences in shaping fertility behaviour in Germany. Overall, this research contributes to a better understanding of the impact of paternal involvement on fertility and sets the stage for future studies on parental leave uptake, family norms, and gender equity.

Ultimately, the nuanced relationship between parental leave uptake, regional differences, and continued childbearing highlights the complexity of fertility behaviour in Germany, emphasizing the need for tailored family policies that consider regional and cultural contexts. This research underscores the importance of supporting paternal involvement in childcare as a potential means to foster higher fertility rates, thereby contributing to the broader discourse on demographic change and family policy.

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Appendix

Appendix 1. Evolution of German Parental Leave and Benefit Policy (1952-2024).

Year	Policy Reform	Key Changes
1952	Maternity Protection Period	Introduced maternity protection period of six weeks before and eight weeks after giving birth.
1972	East Germany – *Babyjahr*	Introduced year-long maternity leave (*Babyjahr*) with benefits equal to sickness benefits. Only mothers eligible.
1979 to 1986	West Germany – Paid Maternity Leave	Paid maternity leave for working mothers for six months after giving birth. Benefit equivalent to previous net income. Only mothers eligible.
1986	Federal Child-Rearing Benefit Law	Job protection for one working parent for 10 months after childbirth. Extension of protected leave for the new parent to 8 months after the mother-protection period. Introduction of child-rearing benefit independent of parent's previous employment status until the child is 10 months old. Both parents, not in full-time work, eligible for benefit.
1988 to 1990	Extension of Benefit and Leave	Benefit entitlement and parental leave period increased from 10 to 12 months in 1988. Further extensions to 15 months in 1989 and 18 months in 1990.
1992	Individual Parental Leave Extension	Parental leave extended until the child's third birthday for one parent at a time.
1993	Child-Rearing Benefit Eligibility Extension	Extension of child-rearing benefit eligibility period from 18 to 24 months.
1994	Income Limits and Family Income Changes	Introduced upper limits on net annual family income for the benefit's first six months.

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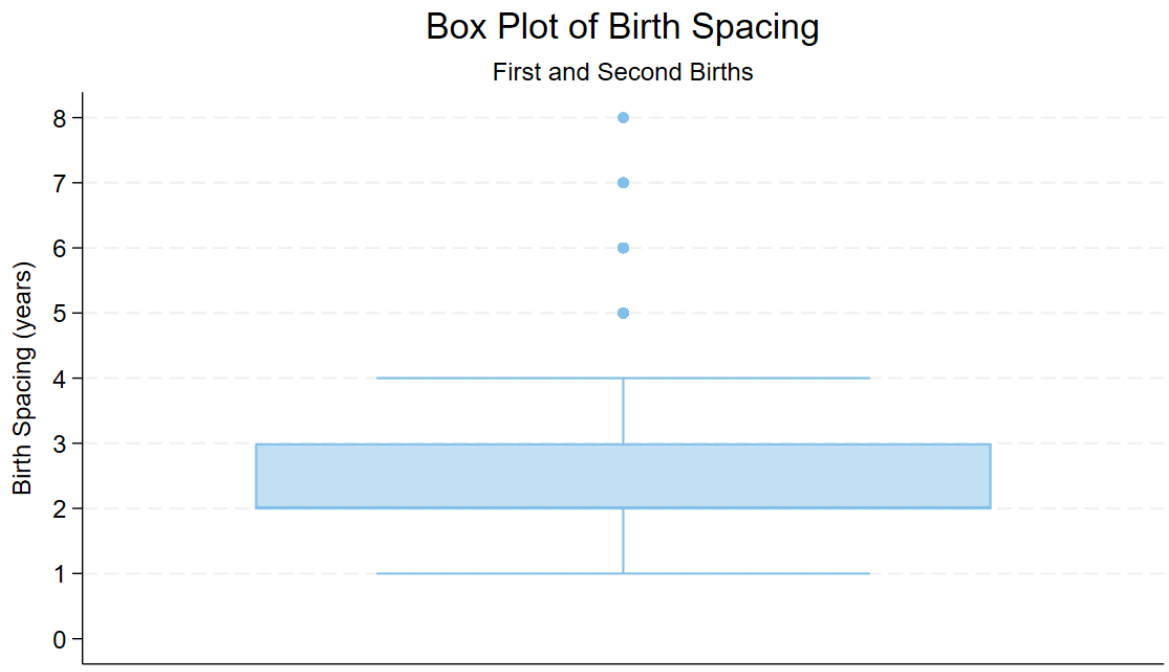
2001	Parental Leave Flexibility	Fathers and mothers allowed to use parental leave simultaneously. Parental leave extended beyond parents with a child under age three. Maximum duration of three years of leave over the first eight years of the child's life.
2004 to 2006	Income Limit Changes	Drastic reduction in income limits for parental leave benefits.
2007	Overhaul of Parental Leave Benefit System	Radical change from a flat rate benefit to 67% of prior net income. Introduced income cap and shortened maximum duration to 12 months. "Paternity quota" introduced with two months reserved for each parent.
2011	Further Changes to Income Limits	Gradual reduction of benefit to 65% for individuals with net income higher than €1,200. Individuals with a gross household income of more than €500,000 no longer eligible for the benefit.
2024	Paternity/Partner Leave	Introduced paid paternity leave period of 2 weeks after childbirth. The other parent (non-birthing parent) eligible.

Source: Geisler & Kreyenfeld (2019), Kern & Lecerf (2023), and Ondrich et al. (2002).

Appendix 2. Box Plot of First and Second Birth Spacing.



Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Appendix 3. Parity Distribution among the 1971-1973, 1981-1983, and 1991-1993 Cohorts, 2008-2019.

Parity	Frequency	Percentage
0	46,164	57.25
1	13,014	16.14
2	14,929	18.51
3+	6,532	8.10
Total	80,639	100.00

Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Appendix 4. Multivariate Analysis of Predictors for Second Childbirth Probability.

	Global			East			West		
	Coef.	P>|z|	CI	Coef.	P>|z|	CI	Coef.	P>|z|	CI
Parental leave									
No	0			0			0		
Yes	.06	.179	-.03;.14	**-.06**	**.007**	**-.11;-.02**	**.11**	**.049**	**.00;.23**
Age father									
18-34	0			0			0		
35+	.01	.790	-.05;.06	.05	.344	-.05;.15	-.02	.531	-.09;.05
Age mother									
18-34	0			0			0		
35+	-.02	.584	-.11;.06	.03	.480	-.06;.12	.05	.379	-.17;.07
Age difference									
Y-Y	0			0			0		
O-O	.03	.593	-.08;.14	-.05	.552	-.20;.11	.07	.325	-.07;.22
Y-O		(omitted)			(omitted)			(omitted)	
O-Y		(omitted)			(omitted)			(omitted)	
Marital status									
Unmarried	0			0			0		
Married	**0.04**	**.023**	**.01;.08**	0.04	0.164	-0.02;0.10	0.03	0.213	-.02;.08
Education father									
Low	0			0			0		
Medium	-.05	.210	-.13;.03	-.09	.098	-.19;.02	-.01	.891	-.09;.08
High	-.04	.437	-.13;.06	-.01	.957	-.17;.14	-.03	.629	-.13;.08
Education mother									
Low	0			0			0		
Medium	-.01	.891	-.08;.07	-.15	.057	-.30;.00	.04	.392	-.05;.12
High	-.03	.524	-.11;.05	**-.19**	**.019**	**-.35;.03**	.03	.499	-.06;.12
Education difference									
L-L	0			0			0		
H-H	.04	.232	-.03;.12	.03	.732	-.14;.19	.05	.226	-.03;.14
L-H		(omitted)			(omitted)			(omitted)	
H-L		(omitted)			(omitted)			(omitted)	

Table continued on the next page.

Occupation father									
Employed	0			0			0		
Self-employed	.05	.552	-.12;.23	-.03	.518	-.14;.07	.07	.472	-.13;.28
Inactive	.10	.296	-.16;.22	.07	.292	-.06;.21	.14	.213	-.08;.36
Other	.03	.773	-.16;.22	**-.29**	**.001**	**-.47;-.12**	.10	330	-.10;.30
Contract father									
Permanent	0			0			0		
Temporary	-.02	.473	-.07;.03	.03	.543	-.06;.12	-.05	.050	-.11;-.00
N/A	-.12	.242	-.31;.08	-.12	.342	-.37;.13	-.10	.357	-.32;.12
Sector father									
Private	0			0			0		
Public	-.04	.110	-.09;-.01	-.04	.519	-.14;.07	-.02	.513	-.08;.04
N/A	.00	.917	-.07;.08	.04	.707	-.19;.27	-.02	.550	-.10;.06
Origin father									
Germany	0			0			0		
Foreign	-.03	.439	-.11;.05	**.20**	**.004**	**.06;.34**	-.06	.172	-.14;.02
Origin mother									
Germany	0			0			0		
Foreign	-.00	.960	-.06;.06	-.12	.141	-.28;.04	.01	.831	-.06;.07
Gender attitudes									
Housewife	-.01	.307	-.03;-.01	.01	.689	-.02;.04	-.02	.112	-.04;.00
Housework	**-.03**	**.021**	**-.05;-.00**	**-.06**	**.007**	**-.10;-.02**	-.02	.160	-.04;.01
Mother	-.01	.264	-.03;-.01	.01	.733	-.02;.03	-.01	.383	-.03;.01
Father	.00	.742	-.02;.02	.00	.948	-.04;.04	.01	.443	-.01;.03

Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Appendix 5. Multivariate Analysis of Predictors for Second Childbirth Probability with Modified Parental Leave Variable.

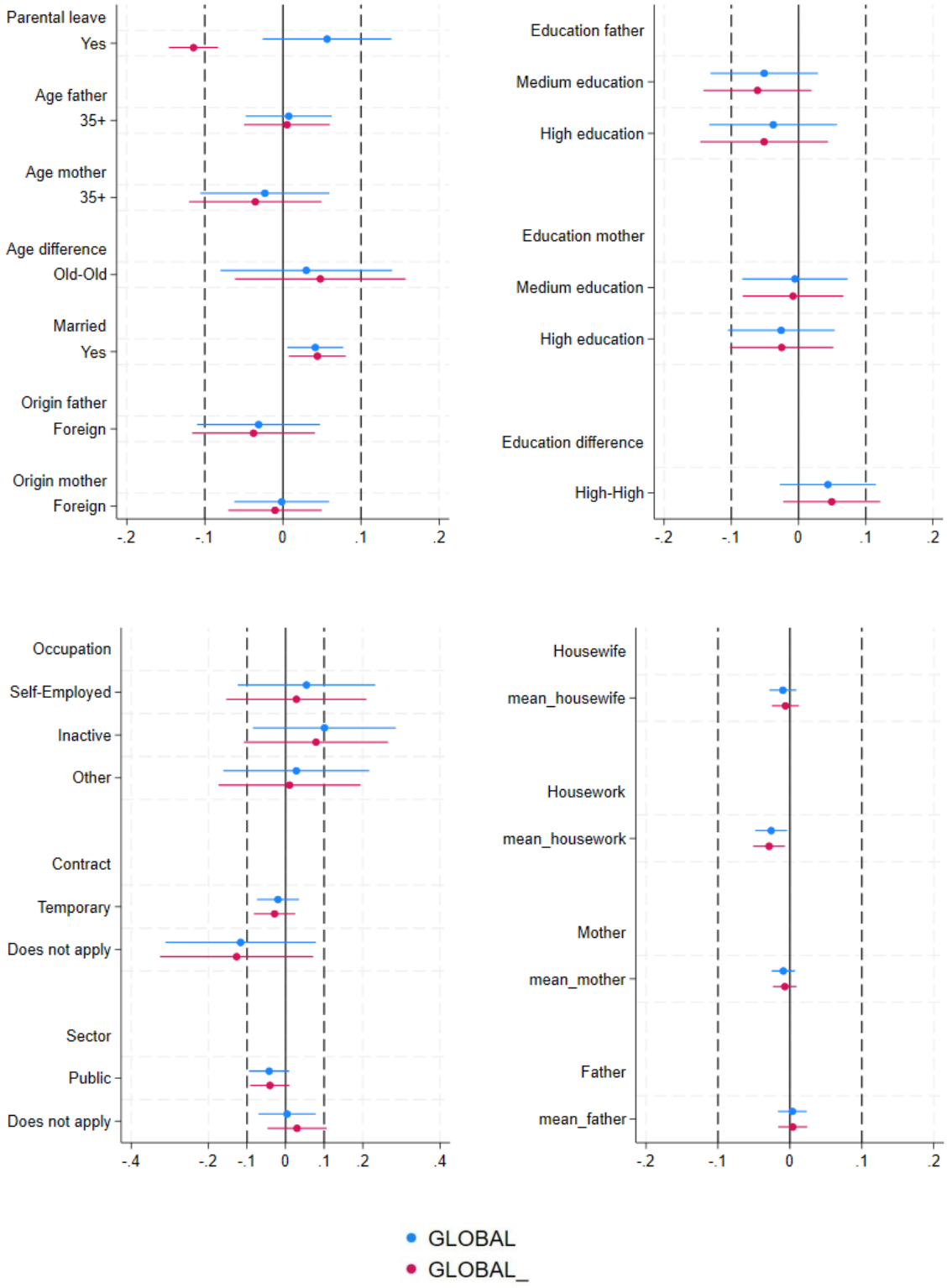
	Global			East			West		
	Coef.	P>|z|	CI	Coef.	P>|z|	CI	Coef.	P>|z|	CI
Parental leave (without condition c)									
No	0			0			0		
Yes	**-.11**	**.000**	**-.15;-.08**	**-.06**	**.007**	**-.11;-.02**	**-.14**	**.000**	**-.18;-.09**
Age father									
18-34	0			0			0		
35+	.01	.852	-.05;.06	.05	.344	-.05;.15	-.02	.676	-.09;.06
Age mother									
18-34	0			0			0		
35+	-.04	.414	-.12;.05	.03	.480	-.06;.12	-.07	.287	-.20;.06
Age difference									
Y-Y	0			0			0		
O-O	.03	.593	-.08;.14	-.05	.552	-.20;.11	.09	.249	-.06;.24
Y-O		(omitted)			(omitted)			(omitted)	
O-Y		(omitted)			(omitted)			(omitted)	
Marital status									
Unmarried	0			0			0		
Married	**0.04**	**.017**	**.01;.08**	0.04	0.164	-0.02;0.10	0.04	0.146	-.01;.10
Education father									
Low	0			0			0		
Medium	-.06	.136	-.14;.02	-.09	.098	-.19;.02	-.02	.643	-.11;.07
High	-.05	.291	-.15;.04	-.01	.957	-.17;.14	-.04	.472	-.15;.07
Education mother									
Low	0			0			0		
Medium	-.01	.831	-.08;.07	-.15	.057	-.30;.00	.04	.314	-.04;.12
High	-.03	.521	-.10;.05	**-.19**	**.019**	**-.35;-.03**	.04	.309	-.04;.13
Education difference									
L-L	0			0			0		
H-H	.05	.180	-.02;.12	.03	.732	-.14;.19	.05	.271	-.04;.14
L-H		(omitted)			(omitted)			(omitted)	
H-L		(omitted)			(omitted)			(omitted)	

Table continued on the next page.

Occupation father									
Employed	0			0			0		
Self-employed	.03	.764	-.15;.21	-.03	.518	-.14;.07	.03	.794	-.18;.23
Inactive	.08	.407	-.11;.27	.07	.292	-.06;.21	.09	.443	-.14;.36
Other	.01	.913	-.17;.19	**-.29**	**.001**	**-.47;-.12**	.09	398	-.11;.29
Contract father									
Permanent	0			0			0		
Temporary	-.03	.296	-.08;.03	.03	.543	-.06;.12	**-.06**	**.047**	**-.11;-.00**
N/A	-.13	.210	-.33;.07	-.12	.342	-.37;.13	-.12	.303	-.35;.11
Sector father									
Private	0			0			0		
Public	-.04	.117	-.09;-.01	-.04	.519	-.14;.07	-.04	.295	-.10;.03
N/A	.03	.449	-.05;.11	.04	.707	-.19;.27	.02	.580	-.06;.11
Origin father									
Germany	0			0			0		
Foreign	-.04	.348	-.12;.04	**.20**	**.004**	**.06;.34**	-.06	.121	-.14;.02
Origin mother									
Germany	0			0			0		
Foreign	-.01	.740	-.07;.05	-.12	.141	-.28;.04	-.00	.907	-.07;.06
Gender attitudes									
Housewife	-.01	.512	-.02;.01	.01	.689	-.02;.04	-.01	.322	-.04;.01
Housework	**-.03**	**.010**	**-.05;-.01**	**-.06**	**.007**	**-.10;-.02**	-.02	.072	-.04;.00
Mother	-.01	.397	-.02;-.01	.01	.733	-.02;.03	-.01	.440	-.03;.01
Father	.00	.697	-.02;.0.2	.00	.948	-.04;.04	.01	.423	-.01;.03

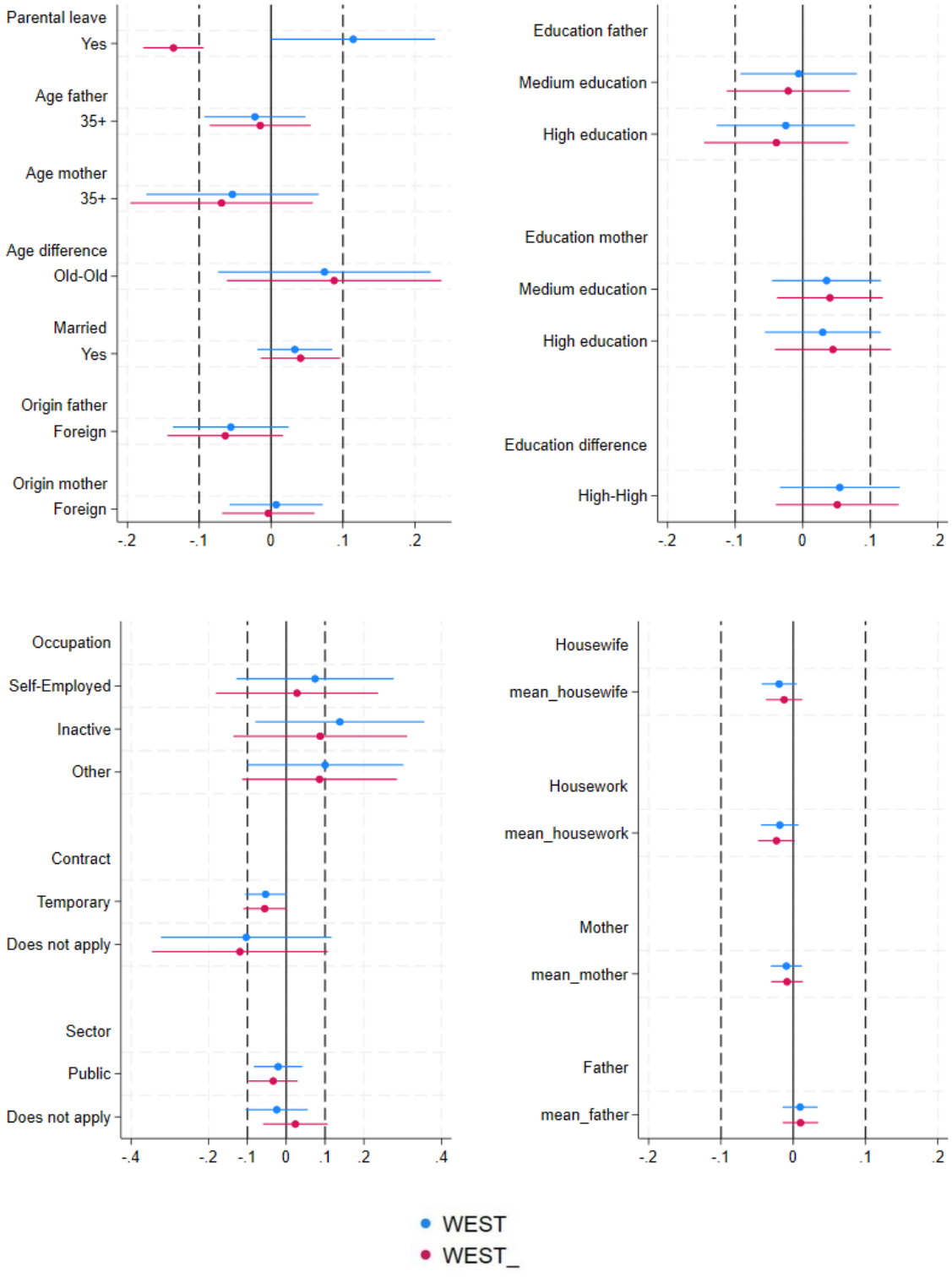
Source: Author's own work, based on data collected from pairfam (waves 1 to 11).

Appendix 6. Global Model – Result Comparison with Modified Parental Leave Variable.



Note: The GLOBAL model represents the original global model while the GLOBAL_ model represents the model including the modified independent variable. **Source:** Author's own work, based on data collected from pairfam (waves 1 to 11).

Appendix 7. West Model – Result Comparison with Modified Parental Leave Variable.



Note: The WEST model represents the original West model while the WEST_ model represents the model including the modified independent variable. **Source:** Author's own work, based on data collected from pairfam (waves 1 to 11).

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Keywords
Parental leave · Fertility · Fathers · Gender equality · Germany

Abstract
In response to declining fertility rates, European countries have significantly enhanced their family policies and welfare systems, with a particular emphasis on parental leave provisions to encourage childbearing (Gauthier, 2007; Gauthier & Philipov, 2008). Notably, in 2007, Germany introduced the fathers' quota, aimed at increasing paternal participation in parental leave and, subsequently, fertility rates. Given Germany's persistently low fertility rates, understanding the impact of paternal leave on subsequent childbearing is critical and represents a substantial political concern. Using data from the German Family Panel (pairfam) across a sample of heterosexual fathers over 11 waves (2008-2019), we conducted a linear probability regression and performed a stratified analysis by region. The findings indicate that paternal leave uptake for the first child has a robust and positive effect on continued childbearing in West Germany, whereas a negative effect is observed in East Germany. These results carry significant implications for family policy and demographic research, underscoring the importance of paternal involvement, gender attitudes, and regional variations in fertility behaviour.

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