The Impact of Family Policies on Fertility in OECD Countries

Timothy Lloyd O'Brien

Peter Arcidiacono, Faculty Advisor
Michelle Connolly, Faculty Advisor

Honors Thesis submitted in partial fulfillment of the requirements for Graduation with Distinction in Economics in Trinity College of Duke University.

Duke University
Durham, North Carolina
2025

Acknowledgments

I am deeply grateful to Professors Connolly and Arcidiacono for their invaluable guidance, insight, and commitment throughout this project. Their mentorship was instrumental at every stage of the research process. I also wish to thank the many members of the Duke Economics Department whose rigorous training and thoughtful instruction prepared me for the challenges of this undertaking. Finally, I am especially thankful to my family, as well as Jonathan Valdes, Kyle Kogan, Sam Genatt, and Will Bingle, for their unwavering support along the way.

Abstract

This study investigates the impact of family policies in addressing declining fertility rates across OECD countries between 1990 and 2019. Over the past six decades, fertility rates in these nations have dropped substantially, with most falling below replacement level. This study evaluates the influence of three core policy instruments: cash benefits, parental leave entitlements, and early childcare provisions. Using a fixed-effects panel model, this research accounts for country-specific characteristics and includes controls for various economic and social conditions. Leveraging recent data from persistently low fertility periods, the analysis incorporates previously underutilized variables such as contraception accessibility and disaggregates results by both regional and demographic contexts. The findings reveal significant heterogeneity in policy effectiveness. Cash transfers and early childcare expenditures exhibit consistent positive associations with fertility, particularly in Europe and the Americas. Paid maternal leave shows a positive effect primarily in low-fertility countries and European settings, while its impact is less robust elsewhere. Conversely, economic conditions, especially unemployment, emerge as strong and consistently negative predictors of fertility across all regions and fertility levels. These results underscore the importance of early, context-sensitive, and multidimensional policy interventions in shaping fertility outcomes.

JEL classification: J13, J16, J17

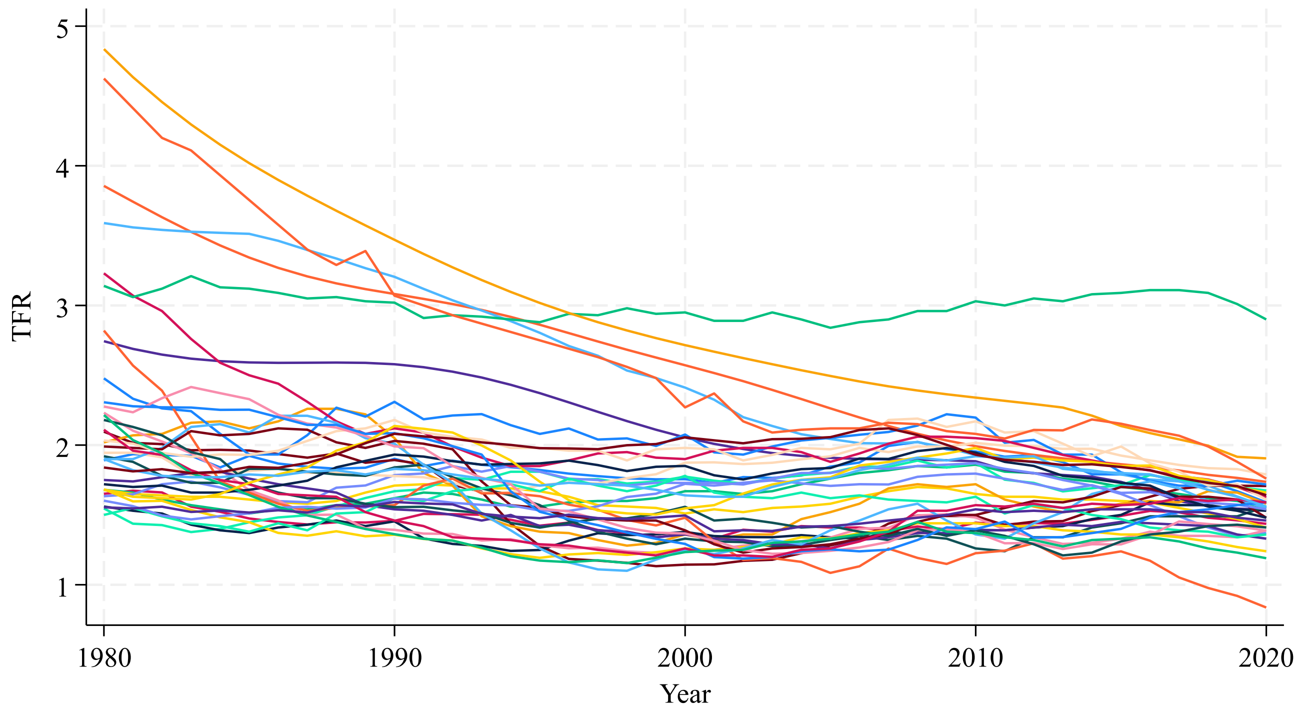
Keywords: Fertility; Family Policy: Parenthood

1. Introduction

Over the past half-century, virtually all wealthy nations have undergone a dramatic demographic shift, transitioning from moderately young populations with high fertility rates to aging populations with low fertility rates. In many East Asian and European countries, childbearing rates have fallen below the population replacement threshold, and similar trends are expected in Asia and Latin America (Strulik & Vollmer, 2015; UN DESA 2019). Such a shift can cause significant economic crises, such as a declining labor force and an aging population distribution, raising concerns about countries' financial prospects (McDonald, 2006).

Member countries of the Organization for Economic Co-operation and Development (OECD) have experienced an especially dramatic decline in fertility rates over the past six decades. The average Total Fertility Rate (TFR)—the expected number of children a woman will have over her lifetime—has declined markedly across OECD countries, falling from 3.3 in 1960 to just 1.5 in 2022, as illustrated in Figure 1.This decline has been particularly pronounced in countries like Italy and Spain, where the TFR reached 1.2 children per woman in 2022, and most strikingly in South Korea, which reached an estimated 0.7 children per woman in 2023 (OECD, 2024). The persistent decline in fertility rates poses significant challenges for OECD countries, threatening future economic growth, altering societal structures, and potentially jeopardizing the prosperity of future generations.

Figure 1: Fertility Rates in OECD Countries (1980-2020)[1]



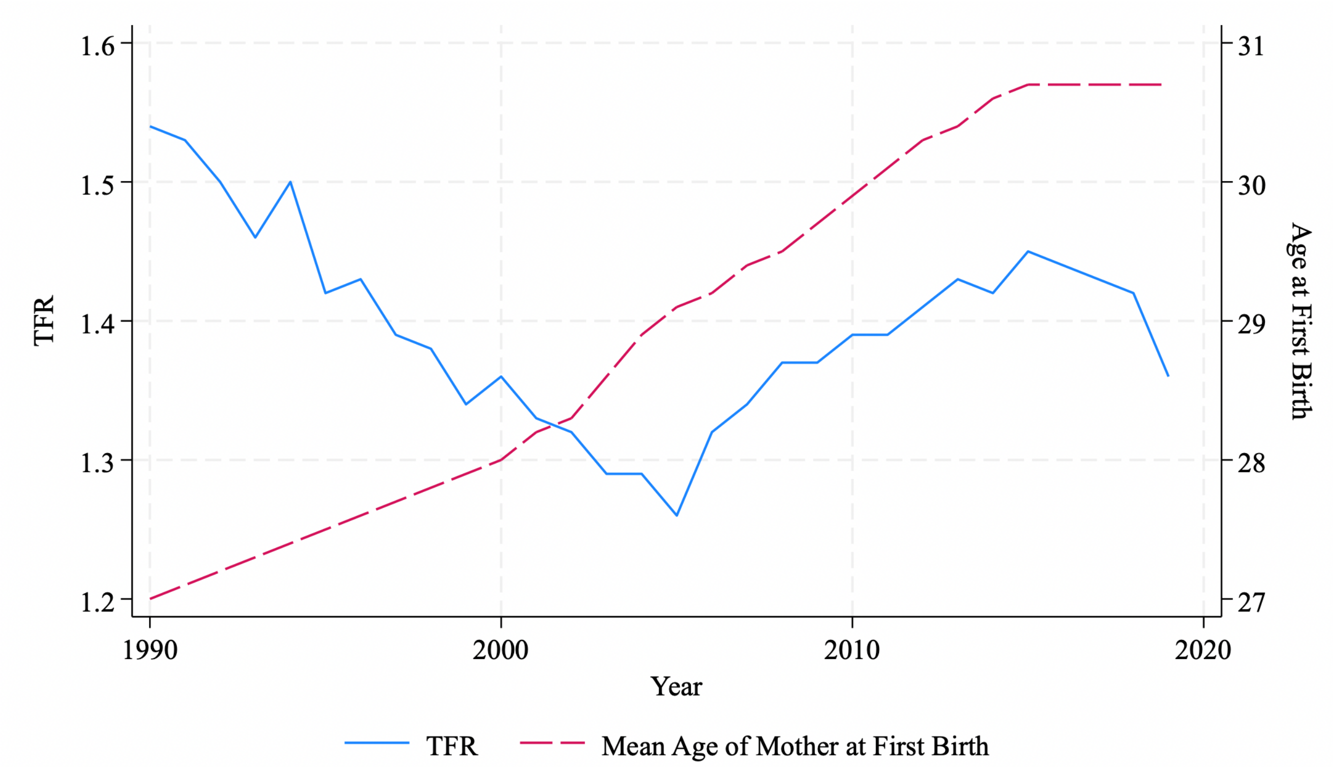
In response, policymakers have attempted to boost fertility through the implementation of pro-natalist policies, which aim to ease the direct and indirect costs of parenthood. As of 2015, 66% of European and nearly 40% of Asian countries had enacted policies intended to support the fertility rate, yet the ability of such policies to increase the fertility rate remains in question (United Nations, 2018).[2]

To provide context, we examine two countries that have experienced contrasting fertility trends. Japan serves as one of the most prominent examples of a country experiencing a significant fertility decline despite extensive government intervention. Fertility in Japan fell below the replacement level of 2.1 births per woman in 1974 and has continued to decline in the decades that followed. By the early 1990s, Japan's TFR had fallen to 1.57, a historic low at the time that became known as the "1.57 Shock"

[1] Israel's fertility rate is depicted by the green line that hovers around 3 TFR for the entire period. This divergent behavior from the broader global decline is attributed to a multitude of factors including: Jewish nationalism, state support for childbearing, and a dual emphasis on women's employment in tandem with fertility (Weinreb et al., 2018; Okun, 2016).
[2] A limited number of countries have explicitly implemented policies aimed at increasing fertility rates. Instead, most nations adopt measures designed to support parents and families, contributing to higher fertility. Consequently, this paper uses the terms "pro-natalist policies" and "family policies" interchangeably.

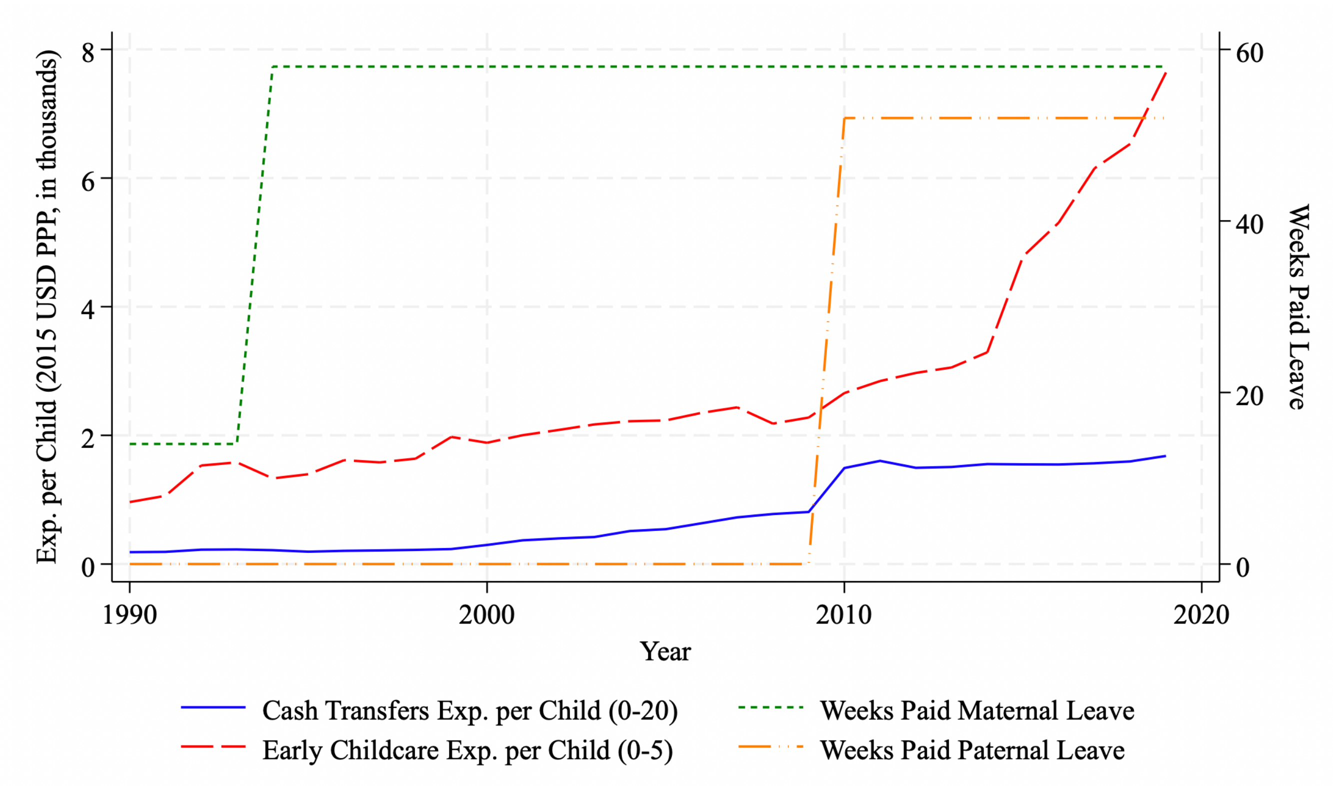
(Ogawa & Retherford, 1993). In response, the government introduced its first explicit pro-natalist measures with the Angel Plan in 1994, which aimed to support working parents by expanding childcare services, promoting parental leave, and encouraging a better work-life balance (Boling, 2008). Day-center capacity across the country subsequently rose by 25%, yet fertility rates continued to decline, as shown in Figure 2 (Retherford & Ogawa, 2005).

Figure 2: Fertility Rate and Age of Mother at First Birth in Japan (1990-2019)



The Angel Plan was revised in 1999 with the New Angel Plan, which included additional funding for daycare centers, family support centers, and after-school programs (Retherford & Ogawa, 2005). However, these policies had a limited impact on fertility rates, and by 2005, Japan's TFR had fallen further to a record low of 1.26 births per woman. As Japan's demographic crises worsened, its public officials significantly expanded their pro-natalist policies under successive governments. The Plus One Policy introduced in 2009 emphasized creating a more family-friendly society by promoting flexible work arrangements and encouraging men's involvement in childcare; financial incentives were also introduced at national and local levels (Raymo & Shibata, 2017). Under Prime Minister Shinzo Abe's administration (2012–2020), family policies became central economic revitalization efforts. The government set ambitious goals to increase the TFR to 1.8 by addressing barriers to marriage and childbearing through free preschool education, expanded parental leave benefits, and subsidies for housing costs for families with children (Suzuki, 2020). Despite these efforts, fertility rates remained low at around 1.3–1.5 births per woman.

Figure 3: Family Policies in Japan (1990-2019)



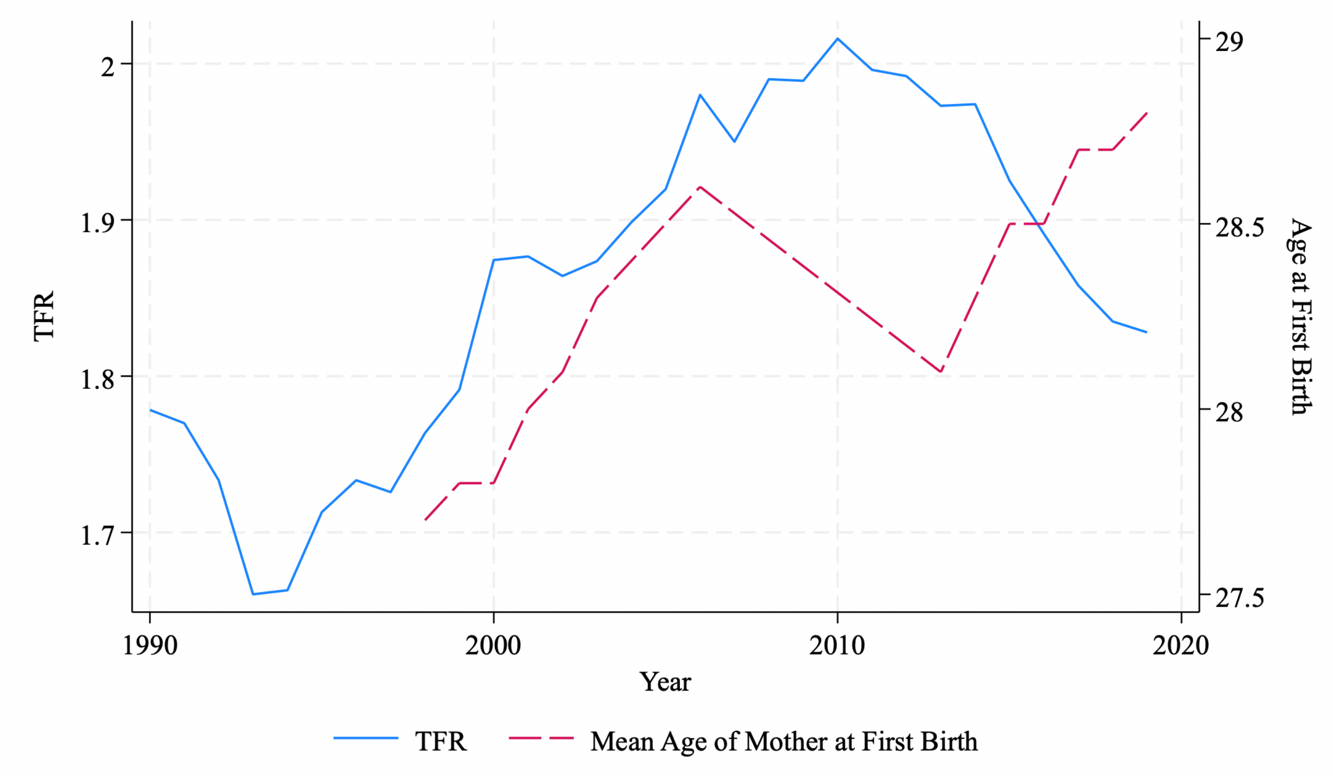
When considering the cause of this seemingly irreversible trend, numerous academics list structural factors such as long working hours, limited availability of affordable childcare services, and gender inequality as fundamental obstacles to Japanese family formation; others blame social norms surrounding prioritizing career over family as the root cause of delayed marriage and lower birth rates

(Raymo & Shibata, 2017; Atoh et al., 2004). Despite these challenges, Japan continues to implement rigorous policies to reverse the decline in fertility. In 2023, Prime Minister Fumio Kishida announced the “Children’s Future Strategy,” which introduces an additional ¥3.6 trillion (~$24 billion) of funding to pro-natalist measures (“Japan’s Fertility: More Children Please,” 2024). Key initiatives include improving the quality of early childhood education and childcare, increasing child allowances, and further incentivizing the use of leave entitlements (Prime Minister's Office of Japan, 2025). However, experts remain skeptical about whether these measures will be sufficient to achieve significant increases in fertility given Japan’s deeply rooted social and economic constraints.

The country is already feeling the impact of these constrained rates: its population, which peaked at 128 million in 2008, is expected to drop to 87 million by 2070 (Sato, 2023). Meanwhile, the working-age population is forecast to decline from 75 million in 2020 to 45 million by 2070 (Sato, 2023). This kind of dramatic demographic shift is without precedent and will likely bring unexpected challenges, but one near certainty is that it will create grave economic difficulties. Immediate effective intervention is urgently needed.

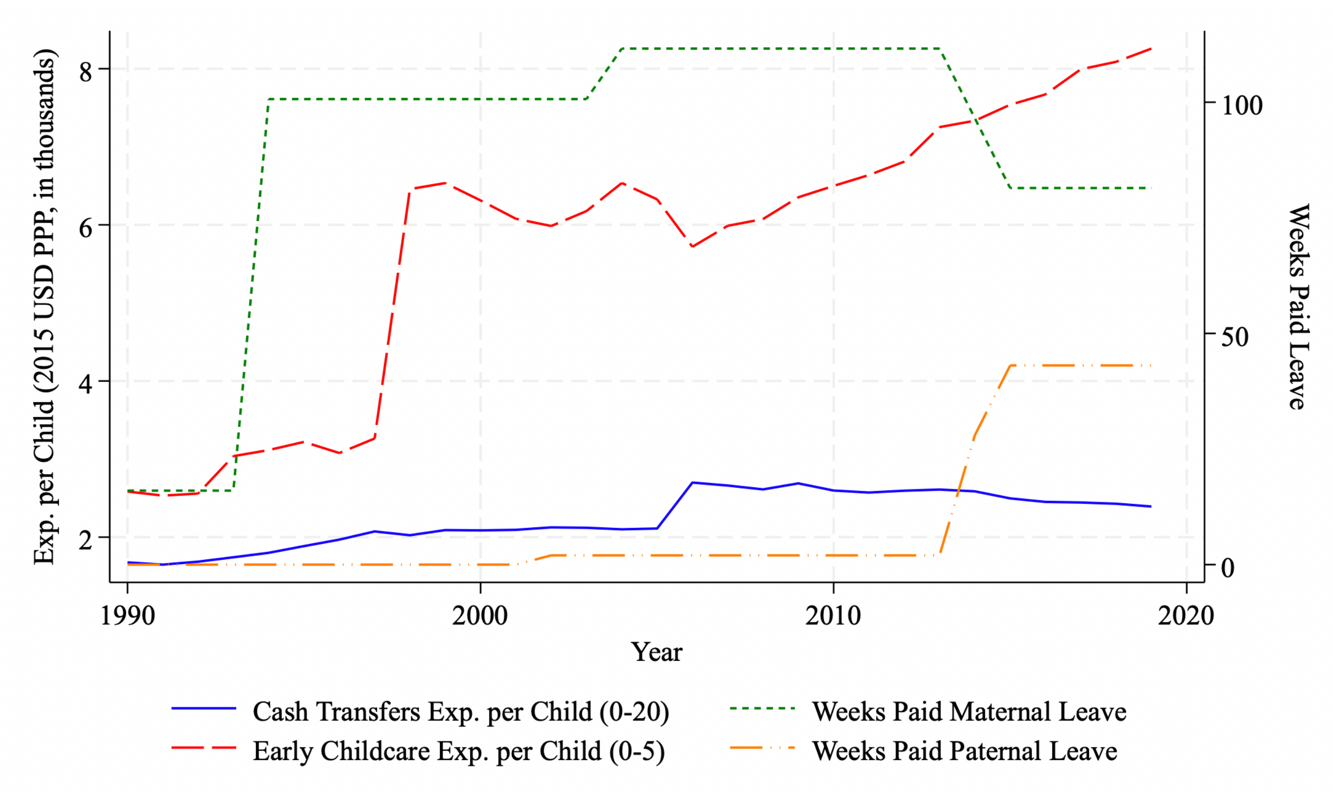
France, on the other hand, has achieved relatively high fertility rates compared to other European nations while heavily investing in long-standing pro-natalist policies. As one of the earliest adopters of family policies, France’s pro-natalist history dates back to the interwar period, with the introduction of the Family Code in 1939, which provided direct financial transfers to families with multiple children, tax benefits for larger households, and maternity grants (Letablier, 2003). These policies were expanded after World War II with the establishment of universal child allowances and subsidized childcare services (Letablier, 2003). By the 1980s, women increasingly participated in the labor force; in response, officials adapted policies to support the working mother by introducing paid parental leave and subsidies for childcare centers to reduce the opportunity costs of childbearing (Letablier, 2003; Pailhé et al., 2008). This focus has permeated through French family policy, resulting in a culture where mothers are encouraged to combine work and parenthood.

Figure 4: Fertility Rate and Age of Mother at First Birth in France (1990-2019)



In modern-day France, family policy is structured into three main components: basic child maintenance benefits, support for early childhood, and assistance for special family circumstances (Stone & Wingerter, 2024). Basic maintenance benefits include four divisions of monthly payments for children up to age 20: a universal benefit, two for larger families, and one for inadequate child support (Stone & Wingerter, 2024). Additional components cover childbirth and early childhood costs up to age three, as well as support for disabilities, serious illness, death, or unstable employment. This combination of policies has helped support France's TFR, which has ranged between 1.8 and 1.9 since 2000, contrasting sharply with other southern European nations like Italy (1.3) and Spain (1.2). Researchers argue that France's success lies in its holistic approach to family support, which alleviates both direct and indirect costs of raising children while enabling women to balance careers and motherhood (Letablier, 2003; Pailhé et al., 2008).

Figure 5: Family Policies in France (1990-2019)



Despite these achievements, challenges persist. Fertility rates remain below replacement level, and regional disparities in childcare access continue to affect outcomes. Nonetheless, France's sustained investment in family policies, which amount to nearly 4% of GDP, has made it a model for other countries seeking to address fertility decline (Cordier, 2023). France's approach illustrates the potential impact of comprehensive family policy, prompting broader inquiry into which specific interventions have been most effective across similar countries.

This study examines the efficacy of the most prominent family policies across all OECD countries. Policies are grouped into three main categories: cash transfers, parental leave entitlements, and early childhood education and care. Each aims to alleviate distinct costs of parenthood. The following sections assess each policy type in turn, beginning with cash transfers, which are the most widely adopted among OECD nations.

Cash transfers provide parents with essential monetary support intended to ease the financial burden of childbearing. The form of payment can vary greatly in implementation, as some nations offer one large lump sum at the time of birth, while others offer monthly cash benefits until children reach adulthood; in most countries, payments scale with family size, offering the greatest support to parents of large families. The literature generally concludes that cash bonuses for childbearing positively affect fertility, though the degree of impact varies. Studies using macro-level data often find that such policies influence the timing of births more than the total number of children, with small but positive effects seen in aggregate fertility rates (Gauthier, 2007; Gauthier & Hatzius, 1997; Hoem, 2005; Andersson et al., 2006). Micro-level data shows similar positive effects, with studies from Quebec, Switzerland, Israel, and South Korea all demonstrating increases in fertility, though results vary by region, household income, and whether the child is a first, second, or higher-order birth (Milligan, 2005; Chuard & Chuard-Keller, 2021; Cohen et al., 2013; Kim, 2023). While cash transfers address the direct financial costs of raising children, parental leave policies aim to alleviate time-related constraints, particularly in the early stages of parenthood.

Parental leave policies mandate employers to offer job-protected time off for parents to care for their newborn or newly adopted children, often with some form of income replacement. Leave benefits were first introduced by Germany in 1883, with the inaction of health insurance, paid sick leave, and paid maternity leave as a form of social insurance (Kamerman, 2000; Shim, 2014). In the modern-day, leave entitlements vary widely in terms of duration, payment levels, and eligibility criteria across different countries. The literature suggests that parental leave policies positively affect fertility rates, although the magnitude of impact differs across studies. Macro-level studies indicate that job-protected paid leave significantly increases fertility rates, with one study finding a 2.27% increase in fertility with every additional 10 weeks of job-protected paid leave (Shim, 2014). Micro-level studies show that the introduction of paid parental leave can increase fertility intentions among working women, with one study reporting a 16% increase in the intended number of children (Bassford & Fisher, 2020). However, the effects of parental leave policies are not uniform. Some research suggests that paternity leave quotas may delay higher-order births and reduce subsequent fertility among older women (Farré & Gonzalez, 2017). The impact of these policies appears to be most pronounced when they offer generous increases in duration or remuneration, suggesting that substantial enhancements to parental leave benefits could be a viable strategy for governments aiming to raise fertility rates. Nevertheless, as parental leave typically covers only the initial months following childbirth, affordable childcare becomes crucial for sustaining labor force participation and supporting continued childrearing.

State-sponsored early education and care is the third and final primary policy approach intended to ease the burden of childcare; such policies offer state-sponsored or state-subsidized care before the child begins their formal education. By offering inexpensive childcare for parents of young children, parents can return to the workforce sooner, reducing the opportunity cost of childbearing. Such policies are especially relevant for dual-earner households, where childcare availability is central to fertility decisions (Lopoo & Raissian, 2018). Theoretically, increased access to affordable care should reduce the opportunity cost of childbearing and encourage higher fertility; however, empirical findings remain mixed. Macro-level analyses reveal conflicting results. Some findings find that increases in care availability or decreases in the cost of care positively influence fertility, while others suggest that policies affect birth timing rather than fertility. Micro-level studies also offer mixed results, with numerous studies finding fertility gains among specific demographics, while others find no significant impact. Studies are difficult to compare because state-sponsored early education and childcare systems vary considerably across countries regarding accessibility, affordability, coverage rates, and program quality. Collectively, these findings suggest that the effectiveness of childcare policy on fertility depends on policy design, local context, and household characteristics.

Taken together, the evidence on cash transfers, parental leave, and childcare provision indicates that while family policy interventions can positively influence fertility, their effectiveness is highly contingent on contextual and demographic factors. This variation underscores the need for methodologically rigorous analyses to account for differences across fertility regimes and evolving social conditions. This study aims to do so while adding to the existing literature in three ways:

1) Exploiting recent data from lower fertility periods to build upon previous studies.
2) Implementing previously unutilized controls, such as access to contraception, for this subset of countries.
3) Evaluating the relative success of policies by distinguishing results between medium, low, and very low fertility environments.

We follow the model outlined by Luci-Greulich and Thévenon (2013) to estimate the linear impact of family policy variables on fertility using country-year panel data. To address omitted variable bias and unobserved heterogeneity, we implement a two-way fixed effects model with country and year-fixed effects and country-specific time trends. Our specification includes economic and social controls such as unemployment, female labor participation, female tertiary education, contraception accessibility, and maternal age at first birth, with a one-year lag to better capture causal effects. This structure allows us to isolate the influence of policy interventions from persistent cross-country differences in fertility behavior.

By addressing empirical limitations and incorporating recent data, this study contributes to a more nuanced understanding of how family policies function under varying demographic pressures. By distinguishing between fertility contexts, this study enables a comparative assessment of policy effectiveness across different national settings. This approach clarifies which policies are most likely to influence fertility and informs the design of future interventions by highlighting the conditions under which they are most successful. Ultimately, the findings aim to assist policymakers in tailoring fertility-supportive strategies to the specific demographic and institutional contexts they face.

2. Literature Review

2.1 Childbearing Theory

In the neoclassical economic theory of family, the number of children a couple chooses to bear is viewed as a utility maximization process depending on three factors: their purchasing power, the resources required to have a child, and the parents' preferences for childbearing relative to goods (Becker, 1991). Based on this model, a decrease in the cost of raising children or an increase in income is expected to lead to a higher demand for children; therefore, policies that increase household income or decrease the opportunity cost of parenthood are anticipated to affect fertility positively (Becker, 1991; Gauthier, 2007). This economic model is the core of the assumed relationship between policies and household decisions; however, it is based on five key assumptions, each of which may help explain the inconsistent results found in the empirical literature (Gauthier, 2007).

First, an increase in income is expected to result in a greater demand for children, when it may result in higher quality and cost of childcare instead (Gauthier, 2007). For example, a recurring cash transfer to parents of newborns may result in the parents selecting higher-cost care instead of having more children; thus, a cash transfer may not necessarily boost fertility despite increasing income (Gauthier, 2007).

Second, the model posits that individuals make decisions about having children based on complete information of costs and benefits. However, scholars have challenged this, arguing that individuals likely have imperfect information (Goldthorpe, 2000). Adaptations of rational choice theory suggest that individuals rely on situational information, which may be incomplete or inaccurate, and this could either increase or decrease the perceived impact of cash benefits depending on whether individuals overestimate or underestimate the cost of children (Gauthier, 2007).

Third, the model assumes that decisions such as having a child, marrying, or divorcing are economically rational. Scholars, however, have redefined rationality more broadly, suggesting that actions are considered rational if they are "appropriate" or "adequate" given individuals' goals and their situational context, including their beliefs (Goldthorpe, 2000; Gauthier, 2007). This implies that individuals may evaluate child benefits or parental leave not purely by their economic value but by their perceived utility in helping achieve personal goals. Scholars are uncertain how this can influence the impact of policies; however, it's expected to introduce noise to the relationship between policy and fertility (Gauthier, 2007).

The fourth assumption is that policies affect fertility by reducing child-bearing costs or increasing income without influencing individuals' preferences for children. However, research emphasizes the role of peers, traditions, and publicity in shaping preferences and values (Becker, 1996; Becker & Murphy, 2000). Based on this, it can be argued that specific family policies, such as cash transfers, may influence fertility by promoting the value of children, and policies like parental leave may affect fertility by normalizing time off to care for newborns (Gauthier, 2007).

The final assumption of the economic model of fertility is that all household members share homogeneous preferences regarding children. Scholars have challenged this assumption, suggesting that household preferences may differ (Rasul, 2002). This heterogeneity can significantly impact the effect of policies on fertility by allowing spouses to have divergent preferences about children, family, careers, and the perceived costs of childbearing, a point echoed by McDonald's (2000) gender theory, which links gender inequalities to low fertility levels (Gauthier, 2007). For these reasons, the model is susceptible to imperfect information due to the roles of noneconomic costs and benefits and cultural norms, making accurate empirical analysis difficult.

2.2 Cash Benefits

The literature on cash benefits for childbearing policies broadly concludes that they positively affect fertility; however, the degree of efficacy varies by study. Studies using macro-level data use a global measure of fertility as the dependent variable, with policy indicators and macro indicators as independent variables. Studies tend to focus on countries in Europe and North America and use either a cross-national or single-country design to perform their analyses, mainly finding a small but positive impact on aggregate fertility indices (Gauthier, 2007). One study of OECD countries used a pooled time series and cross-national dataset to examine the 22 member-states from 1970-1990 and found fertility to be 0.07 children per woman higher for benefits 25% above average (Gauthier & Hatzius, 1997). Notably, studies suggest that policies are more likely to affect when people have children rather than how many children they ultimately have. For instance, Ermisch (1988) found that more generous child allowances in Britain encouraged earlier childbearing and increased births among mothers with multiple children. Similar shifts in the timing of births, known as tempo effects, were observed in Sweden in response to parental leave allowances (Hoem, 2005; Andersson et al., 2006). Micro-level data also generally finds a positive impact of cash benefits on fertility; however, the findings vary by region and are more nuanced as they account for policies' effects depending on the mother's childbearing history (Gauthier, 2007). Milligan (2005) examines the impact of a significant increase in transfers in Quebec in 1988 using a difference-in-difference approach, with the rest of Canada as the control group. His results indicate a 12 percent rise in fertility due to the reform, with the most significant effect observed for third births, suggesting an impact on completed fertility. However, some uncertainty remains due to the five-year observation period. Malak et al. (2019), using a similar design with a longer follow-up period, provide further evidence of lasting effects on completed fertility. A study on the increase in baby bonuses in some regions of Switzerland used a two-way fixed design to suggest a temporary 5.5% increase in fertility (Chuard & Chuard-Keller, 2021). A study in Israel exploited variations in child subsidies to find a positive effect of cash transfer on fertility; surprisingly, the study found the highest income brackets demonstrated the largest effects (Cohen et al., 2013). In South Korea, local governments introduced cash transfers for families with newborns, and Kim (2023) used variations in policy implementation timing and transfer generosity across birth parity to analyze the impact. Utilizing administrative birth registry data, the study estimated a 1 to 5 percent increase in birth rates. These results are complex and likely stem from variations in the structure of policies based on birth order, such as benefit levels and eligibility criteria. Additionally, they may reflect differences in decision-making for having a first, second, or third child, including the varying costs associated with each parity.

2.3 Parental Leave

Parental leave policies are theorized to promote fertility by reducing the costs of childbearing and facilitating a balance between work and family life (Gauthier, 2008). These policies allow parents to take remunerated time off work, thus enabling individuals to realize their childbearing aspirations while maintaining employment. However, the impact of leave on fertility is complex, as it interacts with existing gender roles and the broader welfare regime of each country. Five mechanisms explain how leave policies influence fertility outcomes.

First, parental leave supports work-life balance by allowing parents to care for infants while maintaining their careers. For those prioritizing professional and family goals, this mechanism enables childbearing that might otherwise be deferred or foregone (Becker, 1973; Thomas et al., 2022). Second, when leave is partially or fully paid, it reduces the financial burden of early child-rearing, making leave a cost-effective alternative to external childcare (Gauthier, 2008). These mechanisms are crucial for maternity and paternity leave, alleviating economic pressures while facilitating time with newborns. Gender dynamics significantly affect how leave policies impact fertility, as leave policies may foster gender equity by encouraging shared domestic and childcare responsibilities. The third mechanism states maternity leave allows women to remain in the workforce, mitigating inequities in employment and enabling subsequent childbearing (Geyer et al., 2015). Similarly, the fourth mechanism theorizes paternity leave can promote fathers' participation in childcare, leading to a more equitable division of labor and reducing constraints on mothers' employment (Farré, 2016). These mechanisms align with McDonald's gender equity theory, which suggests fertility is higher when institutional expectations for gender roles in family and public spheres are coherent (McDonald, 2000; McDonald, 2006). However, traditional gender roles can also be reinforced by leave policies. Most systems disproportionately allocate leave to mothers, perpetuating the view of women as primary caregivers and potentially limiting their workforce engagement (Evertsson & Duvander, 2010). Therefore, the final mechanism theorizes that prolonged maternity leave may thus reduce fertility by exacerbating gender inequality, which has been observed in many European countries with unequal entitlements for mothers and fathers (Haas, 2003).

Empirical evidence indicates that leave policies positively affect gender equity and women's labor force participation, though excessive leaves are associated with larger reductions in earnings for mothers (Dearing, 2015). While paternity leave's impact on domestic labor is mixed, studies from countries like Germany and Spain suggest it supports more balanced gender roles, indirectly boosting fertility (Bünning, 2015; Fernández-Cornejo et al., 2018). Ultimately, leave policies can promote fertility, support equity, and minimize financial and social barriers.

2.4 Early Childhood Education and Care

Childcare represents an especially significant consideration for families in which both parents work (Lopoo & Raissian, 2018). The theoretical literature on childcare indicates that increased access to formal childcare should lower the opportunity cost of childbearing and thus positively influence fertility (Lopoo & Raissian, 2018). Empirical studies generally focus on two principal policy levers: reducing the direct cost of child care and expanding its availability; however, the literature on both approaches has yielded mixed results (Lopoo & Raissian, 2018).

Macro-level analyses have produced conflicting findings regarding the efficacy of childcare interventions (Gauthier, 2007). Kravdal (1996) finds that a 20 percent increase in formal childcare provision would raise fertility by no more than 0.05 children per woman in Norway. Similarly, multi-country analyses by DiPrete et al. (2003) and Del Boca et al. (2003) report a positive association between reductions in childcare costs, increased availability, and aggregate fertility rates (Gauthier, 2007). At a cross-national level, Feyrer et al. (2008) find that publicly provided care is one of the strongest predictors of higher fertility rates. However, studies from Sweden report effects on the timing of births but not fertility (Andersson et al., 2004; Hoem, 2005). The contradictory nature of these macro-level results has been attributed to several factors, including the concurrent increase in female labor force participation and the expansion of childcare supply, varying standards of childcare systems, and the complex relationship between public childcare institutions and other social systems (Gauthier, 2007).

Micro-level studies find equally nuanced results. Mörk et al. (2011) examine a Swedish reform that capped childcare fees, finding that cost reductions increased fertility most significantly among couples with two or more children. Similarly, a study on a subsidy reform in South Korea found a modest increase in fertility, with more significant effects among young women who had already had their first child (Hong & Sullivan, 2016). Evidence from Germany contradicts these findings, as a study found that childless women exhibited the greatest increase in births in response to an expansion of the care system (Bauernschuster et al., 2015). In contrast, other studies from Norway, Finland, and Western Germany report null effects on fertility (Ronsen, 2004; Hank & Kreyenfeld, 2003). Notably, multiple studies find that improved childcare availability increases labor force participation but not fertility (Haan & Wrohlich, 2011; Del Boca et al., 2008). Overall, empirical findings remain mixed, as findings suggest the efficacy of childcare depends on the policy details, local context, and the couple's circumstances.

2.5 Measuring Fertility

Due to a host of issues related to data availability, short-term fluctuations, and timing discrepancies, fertility rates are challenging to assess accurately. Ideally, studies would use the completed fertility rate (CFR) as the fertility measure. CFR is the number of children a cohort of women had over their lifetimes. However, this measure can only be calculated for cohorts of women who have completed their childbearing years, thus significantly delaying data availability (Erbabian & Osorio, 2022). In response, demographers and economists have constructed several alternative methods to measure fertility in real time, each addressing a weakness of the fertility equation.

The most crude measure of fertility is the General Fertility Rate (GFR), which is the number of live births per 1,000 females of childbearing age (Hageman & Galoustian, 2024).

$$GFR = (\#of\ births\ \div\ midyear\ population\ of\ females\ aged\ 15-49) * 1000 \tag{1}$$

The GFR is susceptible to distortion by a disproportionately large or small sub-population of women of childbearing age. Thus, one alternative is the Age-Specific Fertility Rate (ASFR), which is calculated using the same principle as the GFR, but it calculates values for a specified age group (Hageman and Galoustian, 2024). This gives a more nuanced insight into a country’s demographic by measuring the fertility rate of a specific population subgroup.

$$ASFR_{(25-29)} = (\#of\ births\ by\ women\ (25-29)\ \div midyear\ population\ of\ women\ (25-29)) * 1000 \tag{2}$$

The Total Fertility Rate (TFR) builds on ASFR by calculating a hypothetical measure of fertility defined as "the average number of births a woman would have if she were to live through her reproductive years (ages 15-49) and bear children at each age at the rates observed in a particular year or period" (Bongaarts & Feeney, 1998). In other words, the measure is the sum of age-specific fertility rates for each age group in a particular year.

$$TFR = \sum n_i * ASFR_i \div 1000 \tag{3}$$

This is a hypothetical measure of fertility since no real group of women will experience this particular rate; instead, it represents the fertility rate of a specific year assuming fertility rates across age groups persist (Bongaarts & Feeney, 1998). This mechanism makes TFR susceptible to short-term distortions due to changes in the timing of childbearing. For example, suppose a country undergoes an unexpected transient shock to household income without a change to childbearing preferences; this would likely result in parents across age groups delaying childbearing due to the increase in economic uncertainty. In this scenario, TFR would depict a steep decline in fertility over this period in response to the financial shock, followed by a strong uptick in fertility once economic conditions rebounded. In actuality, childbearing preferences, total births, and underlying fertility would remain constant over the period, while the shift in the timing of births would skew TFR. For this reason, TFR is a suboptimal measure of long-term fertility trends; however, it remains the measure in this study due to the lack of availability of a superior alternative.[3]

[3] While the tempo-adjusted total fertility rate (adjTFR) developed by Bongaarts and Feeney (1998) is a more accurate measure of fertility by accounting for shifts in the timing of births, its calculation requires detailed data on maternal age. Due to the limited availability of such data, this study relies on the conventional total fertility rate (TFR) as its primary fertility measure.

3. Empirical Approach

We follow the model presented in Luci-Greulich and Thévenon (2013) by empirically estimating a linear impact of family policy variables on fertility. Our analysis uses data at the country and year level to assess the influence of policies. To manage potential bias due to the omission of explanatory factors that may correlate with policies, we deploy a two-way Fixed effects model with country-fixed effects, year-fixed effects, and country-specific time trends to control for unobserved factors across countries and periods (Luci-Greulich & Thévenon, 2013; Shim, 2014).

We deploy a set of independent variables to control for economic and social conditions that may influence fertility decisions in tandem with policies. These include the unemployment rate, the first difference in the unemployment rate, the female participation rate, the proportion of women with tertiary degrees, the accessibility of contraception, and the average age of a mother at first birth (Gauthier & Hatzius, 1997; Luci-Greulich & Thévenon, 2013). In line with Gauthier and Hatzius's (1997) work, we incorporate a one-year lag to capture the delayed impact of changes in independent variables on fertility, allowing for a more accurate representation of cause-and-effect relationships in the data and minimizing the risk of reverse causality in our estimations. Given the complex nature of cross-country comparisons, we use country-fixed effects to address country-specific characteristics that remain constant over time but may correlate with the independent variables (Gauthier & Hatzius, 1997). This allows the model to more accurately separate the impact of policy changes from the underlying national fertility.

We construct the model that guides our empirical work as such:

$$f_{i,t+1} = \alpha_i + \beta \times p_{i,t} + \lambda X_{i,t} + T_t + c_i t + \varepsilon_{i,t} \tag{6}$$

where $f_{i,t+1}$ is the fertility rate at time $t+1$ in country i; α_i, the country fixed effects; $p_{i,t}$, policy variables; $X_{i,t}$, other time-varying controls; T_t, the year fixed effects; $c_i t$, country-specific time trends; ε_i,t, error term.

4. Data Selection

To assess the impact of pronatalist policies on fertility rates, our approach requires data on key economic and social indicators that have been found to influence fertility decisions. We use a set of public databases from the OECD Data Explorer site to create a comprehensive dataset for our analysis.

4.1 Policy Indicators

This paper uses three policy variables to measure the impact of pronatalist policies in OECD countries in our analysis. Policy variables are separated into three categories: cash transfers, early childhood education and care, and leave entitlements. Policy variables are constructed using data that spans 1990-2019 with mixed coverage across 38 OECD member countries. The data report policy figures by public spending as a percentage of GDP, which is used to construct a per capita metric that aims to capture the perceived benefits of these programs. This transformation allows for a more nuanced measure than raw spending values by ensuring comparability across regions with varying cost-of-living standards (Gauthier & Hatzius, 1997). To construct a per capita metric, we deployed the OECD green growth dataset to pull time-series real GDP per capita data, adjusted to reflect the purchasing power parity (PPP) in 2015 US dollars. To calculate the metric, we multiply the policy expenditure (in % of GDP) by real GDP per capita and the proportion of the population eligible for the program, resulting in a per-child metric measured in real dollars.

$$Exp.per\ Child = \frac{Expenditure\ on\ Policy\ (\%\ of\ GDP) \times\ Real\ GDP\ per\ Capita\ \times\ \%\ of\ Population\ Eligible}{100} \tag{7}$$

We acknowledge that this method fails to consider a multitude of factors that may influence how policies influence decision-making across households, such as variations in taxation, government efficiency, and childcare costs; however, proficient controls for such variations are beyond the scope of this paper.

There are some nuances to the data used to measure these policies. Childcare expenditure measures the public spending on child education and care before a child enters primary school. Due to cross-country differences in the age at which children enter primary school, there are complications in deciphering early childcare spending from primary education spending. For context, in most OECD countries, children begin primary school at age six, while in some OECD countries, they begin at age 5 or 7 (OECD, 2019). The Family Database accounts for this discrepancy by defining the expenditure on early childcare programs as public spending on education or care for children under six. To do so, the data is adjusted "for countries where children enter primary education earlier than age 6, expenditure on ECEC is adjusted upwards by adding in any expenditure corresponding to children under age six enrolled in primary school. For countries where children enter primary school at age seven or later, expenditure on ECEC is adjusted downwards by excluding any expenditure corresponding to children age six or above" (OECD, 2019). For this reason, the per capita metric measuring expenditure on early childcare is calculated to reflect that benefits are exclusively for children under six.[4]

Cash transfer policies are similarly challenging to interpret, as they include any form of direct financial support to parents, ranging from one-time birth grants to ongoing child allowances. To create a comprehensive measure, per capita expenditure is calculated using the total number of children under twenty. While this approach likely underestimates spending per eligible child, more precise calculations are not possible due to data limitations.

[4]Per-child expenditure is calculated based on the total number of children younger than six years old. It would be more precise to measure expenditures per child enrolled in childcare services; however, data limitations prevent this approach.

Figures 6&7: Bar Charts of Public Expenditure on Pronatalist Cash Transfers and Early Education and Care by OECD Countries (1990, 2005, 2019)

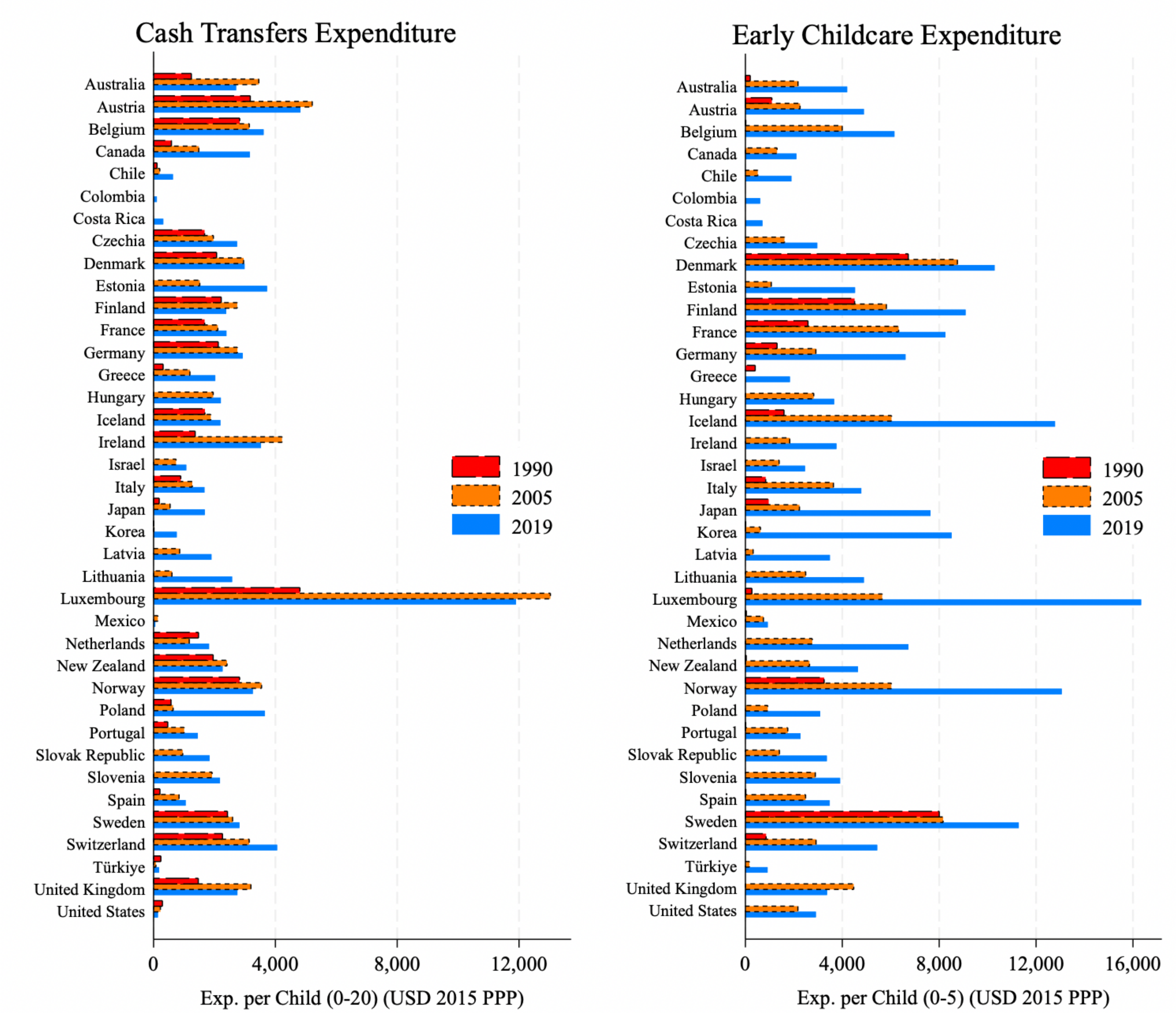


Table 1: Summary Statistics of Childcare and Cash Transfer Policies (1990-2019)

VARIABLES	(1) Obs	(2) Mean	(3) SD	(4) Min	(5) Max
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	991	3.144	2.788	0	16.34
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	1,047	2.040	1.985	0	15.19

The data also include detailed time-series information on durations of federally protected leave entitlements surrounding childbirth reported in weeks, distinguishing between job-protected and paid leave, with further breakdowns for specific uses. It is important to note that the many aspects of leave entitlements make analysis of this policy quite complex. As shown in Figure 8, the most common form of leave is maternity leave, which entitles mothers to a period of leave around the time of childbirth, guaranteeing job protection within a certain number of weeks after childbirth (Luci-Greulich & Thévenon, 2013). Paternal leave entitles fathers to a period of leave after childbirth, however, it is less common and often for shorter durations. Lastly, parental leave allows parents to care for their child beyond the time designated for maternal or paternal leave (Luci-Greulich & Thévenon, 2013). Each of these policies can vary in duration and income, resulting in a problematic measure to compare across economies. For this reason, our analysis aligns with previous literature by exclusively focusing on protected leave entitlements with any level of guaranteed pay.

Figure 8&9: Weeks of Paid Maternal and Paternal Leave Protected by OECD Countries (1990, 2005, 2019)

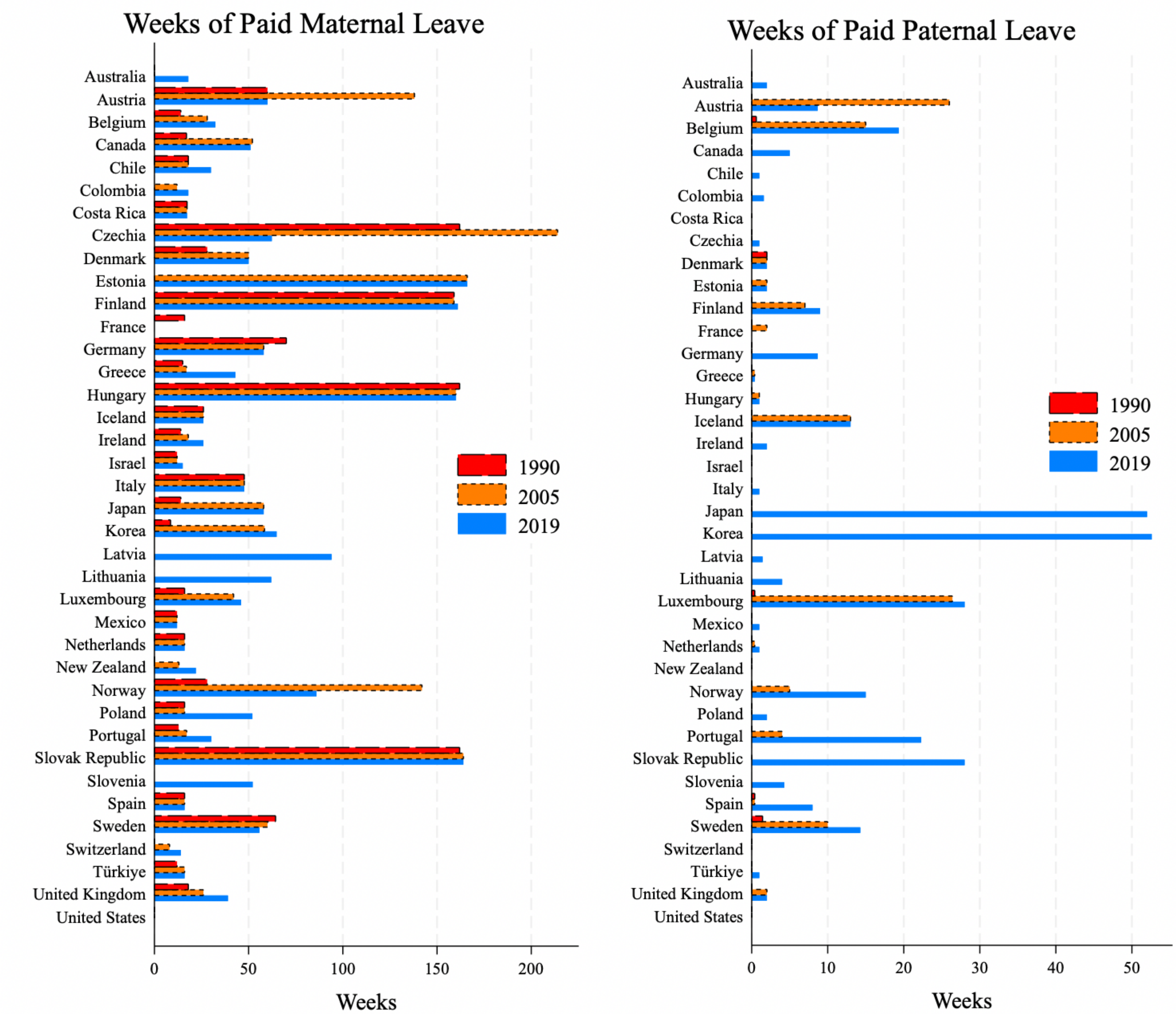


Table 2: Summary Statistics of Leave Entitlements (1990-2019)

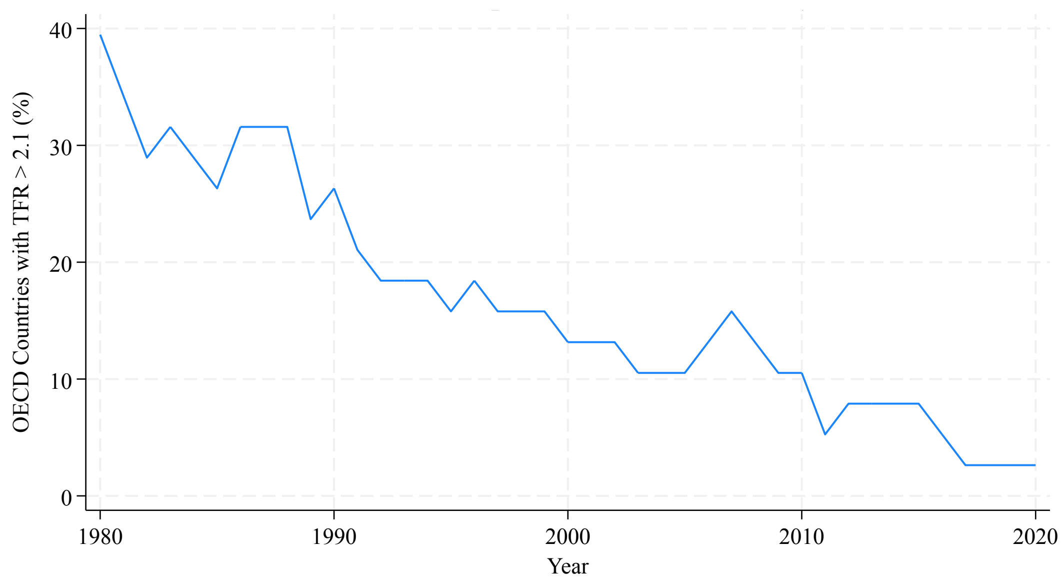
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Obs	Mean	SD	Min	Max
Weeks of Protected Paid Maternal Leave (in tens)	1,048	5.071	5.189	0	21.40
Weeks of Protected Paid Paternal Leave (in tens)	1,023	0.478	1.020	0	5.260

Summary statistics of leave entitlements (Table 2) reveal expected conclusions, as OECD countries have historically favored maternal to paternal leave. The data show high standard deviations and large gaps between the minimum and maximum values, indicating a wide divergence in policies across countries.

4.2 Fertility Data

This paper uses country-year estimates of Total Fertility Rate (TFR) as the measure of fertility and dependent variable. TFR is a period measure calculated by summing age-specific fertility rates across a woman's reproductive lifespan (15–49 years), reflecting the average number of children a woman is expected to have over her lifetime.[5] Provided by the OECD Family Database, these data offer complete data for all 38 member countries from 1990-2019.

Figure 10: Proportion of OECD Countries with Replacement-Level Fertility (1980-2020)



For our analysis, we categorize countries by the level of fertility in 1990 to evaluate the relative efficacy of policies by initial fertility environment. Categories are defined as follows: medium: from 2.1 to 3.5 births per woman; low: fewer than 2.1 but higher than 1.5 births; and very low fertility: 1.5 births and less (United Nations, 2017).[6] The groups of countries are shown in Table 3 below.

[5] See section 2.5 for more details.
[6] The UN defines high fertility as having more than five births per woman, while medium-high fertility ranges from 3.5 to 5 births per woman. However, the data used in this study contained no cases that fell into either of these categories.

Table 3: TFR in Countries by Fertility Group

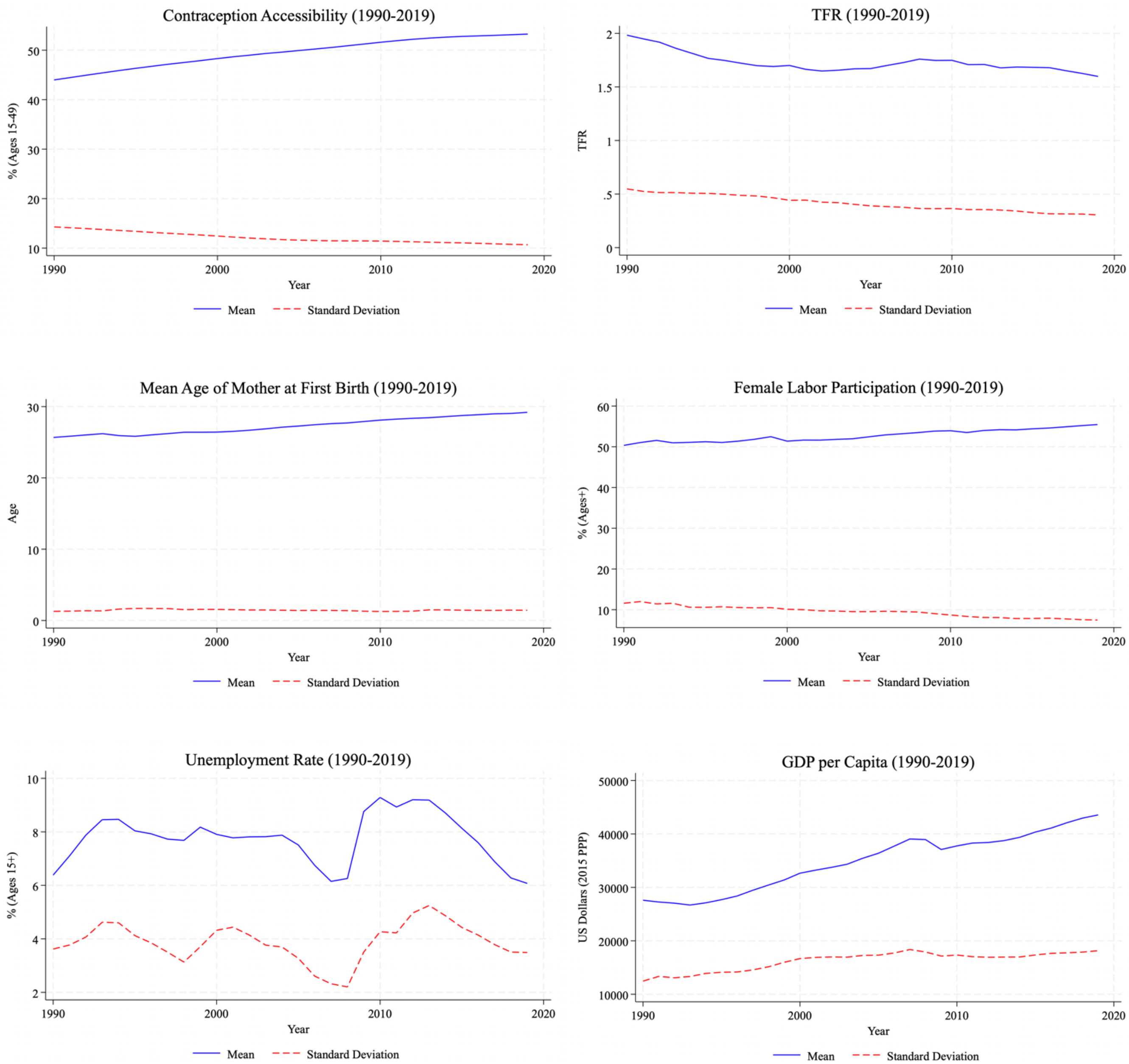
Country	TFR (1990)	TFR (2019)
Fertility Group: Medium (2.1-3.5)		
Chile	2.579	1.545
Colombia	3.082	1.765
Costa Rica	3.205	1.632
Iceland	2.310	1.745
Ireland	2.120	1.700
Israel	3.020	3.010
Mexico	3.470	1.916
New Zealand	2.180	1.720
Sweden	2.137	1.700
Türkiye	3.070	1.880
Fertility Group: Low (>1.5-<2.1)		
Australia	1.902	1.670
Belgium	1.620	1.600
Canada	1.710	1.470
Czechia	1.893	1.709
Denmark	1.670	1.699
Estonia	2.050	1.660
Finland	1.785	1.350
France	1.778	1.828
Hungary	1.840	1.490
Japan	1.540	1.360
Korea	1.570	0.920
Latvia	2.010	1.610
Lithuania	2.030	1.610
Luxembourg	1.620	1.340
Netherlands	1.617	1.574
Norway	1.932	1.530
Poland	1.991	1.419
Portugal	1.556	1.430
Slovak Republic	2.085	1.570
Switzerland	1.593	1.480
United Kingdom	1.830	1.630
United States	2.081	1.706
Fertility Group: Very Low (<=1.5)		
Austria	1.458	1.461
Germany	1.454	1.540
Greece	1.394	1.340
Italy	1.358	1.270
Slovenia	1.460	1.610
Spain	1.362	1.230

4.3 Economic and Social Indicators

Since the macro environment can influence policy and fertility decisions, controls for such factors are necessary in our analysis. This paper uses a combination of OECD databases to produce a comprehensive dataset to control for various economic and social indicators. To measure broader economic opportunities, we include real GDP per capita (measured in 2015 US dollars at purchasing power parity), the unemployment rate (persons 15 years or older), the change in the unemployment rate, and the labor participation rate (women 15 years or older). We also control for female education, as it has been identified as a key determinant of fertility; to do so, we include the proportion of women aged 25-64 who have completed tertiary education (Murphy, 1993). Our analysis also consists of a proxy for contraception access due to its studied implications on fertility outcomes; this is measured as "the proportion of women of reproductive age (15-49) who have their need for family planning satisfied with modern methods" (United Nations, 2024).[7] This paper uses median estimates from the World Contraceptive Use data set, which combines numerous national and global surveys to estimate family planning indicators. Lastly, we control for maternal age at birth, as delayed parenthood is a key factor in fertility decline (Sobotka & Beaujouan, 2021). While ideal controls would include age by birth order, data limitations restrict our analysis to the mean age at first birth. Figures 11–16 highlight a broader shift in OECD countries toward greater wealth and equity, accompanied by a declining rate of childbearing.

[7] Modern contraceptive methods include sterilization, hormonal treatments (such as pills, injectables, implants), barrier methods, IUDs, emergency contraception, and newer technologies like the patch or vaginal ring; this does not include alternative "traditional methods" such as fertility awareness (rhythm), withdrawal, and other non-modern approaches (United Nations, 2024).

Figures 11-16: Social Trends in OECD Countries (1990-2019)



4.4 Data Overview

The unit of observation for this empirical analysis is a country year, as captured across multiple panel datasets spanning 1990–2019. The dataset includes observations from 38 OECD countries across various regions, focusing heavily on Europe. Our analysis uses TFR as the dependent variable, with independent variables capturing various macro conditions. Controls include economic opportunities (real GDP per capita, unemployment rates, labor participation) and social conditions such as female education levels (percentage of women with tertiary education), access to contraception, and family policy supports (early childcare, cash benefits, and leave entitlements).

Table 4: Correlation Matrix of Key Economic and Social Indicators

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) GDP per Capita	1.000						
(2) Unemployment Rate	-0.347***	1.000					
(3) Change in Unem. Rate	-0.024	0.157***	1.000				
(4) Female Labor Part.	0.338***	-0.230***	0.012	1.000			
(5) Female Tertiary Educ.	0.459***	-0.209***	-0.075**	0.594***	1.000		
(6) Contraception Acces.	0.624***	-0.150***	-0.014	0.529***	0.380***	1.000	
(7) Maternal Age at Birth	0.559***	-0.085**	-0.059	-0.070*	0.351***	0.338***	1.000

*** p<0.01, ** p<0.05, * p<0.1

A preliminary correlation matrix (Table 4) reveals the anticipated relationships between economic indicators, such as correlations between GDP, unemployment, and labor participation. The matrix also suggests our use of comprehensive control variables may cause multicollinearity problems, likely introducing difficulty in our interpretation of estimated coefficients. However, we prefer to reduce the risk of omitted variable bias by including such measures and dealing with multicollinearity instead of risking OVB (Luci-Greulich & Thévenon, 2013).

Table 5: Correlation Matrix of Key OECD Policy Measures

VARIABLES	(1)	(2)	(3)	(4)
(1) Early Childcare Exp. Per Child (0-5) (2015 PPP, in hundreds)	1.000			
(2) Cash Transfers Exp. Per Child (0-20) (2015 PPP, in hundreds)	0.478***	1.000		
(3) Weeks of Protected Paid Maternal Leave (in tens)	0.140***	0.199***	1.000	
(4) Weeks of Protected Paid Paternal Leave (in tens)	0.301***	0.409***	0.142***	1.000

*** p<0.01, ** p<0.05, * p<0.1

As expected, a correlation matrix of pronatalist policies (Table 5) shows positive correlations between policies, suggesting governments largely implement a multi-faceted approach in response to falling fertility rates.

5. Results

5.1 Initial Results

Table 6 presents estimates from a two-way fixed effects model examining the relationship between family policy variables and TFR across OECD countries. The analysis includes three model specifications: Model 1 incorporates basic controls and fixed effects; Model 2 adds country-specific time trends to account for unobserved heterogeneity; and Model 3 further introduces the mean age of mothers at first birth to capture tempo-related effects on fertility.

Beginning with core policy variables, both cash transfers and early childcare expenditures exhibit consistently positive and statistically significant effects on fertility. In Model 1, cash transfers yield a positive association with fertility of 0.093 ($p<0.01$), which remains robust in Models 2 and 3 (0.056 and 0.074, respectively). This suggests that a $1,000 increase in per-child cash transfer expenditure is associated with an increase of approximately 5 to 7 births per 100 women, even after accounting for the timing of childbearing. Early childcare expenditures also show a positive effect, with significance emerging in Models 2 and 3. While the magnitude is smaller (0.038 and 0.025), these results indicate that investment in early childcare may help alleviate work-family conflicts and influence childbearing decisions. In contrast, maternal leave initially show a negative and statistically significant association with fertility in Model 1 (–0.015, $p<0.01$). However, the coefficient becomes positive and significant once country-specific time trends are included in Models 2 and 3 (0.014 and 0.010, both $p<0.01$). This pattern suggests that the fertility effects of parental leave may be confounded by country-level dynamics, such as pre-existing fertility trends or policy environments, that must be accounted for to reveal a more accurate positive relationship.

Turning to economic variables, results are broadly consistent with expectations from the literature. The unemployment rate is negatively and significantly associated with fertility across all models, indicating that economic insecurity continues to be a major deterrent to family formation. Notably, the change in unemployment rate is statistically insignificant, suggesting that long-term labor market conditions may exert a more consistent influence than short-term fluctuations. In all three models, female labor force participation remains positively and significantly associated with fertility, underscoring the view that structural support for working women can promote fertility by facilitating work-family balance.

In terms of social determinants, contraception accessibility is significantly and negatively associated with fertility in Models 2 and 3, with coefficients of –0.019 and –0.018, respectively. These findings support the interpretation that broader contraceptive access reduces fertility, likely by decreasing unintended pregnancies and enabling more precise family planning. The introduction of the mean age at first birth in Model 3 reveals a significant negative relationship (–0.092, $p<0.05$), affirming the hypothesis that delayed childbearing is a key driver of fertility decline. Importantly, the inclusion of this variable does not substantively alter the direction or significance of key policy coefficients, indicating the robustness of their effects even after controlling for demographic timing.

Overall, the results suggest that direct financial support through cash transfers and investments in childcare remain the most consistent policy levers for increasing fertility. While more sensitive to model specification, paid maternal leave shows a positive association once national trends are considered. Economic conditions, particularly employment stability and access to family planning tools, also significantly shape fertility behavior. These findings reinforce the notion that multidimensional policy environments are most effective in addressing fertility decline across diverse national contexts.

To assess the robustness of these results and ensure the validity of our preferred specifications, we conduct a series of additional estimations. First, we re-estimate the model, excluding the control for contraception accessibility, to incorporate observations from Iceland and Luxembourg. The results show no substantial changes in the magnitude or statistical significance of the coefficients (results available in Appendix Table A2). Results of the fixed effects model are compared with a random effects model (Table A3); however, a Hausman test suggests that the fixed effects model is superior. We conduct additional regressions incorporating controls for paid paternal leave; however, results indicated no statistically significant association for paternal leave, neither independently nor when interacted with maternal leave (Table A4). Consequently, paternal leave has been excluded from subsequent analyses to mitigate issues related to multicollinearity. To further explore policy effects on the timing of births, we re-estimate the model with interaction terms across each policy variable. However, these additional specifications yield no statistically significant results, suggesting limited evidence that the observed policy effects are driven by birth timing rather than completed fertility (Table A5).

Given the significant and negative effect of maternal age at first birth observed in Model 3, we designate this specification as our preferred model for further analysis. Including this demographic control not only aligns with theoretical expectations regarding the role of delayed childbearing in fertility decline but also enhances the explanatory power of the model by accounting for key tempo effects. Importantly, the robustness of core policy coefficients across all specifications reinforces their relevance, while Model 3 offers a more comprehensive framework for isolating policy impacts from underlying demographic shifts. However, data limitations limit the ability to conduct rigorous empirical work with consideration for maternal age at first birth. Therefore, subsequent analyses and interpretations are based on the estimates presented in Models 2 and 3.

Table 6: Regression Results for Two-way Fixed Effects Models

Dependent Variable: TFR			
	(1)	(2)	(3)
LAGGED VARIABLES	Model 1	Model 2	Model 3
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	0.093***	0.056**	0.074***
	(0.0266)	(0.0235)	(0.0186)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.023	0.038***	0.025**
	(0.0166)	(0.0111)	(0.0114)
Weeks of Protected Paid Maternal Leave (in tens)	-0.015**	0.014***	0.010**
	(0.0067)	(0.0037)	(0.0039)
GDP per Capita (2015 PPP)	-0.000	-0.000	0.000
	(0.0000)	(0.0000)	(0.0000)
Unemployment Rate (% aged 15+)	-0.015***	-0.013***	-0.010**
	(0.0041)	(0.0040)	(0.0038)
Change in Unemployment Rate	-0.000	0.005	0.001
	(0.0049)	(0.0039)	(0.0038)
Female Labor Participation (% aged 15+)	0.007**	0.006**	0.005*
	(0.0025)	(0.0026)	(0.0023)
Female Tertiary Education (% aged 25-64)	0.001	0.004	0.000
	(0.0080)	(0.0026)	(0.0055)
Contraception Accessibility (% aged 15-49)	-0.002	-0.019***	-0.018**
	(0.0039)	(0.0061)	(0.0090)
Mean Age of Mother at First Birth			-0.092**
			(0.0364)
Constant	1.552***	2.158***	4.352***
	(0.2789)	(0.3695)	(0.9480)
Observations	643	643	496
Adj. R-squared	0.405	0.811	0.800
Number of Countries	36[a]	36[a]	32[b]
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country-Specific Time Trends	No	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] Iceland and Luxembourg drop due to lack of data on contraception accessibility.

[b] Colombia, Costa Rica, Mexico, and New Zealand also drop due to lack of data on maternal age.

5.2 Results by Initial Fertility Level

To better understand how the success of family policies varies depending on where a country begins its fertility trajectory, we re-estimate the two-way fixed effects model by grouping countries according to their initial fertility levels in 1990. This approach captures how policy responsiveness may shift depending on a nation's position in the fertility transition. Countries are classified into three categories: medium fertility (initial TFR 2.1–3.5), low fertility (1.5–2.1), and very low fertility (below 1.5). Table 7 presents the results, with odd-numbered columns omitting the maternal age control due to data constraints and even-numbered columns including it where available.

Family policy appears most effective in medium-fertility countries, where birth rates began near replacement. Early childcare expenditure is a strong and consistent predictor of increased fertility, as results suggest that a $1,000 increase in per-child childcare expenditure is associated with an increase of approximately 10 to 11 births per 100 women. Paid maternal leave also shows the largest robust positive association, indicating a 10-week increase in paid leave is associated with 12 to 21 births per 100 women.

As we shift to low-fertility countries, the policy landscape remains promising but begins to narrow. Maternal leave exhibits the only robust, strong, and significant effect; however, the associated coefficients are considerably smaller (0.012–0.013, $p<0.01$). Early childcare retains significance only in the model excluding maternal age, suggesting its impact may partly operate through timing. Notably, cash transfers become a significant predictor in this group (0.089, $p<0.01$), indicating that direct financial support becomes a more salient lever as fertility drops. Moreover, the positive coefficients for female labor participation and tertiary education reinforce that when coupled with enabling policies, women's economic advancement can be compatible with higher fertility.

In very low fertility contexts, however, policy levers appear far less potent. Most interventions lose robust statistical significance, and the only consistently important predictors are unemployment (–0.013 to –0.005, $p<0.05$) and maternal age at first birth (–0.164, $p<0.1$). These results may be a result of empirical limitations due to the limited data on such circumstances, yet they imply that once fertility reaches very low levels, it may become increasingly resistant to policy intervention, with structural and demographic factors playing a dominant role.

Taken together, these findings suggest a clear message: timing matters. The effectiveness of family policy is not static, as it may depend heavily on a country's demographic starting point. In low fertility settings, there is still a meaningful window for policy to make an impact, particularly through maternal leave, childcare investment, and income support. However, once fertility slips into very low territory, conventional policy tools lose traction, constrained by deeper societal forces. This underscores the value of early, sustained, and context-sensitive intervention before fertility enters a range where reversal becomes far more difficult.

Table 7: Fixed Effects Models by Fertility Group

	Dependent Variable: TFR					
	(1)	(2)	(3)	(4)	(5)	(6)
LAGGED VARIABLES	Medium Fertility		Low Fertility		Very Low Fertility	
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	0.019	-0.036	0.050	0.089***	-0.004	0.023
	(0.0487)	(0.0286)	(0.0300)	(0.0208)	(0.0543)	(0.0246)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.102***	0.110**	0.028**	0.012	0.021**	-0.024
	(0.0296)	(0.0369)	(0.0111)	(0.0112)	(0.0059)	(0.0136)
Weeks of Protected Paid Maternal Leave (in tens)	0.122*	0.208**	0.012***	0.013***	0.015**	-0.001
	(0.0616)	(0.0601)	(0.0037)	(0.0041)	(0.0051)	(0.0070)
Unemployment Rate (% aged 15+)	-0.000	0.010	-0.019***	-0.018***	-0.013**	-0.005*
	(0.0063)	(0.0087)	(0.0051)	(0.0045)	(0.0040)	(0.0022)
Change in Unemployment Rate	0.016	0.018	0.003	0.000	0.010	-0.004
	(0.0088)	(0.0142)	(0.0047)	(0.0050)	(0.0085)	(0.0045)
Female Labor Participation (% aged 15+)	0.002	0.003	0.006**	0.003	0.008	0.004*
	(0.0052)	(0.0071)	(0.0028)	(0.0027)	(0.0066)	(0.0018)
Female Tertiary Education (% aged 25-64)	-0.001	-0.017	0.006**	0.001	-0.008	-0.007
	(0.0132)	(0.0115)	(0.0021)	(0.0045)	(0.0086)	(0.0048)
Contraception Accessibility (% aged 15-49)	-0.086**	-0.067	-0.020**	-0.028**	-0.012**	0.000
	(0.0313)	(0.0727)	(0.0095)	(0.0129)	(0.0041)	(0.0053)
Mean Age of Mother at First Birth		-0.015		-0.129***		-0.164*
		(0.0634)		(0.0360)		(0.0748)
Constant	5.752***	4.911	2.202***	5.995***	1.486**	5.378**
	(1.4350)	(4.5726)	(0.4861)	(0.9944)	(0.3688)	(1.9003)
Observations	121	53	416	367	106	76
Adj. R-squared	0.952	0.978	0.793	0.833	0.873	0.959
Number of Countries	9[a]	5[b]	21[c]	21[c]	6[d]	6[d]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] Chile, Colombia, Costa Rica, Ireland, Israel, Mexico, New Zealand, Sweden, Türkiye.

[b] Chile, Ireland, Israel, Sweden, Türkiye.

[c] Australia, Belgium, Canada, Czechia, Denmark, Estonia, Finland, France, Hungary, Japan, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovak Republic, South Korea, United Kingdom, United States.

[d] Austria, Germany, Greece, Italy, Slovenia, Spain.

5.3 Results by Region

Our analysis further clusters countries based on geographical regions to evaluate how policy and socioeconomic variables influence fertility across different regional contexts. This regional lens allows for the assessment of whether similar policy instruments yield different outcomes depending on contextual factors such as welfare regimes, gender norms, or labor market structures. Table 8 provides the estimates derived from a robust two-way fixed effects specification, including country-specific time trends; odd-numbered columns omit the control for maternal age at first birth; even-numbered columns include it when available.

Comparative results reveal heterogeneity in both the magnitude and consistency of policy effects across regions. In the Americas, early childcare expenditure stands out as a significant predictor of higher fertility (0.064 and 0.079, $p<0.05$), suggesting that public investment in early care infrastructure is particularly effective in this region. Most economic controls return either insignificant or expected results, except for the change in unemployment, which shows a positive effect (0.032, $p<0.01$), possibly reflecting short-term recovery effects or policy responses.

In the Asia-Pacific region, fertility responses to policy levers are more nuanced. Early childcare expenditure is positively associated with fertility in the model excluding maternal age (0.038, $p<0.05$) but loses significance with the inclusion of maternal age, possibly indicating that childcare policy may primarily influence timing rather than quantum of births. Female labor participation, unemployment, and contraception access return associations in line with prior findings. Overall, policy effects in Asia-Pacific appear less robust, potentially due to a combination of institutional fragmentation, entrenched gender norms, or empirical limitations.

In Europe, the effects of family policy are both strongest. Cash transfers (0.072 and 0.071, $p<0.01$) and paid maternal leave (0.017 and 0.011, $p<0.01$) return robust positive associations, while early childcare (0.029, $p<0.05$) loses significance once maternal age is considered. These results reflect the longstanding commitment of European welfare states to supporting families through generous and comprehensive policy packages. The consistent negative effects of unemployment, maternal age at first birth, and contraception access further emphasize the role of economic security and reproductive timing in shaping fertility behavior across the region.

In summary, this regional comparison highlights the critical role of context in moderating policy effectiveness. While Europe demonstrates that sustained, well-integrated policy investments can support fertility even in aging societies, the Americas show that targeted childcare interventions may yield dividends when economic uncertainty is addressed. In contrast, the Asia-Pacific region illustrates that without institutional coherence or cultural alignment, even well-designed policies may have limited fertility impacts. These findings suggest that policy transfer across regions must be approached with caution and that success depends not only on the policy itself but also on the demographic, cultural, and institutional landscape in which it is embedded.

Table 8: Fixed Effects Models by Region

	Dependent Variable: TFR					
	(1)	(2)	(3)	(4)	(5)	(6)
LAGGED VARIABLES	Americas		Asia-Pacific		Europe	
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	0.067	-0.062	-0.001	-0.171*	0.072***	0.071***
	(0.0377)	(0.0590)	(0.0120)	(0.0487)	(0.0217)	(0.0180)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.064**	0.079*	0.038**	0.012	0.029**	0.012
	(0.0174)	(0.0252)	(0.0119)	(0.0160)	(0.0125)	(0.0093)
Weeks of Protected Paid Maternal Leave (in tens)	-0.005	-0.013	0.011	0.018	0.017***	0.011***
	(0.0091)	(0.0054)	(0.0117)	(0.0072)	(0.0035)	(0.0035)
Unemployment Rate (% aged 15+)	-0.045***	-0.011	0.016	0.030	-0.013***	-0.010**
	(0.0039)	(0.0136)	(0.0164)	(0.0108)	(0.0037)	(0.0037)
Change in Unemployment Rate	0.032***	-0.040	-0.006	-0.021*	0.005	-0.001
	(0.0060)	(0.0149)	(0.0107)	(0.0050)	(0.0044)	(0.0041)
Female Labor Participation (% aged 15+)	-0.011	-0.017*	0.018**	0.014	0.005**	0.005**
	(0.0071)	(0.0044)	(0.0037)	(0.0154)	(0.0025)	(0.0019)
Female Tertiary Education (% aged 25-64)	0.010	-0.000	0.002	0.028	0.003	0.001
	(0.0096)	(0.0110)	(0.0084)	(0.0146)	(0.0044)	(0.0065)
Contraception Accessibility (% aged 15-49)	-0.064***	-0.082	-0.076**	-0.033	-0.014*	-0.016*
	(0.0088)	(0.0532)	(0.0222)	(0.0184)	(0.0073)	(0.0090)
Mean Age of Mother at First Birth		0.109		-0.070		-0.091**
		(0.1229)		(0.0596)		(0.0425)
Constant	6.133***	5.374***	4.172**	3.435	1.859***	4.209***
	(0.7151)	(0.2476)	(0.8072)	(2.4846)	(0.3637)	(0.9346)
Observations	99	49	76	55	468	392
Adj. R-squared	0.973	0.995	0.937	0.970	0.777	0.810
Number of Countries	6[a]	3[b]	4[c]	3[d]	26[e]	26[e]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] Canada, Chile, Colombia, Costa Rica, Mexico, United States.

[b] Canada, Chile, United States.

[c] Australia, Japan, South Korea, New Zealand.

[d] Australia, Japan, South Korea.

[e] Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, United Kingdom.

6. Discussion

The findings presented in this study reaffirm that family policies can positively influence fertility outcomes, but their effectiveness is shaped profoundly by demographic, institutional, and regional contexts. This aligns with the central concern raised in the review of prior literature: although declining fertility rates have triggered widespread policy interventions across OECD countries, their efficacy remains mixed and highly contingent on underlying structural conditions.

At a broad level, cash transfers and early childcare expenditures emerged as the most consistently effective policy instruments. These findings corroborate long-standing economic theories that posit a reduction in the direct and opportunity costs of childbearing as central to increasing fertility (Becker, 1991; Gauthier, 2007). In our baseline model, higher levels of cash support and investment in early childhood care were both significantly associated with increased TFR. This is consistent with the literature indicating that when structured to reduce household financial burden meaningfully, monetary support can encourage childbearing, particularly among those already inclined toward parenthood. However, the analysis also shows that not all policy tools function uniformly across demographic regimes. Paid maternal leave initially appeared negatively associated with fertility, but this relationship reversed and became significantly positive after accounting for country-specific time trends. This suggests that leave entitlements may be entangled with broader institutional factors that obscure their true effect if left unaccounted for. It also highlights the importance of robust model specification when evaluating policy success.

A more nuanced picture emerged when countries were stratified by initial fertility levels. Policy instruments were most effective in medium-fertility settings, where TFRs began near replacement. In particular, both maternal leave and early childcare investment returned large, statistically significant coefficients, supporting the idea that policy intervention is most successful when implemented before fertility reaches critically low levels. In contrast, policy effects were largely muted in countries with very low initial fertility. Here, unemployment and maternal age at first birth, rather than policy variables, were the only consistent predictors of fertility. This suggests that once countries enter the lowest range of the fertility spectrum, structural constraints such as economic insecurity and delayed family formation become more decisive than policy design itself.

These findings echo the contrast between Japan and France discussed in the introduction. Japan has implemented increasingly generous pronatalist policies over several decades, yet fertility has remained stagnant, likely due to enduring gender norms, rigid labor markets, and cultural expectations around caregiving (Raymo & Shibata, 2017; Atoh et al., 2004). France, by contrast, has maintained relatively high fertility by embedding family support into a broader welfare regime that facilitates work-family balance. Our results suggest that countries with strong institutional capacity to deliver coordinated policy packages, like those in parts of Europe, are more likely to see durable fertility benefits, whereas piecemeal reforms in less supportive environments may yield minimal returns.

Regionally, Europe stood out for the consistency and magnitude of policy effectiveness. In the Americas, early childcare investment showed the strongest effect, while in Asia-Pacific, effects were less robust and highly sensitive to model specification. This regional divergence reinforces the importance of institutional compatibility: policies must be adapted to fit the cultural, economic, and social infrastructure in which they are implemented. Simply replicating successful models from one context to another is unlikely to produce similar results.

Finally, the negative and statistically significant association between contraception accessibility and fertility, coupled with the effect of maternal age at first birth, underscores the importance of tempo effects and individual autonomy in shaping fertility behavior. As fertility increasingly reflects personal preference rather than economic constraint, policy must do more than subsidize parenthood, it must also foster social environments where parenting is feasible and desirable.

In sum, these findings support a core conclusion: effective fertility policy must be multidimensional, context-sensitive, and implemented early. Cash transfers, childcare provision, and paid leave all have the potential to support fertility, but their impact is conditional on broader demographic dynamics, economic conditions, and cultural norms. For governments grappling with fertility decline, the question is not simply what to implement, but when, how, and in what environment. Future research should continue to disaggregate policy effects across subpopulations and examine the cumulative impact of coordinated interventions over time.

Appendix

Table A1: Summary Statistics of Key Variables

VARIABLES	(1) Obs	(2) Mean	(3) SD	(4) Min	(5) Max
GDP per Capita (2015 PPP)	1,133	34,858	16,988	7,769	115,340
Unemployment Rate (% aged 15+)	981	7.768	3.994	1.658	27.82
Female Tertiary Education (% aged 25-64)	852	29.15	12.70	2.858	65.53
Female Labor Participation (% aged 15+)	1,074	52.82	9.488	23.30	78.17
Weeks of Protected Paid Maternal Leave (in tens)	1,048	5.071	5.189	0	21.40
Weeks of Protected Paid Paternal Leave (in tens)	1,023	0.478	1.020	0	5.260
Contraception Accessibility (% aged 15-49)	1,080	49.47	12.32	19.10	73.90
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	991	3.144	2.788	0	16.34
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	1,047	2.040	1.985	0	15.19
Change in Unemployment Rate	943	-0.0573	1.268	-4.358	9.800
Mean Age of Mother at First Birth	769	27.53	1.807	22.60	32.09

Table A2: FE Results without Control for Contraception Accessibility or Age of Mother

Dependent Variable: TFR		
	(1)	(2)
LAGGED VARIABLES	Model 1	Model 2
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	0.070***	0.040**
	(0.0247)	(0.0149)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.007	0.039***
	(0.0131)	(0.0123)
Weeks of Protected Paid Maternal Leave (in tens)	-0.017***	0.012**
	(0.0062)	(0.0047)
Unemployment Rate (% aged 15+)	-0.015***	-0.010**
	(0.0041)	(0.0038)
Change in Unemployment Rate	0.003	0.005
	(0.0054)	(0.0041)
Female Labor Participation (% aged 15+)	0.005*	0.004*
	(0.0026)	(0.0025)
Female Tertiary Education (% aged 25-64)	0.001	0.003
	(0.0074)	(0.0029)
Constant	1.543***	1.427***
	(0.2458)	(0.1930)
Observations	649	649
Adj. R-squared	0.386	0.784
Number of Countries	38	38
Country FE	Yes	Yes
Year FE	Yes	Yes
Country-Specific Time Trends	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3: Regression Results for Random Effects Model

Dependent Variable: TFR	
	(1)
LAGGED VARIABLES	Random Effects
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	0.090***
	(0.0263)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.020
	(0.0169)
Weeks of Protected Paid Maternal Leave (in tens)	-0.018***
	(0.0066)
GDP per Capita (2015 PPP)	-0.000
	(0.0000)
Unemployment Rate (% aged 15+)	-0.014***
	(0.0042)
Change in Unemployment Rate	-0.000
	(0.0051)
Female Labor Participation (% aged 15+)	0.006**
	(0.0027)
Female Tertiary Education (% aged 25-64)	0.002
	(0.0081)
Contraception Accessibility (% aged 15-49)	-0.001
	(0.0042)
Constant	1.453***
	(0.3691)
Observations	619
Number of Countries	36

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4: FE Results Utilizing Various Leave Entitlement Measures

Dependent Variable: TFR			
	(1)	(2)	(3)
LAGGED VARIABLES	Model 1	Model 2	Model 3
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	0.074***	0.074***	0.074***
	(0.0186)	(0.0186)	(0.0183)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.025**	0.025**	0.024**
	(0.0114)	(0.0106)	(0.0107)
Weeks of Protected Paid Maternal Leave (in tens)	0.010**	0.010**	0.010**
	(0.0039)	(0.0042)	(0.0044)
Weeks of Protected Paid Maternal Leave (in tens)		0.001	0.003
		(0.0067)	(0.0149)
Maternal Leave X Paternal Leave			-0.000
			(0.0021)
GDP per Capita (2015 PPP)	0.000	0.000	0.000
	(0.0000)	(0.0000)	(0.0000)
Unemployment Rate (% aged 15+)	-0.010**	-0.010**	-0.010**
	(0.0038)	(0.0039)	(0.0038)
Change in Unemployment Rate	0.001	0.001	0.001
	(0.0038)	(0.0038)	(0.0038)
Female Labor Participation (% aged 15+)	0.005*	0.005*	0.005*
	(0.0023)	(0.0023)	(0.0023)
Female Tertiary Education (% aged 25-64)	0.000	0.000	0.000
	(0.0055)	(0.0056)	(0.0056)
Contraception Accessibility (% aged 15-49)	-0.018**	-0.018*	-0.018*
	(0.0090)	(0.0091)	(0.0091)
Mean Age of Mother at First Birth	-0.092**	-0.092**	-0.092**
	(0.0364)	(0.0361)	(0.0375)
Constant	4.352***	4.343***	4.355***
	(0.9480)	(0.9343)	(0.9600)
Observations	496	496	496
Adj. R-squared	0.800	0.800	0.800
Number of Countries	32	32	32
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country-Specific Time Trends	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A5: FE Results with Interaction Terms for Age of Mother at First Birth

Dependent Variable: TFR		
	(1)	(2)
LAGGED VARIABLES	Model 4	Model 4
Cash Transfers Exp. Per Child (0-20) (2015 PPP, in thousands)	-0.086	-0.043
	(0.1673)	(0.3329)
Mean Age of Mother at First Birth	-0.063*	-0.057
	(0.0349)	(0.0422)
Cash Transfers X Age of Mother	0.007	0.004
	(0.0062)	(0.0117)
Early Childcare Exp. Per Child (0-5) (2015 PPP, in thousands)	0.068	-0.044
	(0.1109)	(0.1220)
Early Childcare X Age of Mother	-0.002	0.002
	(0.0037)	(0.0043)
Weeks of Protected Paid Maternal Leave (in tens)	-0.091*	0.121
	(0.0529)	(0.1000)
Maternal Leave X Age of Mother	0.003	-0.004
	(0.0020)	(0.0036)
GDP per Capita (2015 PPP)	-0.000	0.000
	(0.0000)	(0.0000)
Unemployment Rate (% aged 15+)	-0.013***	-0.011***
	(0.0037)	(0.0035)
Change in Unemployment Rate	-0.002	0.001
	(0.0044)	(0.0038)
Female Labor Participation (% aged 15+)	0.008**	0.004*
	(0.0030)	(0.0022)
Female Tertiary Education (% aged 25-64)	-0.009	-0.001
	(0.0058)	(0.0060)
Contraception Accessibility (% aged 15-49)	-0.001	-0.018**
	(0.0050)	(0.0089)
Constant	3.090***	3.434***
	(0.8357)	(1.1929)
Observations	496	496
Adj. R-squared	0.553	0.804
Number of Countries	32	32
Country FE	Yes	Yes
Year FE	Yes	Yes
Country-Specific Time Trends	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

References

Adsera, A. Where Are the Babies? Labor Market Conditions and Fertility in Europe. *Eur J Population* 27, 1ñ32 (2011). https://doi.org/10.1007/s10680-010-9222-x

Andersson, G., Hoem, J. M., & Duvander, A.-Z. (2006). Social differentials in speed-premium effects in childbearing in Sweden. *Demographic Research, 14*(4), 51ñ70.

Atoh, M., Kandiah, V., & Ivanov, S. (2004). The Second Demographic Transition in Asia? Comparative Analysis of the Low Fertility Situation in East and South-East Asian Countries. *The Japanese Journal of Population*, *2*(1). https://www.ipss.go.jp/webj-ad/WebJournal.files/Population/2004_3/atohdoc2004mar.pdf

Bassford, M., & Fisher, H. (2020). The Impact of Paid Parental Leave on Fertility Intentions*. *Economic Record*, *96*(315). https://doi.org/10.1111/1475-4932.12561

Bauernschuster, S., Hener, T., & Rainer, H. (2015). Children of a (Policy) Revolution: The Introduction of Universal Child Care and Its Effect on Fertility. *Journal of the European Economic Association*, *14*(4), 975–1005. https://doi.org/10.1111/jeea.12158

Becker, G. S. (1973). A Theory of Marriage: Part I. *Journal of Political Economy*, *81*(4), 813–846. https://doi.org/10.1086/260084

Becker, G. S. (1991). A Treatise on the Family: Harvard university press.

Becker, G. S. (1996). *Accounting for tastes*. Cambridge, MA: Harvard University Press.

Becker, G. S., & Murphy, K. M. (2000). *Social economics: Market behavior in a social environment*. Cambridge, MA: Harvard University Press.

Bongaarts, J., & Feeney, G. (1998). On the Quantum and Tempo of Fertility. *Population and Development Review*, *24*(2), 271ñ291. https://doi.org/10.2307/2807974

Bünning, M. (2015). What Happens after the "Daddy Months"? Fathers' Involvement in Paid Work, Childcare, and Housework after Taking Parental Leave in Germany. *European Sociological Review*, *31*(6), 738–748. https://doi.org/10.1093/esr/jcv072

Chuard, C., & Chuard-Keller, P. (2021). Baby bonus in Switzerland: Effects on fertility, newborn health,and birth-scheduling. Health Economics, 30(9), 2092-2123.

Cohen, A., Dehejia, R., & Romanov, D. (2013). Financial incentives and fertility. Review of Economicsand Statistics, 95(1), 1-20.

Cordier, S. (2023, January 21). Fertility: Why France remains a model in Europe. *Le Monde*. https://www.lemonde.fr/en/france/article/2023/01/21/fertility-why-france-remains-a-model-in-europe_6012434_7.html

Dearing, H. (2015). Does parental leave influence the gender division of labour? Recent empirical findings from Europe. *WU Vienna University of Economics and Business*. https://doi.org/10.57938/ff53cb2b-a940-4fd9-8a17-6772597598d9

Del Boca, D., Aaberge, R., Colombino, U., Ermisch, J., Francesconi, M., Pasqua, S., & Strøm, S. (2003). *Labour Market Participation of Women and Fertility: the Effect of Social Policies*. https://www.frdb.org/wp-content/uploads/2003/06/copy_0_paper_delboca.pdf

Del Boca, D., Pasqua, S., & Pronzato, C. (2008). Motherhood and market work decisions in institutional context: a European perspective. *Oxford Economic Papers*, *61*(Supplement 1), 147–171. https://doi.org/10.1093/oep/gpn046

Diprete, T. A., Morgan, S. P., Engelhardt, H., & Pacalova, H. (2003). Do Cross-National Differences in the Costs of Children Generate Cross-National Differences in Fertility Rates? *Population Research and Policy Review*, *22*(5/6), 439–477. https://doi.org/10.1023/b:popu.0000020961.89068.91

Erbabian, M., & Osorio, V. (2022, August 8). *Measuring Fertility in the United States*. Penn Wharton

Budget Model. https://budgetmodel.wharton.upenn.edu/issues/2022/7/8/measuring-fertility-in-the-united-states

Ermisch, J. (1988). The econometric analysis of birth rate dynamics in Britain. *The Journal of Human Resources, 23*(4), 563ñ576.

Evertsson, M., & Duvander, A.-Z. . (2010). Parental Leave--Possibility or Trap? Does Family Leave Length Effect Swedish Women's Labour Market Opportunities? *European Sociological Review*, *27*(4), 435–450. https://doi.org/10.1093/esr/jcq018

Farré, L. (2016). Parental Leave Policies and Gender Equality: A Survey of the Literature. *Studies of Applied Economics*, *34*(1), 45–60. https://doi.org/10.25115/eae.v34i1.3005

Farré, L., & Gonzalez, L. (2017). The Effects of Paternity Leave on Fertility and Labor Market Outcomes. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2998974

Fernández-Cornejo, J. A., Pozo-García, E. D., Escot, L., & Castellanos-Serrano, C. (2018). Can an egalitarian reform in the parental leave system reduce the motherhood labor penalty? Some evidence from Spain. *Federación Española de Sociologí*, *27*(3). https://recyt.fecyt.es/index.php/res/article/view/66445/41188

Feyrer, J., Sacerdote, B., & Stern, A. D. (2008). Will the Stork Return to Europe and Japan? Understanding Fertility within Developed Nations. *Journal of Economic Perspectives*, *22*(3), 3–22. https://doi.org/10.1257/jep.22.3.3

Gauthier, A.H. (2007). The impact of family policies on fertility in industrialized countries: a review of the literature. *Popul Res Policy Rev* 26, 323ñ346. https://doi.org/10.1007/s11113-007-9033-x

Gauthier, A. H. (2008). Some theoretical and methodological comments on the impact of policies on fertility. *Vienna Yearbook of Population Research*, *6*, 25–28. JSTOR. https://doi.org/10.2307/23025491

Gauthier, A. H., & Hatzius, J. (1997). Family benefits and fertility: An econometric analysis. *Population Studies, 51*, 295ñ306.

Goldthorpe, J. (2000). *On sociology; Numbers, narratives, and the integration of research and theory*. Oxford, England: Oxford University Press.

Haan, P., & Wrohlich, K. (2011). Can child care policy encourage employment and fertility? *Labour Economics*, *18*(4), 498–512. https://doi.org/10.1016/j.labeco.2010.12.008

Haas, L. (2003). Parental Leave and Gender Equality: Lessons from the European Union. *Review of Policy Research*, *20*(1), 89–114. https://doi.org/10.1111/1541-1338.d01-6

Hageman, A., & Galoustian, P. (2024). Chapter 11: Measuring Fertility. In *Demography and Economics*. Queens University. https://ecampusontario.pressbooks.pub/demographyandeconomics/chapter/chapter-11-measuring-fertility/#footnote-97-1

Hank, K., & Kreyenfeld, M. (2003). A Multilevel Analysis of Child Care and Women's Fertility Decisions in Western Germany. *Journal of Marriage and Family*, *65*(3), 584–596. https://doi.org/10.1111/j.1741-3737.2003.00584.x

Hoem, J. (2005). Why does Sweden have such high fertility? *Demographic Research*, *13*, 559–572. https://doi.org/10.2307/26347877

Hoem, J. M. (2005). Why does Sweden have such high fertility?. *Demographic Research, 13*(22), 559ñ572.

Hong, S. H., & Sullivan, R. (2016). The Effects of Subsidies For Childbearing on Migration and Fertility: Evidence From Korea. *The Singapore Economic Review*, *61*(04), 1550040. https://doi.org/10.1142/s021759081550040x

Japan's Fertility: More Children Please. (2024). In *International Monetary Fund* (Vol. 2024, Issue 119).

International Monetary Fund. Asia and Pacific Dept. https://doi.org/10.5089/9798400276682.002.A002

Kamerman, S. B. (2000). Parental Leave Policies: An Essential Ingredient in Early Childhood Education and Care Policies. *Social Policy Report*, *14*(2), 1–16. https://doi.org/10.1002/j.2379-3988.2000.tb00013.x

Kim, W. (2023). Baby Bonus, Fertility and Missing Women. Available at SSRN:https://ssrn.com/abstract=3704188 or http://dx.doi.org/10.2139/ssrn.3704188

Kravdal, O. (1996). How the local supply of day-care centers influences fertility in Norway: A parity-specific approach. *Population Research and Policy Review*, *15*(3), 201–218. https://doi.org/10.1007/bf00127049

Letablier, M.-T. (2003). Fertility and Family Policies in France. *Journal of Population and Social Security (Population)*, *1*. https://www.ipss.go.jp/webj-ad/WebJournal.files/population/2003_6/9.Letablier.pdf

Lopoo, Leonard M., and Kerri M. Raissian, 'Fertility Policy in Developed Countries', in Susan L. Averett, Laura M. Argys, and Saul D. Hoffman (eds), *The Oxford Handbook of Women and the Economy*, Oxford Handbooks (2018; online edn, Oxford Academic, 6 July 2017), https://doi.org/10.1093/oxfordhb/9780190628963.013.20

Luci-Greulich, A., ThÈvenon, O. The Impact of Family Policies on Fertility Trends in Developed Countries. *Eur J Population* 29, 387ñ416 (2013). https://doi.org/10.1007/s10680-013-9295-4

Malak, N., Rahman, M. M., & Yip, T. A. (2019). Baby bonus, anyone? Examining heterogeneousresponses to a pro-natalist policy. Journal of Population Economics, 32, 1205-1246.

McDonald, P. (2000). Gender equity, social institutions and the future of fertility. *Journal of Population Research* 17, 1ñ16. https://doi.org/10.1007/BF03029445

McDonald, P. (2006). Low Fertility and the State: The Efficacy of Policy. *Population and Development Review*, *32*(3), 485ñ510. http://www.jstor.org/stable/20058901

Milligan, K. (2005). Subsidizing the stork: New evidence on tax incentives and fertility. Review ofEconomics and Statistics, 87(3), 539-555. doi:10.1162/0034653054638382

Mörk, E., Sjögren, A., & Svaleryd, H. (2011). Childcare costs and the demand for children—evidence from a nationwide reform. *Journal of Population Economics*, *26*(1), 33–65. https://doi.org/10.1007/s00148-011-0399-z

Murphy, M. (1993). The Contraceptive Pill and Womenís Employment as Factors in Fertility Change in Britain 1963ñ1980: A Challenge to the Conventional View. *Population Studies*, *47*(2), 221ñ243. https://doi.org/10.1080/0032472031000146986

OECD. (2024). *Declining fertility rates put prosperity of future generations at risk*. OECD. https://www.oecd.org/en/about/news/press-releases/2024/06/declining-fertility-rates-put-prosperity-of-future-generations-at-risk.html

Ogawa, N., & Retherford, R. D. (1993). The Resumption of Fertility Decline in Japan: 1973-92. *Population and Development Review*, *19*(4), 703. https://doi.org/10.2307/2938411

Okun, B. S. (2016). An investigation of the unexpectedly high fertility of secular, nativeborn Jews in Israel. *Population Studies*, *70*(2), 239–257. https://doi.org/10.2307/24772958

Pailhé, A., Rossier, C. R., & Toulemon, L. (2008). French family policy: long tradition and diversified measures. *Vienna Yearbook of Population Research*, *2008*, 149–164. https://doi.org/10.1553/populationyearbook2008s149

Prime Minister's Office of Japan. (2025). *Policies supporting children and child-rearing ｜Major* *policies of the Kishida Cabinet* ｜*Prime Minister's Office of Japan*. Prime Minister's Office of Japan. https://japan.kantei.go.jp/ongoingtopics/policies_kishida/childsupport.html

Rasul, I. (2002). Household bargaining over fertility: Theory and evidence from Malaysia. Job market paper, London School of Economics.

Raymo, J. M., & Shibata, A. (2017). Unemployment, Nonstandard Employment, and Fertility: Insights From Japan's "Lost 20 Years." *Demography*, *54*(6), 2301–2329. https://doi.org/10.1007/s13524-017-0614-y

Retherford, R., & Ogawa, N. (2005). *Japan's Baby Bust: Causes, Implications, and Policy Responses*. East-West Center | Www.eastwestcenter.org. https://www.eastwestcenter.org/publications/japans-baby-bust-causes-implications-and-policy-responses

Rindfuss, R. R., Guilkey, D. K., Morgan, S. Philip., Kravdal, Øystein., & Guzzo, K. Benjamin. (2007). Child Care Availability and First-Birth Timing in Norway. *Demography*, *44*(2), 345–372. https://doi.org/10.1353/dem.2007.0017

Rønsen, M. (2004). Fertility and Public PoliciesEvidence from Norway and Finland. *Demographic Research*, *10*, 143–170. JSTOR. https://doi.org/10.2307/26348106

Sato, M. (2023, October 6). *Funding the Policies to Boost Japan's Birthrate*. The Tokyo Foundation for Policy Research. https://www.tokyofoundation.org/research/detail.php?id=958

Shim, J. (2014). Family Leave Policy and Fertility Rates in OECD Countries including East Asia. *Population Association of America*. https://paa2014.populationassociation.org/papers/140973

Sobotka, T., & Beaujouan, E. (2021). *Late Motherhood in Low-Fertility Countries: Reproductive Intentions, Trends and Consequences* (pp. 11–29). Springer. https://doi.org/10.1007/978-3-319-14857-1_2

Sobotka, T., Skirbekk, V., & Philipov, D. (2011). Economic Recession and Fertility in the Developed World. *Population and Development Review*, *37*(2), 267–306. https://doi.org/10.1111/j.1728-4457.2011.00411.x

Stone, L., & Wingerter, E. (2024). *Is There Hope for Low Fertility? "Demographic Rearmament" in Southern Europe*. Institute for Family Studies. https://ifstudies.org/ifs-admin/resources/reports/ifs-southerneuropereport-final-1.pdf

Strulik, H., & Vollmer, S. (2015). The fertility transition around the world. *Journal of Population Economics*, *28*(1), 31ñ44. http://www.jstor.org/stable/44289705

Thomas, J., Rowe, F., Williamson, P., & Lin, E. S. (2022). The effect of leave policies on increasing fertility: a systematic review. *Humanities and Social Sciences Communications*, *9*(1), 1–16. https://doi.org/10.1057/s41599-022-01270-w

Thomas, J., Rowe, F., Williamson, P. *et al.* (2022). The effect of leave policies on increasing fertility: a systematic review. *Humanit Soc Sci Commun* 9, 262. https://doi.org/10.1057/s41599-022-01270-w

Tsuya, N. (2017, June 22). *Low Fertility in Japan—No End in Sight*. East-West Center | Www.eastwestcenter.org. https://www.eastwestcenter.org/publications/low-fertility-in-japan%E2%80%94no-end-in-sight

Umeda, S. (2010) Japan:Child Allowance Law. [Web Page] Retrieved from the Library of Congress, https://www.loc.gov/item/global-legal-monitor/2010-04-23/japan-2010-child-allowance-law/.

United Nations. (2017). *World Fertility Report 2015 - Highlights*. United Nations, Department of Economic and Social Affairs, Population Division. https://digitallibrary.un.org/record/3908105/files/un_2015_worldfertilityreport_highlights.pdf

United Nations. (2018). World Population Policies 2015. New York, NY: United Nations, DepartmentofEconomic and Social Affairs.

Weinreb, A., Chernichovsky, D., & Brill, A. (2018). *Israel's Exceptional Fertility*. Taub Center. https://www.taubcenter.org.il/wp-content/uploads/2020/12/exceptionalfertilityeng.pdf