University of Warsaw
Faculty of Economic Sciences

Working Papers
No. 4/2024 (440)

Welfare and Economic Implications of Universal Child Benefits

Aleksandra Kolasa

Warsaw 2024

UNIVERSITY OF WARSAW
FACULTY OF ECONOMIC SCIENCES
WORKING PAPERS

Welfare and economic implications of universal child benefits

Aleksandra Kolasa
University of Warsaw, Faculty of Economic Sciences
Corresponding author: aurbaniec@wne.uw.edu.pl

Abstract: Universal child benefits are an important component of the social protection systems in many developed economies, particularly in Europe. When evaluating their impact, most studies tend to focus primarily on the empirical evidence and short-term effects. However, given their large-scale implementation, such programs can have sizable general equilibrium effects. The aim of this paper is to study the long-run implications of universal child benefits within a theoretical framework that can capture the complexities of household decisions regarding consumption, labor participation, and the timing of children. To this end, I develop an overlapping generations model with idiosyncratic earnings risk, infertility shocks, and endogenous temporal fertility. According to the model simulations, universal child benefits lead to a reduction in the spacing between children and, on average, lower maternal age at childbirth for all births. This, in turn, alleviates some of the negative aggregate effects typically associated with redistributive policies, but has a detrimental impact on the average quality of children. Finally, universal child benefits increase ex-ante welfare by 0.42% of lifetime adult consumption, significantly outperforming broad-based transfer policies not tied to the number of children.

Keywords: universal child benefits, infertility risk, temporal fertility, social welfare, general equilibrium models

JEL codes: I38, H53, H31, E61, D52

Acknowledgments: This project was financed by the National Science Centre of Poland, grant No. 2019/35/D/HS4/02043. I would like to thank the participants of 2023 WIEM conference for their useful comments. I am also grateful to Ewa Weychert for her valuable research assistance. All errors are my own.

Working Papers contain preliminary research results. Please consider this when citing the paper. Please contact the authors to give comments or to obtain revised version. Any mistakes and the views expressed herein are solely those of the authors

1 Introduction

Universal child benefits are an important component of the social protection systems in many developed economies. Particularly, they have a longstanding tradition in European countries, dating back to the mid-20th century. The goal of such policies is to financially support families with children, fight poverty, and, at least to some extent, provide fertility incentives. When evaluating the impact of universal child benefits, many studies tend to primarily focus on the empirical evidence and short-term effects. However, the short-term and the long-term consequences of such transfers might differ, particularly given their large-scale implementation and potentially sizable general equilibrium effects.

Against this backdrop, the aim of this paper is to examine the long-term implications of universal child benefits within a framework that can capture the complexities of household decisions regarding consumption, labor participation, and the timing of children. To this end, I develop a general equilibrium, life-cycle model of a typical European Union (EU) economy, that incorporates individual earnings risk, infertility shocks, and heterogeneity among households in terms of their desired number of children and parental readiness. Following the framework of Becker and Lewis (1973), I consider both the quantity and quality of children as important factors. Children are treated as normal goods, but the process of childrearing is costly and irreversible. In each period, families make decisions regarding the allocation of resources and time dedicated to their children. They also choose the timing and spacing of children, with financial limitations and opportunity costs potentially leading to delays in childbirth. However, such delays carry the risk of having fewer children than desired due to the higher probability of an infertility shock.

The model successfully replicates the empirical age-fertility profile, family size distribution, as well as the well-established empirical relationships between earnings, labor supply, and parenthood. Specifically, the proposed set-up captures the fact that families with higher earnings have children later in life and replicates the positive correlation between employment and earnings among women with children. I then use the model to quantify the effects of universal child benefits, which provide a regular cash payment for each child within a family. The size of the benefit is determined on the basic of the average value of child benefits currently provided across Europe and does not depend on household characteristics other than the number of children. Next, I compare the impact of universal child benefits to that of simple redistributive policies of similar size but not tied to the number of children. I also investigate whether straightforward modifications to the program can enhance its overall performance. Finally, I explore the most effective taxation method to fund universal child benefits.

My main findings are as follows. First, universal child benefits ease household financial constraints, thus significantly affecting temporal fertility and resulting in a decrease of almost 9 months in the mean age of mothers at childbirth (for all births). This acceleration in timing is more pronounced for subsequent births, leading to a reduction in the spacing between children. Second, the changes in temporal fertility due to universal child benefits prompt couples to have children earlier in life when they have relatively limited financial resources. Consequently, overall spending on children decreases, leading to a decline in average child quality. However, the reduction in spacing between children enables parents to return to full-time work sooner, resulting in a slightly higher effective labor supply and higher consumption by older households. Third, universal child benefits improve welfare "under the veil of ignorance" by approximately 0.4% in terms of adult consumption equivalence, outperforming simple universal transfers to the working population by about four times. The gain stems from an increase in the expected lifetime utility from children, partly due to alleviating financial restrictions and thus opening the possibility of having children earlier. The welfare effects of universal child benefits are also heterogeneous with respect to the desired number of children. Those who choose voluntary childlessness lose around 0.95% of their lifetime adult consumption, while those who plan to have two children gain 0.6%. Fourth, universal child benefits impose a significant redistribution of household non-capital income. However, as the transfers lead to changes in fertility timing and crowd out private savings, they are considerably less effective in reducing consumption inequality. Finally, the model simulations suggest a few methods to improve the performance of child benefits in terms of welfare and economic efficiency. These methods include limiting program eligibility to households with at least two children, introducing means-testing or income-based payments, and changing the program's financing method by increasing the involvement of older households in covering program costs, especially through the taxation of consumption expenditure.

Review of the literature

This paper contributes to the literature that assesses the impact of universal child benefit policies. These policies can be evaluated from various perspectives and have been the topic of a number of empirical studies. One crucial finding is that child benefits have proven to be an effective tool in combating child poverty (ODI/UNICEF, 2020; Immervoll, Sutherland, and de Vos, 2001; Bäckman and Ferrarini, 2010). Policymakers often express concerns about the impact of redistributive programs on labor supply, and, indeed, in some studies, universal child benefits have been found to negatively affect women's employment (Schirle, 2015; Magda, Kiełczewska, and Brandt, 2020; González, 2013). However, more recent research has found this effect statistically insignificant (Ananat, Glasner, Hamilton, and Parolin, 2022; Baker, Messacar, and Stabile, 2023). Universal child benefits have also been observed to have short-term positive impact on birth rates, with no evidence supporting a permanent effect on the total fertility rate (Riphahn and Wiynck, 2017; González and Trommlerová, 2023; Sobotka, Matysiak, and Brzozowska, 2019). From a theoretical perspective, Fan and Stark (2008) demonstrate that under certain conditions, child allowances designed to incentivize fertility among skilled individuals can paradoxically yield the opposite effect. Although there is an ongoing discussion about the specific form and coverage of child benefit programs, overall, they are considered to be cost-effective (see, for example, Garfinkel, Sariscsany, Ananat, Collyer, Hartley, Wang, and Wimer, 2022).

There are a few studies that examine the macroeconomic and welfare implications of child policies within overlapping generations (OLG) heterogeneous household models. Guner, Kaygusuz, and Ventura (2020) analyze the impact of child-related transfers on the US economy, and recommend expanding existing programs as this would lead to substantial welfare gains for newborn households. However, they also find that unconditional child transfers have a significant negative effect on women's labor supply. While their model has a rich structure of heterogeneity, they abstract from individual earnings shocks and assume exogenous fertility.

Zhou (2022) also focuses on the US economy and investigates the aggregate effects of pro-fertility policies. He develops a life-cycle model that incorporates endogenous fertility, human capital, and uninsurable productivity shocks. The study finds that the fertility increase resulting from the implemented policies is beneficial to long-term welfare due to changes in the old-age dependency ratio. However, this comes at the cost of lower human capital. Komada (2023) also recognizes the role of children as future taxpayers. Given that policies promoting higher fertility have a positive long-term impact on old-age benefits, they can enhance overall welfare. Indeed, she estimates substantial welfare gains from expanding existing family policies in the US. In their models, both Zhou (2022) and Komada (2023) allow households to make fertility choices only in one period, thus not addressing the effects of changes in temporal fertility or infertility shocks.

My paper is also related to the strand of the literature that examines endogenous fertility choices within the rational agent framework. This literature has grown significantly in recent years. Studies such as Sommer (2016) and Choi (2017) have explored fertility choices in the context of insurable earnings risk and infertility shocks (for a comprehensive overview, refer to Doepke, Hannusch, Kindermann, and Tertilt, 2022).

To the best of my knowledge, this study is the first to quantitatively analyze the effects of universal child policies using a comprehensive life-cycle framework that incorporates risk and infertility shocks, as well as endogenous temporal fertility. Thus, my original contribution is to demonstrate that universal child policies can generate long-term gains in ex-ante welfare due to their impact on temporal fertility, in particular a reduction in spacing between children. Additionally, this study is the first to quantify the redistribution of welfare among families with different desired numbers of children. Finally, it provides unique estimates of the impact of universal child benefits within a heterogeneous household framework, specifically focusing on European economies.

The remainder of the paper is organized as follows. In Section 2, I briefly summarize the history of child benefits in Europe and outline their main characteristics. Section 3 presents the general equilibrium, OLG model developed for this study. In Section 4, the calibration procedure is discussed, along with an evaluation of the model's ability to match selected non-targeted statistics. Section 5 presents the model's estimates of the demographic, aggregate, welfare, and redistributive effects of universal child benefits. It also juxtaposes the impact of universal child benefits with that of other simple redistributive policies, evaluates several straightforward modifications to the program, and introduces different financing methods. The section ends with brief discussion, followed by a summary of the main findings of this paper.

2 Child benefits in Europe

Child benefits, also known as children's allowances, are a form of financial support directed towards families with children to assist them in covering child-related expenses. These benefits are typically structured as long-term monthly cash transfers and span the period from the birth of children until they reach adulthood. Generally, they are aimed at a wide range of recipients, extending beyond those in the poorest income quantile. When granted to all children without applying income criteria for both payment and eligibility, they are referred to as universal.

Child benefits have a longstanding history in European countries. In the United Kingdom, mothers received the first income-independent children's allowance in 1946. However, the earliest references to the need for child support in the form of universal transfers date back to the 1920s, and were postulated by social reformers such as Eleanor Rathbone (Brindle, 2010). In Scandinavian countries, known for their family policies, children's allowances were established shortly after the Second World War. Norway and Denmark introduced them in 1946, Sweden in 1947, and Finland in 1948 (Christiansen, 2006). In the 1950s, West Germany also began granting child benefits to its citizens. Initially, these were provided only for the third and subsequent children, but eligibility was gradually expanded. The reform of 1996 integrated child benefit rights into the German legal system (Rainer, Bauernschuster, Danzer, Fichtl, Hener, Holzner, and Reinkowski, 2014).

Currently, child benefits are a key component of social protection systems in many developed economies. In particular, all European OECD members provide child benefits to their citizens. The European Statistical Office (Eurostat) estimates that, in 2020, child-related government expenditure across the EU accounted for 2.5% of GDP, and, in real terms, rose by about 50% between 2000 and 2020. The children's allowance stands out as the predominant form of government support for families with children, currently constituting more than 40% of public child-related expenditure. However, this has decreased by over 10 percentage points in the last two decades, giving way to benefits in kind, particularly those directly related to child care.

As shown in Figure 1, around half of European OECD countries have purely universal child benefits. In another 30% of the countries, there are no a priori eligibility restrictions, but children's allowance payments vary according to household income. The remaining European OECD countries operate means-tested schemes. In general, based on the Eurostat estimates, more than one-quarter of all government child-related expenditures are tied to means-tested benefits.

Children's allowance payments can depend on the family size. In most European OECD countries, the per-child payment is either fixed or slightly increases with the number of children in a household (Figure 1). Moreover, in some countries the value of the transfer varies according to the child's age, but the differences are usually not substantial, and a flat rate applies in two-thirds of the European OECD economies (Figure 2).

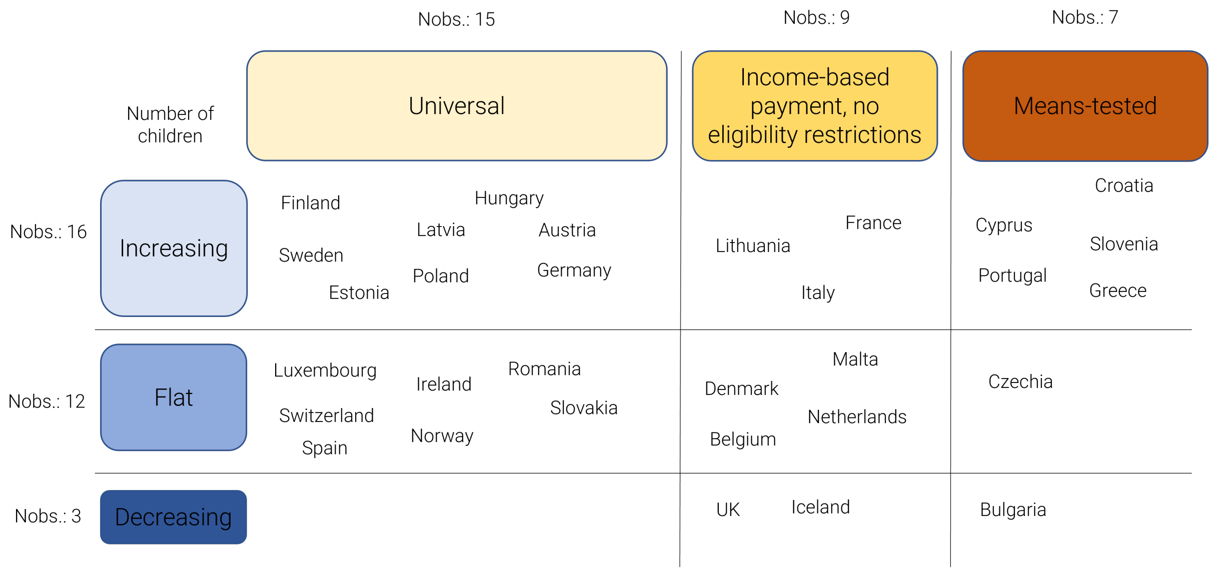
Finally, the generosity of child benefits varies significantly across countries. Specifically, when considering a family with two children, where both partners earn the average income, the child benefits they receive typically range from 2% to 12% of their earnings, with an average of 5.6% (Figure 3).[1] Luxembourg, Germany, and Poland currently have the most generous children's allowance programs relative to average income. At the opposite end of the spectrum are Iceland, Croatia, Spain, and Bulgaria, where child benefits account for less than 3% of household earnings for a family with the above-mentioned characteristics.

Child benefits are often considered as a means to stimulate fertility. However, the data does not directly support the notion that countries with more generous children's allowances also have higher fertility rates. In Figure 4 based on Eurostat data from 2021, the total fertility rate is plotted against the typical share of child benefits in the earnings of working families with two children for a sample of 28 European OECD countries. The correlation between these variables is positive but very small, standing at 0.056. However, when we focus on subgroups of countries that are geographically or culturally similar, we observe a positive relationship between the total fertility rate and the extent of child benefits only in Southern European economies. For the remaining countries, we find evidence to the contrary.

Universal child benefits can also influence temporal fertility, as the prospect of additional resources might encourage families to have children earlier than in a situation with no benefits in place. Using the same sample of countries as in the previous figure, I now contrast the size of child benefits with the maternal age at the birth of the first child (Figure 5). The relationship between these variables is negative, with a correlation coefficient of -0.19. Similar to the total fertility rate, the maternal age at birth might

[1] Data from the OECD Family Database (2018) give rise to a similar picture. Indeed, for a middle-class family with two children (aged 9 and 12), the average share of family cash benefits in household earnings is estimated at 5.6% across European OECD countries.

Figure 1: Types of children's allowance in European countries (part 1)



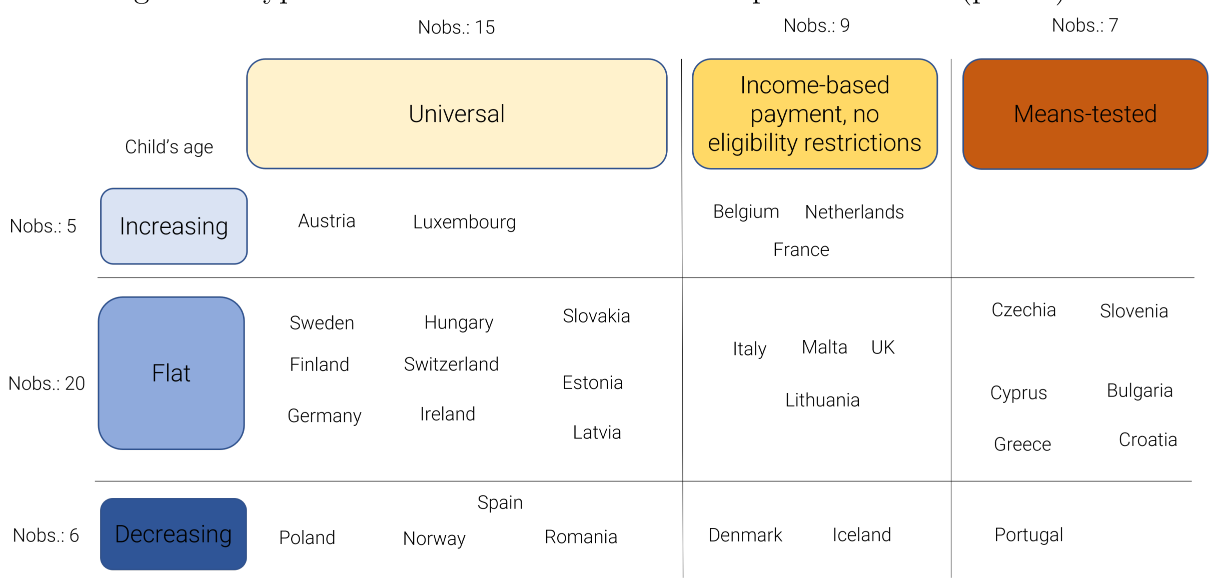
Notes: Own elaboration based on information from the official European Commission website (`https://commission.europa.eu/`) and country-specific government websites, extracted: June 2023. Only long-term periodic cash benefits for children, not linked to specific purposes (such as maternity leave or daycare supplements), are included. France: allowance starts with the second child, basic allowance not included; Czech Republic: parental allowance not included; Spain: only children under 3 are eligible; Poland: benefits include the 'Rodzinny Kapitał Opiekuńczy' program.

depend on various cultural and economic factors. The separate analyses for different groups of European countries show that, on average, both post-communist economies and the Southern European countries tend to have children slightly earlier if more child benefits are provided. This relationship does not hold for the rest of the sample, where greater dispersion is also observed.

3 The model

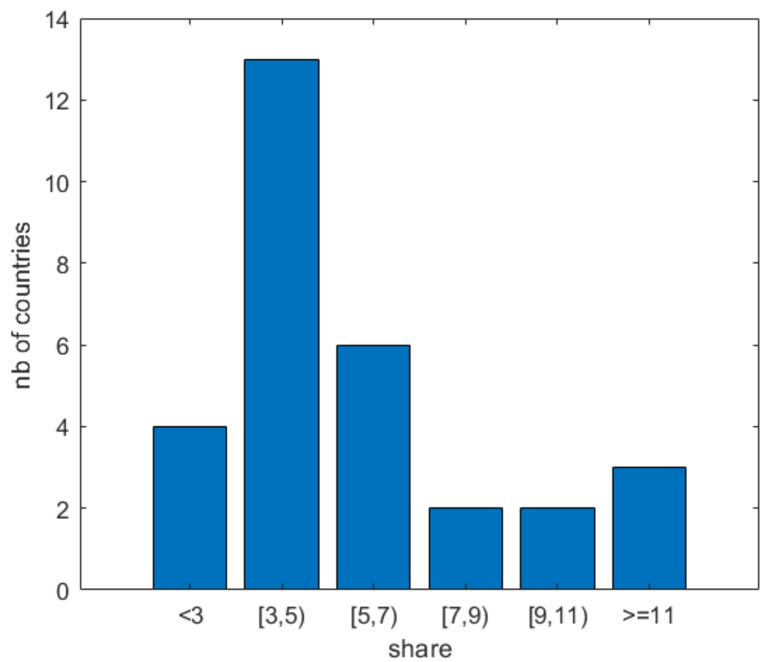
To study the long-run effects of universal child benefits, I develop an OLG model with heterogeneous households facing idiosyncratic earnings, fertility, and mortality risks. These households vary in their desired number of children and emotional readiness for childrearing. Similar to Sommer (2016), parents choose the timing and quality of their children. Since having a child is costly and irreversible, families might choose to postpone childbearing due to borrowing constraints and opportunity costs. There is an incomplete market without insurance against earnings shocks (see Aiyagari, 1994; Bewley, 1983; Huggett, 1993)

Figure 2: Types of children's allowance in European countries (part 2)



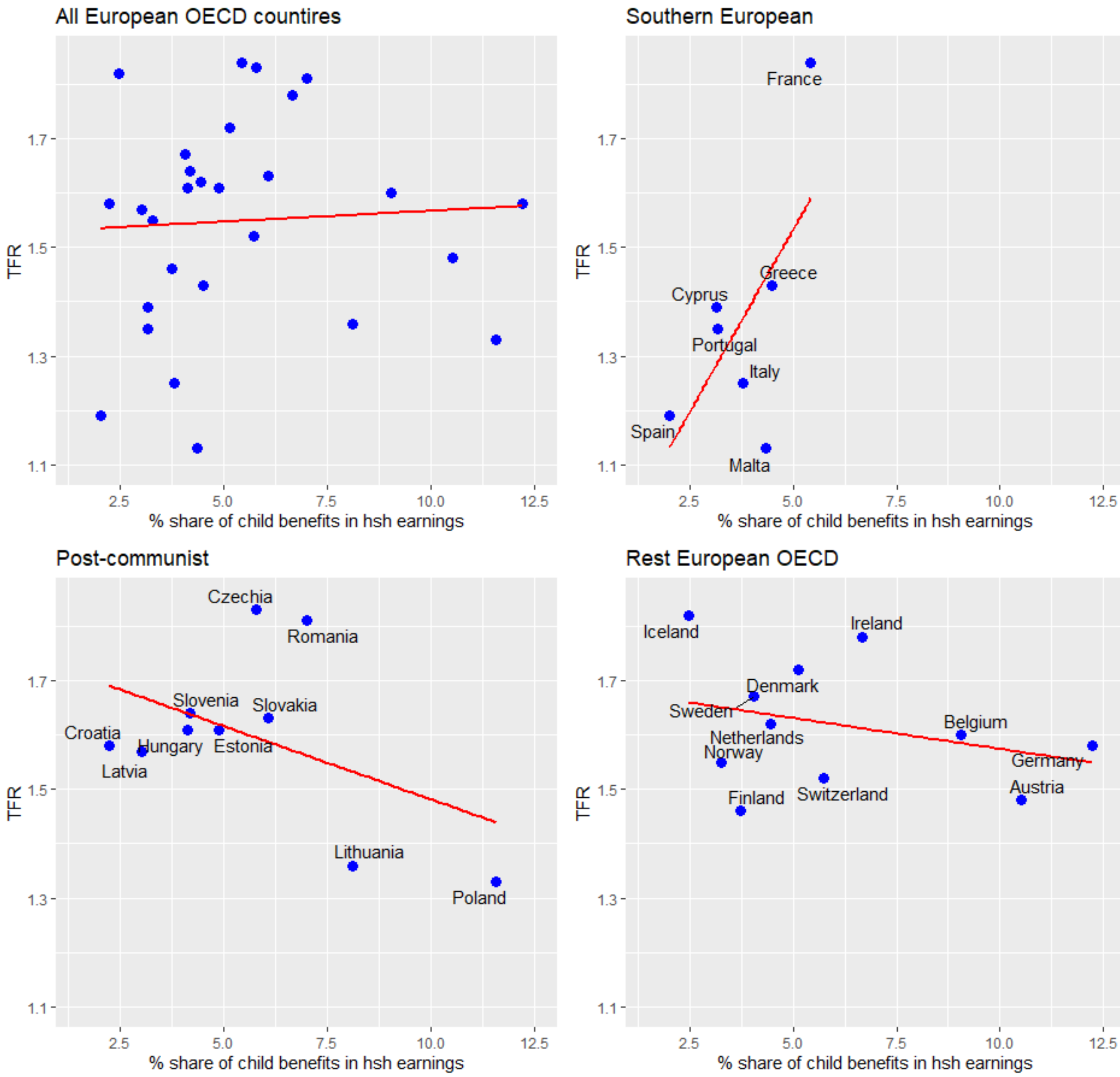
Notes: Own elaboration based on information from the official European Commission website (`https://commission.europa.eu/`) and country-specific government websites, extracted: June 2023. Only long-term periodic cash benefits for children, not linked to specific purposes (such as maternity leave or daycare supplements), are included. France: allowance starts with the second child, basic allowance not included; Czech Republic: parental allowance not included; Spain: only children under 3 are eligible; Poland: benefits include the 'Rodzinny Kapitał Opiekuńczy' program.

Figure 3: The share of child benefits in household earnings, distribution across OECD European countries



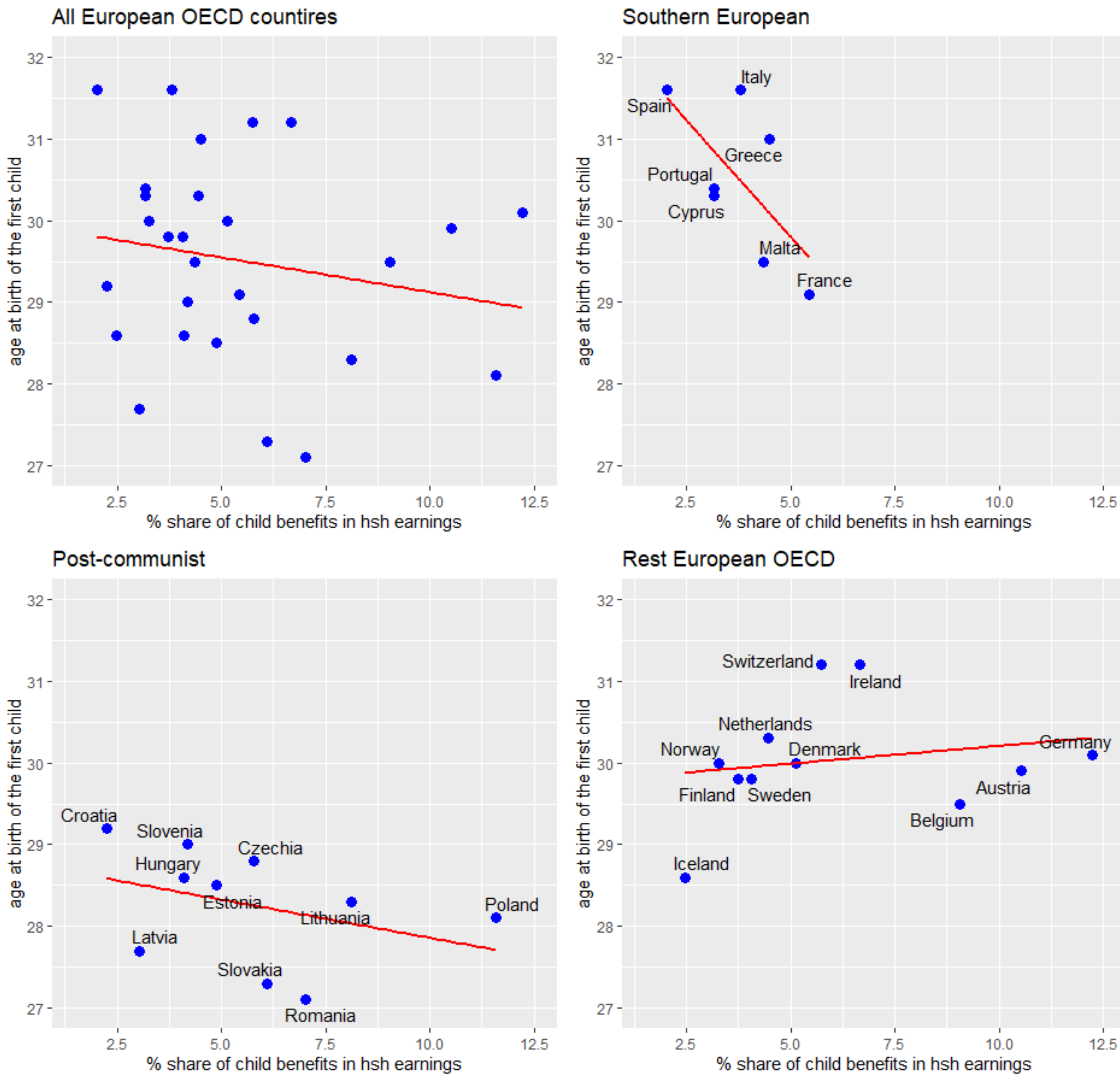
Source: Own calculations based on Eurostat data from 2021. Calculated for two-child families with an average income. Includes all OECD European countries except UK.

Figure 4: Total fertility rate and the generosity of child benefits across OECD European countries



Notes: Own calculations based on Eurostat data for 28 OECD European countries from 2021. Share of child benefits calculated for two-child families with an average income. Bulgaria, characterized by an unusually low maternal age at childbirth, and Luxembourg, operating an exceptionally generous child benefits policy, have been identified as outliers and excluded from the analyses.

Figure 5: Mean maternal age at fist birth and the generosity of child benefits across OECD European countries



Notes: Own calculations based on Eurostat data for 28 OECD European countries from 2021. Share of child benefits calculated for two-child families with an average income. Bulgaria, characterized by an unusually low maternal age at childbirth, and Luxembourg, operating an exceptionally generous child benefits policy, have been identified as outliers and excluded from the analyses.

In my model, the household life cycle consists of five distinctive phases, as illustrated in Figure 6. First, at the age of 20, individuals form couples and start new households. Each household knows their desired number of children from the beginning. During the first few years (the *pre-kids phase*), household members work full-time, consume, save, and derive utility from consumption. While working, households face uninsurable earnings shocks. When individuals turn 24, the *childbearing phase* starts, and children are born. Households should be emotionally prepared before deciding to have children, and the timeline for this readiness can vary among different households. In the model, parental unreadiness is considered as an exogenous shock. Families also face infertility risk, which increases with age. Experiencing an infertility shock does not mean the household will not be able to have children in the future, but it significantly decreases the chances of it. Therefore, between ages 24 to 39, fertile and emotionally ready parents might choose to have children. Households will only have up to their desired number of children, as exceeding this limit does not contribute to their utility. In the next phase, the *childrearing phase*, children are already present in those households that want and can have them, and they depend financially on their parents. No new children are born during this phase. The children form their own households when they reach 20. Similarly to the pre-kids *phase*, utility of a childless family depends solely on consumption. However, when children are present, household utility is derived from adult consumption and the quality of children, which is built by the money and time invested in them. Thus, households allocate resources to adult consumption, expenditure on children, and savings. They also divide their time between work and caregiving. For simplicity, I assume that only one parent works less than full-time, with the option to become professionally inactive and dedicate all available time to raising children. Once adult household members turn 56 (and enter the *post-childrearing phase*), there are no more children in families. At this point, household utility reduces to the utility derived from consumption, and both members work full-time. When households retire at the age of 64 (the *retirement phase*), they stop working and receive pension benefits based on their lifetime earnings. They also face age-dependent mortality risk and can live up to the age of 100. Below, I present a formal description of the model.

Demographics The economy is inhabited by overlapping generations of households – same-age couples with or without children. The time is discrete, and the model period is four years. Households are formed at period $j = 1$ (at the age of 20) and are heterogenous in their optimal number of children n^*. The distribution of n^* is correlated with the initial earnings shock. Households have a maximum lifespan of $J_{\max}$ periods.

Adult household members have a limited number of periods when they can be fertile, specifically when $j \in [J_1, J_1+3]$ and $J_1 > 1$. They also face uncertainty about their emotional readiness to have children. Households can expand their families only when they are emotionally ready. Let us denote the parental readiness shock as $\upsilon \in \{0,1\}$, where 0 means that a household is not ready to have children and 1 otherwise. During the *pre-kids phase* (for $j < J_1$), households are too young to have children: $\upsilon \equiv 0$. Everyone reaches emotional maturity before the end of the childbearing phase: $\upsilon \equiv 1$, for J_1+3 and all subsequent periods. The transition matrix for the intermediate periods $j \in [J_1, J_1+2]$ is given by

$$\mathbf{P} = \begin{bmatrix} 1 - p_{j,n^*} & p_{j,n^*} \\ 0 & 1 \end{bmatrix},$$

where the probability of reaching parental readiness p_{j,n^*} depends on a household's age and the desired number of children.

In the *childbearing phase*, emotionally mature households can choose to bear up to two children per period. Once a family has $n^* \leq 4$ children, it no longer desires additional ones. The birth of children depends on the infertility shock f, which takes values from the set $\{0,1,2\}$ that indicate a maximum number of new children that a household can have in a given period. Infertility risk is determined by its realization in the previous period and the household's age. $\{F_0(f)\}_{f=0,1,2}$ describes the initial distribution of infertility shock while $\{F_j(f_2,f_1)\}_{f_2=0,1,2}$ its transition matrix for given f_1 and j. Outside the *childbearing phase*, i.e. for $j < J_1$ or $j > J_1+3$,we have $f \equiv 0$.

Variable $\varpi = (\varpi_{J_1}, \varpi_{J_1+1}, \varpi_{J_1+2})$ represents the number of children born in a household during the specific periods. Namely, $\varpi_i \in \{0,1,2\}$ is the number of children born in the period i, for $j \leq i$ it is assumed that $\varpi_i = 0$. As children always form their own families when they turn 20, ϖ fully describes a household's composition after the childbearing phase.

The mortality risk starts at the *retirement phase* (for $j \geq J_{\text{ret}}$), and $s(j)$ describes the age-dependent conditional survival probability.

Preferences Following Sommer (2016), the period utility function for households with children is given by:

$$u(c_p, n, q) = \log(c_p) + \gamma \frac{(nq)^{1-\kappa}}{1-\kappa}, \quad c_p \geq c_{p,\min},$$

$$q = \left(\mu \left(\frac{c_k}{n^{\phi_c}} \right)^{\rho} + (1-\mu) \left(\frac{\iota l_k}{n^{\phi_l}} \right)^{\rho} \right)^{1/\rho}, \quad q \geq q_{\min}, \quad l_k \in [0,1], \tag{1}$$

where c_p denotes adult consumption, and n is the actual number of children in a household. The average quality of children q is a function of expenditure on children c_k and time devoted to them by one of their parents l_k. One parent can be inactive on the labor market and use all her/his available time for caregiving, in which case $l_k = 1$. γ, κ, μ, ρ, ϕ_c, ι and ϕ_l are the parameters, while $c_{p,\min}$ and $q_{\min}$ denote the lower thresholds for adult consumption and quality, respectively.

Utility for households without children simplifies to

$$u(c_p, 0, 0) = \log(c_p), \quad c_p \geq c_{p,\min}.$$

Labor income and pensions Over the working period, household productivity is a product of an age-dependent deterministic component $\bar{e}(j)$ and a stochastic component e, which follows an age-invariant Markov process. Adults without children work full-time ($l_k = 0$). In families with children, one parent divides time between labor and care. Net labor earnings of working households are

$$z_l(e, j, l_k) = (1 - \tau_l(j))(1 - \tau_l^{ss})(1 - 0.5 l_k) w \bar{e}(j) e,$$

where w stands for the wage rate per efficiency unit of labor, and τ^{ss} and τ_l are the labor income tax rates that finance social security and transfers programs, respectively.

Households whose members have reached the retirement age (from period J_{ret} onwards) no longer supply labor, but are entitled to receive pension benefits. Pension benefits are proportional to households' average lifetime earnings $\bar{z}_l$ given the pension replacement rate θ.[2] Thus, household net pension benefits are given by

$$z_p(\bar{z}_l) = (1 - \tau_l(j))\,\theta\bar{z}_l.$$

Social transfer Households might also receive a social transfer, such as child benefits. Their value and eligibility vary with the number of children n and the number of newborn children n_{new} in a household, household age, and productivity shock. Thus, they are represented by function $\Theta(n - n_{\text{new}}, n_{\text{new}}, j, e)$.

Household problem

A household's optimization problem takes a general form

$$V(j, a, e, \bar{z}_l, f, \upsilon, n_{-1}, n^*, \varpi) = \max_{\substack{c_p > c_{\text{p,min}}, a' > 0, \\ n_{\text{new}} \in [0, \ldots, \min(2, n^* - n_{-1}, f\upsilon)], \\ l_k \in [0,1], c_k \geq c_{k,\min}(q_{\min}, l_k, n) I(n>0)}} \{u\left(c_p, n, q(c_k, l_k)\right) + \beta s(j)\left[V\left(j+1, a', e', \bar{z}_l^{'}, f', \upsilon', n, n^*, \varpi^{'}\right) \mid e, \bar{z}_l, f, \upsilon, \varpi\right]\}$$

subject to

$$(1+r(1-\tau_a))a + I(j < J_{\text{ret}})z_l + I(j \geq J_{\text{ret}})z_p + \flat = a' + (1+\tau_c)(c_p + c_k) + \Theta(n - n_{\text{new}}, n_{\text{new}}, j, e),$$

where q is defined by Equation 1, $\flat$ stands for accidental bequests, a stands for accumulated assets, τ_a and τ_c are tax rates on assets and consumption, respectively, r is the rate of return on assets, n_{-1} denotes the number of children in the last period, and $I(\ldots)$ is a binary indicator function.[3] When children are in a household during a given period ($n > 0$), they require at least the minimum quality $q_{\min}$. Thus, in such a case, the low threshold for expenditure on children can be expressed as $c_{k,\min}(q_{\min}, l_k, n)$. The utility function implies that families have non-zero values of l_k and c_k only if they

[2]The average lifetime earnings of households are computed based on earnings before the application of τ_l.

[3]$I(\ldots)$ returns one if the expression inside a bracket is true and zero otherwise.

have children ($n > 0$). Households choose the number of new children from a discrete set: $[0, \ldots, \min(2, n - n^*, f\upsilon)]$. This means that households adhere to the following conditions:

1. Households can have a maximum of two new children in one period.
2. Households have children only up to their desired number.
3. Only emotionally ready households have children.
4. Household fertility limits the possible number of children.

Government The government administers a pay-as-you-go pension system and uses a flat payroll tax rate τ^{ss} to finance pension benefits. The government might also introduce a social transfer policy and fund it by one of the following types of proportional taxes: labor income tax imposed on workers (default scenario, $\tau_l(j) > 0$, for $j < J_{\text{ret}}$, $\tau_l(j) = 0$, otherwise), labor income tax imposed on workers and pensioners ($\tau_l(j) > 0$), consumption tax ($\tau_c > 0$), or assets tax ($\tau_a > 0$). The government's budget is balanced every period. Specifically, τ^{ss} is kept constant across simulations, and the pension replacement rate θ is adjusted accordingly.[4]

Firms I assume that adults and children consume the same homogeneous goods produced by identical, perfectly competitive firms. There is no borrowing from abroad, and households are the owners of capital. The production function is Cobb-Douglas with constant returns to scale

$$Y \equiv K^{\alpha} L^{1-\alpha}.$$

Firms rent labor L and capital K from households. Profit maximization implies that factor prices equal their marginal products:

$$\partial Y / \partial L = w \quad \text{and} \quad \partial Y / \partial K = r + \delta,$$

where δ denotes the capital depreciation rate.

[4]See the Supplementary Appendix for exact formulas.

Stationary equilibrium In this paper, I look at models' stationary equilibria, i.e. when all variables are time-invariant, all aggregate values, factor prices, and household distribution are consistent with optimization by individual agents, and the government budget is balanced. The Supplementary Appendix presents the formal definition of the steady-state equilibrium for this model. The model is solved using a method of finite dynamic programming that involves discretizing the state space to approximate the solution to the household problem.

4 Calibration

The model is calibrated to represent a typical EU economy. To calibrate the model, I primarily rely on data-derived averages for European economies. In the absence of readily accessible empirical evidence, I supplement the analysis by performing additional calculations using household-level data from the Polish Household Budget Survey (HBS). The Polish HBS is an annual survey conducted by the Polish Central Statistics Office (CSO), covering approximately 38,000 Polish households. In addition to providing detailed information on consumption and income, the survey also includes a rich set of socio-economic indicators. Wherever possible, I set the parameters using the available estimates and adhere to the standard calibration strategy for this class of models. The remaining parameters are formally calibrated so that the model meets the specified empirical targets. In the baseline model, I assume no social transfers other than pensions, i.e. $\tau_l = \tau_c = \tau_a = 0$.

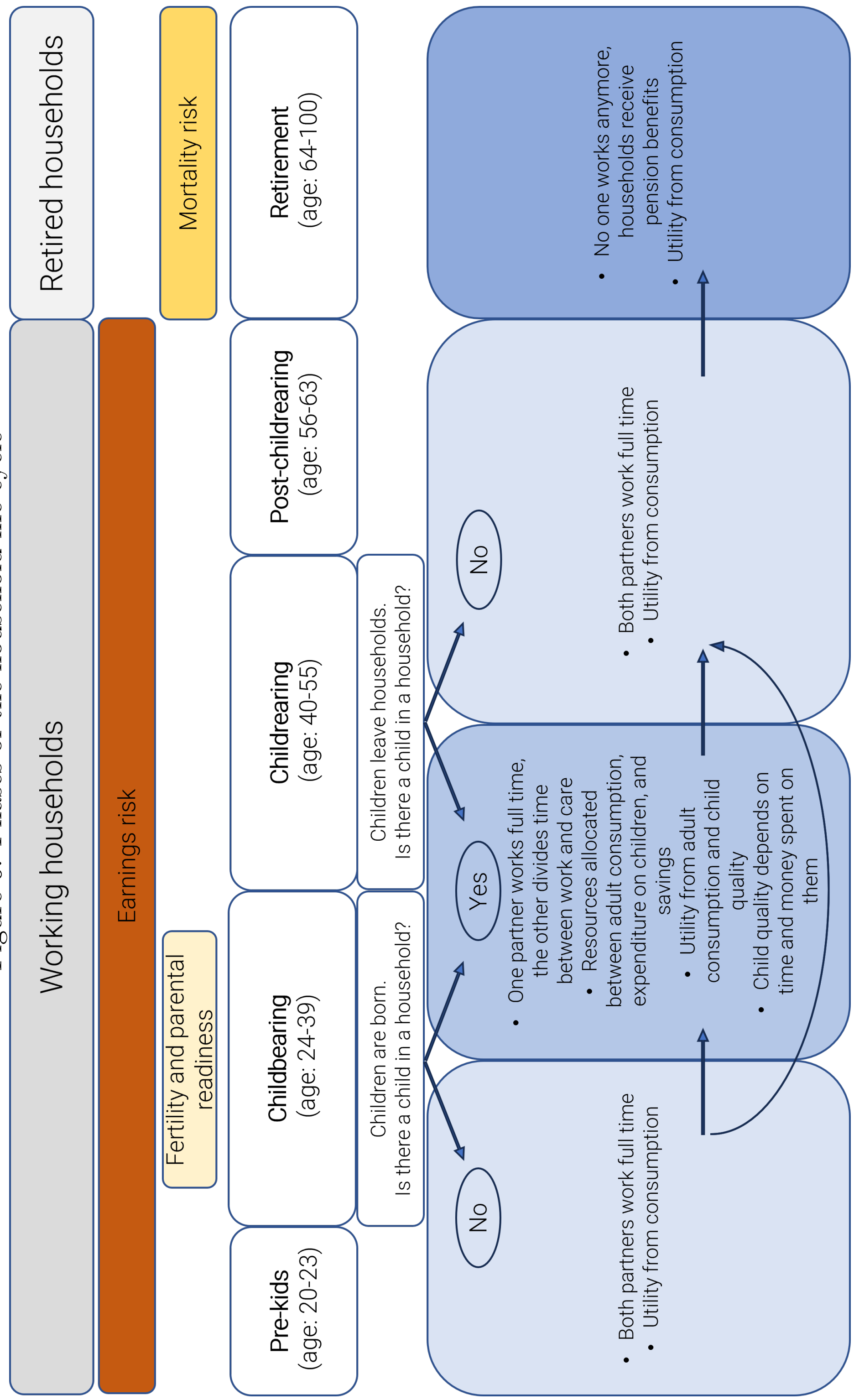
Table 1 presents a summary of the externally set parameters, while Table 2 shows the internally calibrated parameters and chosen targets. In the next two subsections, I provide a brief discussion of the general assumptions underlying each parameter value.

4.1 Externally Set Parameters

Demographics

Ongoing demographic processes have led to a significant proportion of individuals remaining childless throughout their lives. Aside from medical inability, the reasons for people not having children can vary, ranging from personal choice in order to pursue other goals, to difficult partnership situations (Kreyenfeld and Konietzka, 2017). In the

Figure 6: Phases of the household life cycle



model, I do not explicitly take into account these factors, but instead, I allow for some households to derive no utility from raising children. The estimates of the *European Demographic Data Sheet* (2022) indicate that approximately 20% of European women (from the cohort born in 1980) have not had any children. Considering that around 1% of all women are medically unable to have children (Dunson, Baird, and Colombo, 2004), I exogenously set the desired number of children to zero for 19% of all households, regardless of the initial earnings shock.[5]

Given that couples have their unique and diverse preferences regarding the number of children they wish to have, and there is little evidence that these can be permanently changed by child-related cash transfers, I assume that the desired number of children is fixed and exogenous. I approximate its distribution for those who want children with the actual number of children in families that have completed their reproduction. Using the Polish HBS from 2016, I look at households where the age of the household head falls between 38 to 45. I employ the education level of the household head as a proxy indicator for the initial earnings shock. The correlation between education and the total fertility rate is negative in the data. Given that 19% of households choose to be childless, the total fertility rate ranges from 1.55 for households with at least postsecondary education to 1.80 for those with less than secondary education. Overall, the total fertility rate assumed in the model is set at 1.65, which aligns with the average for EU countries used in the Eurostat population projections for 2080 (baseline scenario in EUROPOP2023). As my analysis focuses on the stationary equilibrium, I seek to eliminate short-term fluctuations. Thus, my assumption on the maximum total fertility rate reflects its long-term trend or the tempo-adjusted statistics, rather than the current total fertility rate for Europe, which stood at 1.53 in 2021 according to Eurostat.

The sociological literature points to significant non-economic factors responsible for the postponement of parenthood (see Mills, Rindfuss, McDonald, Te Velde, Reproduction, and Force, 2011 for an overview). Evolving norms and values have led to a greater emphasis on personal development, self-fulfillment, and individual freedom. The decision to have a child involves new responsibilities and sacrifices, making emotional readiness

[5]In general, we observe a positive correlation between childlessness and education. However, as some studies have pointed out, the relationship between having no children and educational attainment may be more complex, following a U-shaped pattern (Baudin, De La Croix, and Gobbi, 2015). Additionally, there is a decreasing trend in childlessness among the most highly educated women (Livingston and Cohn, 2010). Accounting for the complex nature of childlessness is a challenging task. Therefore, in the model, I make the simplifying assumption that voluntary childlessness is a random and independent shock.

to expand a family vary among individuals. I capture this effect by exogenous variable p_{j,n^*}. For simplicity, I limit the number of parameters as follows. Firstly, I assume that households wanting to have at least three children are aware that it requires time to do so. Therefore, they are emotionally ready for children at the beginning of the *childrearing phase* ($p_{j,n^*} = 1$, for $n^* \geq 3,\ j \geq J_1$). Secondly, for the remaining households, the probability of achieving parental readiness for those who were not emotionally ready in the previous period is assumed to be age-invariant, denoted as $p_{j,n^*} = p$, for $n^* < 3,\ j \in [J_1, J_1+3]$. Finally, for the transition matrix of infertility risk I use the estimates provided by Dunson, Baird, and Colombo (2004), while the age-specific survival rates reflect the current mortality patterns in Europe.

Earnings and pension

The shape of the average age-productivity profile ($\bar{e}$) is estimated using the Polish HBS from 2016, with the sample limited to households where two adults are working full-time. The logarithm of household monthly earnings is regressed on a cubic of age, along with a set of dummy controls for month, educational attainment, and geographic location. The average age-productivity profile shows an increasing trend until the person's mid-forties, followed by a gradual decline.

The logarithm of the age-adjusted individual earning process is expressed as a sum of persistent AR(1) and transitory shocks (Storesletten, Telmer, and Yaron, 2004). The parameters for the autoregressive component are taken from Kolasa (2017), which gives a lower persistence of the permanent earnings shock compared to what is typically assumed for the US.[6] The variance of the transitory component is chosen for the simulated earnings process to reproduce the empirical variance of earnings in European countries. As a target, I use the average variance of the residualized log earnings from the GRID database (Guvenen, Pistaferri, and Violante, 2022). The contribution rate τ_l^{ss} is calibrated to produce the pension replacement rate θ of 67%, corresponding to current pension policies implemented in Europe.

[6] The availability of exact parameter estimates for European countries is limited. However, empirical evidence suggests that the general level of earnings persistence varies greatly across Europe. Earnings persistence tends to be low in Scandinavian countries, while it is relatively high in Southern European countries, France and the UK (Guvenen, Pistaferri, and Violante, 2022). As a robustness check, I also conducted model simulations using a higher value for the autoregressive parameter (results available upon request). This exercise did not significantly alter the findings of this paper. As one would expect, in the presence of higher earnings persistence, child benefits generate a greater ex-ante welfare gain and have a stronger impact on consumption inequality.

In working-age households without children, there is no incentive to reduce labor supply. Thus, both partners can fully dedicate their available time to work. In families with children, one parent takes the role of the primary earner and works full-time, while the other must balance time between childrearing and work, with the option of becoming inactive in the labor market. The model does not imply any specific gender roles in households. However, given that, even in the most developed and modern economies, child-related responsibilities still predominantly fall on women, for simplicity, I will assume that women are the secondary earners in households. Thus, the model is calibrated to reflect the impact of women's involvement in childrearing on their labor choices. First, existing literature highlights that having children is the primary source of the gender earnings gap in developed countries (Kleven, Landais, and Søgaard, 2019; Cortés and Pan, 2020; Goldin, Kerr, Olivetti, and Barth, 2017). Hence, in the model a gender wage gap is not exogenously imposed, but instead is determined endogenously by individual labor supply decisions. Labor supply is measured by total available time minus time invested in child quality. This investment extends beyond direct childcare hours, encompassing increased flexibility to attend to children's needs and an enhancement of overall household quality of life, ultimately benefiting the children. In the model, a lower work-related time input may imply that secondary earners reduce their productivity by working fewer hours, adopting a less constrained work schedule, or transitioning to lower-paying sectors that offer greater flexibility.

Remaining parameters

I calculate the average wage $\bar{w}$ based on a sample of full-time employees. I assume that working full-time means devoting at least three-fourths of the maximum available time to work, which is equivalent to allocating less than one-fourth of an individual's time to child rearing ($l_{\text{full-min}} = 0.25$). To standardize the units of time and money in the production function of quality, I set ι equal to $\bar{w}$. The lower limit for adult consumption $c_{p,\min}$ corresponds to the extreme poverty line (14% of the average wage), while the threshold for child quality $q_{\min}$ represents an equal allocation of one-person minimal consumption value between expenditures on children and caregiving. Additionally, the production share α and depreciation rate δ for one year are set to 0.33 and 0.08, respectively, which are standard values commonly adopted in this class of models.

Table 1: Externally set parameters, annual values

Parameter	Value	Source
Demographics		
Survival probabilities		life-tables from 2019; level: adjusted to EU life expectancy; shape: 85 years old or younger - Eurostat database (EU average); after 85 - the Polish CSO
Infertility risk		Dunson, Baird, and Colombo (2004)
Voluntary childlessness	19%	Cohort childlessness for women born in 1980 minus the share of sterile families, EU average from Population Europe (2022), and Dunson, Baird, and Colombo (2004)
Initial distribution of the desired number of children		distribution of children among households aged 38-45 from the Polish HBS, 2016; education as a proxy for initial productivity
Earnings and pension		
Age-productivity profile ($\bar{e}$)		the Polish HBS, 2017
Earnings process - permanent shock, the autoregressive parameter	0.9	Kolasa (2017)
Earnings process - permanent shock, st. dev.	$\sqrt{0.03}$	Kolasa (2017)
Earnings process - transitory shock, st. dev.	0.25	the value matches the residualized log earnings of voluntary childless members of the workforce to the mean from the estimates for employed males in European countires, GRID database (Guvenen, Pistaferri, and Violante, 2022)
Pension replacement rate (θ)	67%	net replacement rate, EU countries (OECD, 2023)
Production function & prices		
Production share (α)	33%	standard value
Depreciation rate (δ)	8%	standard value
Consumption & quality		
$c_{p,\min}$	$0.14\bar{w}$	the threshold for extreme poverty, the Polish CSO
$q_{\min}$	$c_{p,\min}/4$	
ι	$\bar{w}$	

4.2 Internally set parameters

There are eight remaining parameters: $(p, \mu, \rho, \phi_c, \phi_l, \kappa, \gamma, \beta)$ that need to be determined in the model. I formally calibrate these parameters so that the selected aggregate and distributional moments calculated from the model match those observed in the data.

The parameter κ in the utility function for child quality, and the probability of parental readiness p, affect the age-fertility profile. As the targets, I employ the fertility shares attributed to women younger than 27 (25%) and women between 28 and 35 (54%). I calculate the average empirical age-fertility profile for the Euro Area. Given the ongoing trend of delayed motherhood in certain European countries, particularly post-communist economies, I choose to narrow down the data to economies that have already achieved a high average maternal age.

I assume that the fertility shock is the sole reason for households having fewer children than initially planned. The preference scale parameter γ guarantees that in the model without infertility risk, there are no unfulfilled fertility plans. To ensure that, I set to the zero the number of households who right after the childrearing age have less children than their desired number (i.e. $n < n^*$ at age $J_1 + 3$) assuming that they desire less than three children ($n^* < 3$) and are fully fertile.

Parameters μ and ρ of the child quality function impact the size and proportion of the expenditure on children and time devoted to childrearing. Thus, they are used to match the statistics on the average expenditure on a child and the ratio of women's monthly earnings to men's earnings in the EU (82%). I assume that child-related expenditures amount to 38% of adult consumption, which is the average value for Austria, France, Poland, and Italy, according to Kalbarczyk, Miazga, and Nicińska (2017). The earnings disparity in the model arises from the reallocation of time from work to childcare. When considering a broader perspective on the time input in the quality function described in the previous paragraph, the gender differences in average earnings provide a suitable calibration target.

Parameters ϕ_c and ϕ_l capture the household economies of scale. Thus, they should account for the difference in inputs associated with an additional child. My target for ϕ_c is the size of child-related spending in two-children households (51% of adult consumption), while ϕ_l is calibrated to ensure that the share of non-employed women among those with children matches the EU average (27%).[7]

[7] The estimated values for $\rho = 0.62$ and $\phi_l = 0.53$ are close to those used by Sommer (2016), which

Finally, the discount factor is calibrated to match an annual interest rate of 4%, which serves as a midpoint between the risk-free interest rate (slightly above 0%) and the return on capital (around 8%) in Europe. The resulting annual value of $\beta = 0.975$ falls within the typical range used in OLG models. While a 4% interest rate might be considered relatively high for a model with only risk-free assets, this assumption is motivated by the fact that households are also owners of capital. Such an interest rate value incentivizes households to accumulate savings. Moreover, since the model abstracts from skill accumulation, it renders the opportunity costs of early parenthood closer to those in the real economy.

4.3 Model evaluation

Table 3 evaluates the performance of the model on the basis of its ability to predict a set of non-targeted demographic statistics. The total fertility rate in the model is 1.60, which is higher than the current fertility rate in Europe but aligns with the projected level for the Euro Area in 2070. Infertility risk reduces the total fertility rate by 0.05. The model slightly underestimates the average maternal age at the first birth and overestimates the average age of subsequent births. However, overall, the model reasonably matches the mean maternal age at childbirth for all births and the age-specific distribution of fertility (as depicted by the blue and purple lines in Figure 7).

Figure 7 also illustrates how financial incentives affect the distribution of fertility over age in the model. In the absence of earnings risk and with a zero interest rate (red line), households have their first child as soon as possible. In general, the overall utility that households derive from parenting is higher when they space out the births of their children over time. However, as the cost per child decreases when there are more children in the household, it is financially efficient to have children with a small age gap between them. Moreover, delaying childbirth for too long significantly increases the risk of infertility. As a result of these dynamics, the fertility distribution after 27 exhibits a relatively smooth pattern, with a small peak occurring between the ages of 32 and 35.

When the return on capital is relatively high, households tend to delay having children

are 0.7 and 0.54, respectively. I obtained a higher value of $\mu = 0.512$ (compared to 0.35) and lower elasticity of money ($\phi_c = 0.72$ vs. $\phi_c = 0.91$ in Sommer's article).

Table 2: Internally set parameters and calibration targets

Parameters	Targets		
		source	value
parental readiness			
$p = 0.23$	Fertility share attributed to women younger than 28	Euro area, Eurostat database, 2021	25%
quality function			
$\mu = 0.512$	Expenditures on children as a proportion of adult consumption in one-child families	Kalbarczyk, Miazga, and Nicińska (2017); average for Austria, France, Poland, and Italy	38%
$\rho = 0.62$	The ratio of women's monthly earnings to men's earnings	EU average, Eurostat database, 2018	82%
$\phi_l = 0.53$	the share of non-employed women among those with children	EU average, OECD family database, 2019	27%
$\phi_c = 0.72$	Expenditure on children as a proportion of adult consumption in two-children families	Kalbarczyk, Miazga, and Nicińska (2017); average for Austria, France, Poland, and Italy	51%
utility function			
$\kappa = 0.2855$	Fertility share attributed to women between 28 and 35	Euro area, Eurostat database, 2021	54%
$\gamma = 3.45$	Without infertility risk all households have the desired number of children		
discount factor			
$\beta = 0.9063$ (0.9757*)	Interest rate (r)	the midpoint between the risk free interest rate and the return on capital in Europe (Marx, Mojon, and Velde, 2021)	17% (4%*)

*Annual values

Figure 7: Fertility distribution over age under different model assumptions

in order to accumulate greater savings (yellow line). The presence of capital gains also serves as an incentive to narrow the spacing between the first and last child and, thus, accelerate the transition from caring for children to returning to full-time work. Furthermore, unexpected fluctuations in earnings make these effects more heterogeneous, with more productive households delaying childbirth even further (purple line). Indeed, the fertility rate of families in the fourth quintile of the earnings distribution, as depicted in Figure 8, is lower compared to those in the third quintile and approaches zero at young ages.

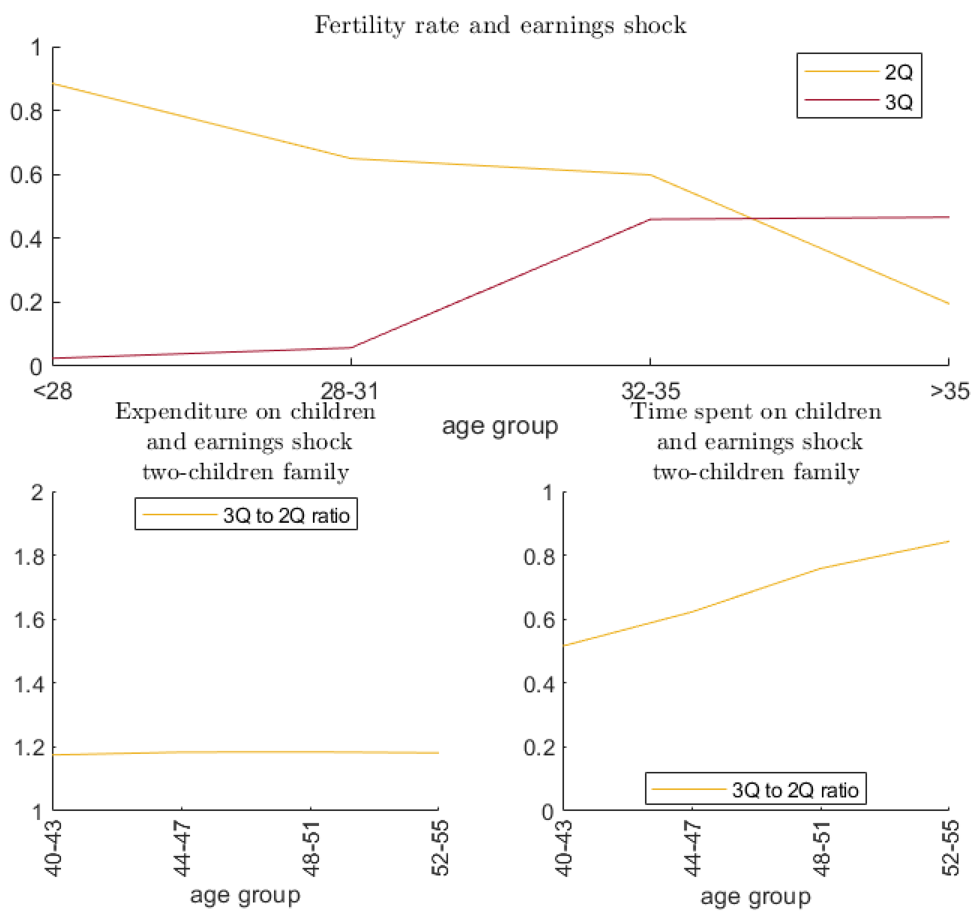
The model successfully replicates the well-known relationship between child-related inputs and earnings (see lower panel of Figure 8). Expenditure on children exhibits a positive correlation with earnings, while households with favorable productivity shocks tend to allocate more time to work, reducing the time devoted to childrearing. The gap between the time spent on children among households with different earnings diminishes with age.

Table 3: Non-targeted fertility statistics

	Euro Area*	Model
Current total fertility rate	1.52	1.60
Projected fertility rate for 2070	1.60	1.60
Mean age of women at childbirth (all births)	31.6	31.8
Mean age of women at birth of first child	30.2	29.4
Mean age of women at birth of second child	32.3	32.9
Mean age of women at birth of third child	33.3	34.7
Mean age of women at birth of fourth and higher order child	34.4	36.5

* Eurostat database 2021

Figure 8: Child-related statistics by earnings shock



5 Results

5.1 Universal child benefits

Having calibrated the model, I next use it to examine the consequences of introducing a simple universal child benefit, which provides a fixed value $val_b * \bar{w}$ for each child in the family, regardless of other household characteristics: $\Theta(n) = n * val_b * \bar{w}$. Parents receive this benefit as long as their child resides with them, and, in the model, this extends until the age of 20. I set the value of the universal child benefit to match the average share of the children's allowance in the labor earnings of a middle class family with two children (see Section 2 for details). That gives $val_b = 0.5 * 5.6\% = 2.8\%$. In the baseline scenario, this benefit is financed by the flat rate tax imposed on labor income, i.e. $\tau_l(j) = I(j < J_{\text{ret}}) * \text{const}$. At the aggregate level, the benefits cost amounts to 0.56% of output and requires additional labor income tax rate of 1.15%. Subsection 5.4 considers different methods of financing the benefits. Below, I discuss the main results of model simulations on the long-term impact of universal child benefits taking into account various aspects of the economy.

Temporal fertility Universal child benefits significantly impact the timing of fertility decisions, resulting in a decrease in the average maternal age at childbirth (for all births) of almost 9 months and a reduction in the spacing between children (Table 4). Multiple factors contribute to this outcome. The decision to have a child within a specific timeframe is influenced by opposing forces. On the one hand, factors such as impatience to start a family and the infertility risk that grows with age favor accelerating the timing of children, while lower per-child costs for larger families encourage a short spacing between offspring. On the other hand, opportunity costs and the desire to accumulate greater capital before having another child tend to delay the decision to expand the family. Moreover, in their fertility decisions, households are limited by their resources, which they allocate between adult consumption, child expenses, and savings. To put it simply, the choice is whether to have a child now, accepting their lower quality and reduced adult consumption, or to wait until the next period, facing higher infertility risk. Universal child benefits alleviate the financial constraints of households and work in favor of earlier childbearing. The advantages of accelerating the timing due to universal child benefits are more pronounced for subsequent children. Indeed, the average age of mothers at the birth of the second child decreases nearly twice as

Table 4: Changes in the mean age of women at birth (in months) due to universal child benefits

overall	first	second	third	fourth
-8.7	-7.8	-13.6	-7.9	-10.7

much as the age decrease observed in relation to the birth of the first child (Table 4). However, the observed changes in temporal fertility have a relatively minor impact on the total fertility rate, resulting in an increase of just 0.01.

Macroeconomic aggregates Universal child benefits have also considerable macroeconomic implications (see Table 5). First, through their effect on the timing of childbearing they impact the aggregate effective labor supply. When women have children earlier and closer in age to each other, it allows them to return to full-time work sooner and at a time when they can still be highly productive. The period during which they can fully devote themselves to work expands, which boosts the overall labor supply. However, the income effect of universal child benefits leads to lower labor market activity of families with children, resulting in a reduction in hours worked and a 1.7 percentage point increase in the proportion of families with a professionally inactive parent. Overall, the long-term effect of the program on effective labor supply is slightly positive.

Second, the introduction of child benefits has long-term negative consequences for domestic assets. A significant reduction in savings occurs in the initial phases of the household life cycle. With the additional financial support provided by benefits, families accumulate fewer resources earmarked for childrearing. Consequently, assets per household decline by almost 0.6%, and the interest rate increases by 0.19 percentage points. In response to the higher return on savings, older households (those who have reached the *post-childrearing phase*) save more, yet not enough to offset the lower savings of younger households. Overall, the adjustments in labor supply and assets due to child benefits marginally reduce macroeconomic efficiency, as measured by aggregate output, by 0.16%.

While total consumption decreases only slightly (by less than 0.1%) due to universal child benefits, noticeable adjustments emerge when this category is broken down into adult consumption and expenditure on children. Adult consumption within working-age households remains unchanged, but it rises by 1% among the retired households. This increase is linked to temporal fertility changes that accelerate the timing of when

Table 5: Aggregate effects of universal child benefits

	change due to UCB
effective labor supply (in %)	0.04
share professionally of inactive among women with children (in pp.)	1.71
domestic assets* (in %)	-0.57
interest rate (in pp.)	0.19
output (in %)	-0.16
total consumption (in %)	-0.07
adult consumption (in %)	0.40
adult consumption, working-age household (in %)	0.00
adult consumption, retired household (in %)	1.03
expenditures on children (in %)	-4.18
average child quality (in %)	-1.42

* - all aggregates are expressed in per household terms.

households are freed from child-related responsibilities during the *childrearing phase*, thus allowing them more time to accumulate retirement savings. Overall, aggregate adult consumption is higher by 0.4% in an economy with universal child benefits in place. On the other hand, expenditure on children declines by 4.2%, which has a negative impact on the average quality of children, reducing it by 1.4%.

The decrease in spending on children due to universal child benefits might seem counterintuitive. However, this phenomenon is again closely associated with shifts in the timing of childbirth. Table 6 provides a breakdown of changes in child-related statistics, specifically attributing them to the movements in temporal fertility. Assuming a fixed distribution of household composition, the average expenditure and time spent on a child actually increase due to universal child benefits by 1.8% and 3.3%, respectively. This also results in an improvement in the average quality of children. However, the availability of these transfers encourages parents to have children earlier in life, which is when they are relatively poorer and need to work longer hours. This distributional effect significantly impacts resources allocated to a child, leading to a decrease in average expenditure by almost 6% and a reduction in time spent on a child by 3.2%. Ultimately, the total effect of universal child benefits on child quality is thus negative.

How are universal child benefits actually allocated and spent? Table 7 presents the model calculations depicting the final distribution of the transfers. The results reveal that approximately 38% and 24% of the benefit, are spent on adult and child-related consumption, respectively. The remaining 38% provides financial compensation

Table 6: Decomposition of changes in child-related statistics due to universal child benefits

	% change in		
	average child quality	average expenditure per child	average time spent per child
with fixed distribution of households over age, number of children, and earnings shocks	2.58	1.84	3.30
due to changes in distribution	-3.89	-5.98	-3.15
total	-1.42	-4.25	0.04

Table 7: Distribution of universal child benefits

Reduction of working hours (Time spent on children)	Expenditure on children	Adult consumption
37.8%	24.0%	38.2%

to mothers, allowing them to work less and spend more time with their children.

Welfare In this paragraph, I examine the welfare implications of universal child benefits. I focus on the welfare of households at the time of their formation, when household members are 20 years old. I start with the ex-ante welfare, also referred to as welfare “under the veil of ignorance”, assuming no prior knowledge of household’s future shocks and life trajectory. The welfare effect is determined by calculating the minimum change required in household adult consumption across all ages for the adult household members to be indifferent between starting their own family in an economy with or without the benefits. Let us denote $W\left(c_p^0, (nq)^0\right)$ as ex-ante welfare for a given stream of adult consumption and the quality of children $\left(c_p^0, (nq)^0\right)$. If $\left(c_p^0, (nq)^0\right)$ and $\left(c_p^1, (nq)^1\right)$ are optimal allocations in the economy without and with universal child benefits, respectively, the total welfare effect of children’s allowance ς fulfills the following condition:

$$W\left((1+\varsigma)c_p^0, (nq)^0\right) = W\left(c_p^1, (nq)^1\right).$$

Building on the Conesa, Kitao, and Krueger (2009) decomposition, the welfare effect can be further broken down into the change ς_c stemming directly from the shifts in the allocation of adult consumption:

$$W\left((1+\varsigma_c)c_p^0, (nq)^0\right) = W\left(c_p^1, (nq)^0\right),$$

and the welfare effect ς_q associated with adjustments in the quality of children:

$$W\left((1+\varsigma_q)c_p^0, (nq)^0\right) = W\left(c_p^0, (nq)^1\right).$$

Additionally, I compute household welfare effects conditional on the desired number of children and initial earnings shock.

According to the model simulations, universal child benefits improve long-term welfare by 0.42% of lifetime adult consumption (Table 8). The aggregate adult consumption is 0.4% higher in an economy with universal child benefits. However, shifts in their distribution towards older ages are welfare-deteriorating, and the total welfare effect of changes in the allocation of adult consumption is slightly negative, estimated at -0.06%. Universal child benefits also affect timing and choice related to the quality of children. By easing financial constraints for households as they enter parenthood, it expands the feasible timing for having children. Consequently, households ex-ante benefit from changes in the average discounted value of utility stemming from child quality, and the associated welfare effect amounts to 0.48%.

The impact of universal child benefits on household welfare varies with the desired number of children (Table 8). Households planning to be childless or have only one child experience a reduction in lifetime adult consumption by 0.95% and 0.29%, respectively. For larger families, the welfare gains increase exponentially with the desired number of children, ranging from 0.60% for two children to 3.11% for four children.

When examining households grouped by their initial earnings shock, I find that all groups benefit from universal child benefits. However, the welfare effects are highly heterogeneous, with those in the lowest 10% of the initial earnings shock gaining more than twenty times as much as those in the highest 10% of the initial earnings shock.

Inequality Child benefits are primarily praised for their impact on monetary inequality, particularly the reduction in child poverty rates. The modeling approach employed in this study is not designed to assess poverty, and as such, this falls beyond the scope

Table 8: Welfare effects of universal child benefits (%, adult consumption equivalent)

unconditional		conditional on:						
		desired number of children					initial earnings shock	
		0	1	2	3	4	low 10%	top 10%
overall	0.42	-0.95	-0.29	0.60	1.83	3.11	0.89	0.04
due to changes in:								
adult consumption	-0.06	-0.95	-0.36	0.16	0.55	1.07	0.09	-0.25
utility of children	0.48	0.00	0.07	0.44	1.27	2.01	0.80	0.29

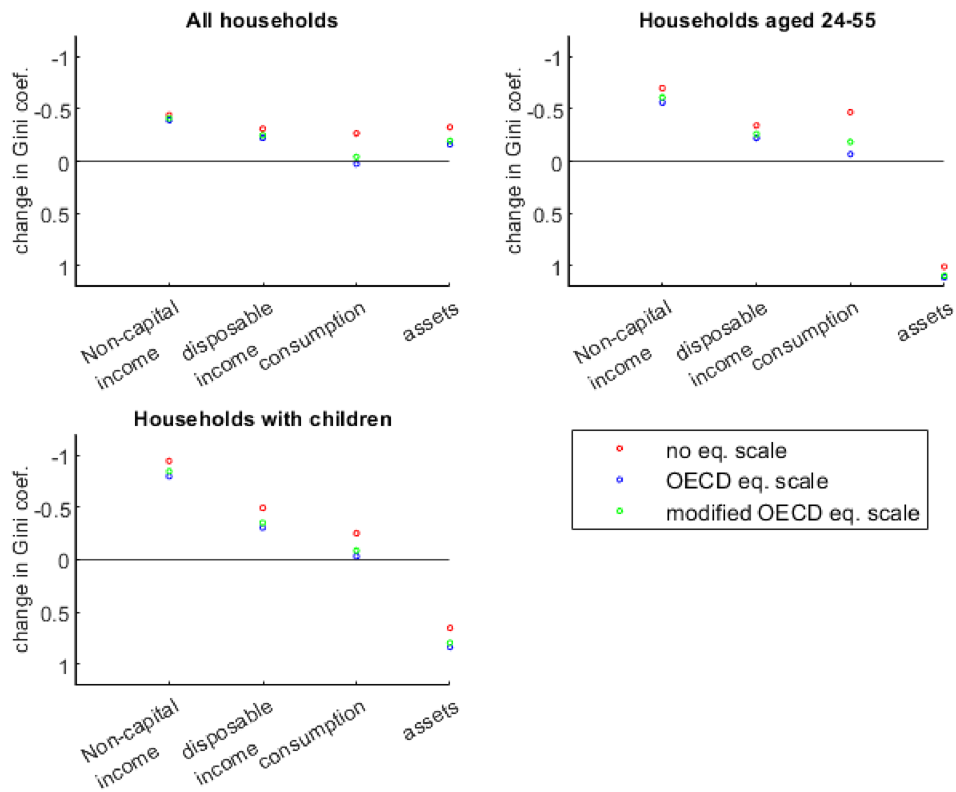
of this paper. Instead, the model can offer insights into long-term changes in overall measures of inequality. Most of related studies rely on recent empirical data, and thus provide estimates of the immediate or medium-term changes in inequality following the introduction of the transfers. In contrast, I focus on long-term effects, allowing household decisions and the economy to fully adjust to the new environment.

Figure 9 shows the changes in the Gini coefficient (defined for the 0-100 scale) for income, consumption, and assets stemming from universal child benefits. I use three different samples 1/ all households 2/ households in the childbearing and childrearing phases (aged 24-55), 3/ households with children. I also employ three different approaches to handling family composition: 1/ no equivalence scale, 2/ "OECD equivalence scale" with weights set at 1.7 for two adults and 0.5 for each additional child, 3/ "modified OECD equivalence scale" using 1.5 for two adults and 0.3 for a child.

First, a significant reduction in inequality is observed for household income excluding capital gains, with estimated changes in the Gini coefficient ranging from approximately 0.4 for the entire population to 0.8-0.95 for families with children. However, as a result of the child-related transfers, households who either have or plan to have children save less. As a result, the redistribution of total household disposable income is correspondingly smaller, with Gini estimates reduced by 0.2-0.5.

Moreover, consumption inequality decreases to an even lesser extent due to universal child benefits. A modest reduction in the Gini coefficient (0.2-0.4) is observed for estimates without correction for family size. With additional resources from child-related transfers, one would expect the relative consumption position of families with children to improve. However, the offsetting effect of the decision to have children at younger ages (when households have fewer financial resources) limits the ability of universal child benefits to significantly impact long-term inequality in (equivalized)

Figure 9: Changes in the Gini coefficient due to universal child benefits across subsamples and measures



Note: Gini coefficient on a scale 0-100; OECD equivalence scale: 1.7 for two adults, 0.5 for each additional child; modified OECD equivalence scale: 1.5 for two adults, 0.3 for each additional child.

consumption.

The distribution of assets is affected by two factors associated with the presence of universal child benefits. First, children become independent earlier in the life cycle, leaving more time for older households to accumulate retirement savings, thereby enhancing the relative asset position of the elderly. On the other hand, child benefits crowd out child-related savings. The above effects translate into a moderate reduction in asset inequality calculated for all households, but an increase in asset inequality for the groups of households in childbearing and childrearing phases and households with children, with an estimated rise in the Gini coefficient of around 1 and 0.65-0.85, respectively.

5.2 Universal child benefits vs. other redistributive policies

Some of the effects of universal child benefits described earlier in the paper can also be achieved through standard income redistribution policies that are not specifically directed towards families with children. In this subsection, I explore the unique aspects of the children's allowance policy, namely what differentiates it from conventional redistributive policies unrelated to household composition. To this end, I juxtapose the long-term impact of universal child benefits with other transfer policies. First, I consider a simple universal lump-sum transfer to all working households (referred to as the *Universal transfer*). It can be formally expressed by $\Theta(j) = I(j < J_{\text{ret}}) * \text{const.} * \bar{w}$. Next, I narrow the eligibility for the lump-sum transfer based on the realization of productivity shock: $\Theta(j, e) = I(j < J_{\text{ret}}) * I(e < e_0) * \text{const.} * \bar{w}$. These transfers are designed for households that receive comparatively low hourly payments for their work. I consider two variants of this program: the *Universal transfer lower 10%*, intended for those with a productivity shock in the lowest decile, and the *Universal transfer lower 50%*, aimed at households with a productivity shock below the median.[8] Throughout this exercise, I maintain tax neutrality, meaning that all policies considered in this subsection are financed by the same proportional labor income tax used in the case of universal child benefits.

As follows from Table 9, there are evident differences between the outcomes of universal child benefits and transfer policies not linked to children. First, the latter have no effect on temporal fertility and are thus not harmful to average child quality. Second, they trigger a significant negative response in labor supply, resulting in a greater deterioration in aggregate output and consumption. Third, they are more successful in addressing consumption inequality.

The estimates for *Universal transfer lower 10%* and *Universal transfer lower 10%* indicate that incorporating means-testing into a redistributive policy can enhance the ex-ante welfare gains and strengthen inequality reduction. However, this comes at the expense of being more detrimental to economic efficiency, particularly through a significant negative impact on labor supply. The simulations reveal that even with their

[8]Note that in the presence of elastic labor supply, there might not be a perfect mapping between a productivity shock and household labor income. However, by evaluating eligibility based on the former, I eliminate the potential side effects of means-tested programs, particularly the reduction of individual labor supply to meet the eligibility criteria. Analyzing the impact of such adjustments goes beyond the scope of this paper.

universal and income-independent nature, child benefits can yield a welfare gain comparable to that of highly targeted transfer programs and four times larger than that generated by *Universal transfer*.

5.3 Alternative child benefits policies

As universal child benefits prove to have significant consequences for households and the economy at large, it is worth considering whether there is room for improvement in their outcomes. Therefore, in this subsection, I study three common modifications to universal child benefits.

Reducing the eligibility period As universal child benefits represent a relatively costly social policy, policymakers may be particularly interested in reshaping the program by reducing its costs while still achieving certain policy goals. If the objective is to accelerate temporal fertility, a reasonable adjustment might involve shortening the period during which child benefits are granted. Here, I explore a policy that provides child benefits for the first four years of a child's life. The estimated effects of such a policy are presented in column 3 of Table 10.

According to the model simulations, the modified policy incurs substantially lower costs, with the required tax rate for financing amounting to 0.22%. However, this cost reduction weakens the program's impact across all the analyzed dimensions, including temporal fertility. It is worth noting, though, that the ex-ante welfare gains of this policy are as much as half of what universal child benefits can generate, despite the tax burden shrinking to one-fifth.

Setting minimum child limits The impact of universal child benefits on temporal fertility involves both an earlier age of parenthood and a reduction in the spacing between subsequent children. While the pros and cons of the former can prompt discussion, the benefits of the latter are more apparent. A natural modification to universal child benefits, aimed at achieving a shorter spacing between children while simultaneously reducing the program's budget, is to restrict eligibility to families with a minimum number of children. Here, I examine a policy that provides child benefits only to households with two or more children.

Table 9: Effects of selected redistributive policies

	Universal child benefits	Universal transfer	Universal transfer lower 50%	Universal transfer lower 10%
value of benefit (% of $\bar{w}$)	1.4$*n$	1.0	2.0	9.1
changes in temporal fertility (in months):				
mean age at birth (all births)	-8.7	0.0	0.1	-0.3
mean age at birth of first child	-7.8	0.0	0.1	-0.4
mean age at birth of second child	-13.6	-0.2	-0.4	-0.4
changes in aggregates:				
domestic assets (in %)	-0.57	-0.31	-0.48	-0.71
share of professionally inactive (those with children, in pp.)	1.71	1.00	1.67	1.90
output (in %)	-0.16	-0.26	-0.34	-0.38
adult consumption (in %)	0.40	-0.21	-0.23	-0.18
expenditure on children (in %)	-4.18	-0.59	-0.93	-1.43
changes in child-related statistics (in %):				
average child quality	-1.42	0.47	0.50	0.34
adjusted to changes in temporal fertility: average expenditure per child	1.84	-0.57	-0.88	-1.17
average time spent per child	3.30	1.59	1.95	2.13
changes in overall welfare (in %)	0.42	0.11	0.25	0.48
attributed to adult consumption	-0.06	-0.12	-0.03	0.17
attributed to child quality	0.48	0.23	0.29	0.30
changes in Gini coef. (in pp.)				
for all households: equivalized disposable income*	-0.25	-0.11	-0.40	-0.58
equivalized consumption	-0.04	-0.08	-0.25	-0.40
assets	-0.32	-0.15	-0.47	-0.26
for households with children: equivalized disposable income	-0.35	-0.21	-0.66	-0.91
equivalized consumption	-0.09	-0.12	-0.39	-0.58
assets	0.65	-0.11	-0.38	0.47

Notes: * - to calculate equivalized measures, the modified OECD equivalence scale that gives 1.5 for two adults and 0.3 for each additional child is used.

The results confirm the initial intuition, and the modified program effectively reduces the mean age of women at the birth of the second child by more than 38 months, with a slightly positive impact on the age of first-time mothers (column 4 of Table 10). This modification to child benefits policy carries positive macroeconomic implications, including an increase in total effective labor supply, consumption, and aggregate output. Changes in average child quality and ex-ante welfare are comparable to those associated with universal child benefits. However, this policy does not come without drawbacks. These include a significantly higher proportion of professionally inactive mothers (an increase of almost 4.4 procentage points compared to an economy without child benefits) and a more concentrated distribution of assets among families with children.

Introducing means-testing The evidence presented in the previous subsection suggests that incorporating some level of income-dependency into child benefits, either through means-testing or income-based payments, could enhance the welfare and redistributive outcomes of the policy. Here I examine a simplified means-testing approach, in which child benefits are received by households with work productivity not exceeding the median (column 5 of Table 10). This means that eligibility criteria remain independent of labor choices. However, in practice, means-testing might have unintended consequences. When direct income criteria are applied, households might strategically reduce their working hours to meet the eligibility threshold. Consequently, the results presented in this analysis might overestimate labor supply in an economy with such a child benefits policy, and should be interpreted as an optimistic scenario. In this simulation, I keep a constant tax rate (τ_l) for financing the program and adjust the benefit value accordingly.

The means-tested child benefits result in a greater reduction in the spacing between children, while having a relatively smaller impact on the average age at which households enter parenthood. The implementation of this policy significantly decreases the labor supply of low-productive women with children, contributing to an estimated 3.6 percentage point increase in the proportion of professionally inactive mothers. On the other hand, the overall labor supply, domestic assets, aggregate output, and average child quality are higher than in an economy with universal child benefits. Furthermore, means-testing child benefits lead to welfare gains that are one-third larger than those of their universal counterparts. This approach also increases the effectiveness of the children's allowance in income and consumption redistribution, leading to a 0.2 decrease in the Gini coefficient for equivalized consumption.

5.4 Alternative financing

As demonstrated earlier in this section, universal child benefits affect family planning decisions by shifting the timing of childbearing toward younger ages. This influence also contributes positively to the consumption and savings of retired households, as children start independent lives earlier, allowing parents more time to focus on work and the accumulation of retirement savings. Given that older households are indirect beneficiaries of universal child benefits, it may be worth considering their participation in covering the policy's costs. So far, I have assumed that universal child benefits are financed by a proportional labor income tax, and I will refer to the results obtained on the basis of this assumption as the baseline simulations. In this subsection, I introduce three alternative models of taxation and assess how the impact of universal child benefits varies as a result of different financing schemes. I still assume the same value of the benefit $\Theta(n) = 2.8\% * n * \bar{w}$, that is now financed by the flat-rate tax imposed on one of the following: 1/ pensions and labor earnings ($\tau_l(j) = \text{const.} > 0$, for $j \leq J_{\max}$), 2/ adult consumption and expenditure on children ($\tau_c = \text{const.} > 0$), and 3/ capital income ($\tau_a = \text{const.} > 0$).

Taxing pensions and labor earnings According to the model simulations, when universal child benefits are financed through a flat-rate tax applied on pensions and labor earnings, retired households contribute 27% of total tax revenues (Table 11). The changes in fertility associated with the benefits are similar to the baseline simulations, but the modified tax scheme mitigates some negative aggregate effects. The income effect makes older households save more due to lower net pensions, which translates into a smaller decline in total domestic assets. With more income categories subject to taxation, the tax rate τ_l decreases from 1.15% to 0.84%, raising the relative price of time allocated to childcare. The substitution effect tends to increase labor supply, but the overall impact is moderate. In particular, the increase in the share of professionally inactive women with children due to universal child benefits is around 0.2 percentage points lower compared to the scenario where only labor earnings are taxed. As a consequence of the aforementioned adjustments in capital and labor, the estimated decline in aggregate output is reduced to around 0.05%.

Table 10: Effects of child benefits policies

	Universal child benefits	Child benefits first 4y	Child benefits 2+	Child benefits means tested
tax rate that finances the policy (τ_l, in %)	1.15	0.22	0.91	1.15
changes in temporal fertility (in months):				
mean age at birth (all births)	-8.7	-2.4	-8.1	-7.0
mean age at birth of first child	-7.8	-2.1	4.4	-2.5
mean age at birth of second child	-13.6	-3.7	-38.2	-15.7
changes in aggregates:				
domestic assets (in %)	-0.57	-0.10	-0.13	-0.37
share of professionally inactive (those with children, in pp.)	1.71	0.38	4.37	3.64
output (in %)	-0.16	-0.02	0.28	-0.05
adult consumption (in %)	0.40	0.09	1.11	0.52
expenditure on children (in %)	-4.18	-0.85	-6.38	-4.40
changes in child-related statistics (in %):				
average child quality	-1.42	-0.36	-1.37	-0.38
adjusted to changes in temporal fertility: average expenditure per child	1.84	0.54	5.57	2.91
average time spent per child	3.30	0.79	5.14	4.30
changes in overall welfare (in %)	0.42	0.20	0.41	0.64
attributed to adult consumption	-0.06	0.04	0.38	0.24
attributed to child quality	0.48	0.15	0.03	0.40
changes in Gini coef. (in pp.)				
for all households: equivalized disposable income*	-0.25	-0.07	-0.09	-0.35
equivalized consumption	-0.04	-0.02	-0.02	-0.20
assets	-0.32	-0.10	-0.19	0.02
for households with children: equivalized disposable income	-0.35	-0.12	0.16	-0.94
equivalized consumption	-0.09	-0.01	0.39	-0.22
assets	0.65	-0.08	2.42	1.97

Notes: * - to calculate equivalized measures, the modified OECD equivalence scale that gives 1.5 for two adults and 0.3 for each additional child is used.

Taxing pension benefits to finance the children's allowance redistributes income from older to younger cohorts. The additional income of working-age families is mainly allocated to child-related expenditures. The average per-child spending, adjusted for changes in temporal fertility, rises by 2.4% due to universal child benefits, compared to the increase of 1.84% in the baseline simulations. As a result, the total reduction in average child quality stands at 1.27%, which is 0.15 percentage points lower than in the scenario with pensions exempt from taxation. Subsequently, the improvement in welfare due to the children's allowance increases to 0.7% of lifetime adult consumption.

As this taxation scheme negatively affects retirees, whose household income tends to be relatively low income, it also lessens the ameliorating effect of universal child benefits on income inequality. Specifically, the drop in the Gini coefficient for (equivalized) income is about one-third lower compared to the baseline scenario. The impact of the program on consumption inequality is slightly higher, but still relatively moderate.

Taxing capital income The financing of universal child benefits by capital income taxation results in retired households contributing one fifth of the total funding for the program (Table 11). Taxing capital income reduces the effective rate of return on capital, making saving less profitable, which in turn decreases the opportunity costs of parenting. As a result, the estimated impact of universal child benefits on temporal fertility is slightly stronger for this type of financing compared to the baseline simulations. However, as capital income taxation has a distortionary character, it disincentivizes households from accumulating savings, thereby reducing overall economic efficiency. Indeed, in this scenario, a decline in aggregate output due to universal child benefits increases to 0.68%.

Since labor income is now not subject to taxation other than the tax on pension contributions, the relative price of work is higher than in the baseline simulations, and households tend to work more. Although the share of professionally inactive women with children remains higher with universal child benefits in place, the aggregate effective labor supply increases. Moreover, households allocate a relatively high share of their disposable income to current consumption, which is detrimental to average child quality. On the other hand, the changes in the distribution of adult consumption in favor of younger cohorts are found to be welfare improving. The total welfare effect of universal child benefits financed by capital income tax is estimated at 0.63%, which is 0.21 percentage points higher than in the baseline simulations.

Similarly to the previous financing scheme, the impact of the transfers on income inequality is lower in this case than in the baseline scenario. However, as the propensity to save decreases, even for childless households, we observe a stronger impact on consumption inequality. Universal child benefits reduce the Gini coefficient for equivalized consumption and households with children by 0.2 percentage points, twice as much as if labor income were subject to taxation.

Taxing consumption Compared to other taxation schemes analyzed in this paper, taxing consumption to finance universal child benefits results in the highest degree of intercohort redistribution (Table 11). Indeed, retired households effectively cover 35% of all program expenses. While the effect of universal child benefits on temporal fertility in this scenario is of a similar magnitude to previous simulations, the program is no longer detrimental to aggregate output. This follows from the following adjustments. First, the reduction in domestic assets is less profound for this taxation scheme, mostly because the savings of older households increase due to the income effect. Second, similarly to the scenario with capital income taxation, there is no additional tax on wages, so the opportunity costs of not working are higher. As a result, total effective labor supply increases more than in the baseline simulations.

With consumption tax, the drop in average child quality stemming from universal child benefits is the lowest among the financing policies considered in this paper. The extra resources from the program are mostly spent on consumption. Additionally, this taxation method generates the highest ex-ante welfare gain from universal child benefits, equal to 0.84%. The increase in the gain relative to the baseline simulations is primarily attributed to changes in life-cycle allocation of adult consumption, more favorable to younger cohorts.

Redistribution from low-income pensioners to the working-age population incorporated in this taxation method reduces the impact of universal child benefits on income inequality by around half compared to the baseline simulations. The reduction of consumption inequality is somewhat larger in this case but still relatively moderate and smaller than when capital income taxation is applied.

Table 11: Effects of the universal child benefit under different financing schemes

	taxation of			
	labor income (baseline)	labor income and pensions	capital income	consumption
tax contribution (in %) of:				
child-free working households	63.6	46.4	46.0	34.2
retired households	0.0	27.1	20.4	35.6
changes in temporal fertility (in months):				
mean age at birth (all births)	-8.7	-8.9	-9.2	-9.0
mean age at birth of first child	-7.8	-8.1	-8.2	-8.1
mean age at birth of second child	-13.6	-13.9	-14.5	-14.0
changes in aggregates:				
domestic assets (in %)	-0.57	-0.30	-2.31	-0.13
share of professionally inactive (those with children, in pp.)	1.71	1.50	1.13	1.33
output (in %)	-0.16	-0.05	-0.68	0.03
adult consumption* (in %)	0.40	0.43	0.13	0.47
expenditure on children* (in %)	-4.18	-3.70	-4.05	-3.49
changes in child-related statistics (in %):				
average child quality	-1.42	-1.27	-1.58	-1.23
adjusted to changes in temporal fertility: average expenditure per child	1.84	2.42	2.20	3.37
average time spent -per child	3.30	3.12	2.85	2.98
changes in overall welfare (in %)	0.42	0.70	0.63	0.84
attributed to adult consumption	-0.06	0.12	0.10	0.24
attributed to child quality	0.48	0.57	0.53	0.60
changes in Gini coef. (in pp.)				
for all households: equivalized disposable income**	-0.25	-0.16	-0.13	-0.15
equivalized consumption	-0.04	-0.07	-0.16	-0.10
assets	-0.32	-0.33	-0.00	-0.22
for households with children: equivalized disposable income	-0.35	-0.35	-0.31	-0.33
equivalized consumption	-0.09	-0.12	-0.20	-0.13
assets	0.65	0.79	1.16	0.91

Notes: * - after tax; ** - to calculate equivalized measures, the modified OECD equivalence scale that gives 1.5 for two adults and 0.3 for each additional child is used.

5.5 Additional discussion

There are a few assumptions in this study that warrant discussion. Firstly, the model assumes that changes in child quality do not have a direct impact on the child's future productivity at work. The definition of child quality adpoted in this paper encompasses all the investments in a child's overall well-being, not only those aimed at enhancing productivity-related skills. Therefore, the relationship between child quality and future earnings is complex, but a modest positive correlation can be expected. Much work has been done on the family background and future achievements of children (see among others Björklund, Lindahl, and Plug, 2006; Björklund and Salvanes, 2011). However, further research is needed to obtain reliable estimates and fully comprehend the causal effect of the overall quality of life during childhood on future earnings.

Furthermore, some studies have shown that the timing of entry into motherhood can have an impact on subsequent earnings (see Miller, 2011; Taniguchi, 1999; Herr, 2016). The relationship, however, is heterogeneous in nature. For instance, as demonstrated by Herr (2016), there are cases where having a child before entering the labor market can be more beneficial for future earnings compared to interrupting a career after a few years of work. Nevertheless, there is a general consensus that establishing a career and investing in skills before becoming a parent positively influence future earnings which the model does not take into account.

6 Summary

In this paper, I develop a general equilibrium, heterogeneous agent model with endogenous temporal fertility, infertility shocks, and earnings risk. The model is calibrated to a typical EU economy and serves to analyze the long-term welfare, aggregate, and redistributive effects of universal child benefits. The size of the benefit is set to reflect current policies in Europe.

The main findings of the study are as follows. Universal child benefits affect temporal fertility, leading to a decrease in the spacing between children and, on average, a lower maternal age at childbirth for all births. This, in turn, mitigates some of the negative aggregate effects associated with redistributive policies but also reduces average child quality and lowers the effectiveness of the benefits in reducing consumption inequality. According to the model simulations, universal child benefits increase ex-ante welfare by

0.42% of lifetime adult consumption, which is almost four times as much as the welfare gain from simple universal transfers not linked to the number of children.

A long-term perspective offers valuable insights that cannot be derived solely on the basis of current empirical data. Indeed, the increase in fertility observed shortly after universal child benefits are implemented may not necessarily affect the total fertility rate, but rather reflect changes in the temporal fertility pattern. Moreover, previous studies consistently show that a universal child benefits program has a negative impact on women's labor supply. This paper confirms those findings in the short term, as women with children are found to work less as a result of the program. However, in the long term, when the effects of changes in temporal fertility become fully apparent, the labor supply of women might be even higher than in an economy without universal child benefits, as demonstrated in the model.

The shift in temporal fertility due to universal child benefits generates a positive externality for older households. Indeed, as parents are younger when their children reach independence, they have more time left to focus on work and the accumulation of retirement savings. This, in turn, results in higher consumption by retirees. The paper raises the question of whether older households should contribute to the costs of universal child benefits. This can be done by different taxation schemes. Replacing labor income taxation as a source of financing for universal child benefits can positively affect labor supply. Since taxing capital gains has distortionary effects on assets, a flat consumption tax seems to be a better alternative. Indeed, as illustrated by the model simulations, such a financing scheme allows universal child benefits to generate higher welfare gains and, at the same time, does not lead to a worsening of economic efficiency. However, it is important to note that the model assumes a relatively generous pension system, and the findings might not apply to countries with low pension replacement rates and financially constrained pensioners.

The discussion earlier in the paper acknowledges that the actual gains resulting from the universal child benefit might be lower than the model implies. Without a doubt, eliminating financial obstacles that contribute to excessive spacing between children can yield significant economic and welfare improvements. Moreover, policies that prioritize having children with a smaller age difference, rather than providing general fertility incentives, can mitigate some of the negative effects of universal child benefits, such as having a child at an early stage in one's career. This can be achieved by limiting eligibility for the children's allowance to families with a minimum of two children. As shown in this paper, such a modified program can have a positive impact on total effective labor supply and aggregate output, while generating effects on average child quality and ex-ante welfare similar to universal child benefits. Nevertheless, this also leads to a less equitable distribution of wealth among families with children.

Finally, linking the payments from the allowance to a household's financial situation adds an additional insurance channel against low earnings. It strengthens the redistributive and welfare consequences of child benefits while being less detrimental to average child quality. However, it also creates stronger work disincentives for parents with low earnings.

References

AIYAGARI, S. R. (1994): "Uninsured idiosyncratic risk and aggregate saving," *The Quarterly Journal of Economics*, 109(3), 659–684.

ANANAT, E., B. GLASNER, C. HAMILTON, AND Z. PAROLIN (2022): "Effects of the expanded child tax credit on employment outcomes: Evidence from real-world data from April to December 2021," Discussion paper, National Bureau of Economic Research.

BÄCKMAN, O., AND T. FERRARINI (2010): "Combating child poverty? A multilevel assessment of family policy institutions and child poverty in 21 old and new welfare states," *Journal of Social Policy*, 39(2), 275–296.

BAKER, M., D. MESSACAR, AND M. STABILE (2023): "Effects of child tax benefits on poverty and labor supply: Evidence from the Canada child benefit and universal child care benefit," *Journal of Labor Economics*, 41(4), 1129–1182.

BAUDIN, T., D. DE LA CROIX, AND P. E. GOBBI (2015): "Fertility and childlessness in the United States," *American Economic Review*, 105(6), 1852–1882.

BECKER, G. S., AND H. G. LEWIS (1973): "On the interaction between the quantity and quality of children," *Journal of Political Economy*, 81(2, Part 2), S279–S288.

BEWLEY, T. (1983): "A difficulty with the optimum quantity of money," *Econometrica: Journal of the Econometric Society*, 51(5), 1485–1504.

Björklund, A., M. Lindahl, and E. Plug (2006): "The origins of intergenerational associations: Lessons from Swedish adoption data," *The Quarterly Journal of Economics*, 121(3), 999–1028.

Björklund, A., and K. G. Salvanes (2011): "Education and family background: Mechanisms and policies," in *Handbook of the Economics of Education*, vol. 3, pp. 201–247. Elsevier.

Brindle, D. (2010): "Child benefit: a potted history," *The Guardian*, Extracted on 01/12/24.

Choi, S. (2017): "Fertility risk in the life cycle," *International Economic Review*, 58(1), 237–259.

Christiansen, N. F. (2006): *The Nordic model of welfare: A historical reappraisal*. Museum Tusculanum Press.

Conesa, J. C., S. Kitao, and D. Krueger (2009): "Taxing capital? Not a bad idea after all!," *American Economic Review*, 99(1), 25–48.

Cortés, P., and J. Pan (2020): "Children and the remaining gender gaps in the labor market," Discussion paper, National Bureau of Economic Research.

Doepke, M., A. Hannusch, F. Kindermann, and M. Tertilt (2022): "The economics of fertility: A new era," Discussion paper, National Bureau of Economic Research.

Dunson, D. B., D. D. Baird, and B. Colombo (2004): "Increased infertility with age in men and women," *Obstetrics & Gynecology*, 103(1), 51–56.

Fan, C. S., and O. Stark (2008): "Looking at the 'population problem' through the prism of heterogeneity: Welfare and policy analyses," *International Economic Review*, 49(3), 799–835.

Garfinkel, I., L. Sariscsany, E. Ananat, S. Collyer, R. P. Hartley, B. Wang, and C. Wimer (2022): "The benefits and costs of a child allowance," *Journal of Benefit-Cost Analysis*, 13(3), 335–362.

Goldin, C., S. P. Kerr, C. Olivetti, and E. Barth (2017): "The expanding gender earnings gap: Evidence from the LEHD-2000 Census," *American Economic Review*, 107(5), 110–114.

González, L. (2013): "The effect of a universal child benefit on conceptions, abortions, and early maternal labor supply," *American Economic Journal: Economic Policy*, 5(3), 160–188.

González, L., and S. K. Trommlerová (2023): "Cash transfers and fertility: How the introduction and cancellation of a child benefit affected births and abortions," *Journal of Human Resources*, 58(3), 783–818.

Guner, N., R. Kaygusuz, and G. Ventura (2020): "Child-related transfers, household labour supply, and welfare," *The Review of Economic Studies*, 87(5), 2290–2321.

Guvenen, F., L. Pistaferri, and G. L. Violante (2022): "Global trends in income inequality and income dynamics: New insights from GRID," *Quantitative Economics*, 13(4), 1321–1360.

Herr, J. L. (2016): "Measuring the effect of the timing of first birth on wages," *Journal of Population Economics*, 29, 39–72.

Huggett, M. (1993): "The risk-free rate in heterogeneous-agent incomplete-insurance economies," *Journal of economic Dynamics and Control*, 17(5-6), 953–969.

Immervoll, H., H. Sutherland, and K. de Vos (2001): *Reducing child poverty in the European Union: the role of child benefits*pp. 407–432. Policy Press, Bristol, UK.

Kalbarczyk, M., A. Miazga, and A. Nicińska (2017): "The inter-country comparison of the cost of children maintenance using housing expenditure," *Statistics in Transition New Series*, 18(4), 687–699.

Kleven, H., C. Landais, and J. E. Søgaard (2019): "Children and gender inequality: Evidence from Denmark," *American Economic Journal: Applied Economics*, 11(4), 181–209.

Kolasa, A. (2017): "Life Cycle Income and Consumption Patterns in Poland," *Central European Journal of Economic Modelling and Econometrics*, 9(2), 137–172.

Komada, O. (2023): “Raising America’s future: search for optimal child-related transfers,” Discussion paper, GRAPE Group for Research in Applied Economics.

Kreyenfeld, M., and D. Konietzka (2017): *Childlessness in Europe: Contexts, causes, and consequences*. Springer Nature.

Livingston, G., and D. Cohn (2010): “Childlessness up among all women; Down among women with advanced degrees,” A social & demographic trends report, Pew Research Center, Washington, DC.

Magda, I., A. Kiełczewska, and N. Brandt (2020): “The effect of child benefit on female labor supply,” *IZA Journal of Labor Policy*, 10(1), 1–18.

Marx, M., B. Mojon, and F. R. Velde (2021): “Why have interest rates fallen far below the return on capital?,” *Journal of Monetary Economics*, 124, 57–76.

Miller, A. R. (2011): “The effects of motherhood timing on career path,” *Journal of Population Economics*, 24, 1071–1100.

Mills, M., R. R. Rindfuss, P. McDonald, E. Te Velde, E. Reproduction, and S. T. Force (2011): “Why do people postpone parenthood? Reasons and social policy incentives,” *Human Reproduction Update*, 17(6), 848–860.

ODI/UNICEF (2020): *Universal child benefits: Policy issues and options*. London: Overseas Development Institute and New York: UNICEF.

OECD (2023): “Net Pension Replacement Rates (Indicator),” [Accessed on 08 May 2023].

Population Europe (2022): *European Demographic Data Sheet 2022*. Wittgenstein Centre for Demography and Global Human Capital, Vienna.

Rainer, H., S. Bauernschuster, N. Danzer, A. Fichtl, T. Hener, C. Holzner, and J. Reinkowski (2014): “Child benefit and child allowances in Germany: Their impact on family policy goals,” *CESifo DICE Report*, 12(1), 37–45.

Riphahn, R. T., and F. Wiynck (2017): “Fertility effects of child benefits,” *Journal of Population Economics*, 30, 1135–1184.

Schirle, T. (2015): “The effect of universal child benefits on labour supply,” *Canadian Journal of Economics/Revue canadienne d’économique*, 48(2), 437–463.

SOBOTKA, T., A. MATYSIAK, AND Z. BRZOZOWSKA (2019): "Policy responses to low fertility: How effective are they," *United Nations Population Fund*.

SOMMER, K. (2016): "Fertility choice in a life cycle model with idiosyncratic uninsurable earnings risk," *Journal of Monetary Economics*, 83, 27–38.

STORESLETTEN, K., C. I. TELMER, AND A. YARON (2004): "Consumption and risk sharing over the life cycle," *Journal of Monetary Economics*, 51(3), 609–633.

TANIGUCHI, H. (1999): "The timing of childbearing and women's wages," *Journal of Marriage and the Family*, 61(4), 1008–1019.

ZHOU, A. (2022): "The macroeconomic consequences of family policies," *Available at SSRN*, 3931927.

7 Supplementary Appendix

7.1 Stationary equilibrium

Let suppress a household state into $x = (j, a, e, \bar{z}_l, f, \upsilon, n_{-1}, n^*, \varpi)$, and define a state space $\{J_0, 2, \ldots, J_{\max}\} \times [0,\infty) \times [0,\infty) \times [0,\infty) \times \{0,1,2\} \times \{0,1\} \times \{0,1,2,3,4\} \times \{0,1,2,3,4\}$ $\times\{0{,}1{,}2{,}3{,}4\}\times\{0,1\}^3$, and the borel σ-algebra on X as $\Xi(X)$. Denote by $\mu(X)$ a probability measure of households with state $x \in X$.

Definition. Given the government transfer Θ, a **stationary equilibrium** for the model economy consists of households policy functions $c_p(x),\ c_k(x),\ l_k(x),\ n_{\text{new}}(x)$ and $a'(x)$, factor prices $(w,\ r)$, the tax rates $(\tau_c,\ \tau_a,\ \tau_l(x),\ \tau_l^{ss})$, the value of accidental bequests $\flat$, macroeconomic aggregates $(K,\ L,\ \bar{w})$, the distribution function Q, and the population growth rate ξ such that:

1. Households' individual choices sum up to aggregate values:

$$L = \frac{1}{w}\int (1 - 0.5 l_k(x)) z_l(e, j, l_k(x)) d\mu,$$

$$\bar{w} = \left(0.5 \int z_l(e, j, l_k(x))\, (1 + (1 - l_k(x))\, I(l_k(x) < l_{\text{full-min}}))\, d\mu\right) \ldots$$

$$.../\left(\int\left(1+I(l_k(x)<l_{\text{full-min}})\right)d\mu\right)$$

$$A=(1+\xi)^{-1}\int a'(x)d\mu,$$

$$C=\int\left(c_p(x)+c_k(x)\right)d\mu,$$

$$\flat=(1+\xi)^{-1}\int(1+r)\left(1-s(j)\right)a(x)d\mu,$$

where $I(\dots)$ is a binary indicator function.

2. The government's budget is balanced:

$$\tau^{ss}Lw=\int\theta\bar{z}_l I(j\geq J_{\text{ret}})d\mu,$$

$$\tau_a A+\tau_c C+(1-\tau_l^{ss})w\int\tau_l(j)(1-0.5l_k(x))e(j)\bar{e}d\mu=...$$

$$...\int\Theta\left(n\left(n_{-1},n_{\text{new}}(x),\varpi\right)-n_{\text{new}}(x),n_{\text{new}}(x),j,e\right)d\mu.$$

3. Factor prices equal their marginal products:

$$\partial Y/\partial L=w\quad\text{and}\quad\partial Y/\partial K=r+\delta.$$

4. Given $w,\ r,\ \bar{w},\ \tau_c,\ \tau_a,\ \tau_l(j),\ \tau^{ss}$, and $\flat$, policy functions $c_p(x),\ c_k(x),\ l_k(x),\ n_{\text{new}}(x)$ and $a'(x)$ are consistent with the value functions.

5. Aggregate resource constraint holds

$$Y=C+K(\delta+(1+\xi)-1),$$

$$K=A.$$

6. There exists ξ that satisfies the Euler–Lotka equation, given the survival probabilities $s(j)_{j=J_0,\dots,J_{\max}}$ and age-specific fertility rates $\text{FR}(j)$ consistent with optimal

choices $n_{\text{new}}(x)$:

$$\text{FR}(j_i) = \left(\int n_{\text{new}} I(j = j_i) d\mu \right) / \left(\int I(j = j_i) d\mu \right), \quad \text{for} \quad i = J_1, \ldots, J_1 + 3.$$

7. The household distribution coincides with household choices:

$$\mu(x_0) = \int_{x_0} \left(\int_X Q(x, x') I(j' = j + 1) d\mu \right) d\mu', \ \forall x_0 \in \Xi,$$

where Q is a conditional probability of transiting to the state x' in the next period for a household of a current state x.

University of Warsaw
Faculty of Economic Sciences
44/50 Długa St.
00-241 Warsaw
www.wne.uw.edu.pl