Universal Child Benefit and Child Poverty: The Role of Fertility Adjustments*

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Abstract

I study fertility adjustments after the introduction of a large universal child benefit in Poland. The program caused a six percent increase in the number of births. Patterns of selection into parenthood changed significantly and persistently, with a weakening of positive selection based on education and a strengthening of negative selection based on income. The share of births in the bottom half of the income distribution increased from 51 percent to 58 percent. Using a microsimulation approach, I combine changes in the births structure with existing estimates of the transfer's effect on labor supply to study the impact of these adjustments on poverty reduction. These impacts are very small due to the exceptional generosity of the transfer, but they become more pronounced in the middle of the income distribution.

JEL classification: J13, H31, I38

Keywords: fertility, child benefit, unconditional cash transfer, poverty

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Introduction

Universal child benefits paid for each child, regardless of parental income, have become an important element of safety net in many high-income countries. These transfers serve two main goals. First, they are used to reduce child poverty by increasing increasing families' unearned incomes. Second, they are intended to encourage fertility by lowering the cost of having children. However, these two goals may be to some extent contradictory if the incentives to increase fertility are strongest among lower-income households. In addition, universal transfers may reduce parental labor supply due to negative income effects, further diminishing the extent of poverty reduction.

This paper investigates the role of labor supply and fertility adjustments in limiting the scale of poverty reduction associated with a universal child benefit. The rapid introduction of an exceptionally generous monthly universal child benefit in Poland created a unique setting to study the effects on child poverty. Since April 2016, families have been entitled to a monthly cash transfer of approximately 125 dollars per child for their second and subsequent children (40 percent of the net minimum wage). In July 2019, the program was expanded to include first children as well.

The introduction of a universal cash transfer affects fertility through both the price effect (reducing the monthly cost of each additional child by 125 dollars) and the income effect, which combines the increased income from children already born and potential additional children (Komada, 2024). The price channel has straightforward implications: since the cost of a child is positively correlated with household income (e.g., foregone earnings due to childbearing, spending on private education), the lump-sum payment should have the strongest price effects at the bottom of the income distribution. The income channel is more ambiguous. Although children are usually perceived as a normal good, Becker and Tomes (1976) argue that the income elasticity may be U-shaped, with negative elasticity at the bottom of the income distribution. This is because, for the poorest families, the income effects on the demand for the quality of children may outweigh the income effects on the demand for the quantity of children. The U-shaped pattern is consistent with the cross-country variation in fertility rates across high-income countries (Doepke et al., 2023). Micro-level studies tend to find very small income effects and large price effects (Cohen et al., 2013; González, 2013).

I document two key facts about fertility adjustments following the introduction of the child benefit program in Poland. First, there was an immediate six-percent increase in the number of births nine months after the program's announcement. The implied fiscal cost of each additional birth was equal to approximately 389,000 dollars. Second, I find substantial and persistent changes in the structure of births. Prior to the program's introduction, there were no differences in birth rates between the bottom half and the top half of the income distribution. After the program's introduction, birth rates among low-income couples became substantially higher than those among high-income couples. Consequently, the bottom half of the income distribution accounted for 58 percent of all births, compared to 51 percent before the program was introduced.

Using a microsimulation approach, I analyze the contribution of fertility and labor supply adjustments to the poverty reduction associated with the introduction of the universal child benefit for each child. I use estimates of the labor supply effects of the universal child benefit obtained by Gromadzki (2024), who found that for every 100 dollars in monthly child benefit, households reduced their earnings by 25 dollars. I additionally show the results for more modest propensities found in Sweden (Cesarini et al., 2017) and large propensities found in the U.S. (Golosov et al., 2024). To examine the role of fertility adjustments, I use the post-introduction birth structure as a counterfactual scenario for the pre-treatment period. While these fertility adjustments cannot be interpreted causally, they likely provide an upper bound for the true fertility effects, as the variation in birth rate changes depending on couples' income documented in this paper is stronger than in previous studies.

I find that, in the absence of behavioral responses, the additional income from the child benefit would reduce child poverty by 11 percentage points, lifting three out of the four poor children out of poverty. Negative labor supply responses have very limited impact on poverty reductions because of the generosity of the transfer in relation to the poverty line. Even with a complete crowding out of parental earnings, all couples with four or more children are lifted out of the poverty. Despite significant fertility adjustments, their contribution to poverty reduction is very small, reducing the extent of poverty reduction by less than three percent.

This paper is related to the literature on the fertility effects of child benefits in low-fertility countries. Existing quasi-experimental studies consistently find that child benefits significantly increase fertility (Cohen et al., 2013; Cowan and Douds, 2022; Elmallakh, 2023; González, 2013; González and Trommlerová, 2023; Malkova, 2018; Milligan, 2005). I follow the time discontinuity strategy used by González (2013) to estimate the immediate effects of the program's announcement on births. Compared to existing studies, I analyze a much larger shock, both in absolute terms and relative to average incomes. For example, González (2013) studies a one-time payment of 3,900 dollars, whereas the monthly child benefit payments in Poland total 27,000 dollars over 18 years. An additional contribution of my paper to this literature is the study of changes in the structure of births depending on couples' income. Existing results regarding the correlation between the magnitude of fertility effects and income are mixed (Cohen et al., 2013; González and Trommlerová, 2023; Milligan, 2005). Finally, I provide novel evidence on the variation in adjustments in birth rates depending on harmful spending (alcohol, cigarettes, and unhealthy foods). Unlike some other studies, I show that these fertility adjustments are persistent (Bergsvik et al., 2021).

This study also contributes to the literature on the effects of child benefits on poverty. Previous studies show that expansions of existing transfers substantially reduce child poverty (Baker et al., 2023; Hoynes and Patel, 2018). Most recently, the expansion of the Child Tax Credit in the U.S. led to a dramatic decline in child poverty rates (Ananat et al., 2022; Pilkauskas et al., 2022). This paper offers a cleaner setting than previous studies, as it examines the impact of introducing a universal child benefit rather than changes to existing programs. For example, although the expanded Child Tax Credit was effectively a universal cash transfer, the amount of additional income received varied depending on household income. In contrast, I use a setting with two clearly different scenarios: one with no child benefit and one with a large universal child benefit. Additionally, existing studies focus on poverty reductions among households with children already born, overlooking the fertility effects of the transfer. I show that, despite sizable fertility adjustments, their contribution to poverty reduction is very small, in contrast to the significant contribution of adverse labor supply responses.

Institutional background

Following the parliamentary elections in Poland in October 2015, the child benefit program was rapidly implemented. The law introducing the program was passed by parliament in

February 2016, and by April of that year, parents could begin applying for the benefit, receiving payments for the month in which they applied. The program consisted of two main components. All households were entitled to a monthly cash transfer of approximately 125 dollars (500 PLN) per child for the second child and each subsequent child from birth until the age of 18 (universal child benefit). Additionally, there was a means-tested component of the child benefit: households could receive the transfer of the same amount for their first child if their per capita household income did not exceed 215 dollars. In June 2019, the means-tested component was replaced with an unconditional transfer for the first child, making the program fully universal. Since then, parents have been entitled to a monthly cash transfer of 125 euros per child for each child under 18. Therefore, over a period of 18 years, the total payments a family could expect to receive per child amounted to approximately 27,000 dollars. Throughout the study period, there were no changes in the nominal value of the transfer. The real value of the transfer slightly declined over the period, as the average annual inflation rate was equal to around 2.5 percent. Receiving the child benefits did not affect households' eligibility for existing social assistance programs, and the additional income was not subject to income tax. Over 2.5 million households in Poland received child benefits.

The amount of the benefit per child was exceptionally generous, as it was equal to 34 percent of the per capita disposable income among families with children. In the first year, the annual cost of the program amounted to 1.2 percent of GDP. Before the introduction of the family benefit program, Poland belonged to the European Union countries with the lowest spending on family benefits (Figure 1). After the introduction of the program, Poland became the fourth EU country with the highest spending on family benefits. The increase in government spending occurred in two stages: the introduction of the child benefit program in 2016 and the expansion of the program in the second half of 2019. While several other EU countries introduced unconditional child benefits in the past, the size of the shock is unprecedented.

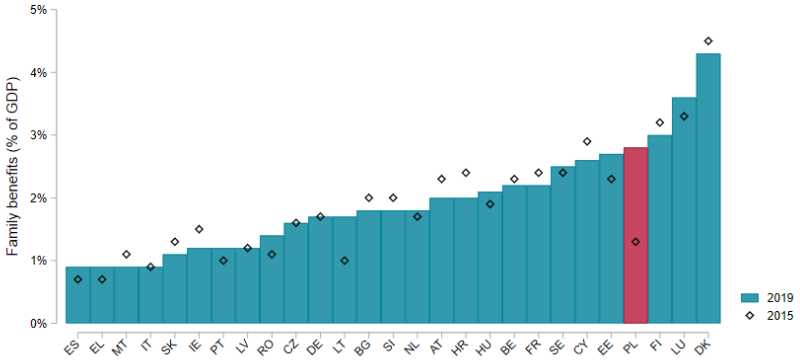
Najsztub and Brzeziński (2017) abstract from behavioral adjustments and use a microsimulation approach to assess the direct effects of the 2016 child benefit program on poverty. In the absence of labor supply and fertility adjustments, they predict a reduction in child poverty in the range of 75-100 percent. Bokun (2024) shows that after the introduction of child benefit, birth rates among women with at least one previous birth increased relative to similar women with no children. The remaining evaluation studies of the Polish child benefit program have primarily focused on its impact on parental labor supply. Initially, the child benefit program had negative effects on the labor force participation of mothers (Magda et al., 2020; Premik, 2022), but the expansion of the program likely reduced these negative labor supply effects (Myck and Trzciński, 2019), as it replaced the means-tested cash transfer for the first child with an unconditional transfer. Gromadzki (2024) estimates that for every extra 100 dollars in unconditional child benefit households received, they reduced their earnings by 25 dollars. Negative labor supply effects were concentrated among households with a low socioeconomic status. The introduction of the transfer substantially reduced child poverty and increased educational enrollment of adult children in treated households.

Data

In the analysis of the short-term fertility effects, I use administrative data on the number of births published by Statistics Poland. In the remainder of the paper, I use repeated cross-section data from the Polish Household Budget Survey (HBS), the largest survey providing detailed information on monthly incomes and expenditures of households in Poland. Moreover, the survey data include demographic information on all household members and individual income data for members over the age of 16. All variables related to income and expenditures are expressed in national currency (PLN).

In the HBS data, I identify births using information on the age of household members and their family relationships. In my study, I focus on partnered women aged 25-39 and select households in which there is only one partner woman within that age range. In addition, I exclude households with non-zero income from a farm because agricultural income is difficult to capture in monthly data. The survey provides information on all children of a given woman in the household. At the individual level, I construct a dummy variable, B_i, which is equal to one if the woman has a child under one year old, and zero otherwise. Hence, this variable measures the occurrence of a birth in the last 12 months rather than in a specific survey year. This introduces a lag of up to 12 months, which is important to consider when interpreting the results. Namely, when thinking about the effects of the child benefit program on fertility, one must account for the time between conception and birth, as well as the lag between birth and the survey interview. All births recorded in the survey in 2018 are potentially endogenous

(a) Government spending on family benefits in the European Union (2015 vs. 2019)



(b) Government spending on family benefits in Poland and the Euro Area (2011-2021)

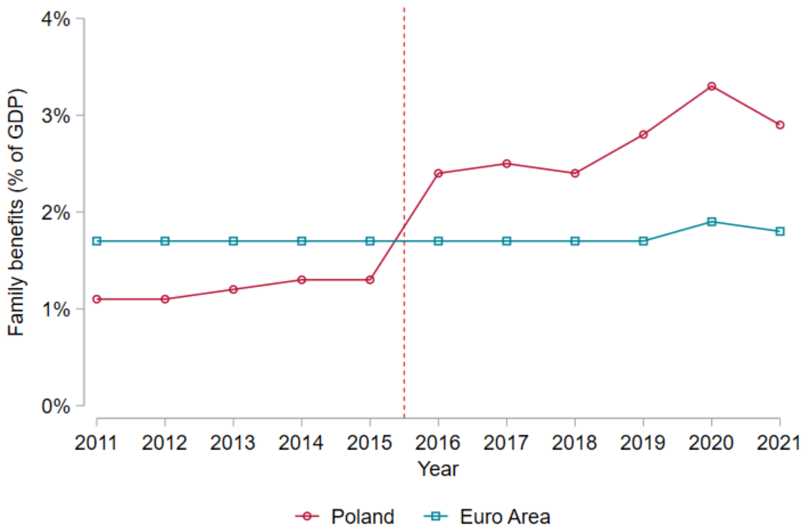


Figure 1: Government spending on family benefits as a % of GDP

Notes: Figure shows the government spending on family benefits as a percentage of GDP.
Data: Eurostat

to the introduction of the child benefit program, while not all births recorded in 2017 are endogenous, and only a tiny share of births recorded in the survey in 2016 can be considered endogenous.

In this study, I study fertility adjustments across the income distribution. I use equivalized couple earnings as the primary measure of income. The variable includes income from paid employment and business activity (including self-employment). I focus on earned income as a measure of income because social benefits are tightly linked to household size, as well as the number and age of children (including the child benefit). I exclude the earnings of other household members because fertility decisions are made by the couple based on their pooled resources. I use modified OECD equivalence scales to construct the income variable, taking into account parents and the number of their children aged 1-17.[1] In robustness checks, I also present results using alternative measures of income, such as total couple earnings and equivalized father's earnings. Throughout the study, I adjust all income and expenditure variables for inflation.

Short-term fertility effects

If the policy was effective, we would expect couples to increase their fertility immediately after November 18, 2015, when the new Polish Prime Minister announced the introduction of the child benefit in her inaugural speech. Since we do not observe conceptions, we rely on administrative data on the monthly number of births published by Statistics Poland. Given that over 80 percent of children are born nine months after the conception (GUS, 2018), I treat August 2023 as the cutoff month. Following González (2013), I use regression discontinuity approach to test for a discrete jump in the number of births nine months after the announcement of the program. I estimate the standard regression discontinuity equation:

$$\tilde{\text{Births}}_t = \alpha + \theta \text{PostTreatment}_t + p(m_t) + \epsilon_t \tag{1}$$

where $p(m_t)$ is a polynomial of the running variable (linear or quadratic depending on the bandwidth). The running variable is time expressed in months. Coefficient θ measures the discontinuity in the number of births. The dependent variable, $\tilde{Births}_t$, is the natural log of births in a given month. I divide the number of births by the number of days to account for the variation in month length. In addition, since births exhibit significant seasonal patterns,

[1] The number of children aged zero years old is not included in the variable because it is used to construct the main outcome variable.

$\tilde{Births}_t$ are the residuals obtained from a regression of the natural log of births in a given month on the month-of-the-year dummies estimated for the pre-introduction period.

Table 1: Short-term effects on births

	10 years (1)	5 years (2)	12-12m (3)	9-9m (4)	3-3m (5)
Births	0.068***	0.054***	0.060***	0.056***	0.052***
	(0.011)	(0.015)	(0.019)	(0.016)	(0.012)
Observations	120	60	24	18	6
Years included	2010-2019	2014-2018	2015-2017	2015-2017	2016
Linear trend in m	Y	Y	Y	Y	Y
Quadratic trend in m	Y	Y	Y	N	N

Notes: Table shows RD estimates with various bandwidths. The dependent variable is the log number of births (residuals from the regression of log births on the month-of-the-year dummies). The "m" stands for months. In all regressions, I include a linear trend of the running variable. For bandwidths longer than 9 months, I additionally include a quadratic trend. Heteroskedasticity-robust standard errors are reported.

Births increased significantly nine months after the announcement of the introduction of the transfer (Table 1). The effects are very stable across specifications with various bandwidths, indicating an increase in the number of births ranging from 5 to 7 percent. Figure 2 visualizes these effects by showing the dependent variable in bimonthly bins. There is a clear jump around August 2016, with virtually no trend in the number of births on both sides of the cutoff month. In robustness checks, I use alternative definitions of the dependent variable (simple differences from the corresponding month in 2010 and annual growth) and find effects that are in line with the baseline results (Tables A.1-A.2).

The estimates of fertility effects can be used to calculate the cost of an extra birth. The child benefit of 125 dollars is paid monthly until the child is 18 years old. Hence, the nominal value of the child benefit is equal to 27,000 dollars. Following Golosov et al. (2024), I use an annual discount rate of 2.5 percent. Hence, the present value of the child benefit is equal to approximately 22,000 dollars, making the fiscal cost of an extra birth equal to 389,000 dollars. This figure is substantially higher than the cost of an extra birth estimated by González (2013), who found that the fiscal cost of an extra birth in the Spanish one-time child subsidy program was equal to 81,000 dollars.[2]

[2] González (2013) estimates a six-percent increase in births due to a one-time child subsidy of 3,900 dollars. I calculate the cost of an extra birth and adjust it for inflation (2007-2016): $3900 \times \frac{1.06}{0.06} \times 1.175$.

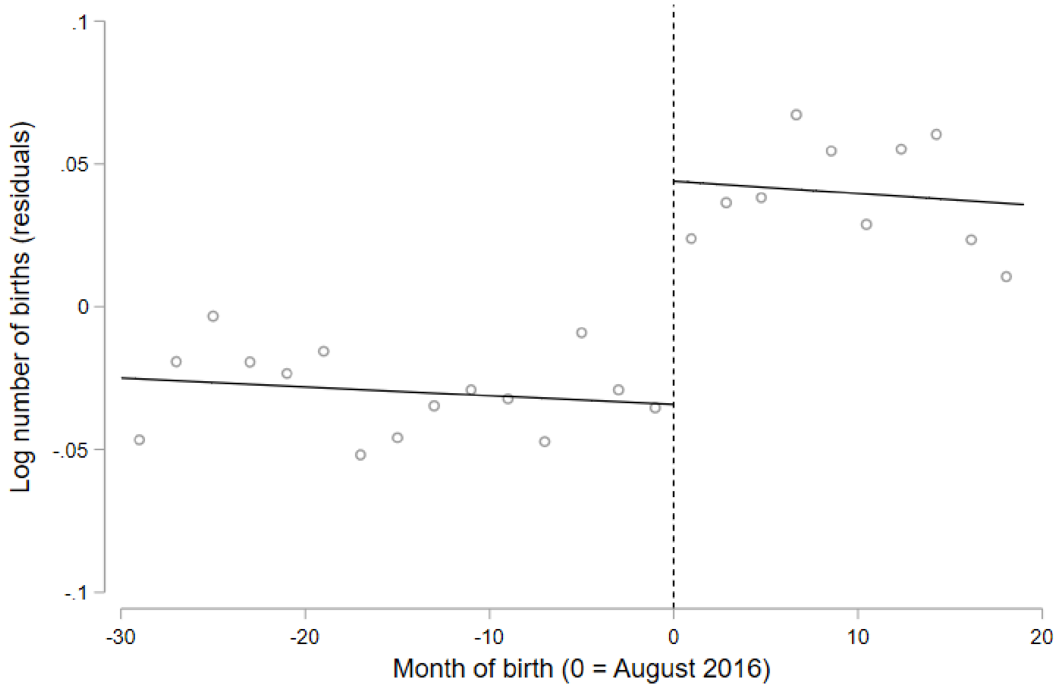


Figure 2: Short-term effects on births

Notes: Figure shows the dependent variable in bimonthly bins. See Figure A.1 for a quadratic trend.

These differences may simply reflect differences in the price elasticity of the demand for children between Poland and Spain, but there are three alternative explanations for these differences. First, the true discount rate might be much higher than 2.5 percent if households expect high inflation or the suspension of the program. However, to match the Spanish estimate, the annual discount rate would need to be equal to around 35 percent. Second, each birth is associated with fixed costs and households may face liquidity constraints, benefiting more from a large transfer received at birth than from smaller monthly payments. Finally, fertility responses may be highly non-linear: the effect of an extra dollar may diminish with the amount of the transfer. The high cost of an additional child in the Polish child benefit program is likely a combination of all these factors.

Although economically large and statistically significant, the regression discontinuity estimates likely provide a lower bound of the true effects. The estimated local average treatment effects measure only immediate fertility responses. The immediate responses will depend on couples' trust in the government's willingness and capacity to implement the announced program. At the time of the announcement, Poland had very low levels of trust in government compared to other European countries.[3] Second, even if couples had no doubts as to whether the child benefit program would actually be introduced, conception takes time. Unfortunately, as all Polish families were treated, it is impossible to cleanly identify overall fertility effects in the longer run.

Cost of a child

In the remaining part of this study, I assume that the cost of a child is higher for high-income couples than for low-income couples. If this is the case, the child benefit should have the strongest effect on fertility among low-income couples due to the price effect. I use detailed household expenditure data to provide suggestive evidence on the differences in the cost of a child between couples below and above median earnings.

I identify two categories of expenditure directly linked to having children: education and children's clothing. Moreover, having more household members likely results in increased spending on food, healthcare, utilities, and personal care. I estimate the following equation for each of these categories as well as their sum:

$$(2) E_{i,t} = \beta_0 + \beta_1 \text{BelowMedian}_{i,t} + \beta_2 C_{i,t} + \beta_3 \text{BelowMedian}_{i,t} \times \text{C}_{i,t} + \kappa X_{i,t} + \delta_t + u_{i,t}$$

where $E_{i,t}$ is household expenditure in a given category, $BelowMedian_{i,t}$ is a binary variable equal to one for couples with equivalized earnings below the median in year t (low-income couples) and zero for couples above median (high-income couples). $C_{i,t}$ is the number of children under the age of 18. I additionally control for year fixed effects, region fixed effects, urban area dummy, as well as the age and education of the partners. Coefficient β_2 reflects additional expenditures associated with an extra child among high-income couples, which I refer to as the cost of a child. Coefficient β_3 measures the difference in the cost of a child between low-income and high-income couples.

[3] The introduction of the child benefit program had a large positive effect on trust in government (Gromadzki et al., 2024).

Table 2: Cost of a child

	Total (1)	Food (2)	Education (3)	Child clothes (4)	Health (5)	Utilities (6)	Personal care (7)
			Panel A. 2013-2015				
Number of Children	332.825***	128.989***	66.614***	56.601***	24.135***	37.199***	19.286***
	(10.285)	(5.153)	(3.509)	(1.789)	(3.725)	(2.253)	(2.055)
Earnings Below Median × Number of Children	-191.475***	-50.572***	-51.501***	-36.865***	-24.763***	-15.743***	-12.032***
	(12.012)	(6.457)	(3.696)	(2.079)	(4.100)	(2.960)	(2.265)
Adj. R-Squared	0.23	0.13	0.12	0.13	0.09	0.07	0.14
Mean of outcome	1550.78	842.35	76.40	75.68	159.41	258.15	138.79
Observations	18,723	18,723	18,723	18,723	18,723	18,723	18,723
			Panel B. 2017-2019				
Number of Children	355.324***	141.190***	71.648***	60.036***	27.914***	32.884***	21.652***
	(12.014)	(6.025)	(3.785)	(2.026)	(4.225)	(2.385)	(2.324)
Earnings Below Median × Number of Children	-136.927***	-36.612***	-46.996***	-26.541***	-15.593***	-3.100	-8.084***
	(14.122)	(7.742)	(4.206)	(2.596)	(4.755)	(3.308)	(2.626)
Adj. R-Squared	0.19	0.13	0.11	0.12	0.05	0.10	0.09
Mean of outcome	1741.25	955.94	80.83	88.31	176.52	282.76	156.90
Observations	18,056	18,056	18,056	18,056	18,056	18,056	18,056
Year FE	✓	✓	✓	✓	✓	✓	✓
Region FE	✓	✓	✓	✓	✓	✓	✓
Age, education, urban area	✓	✓	✓	✓	✓	✓	✓

Notes: Table shows the coefficients from OLS regressions of selected categories of household expenditure on the number of children interacted with a dummy variable denoting the bottom half of equivalized couple earnings distribution. I control for year fixed effects, region fixed effects, urban area dummy, as well as female and male partner's education and age. The sample consists of households with partnered women aged 25-39. The detailed expenditure data is available from 2013 due to changes in the classification of expenditures. I exclude 2016 from the pre-treatment period because families received their first transfers in April 2016. Standard errors are clustered at the level of the household.
* $p < .10$; ** $p < .05$; *** $p < .01$

Panel A in Table A.3 shows the regression results for the pre-treatment period. Hence, these results are not influenced by the introduction of the child benefit in 2016. For all expenditure categories, I find a positive relationship between the number of children and household expenditure. The monthly cost of a child in these selected categories for couples with earnings above median was equal to approximately 333 PLN per child. Low-income couples spent 191 PLN less, reflecting a difference of almost 60 percent. In every category, the cost of a child was higher for high-income couples than for low-income couples. In particular, the education and healthcare costs of a child in low-income couples were close to zero, while these costs accounted for 27 percent of the total cost among high-income couples.[4]

Interestingly, the gap in the cost of a child between high-income and low-income couples was reduced by 28 percent following the introduction of the child benefit program (see Panel B in Table A.3). This suggests that low-income couples decided to invest more in quality of

[4] In Poland, education and healthcare services are provided by the government at no direct cost to individuals. However, individuals may choose to purchase education and healthcare services in the private sector, for instance, to avoid long waiting times in public healthcare or to arrange private tutoring for their children.

children. In particular, the differences in expenditures on children's clothing and utilities were substantially reduced.

Taken together, these results yield two important observations. First, the cost of a child is significantly higher for high-income couples compared to low-income couples, suggesting that price effects are likely to be strongest for low-income couples. Second, it appears that the introduction of the child benefit had some positive effects on the demand for child quality among low-income couples, as suggested by Becker and Tomes (1976). I further investigate changes in the patterns of selection into parenthood and the structure of births to examine adjustments in the demand for the quantity of children.

Selection into parenthood

Table 3 presents descriptive statistics for two groups of households — those who had a birth within the last 12 months and those who did not — before and after the introduction of the child benefit program. Before the introduction of the transfer, there were hardly any differences in earnings between couples who gave birth and those that did not. If anything, new parents had slightly higher earnings than other couples. The positive selection on education is much clearer, as new mothers and fathers were much better educated than other couples.

These patterns change in the post-introduction period. Fertility becomes associated with much lower earnings (a 9 percent gap). The educational gap also narrowed, with the maternal tertiary education rate decreasing from a 12 percentage point gap in 2011-2016 to just a five percentage point gap after 2016.

More formally, I analyze the changes in the selection into parenthood by estimating the following equation:

$$B_{i,t} = \beta_0 + \beta_1 \text{Earnings}_{i,t} + \kappa X_{i,t} + \delta_t + \epsilon_{i,t} \tag{3}$$

where B_i is equal to one if a couple gave birth to a child within the last 12 months, and zero otherwise. $Earnings_i$ measures equivalized couple earnings. I also control for other individual and household characteristics, including education, age, an urban area dummy, region fixed

Table 3: Births before and after the introduction of child benefit

	2011-2016		2017-2021	
	No birth	Birth	No birth	Birth
Equivalized earnings (PLN)	2230.72	2255.06	2591.30	2359.42
Urban area	0.76	0.78	0.70	0.70
Age	32.85	30.92	33.47	31.55
Education: basic	0.21	0.16	0.15	0.13
Education: secondary	0.33	0.27	0.32	0.29
Education: tertiary	0.45	0.57	0.53	0.58
Partner's age	35.41	33.01	36.15	33.95
Partner's education: basic	0.35	0.27	0.28	0.25
Partner's education: secondary	0.34	0.32	0.36	0.35
Partner's education: tertiary	0.31	0.42	0.37	0.40
Observations	34107	3703	25341	2928

Notes: Table reports average values of the selected variables. The "No Birth" columns show the average values for couples in which the woman did not give a birth to a child within the previous 12 months. The "Birth" columns show the average values for couples in which the woman gave birth to a child within the previous 12 months. The dependent variable is a dummy variable which is equal to 1 if a woman gave birth to a child within the previous 12 months or 0 otherwise.

effects, and year fixed effects. I estimate this equation for the pre- and post-introduction periods.

Conditional on other characteristics, there was a negative selection into parenthood based on income throughout the entire study period. However, the negative association between earnings and fertility became significantly stronger in the post-introduction period. The positive relationship between female partner's education level and fertility remained largely unchanged. By contrast, the positive relationship between male partner's education and fertility weakened considerably.

The analysis of the patterns of selection into parenthood yields an important finding: selection patterns changed substantially across the two periods. After the introduction of the child benefit program, parents had relatively lower earnings and were worse educated compared to those before the introduction of the transfer. Nevertheless, these findings may also reflect a broader long-term trend in the selection into parenthood. I analyze the evolution of birth rates among low-income and high-income couples to address this issue.

Table 4: Selection into parenthood before and after the introduction of child benefit

	2011-2016 (1)	2011-2016 (2)	2011-2016 (3)	2017-2021 (4)	2017-2021 (5)	2017-2021 (6)
Earnings (1000s PLN)	0.002	-0.005***	-0.007***	-0.007***	-0.011***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Urban area		0.002	-0.001		-0.002	-0.004
		(0.004)	(0.004)		(0.004)	(0.004)
Education: secondary		-0.002	-0.007		0.006	0.003
		(0.004)	(0.005)		(0.006)	(0.007)
Education: tertiary		0.042***	0.022***		0.042***	0.030***
		(0.005)	(0.006)		(0.006)	(0.007)
Partner's education: secondary			0.005			-0.000
			(0.004)			(0.006)
Partner's education: tertiary			0.033***			0.016**
			(0.005)			(0.007)
Adj. R-Squared	0.02	0.03	0.03	0.03	0.03	0.03
Mean of outcome	0.11	0.11	0.11	0.11	0.11	0.11
Observations	37,810	37,810	37,810	28,269	28,269	28,269
Year FE	✓	✓	✓	✓	✓	✓
Region FE		✓	✓		✓	✓
Age		✓	✓		✓	✓

Notes: Table shows the coefficients from OLS regressions of birth on individual and household characteristics. The dependent variable is a dummy variable which is equal to 1 if a woman gave birth to a child within the previous 12 months or 0 otherwise. The sample consists of partnered women aged 25-39.
* $p < .10$; ** $p < .05$; *** $p < .01$

Birth rates across earnings distribution

The universal cash transfer should have strongest effects on fertility among low-income couples, as the price of a child for low-income couples is much lower than for high-income couples, and the transfer amount was the same for everyone. Figure 3 plots birth rates for couples with earnings above and below the median. By 2016, birth rates were virtually identical and followed very similar trends, remaining stable at around 10 percent. Starting in 2017, one year after the introduction of the child benefit program, birth rates began to diverge. During the pre-pandemic period, birth rates for women in high-income couples remained at approximately 10 percent, while birth rates for women in low-income couples sharply increased in 2017, stabilizing at around 15 percent until 2020. During the pandemic period, birth rates declined for both groups but the gap between low-income and high-income couples remained very stable. The persistent difference in birth rates suggests that the changes in the births cannot be explained by the acceleration of fertility decision. If the adjustments were driven by acceleration rather than completed fertility adjustments, birth rates for low-income couples

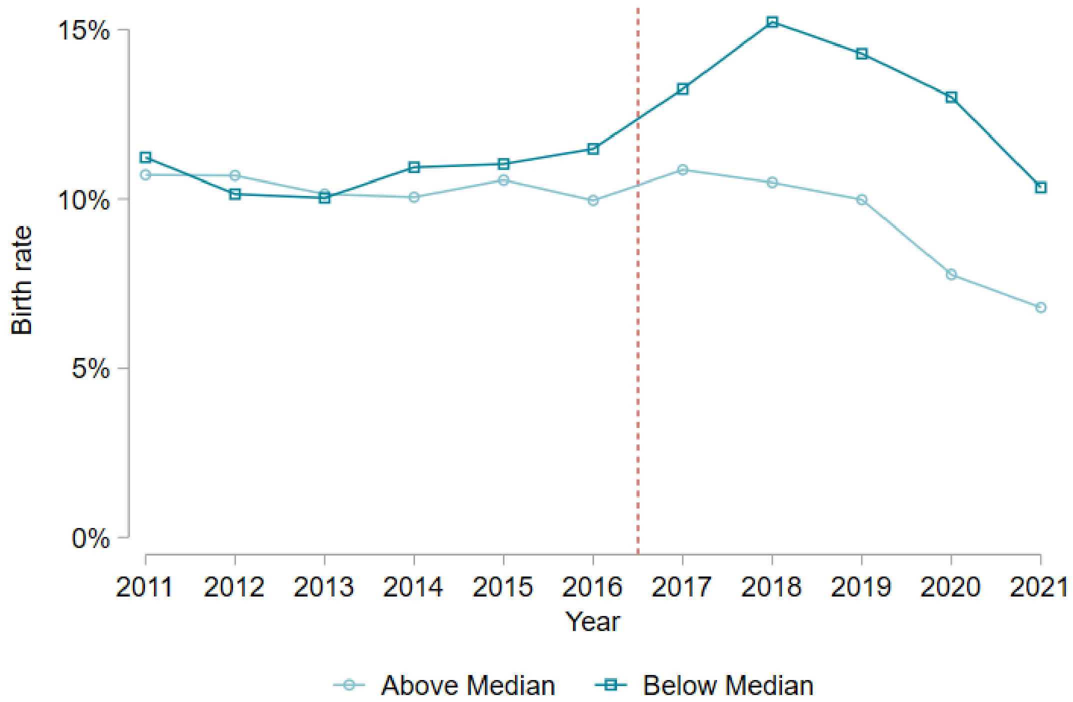


Figure 3: Birth rates, below and above median earnings

Notes: Figure shows the birth rates (the probability of giving a birth within previous 12 months) for women in couples with equivalized earnings above and below the median earnings. The sample consists of partnered women aged 25-39. Standard errors are clustered at the level of the household.

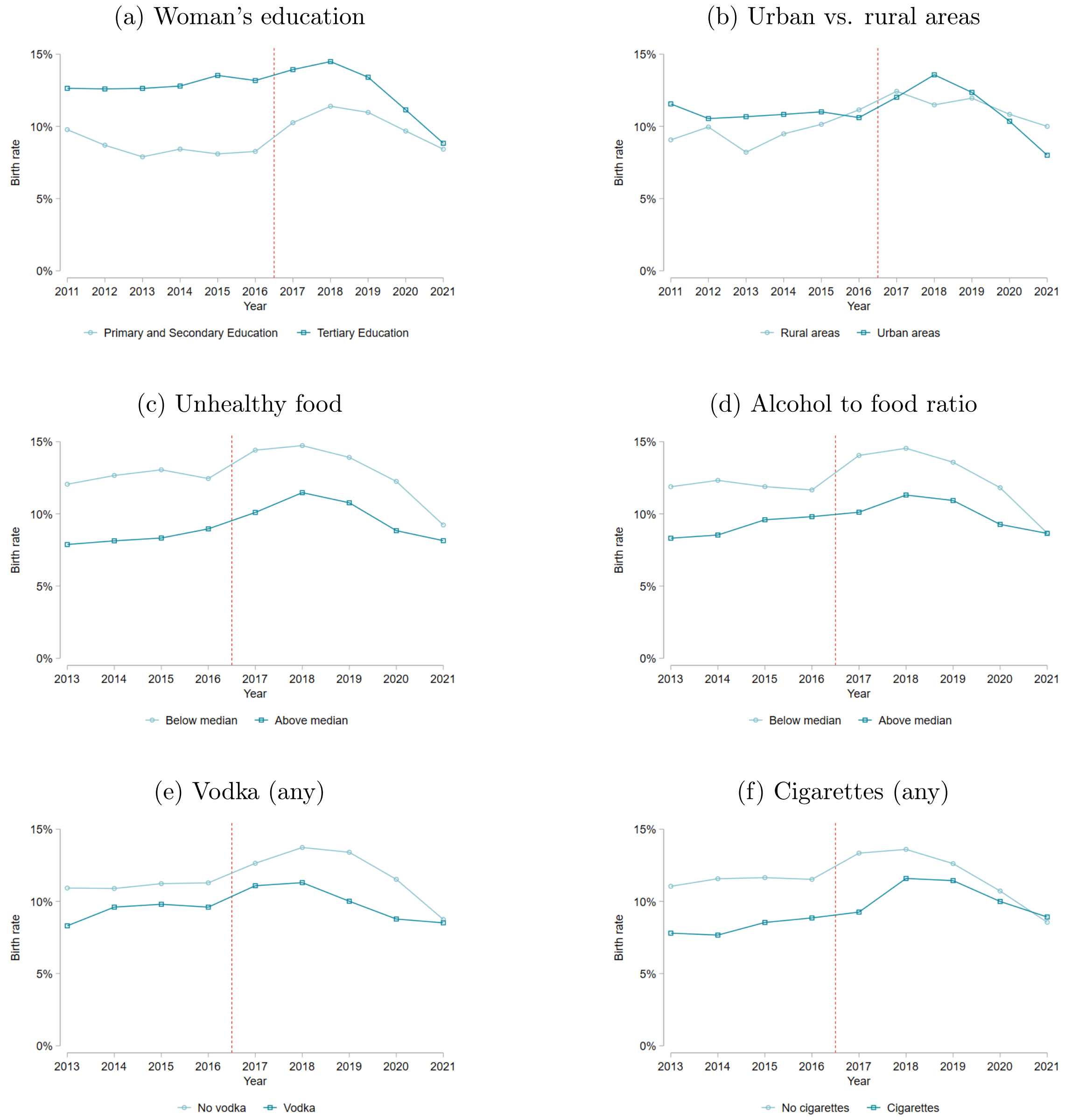


Figure 4: Birth rates, additional dimensions

Notes: Figure shows the birth rates (the probability of giving a birth within previous 12 months) for various groups of women. Figure 4a shows birth rates for women with tertiary education and women with no tertiary education. Figure 4b shows birth rates for women in urban and rural areas. Figure 4c shows birth rates for women depending on household's expenditure on energy-dense, nutrient-poor foods (as a share of all food expenditure, above and below median). Figure 4d shows birth rates for women depending on household's alcohol expenditure (divided by food consumption, above and below median). Figure 4e shows birth rates for women in households with non-zero expenditure on vodka and liquors and women in households with zero expenditure on vodka and liquors. Figure 4f shows birth rates for women in households with non-zero expenditure on cigarettes and women in households with zero expenditure on cigarettes.

would be higher than those for high-income couples in the short run and then lower in the medium run. Instead, the fertility adjustments were permanent.

Changes in fertility structure are also visible across other socioeconomic dimensions (Figure 4). In the pre-introduction period, women with tertiary education had significantly higher birth rates than those with at most secondary education. In the post-introduction period, these birth rates converged. Interestingly, the urban-rural dimension does not seem to play a similar role, as birth rates in urban areas followed similar trends as birth rates in rural areas. I use detailed data on household expenditure to study the evolution of birth rates depending on the consumption of unhealthy food, alcohol, strong alcohol and cigarettes. The relationship between the consumption of energy-dense, nutrient-poor foods and birth rates remained stable over time; households with low levels of unhealthy food consumption had the highest birth rates. Similarly, below-median levels of alcohol expenditure were associated with higher birth rates in both the pre-treatment and post-treatment periods. In contrast, I observe a significant and permanent change in the differences in birth rates between households with non-zero cigarette expenditures and those with zero cigarette consumption. Before the introduction of the transfer, households with smokers had substantially lower birth rates than those without any cigarette consumption. After the introduction of the transfer, birth rates among smokers significantly increased and aligned with the birth rates of non-smokers.

Since equivalized earnings are mechanically related to the number of children (in my analysis, children aged 1-17 only), the divergence in birth rates could be driven by an increased share of high-parity births. In fact, birth register data shows a persistent increase in the share of births for third and a higher-order births (Figure A.5).[5] While this increase may be related to the introduction of the child benefit (as larger families are generally poorer than smaller ones), I also analyze total couple earnings and total household earnings and find that the divergence in birth rates is evident with these definitions of income as well (Figures A.2-A.3). Thus, the observed divergence cannot be entirely explained by the rise in higher-parity births. Additionally, the gradual expansion of parental leave during the period of the study is another potential confounding factor. However, the divergence in birth rates is also visible for the income measure based on male partner's income only (Figure A.4).

[5]See Bokun (2024) for a detailed analysis of the evolution of birth rates in Poland depending on the number of previous children.

During the study period, Poland's demographic structure underwent several changes. In particular, the share of the population with tertiary education increased substantially (see Table 3). I estimate the following equation in an event-study style to account for changes in observable characteristics:

$$B_{i,t} = \beta_0 + \sum_{t=2011}^{2021} \gamma_t \,\text{BelowMedian}_{i,t} \times Y_t + \kappa X_{i,t} + \delta_t + u_{i,t} \tag{4}$$

where $BelowMedian_{i,t}$ is a binary variable that equals one for women in couples with equivalized couple earnings below the median equivalized earnings in year t (low-income couples), and zero for women above median. Coefficients γ_t measure the deviation in the birth rate gap in year t compared to the gap recorded in 2016. I control for individual and household characteristics, as well as year fixed effects.

Figure 5 plots the event study coefficients. Controlling for additional characteristics does not change the main finding: the fertility gaps increased substantially after 2016 with coefficients of around 3 percentage points. The coefficients in the pre-introduction period are small and statistically insignificant. The fertility adjustments were observed on both the extensive and intensive margins (Figure A.6).

Any results for the years starting from 2020 should be interpreted with caution, as both pandemic and the expansion of the abortion ban in Poland may have affected overall fertility and birth composition. Hence, in the remainder of this study, I limit the post-treatment period to years 2017-2019. Figure 6 summarizes the adjustments in birth structure. Before the introduction of the child benefit, the relationship between the share of births and income decile was U-shaped, with largest shares in the bottom and the top deciles. The percentage of children born in households from the lower half of the income distribution was equal to 51 percent. After the introduction, the share of births declined for all deciles in the top half of the income distribution. The percentage of children born in households from the lower half of the income distribution increased to approximately 58 percent (a 13 percent increase).

Given that the pre-introduction child poverty rate was equal to approximately 14 percent, the key fertility adjustments occurred in the bottom two deciles. The share of births in the

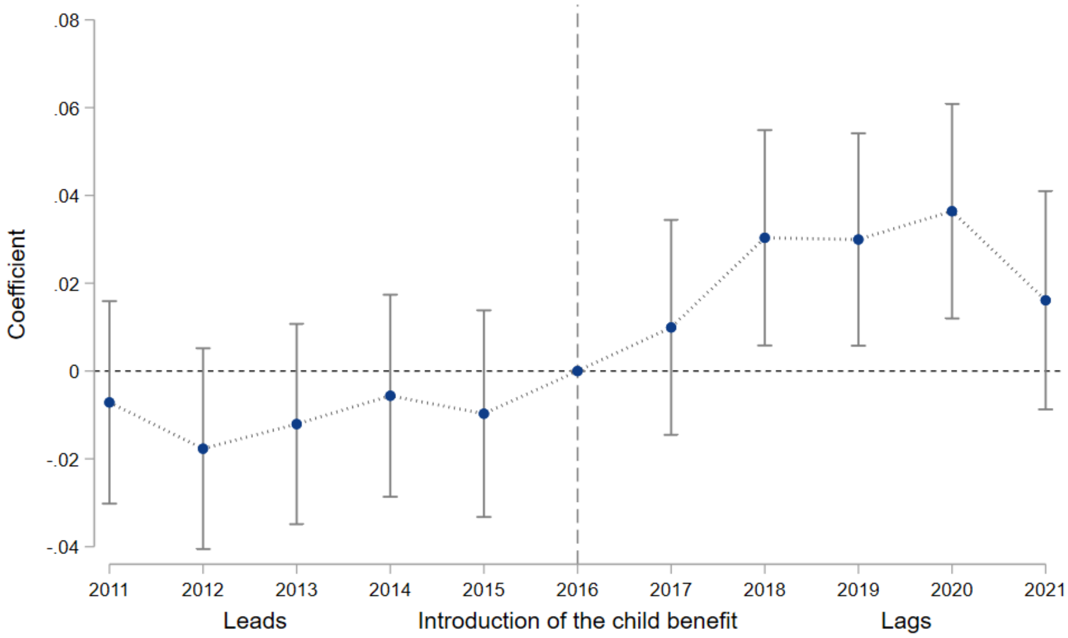


Figure 5: Birth rates and couple earnings, event study

Notes: Figure shows coefficients and 95% confidence intervals of the interaction of year fixed effects, and a dummy that equals one for couples with earnings below median and zero otherwise. Standard errors are clustered at the level of the household.

first decile increased from 11 percent to nearly 12.5 percent. I find a very similar increase in the share of births in the second decile. Changes in the share of births for income deciles are used in the microsimulation to assess the contribution of fertility adjustments to poverty reduction associated with the introduction of child benefit. The largest increases in the share of births occurred in the fourth decile, which represent families above the poverty line. Hence, the contribution of fertility adjustments to poverty reduction will be smaller than the contribution of fertility adjustments to the overall shift of the birth shares from the upper half to the lower half of the income distribution.

Poverty reduction

The effects of child benefit programs on child poverty depend largely on four factors: the initial distribution of equivalized income, the amount of the child benefit, the impact of the child benefit on parental labor supply, and the impact of the child benefit on fertility. The poverty reduction would be largest in the absence of negative labor supply effects and positive

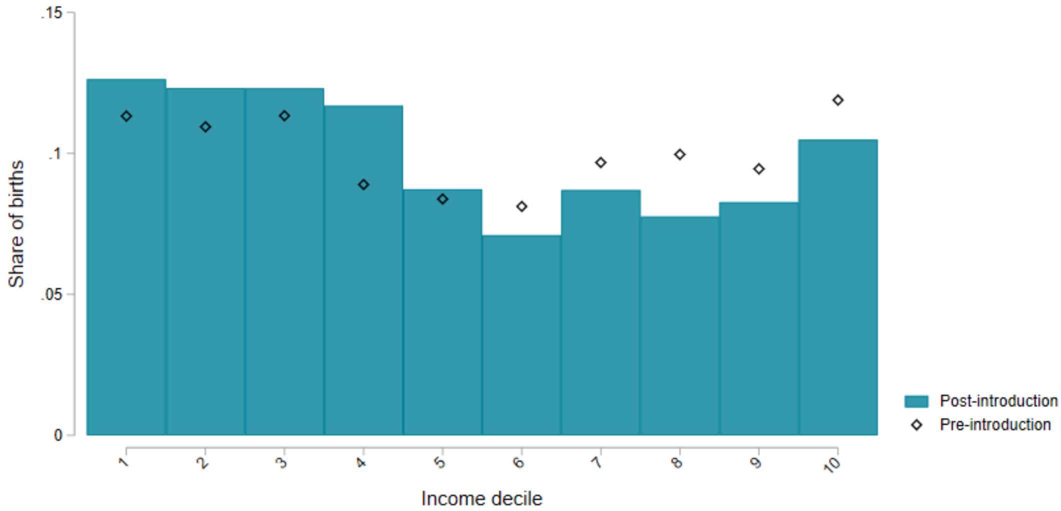


Figure 6: Adjustments of birth structure

Notes: Figure shows the distribution of births across deciles of equivalized couple earnings in the pre-introduction (2013-2015) and the post-introduction period (2017-2019).

fertility effects. I conduct a simple static microsimulation to assess the adverse impacts of labor supply and fertility adjustment on the poverty reduction resulting from the introduction of the child benefit in Poland.

I consider four counterfactual scenarios of child poverty in the pre-treatment period. In all scenarios, I introduce a monthly child benefit for each child under the age of 18.[6] In the first scenario, I assume that household income is increased by the amount of the child benefit, with no labor supply or fertility adjustments. This scenario represents the maximum potential poverty reduction and serves as a benchmark against which I will assess the role of behavioral adjustments. In the second scenario, the effect of the transfer on total household income is a sum of the amount of child benefit received and parental labor income reductions. In the third scenario, I assume no effects on parental labor supply, but I reweight the sample to fit the post-introduction structure of births. Finally, in the fourth scenario, I account for both the labor supply and fertility adjustments to capture additional interaction effects.

I perform the microsimulation on a sample of children from the pre-introduction period. Child poverty rate is a function of the equivalized disposable income distribution, $d(X_i, Y_i^L, CB_i)$,

[6]This is not an evaluation of the 2016 child benefit program because of the means-tested component in the original design. The program was made fully universal in 2019. Since then, households received the monthly child benefit of 500 PLN for each child regardless of their income.

where X_i denotes the household-specific weight of child i based on the decile of the inital parental earnings. Y_i^L is equal to the initial couple's earnings and CB_i is the child benefit function (either 0 or 500 per child). Both Y_i^L and CB_i are equivalized. Poverty rate is defined as the share of children raised by couples with equivalized income below the official poverty line. Income consists of couple's earnings and child benefit only.[7] The direct effect is given by:

$$\Delta^{CB} P = P[d(X_i, Y_i^L, CB_i^{500})] - P[d(X_i, Y_i^L, CB^0)] \tag{5}$$

The labor supply contribution to the poverty reduction is given by:

$$\Delta^{LS} P = P[d(X, \tilde{Y}^L, CB^{500})] - P[d(X, Y^L, CB^{500})] \tag{6}$$

where the after-benefit equivalized earnings, $\tilde{Y}^L$, capture the negative income effects of the child benefit on parental earnings. The fertility contribution to poverty reduction is given by:

$$\Delta^{FR} P = P[d(\tilde{X}, Y^L, CB^{500})] - P[d(X, Y^L, CB^{500})] \tag{7}$$

where $\tilde{X}$ is the initial weight adjusted for changes in the birth structure. Changes in the share of births are visualized in Figure 6. As each birth cohort is being reweighted, the calculated fertility contribution captures the maximum long-term consequences of fertility adjustments. In other words, this counterfactual scenarios assumes that all children would be born according to the post-introduction patterns of selection into parenthood. The contribution of the interaction of labor supply and fertility adjustments is given by:

[7] I abstract from other existing social transfers to make the study more generalizable. For each year, I use poverty line published by Statistics Poland (*ubóstwo względne*). This poverty line is calculated by Statistics Poland as a 50 percent of average household expenditures so it is endogenous to social transfers. Nevertheless, in the microsimulation exercise, I keep it fixed for the ease of interpretation.

$$(8) \qquad \Delta^{LSFR} P = P[d(\tilde{X}, \tilde{Y}^L, CB^{500})] - P[d(X, Y^L, CB^{500})] - \Delta^{LS} - \Delta^{FR}$$

Table 5 presents the results of the microsimulation. The actual child poverty rate in the pre-introduction period was equal to 14 percent. In the absence of behavioral responses, the introduction of child benefit would reduce child poverty by 79 percent (11 percentage points). Column 1 shows the results for the marginal propensity out of unearned income estimated by Gromadzki (2024). Negative labor supply responses reduce the scale of poverty reduction by approximately 0.4 percentage points. Fertility adjustments contribute slightly less to the poverty reduction, decreasing it by 0.3 percentage points. The interaction of the negative labor supply responses and fertility adjustments reduces the scale of poverty reduction by less than 0.1 percentage points. After accounting for labor supply and fertility adjustments, the counterfactual poverty rate would be equal to approximately 3.8 percent, implying an overall poverty reduction of about 73 percent.

Column 2 shows the results of the microsimulation for weaker labor supply responses, as estimated by Cesarini et al. (2017) in a study of lottery winnings in Sweden. The contribution of labor supply and fertility adjustments to poverty reduction are very similar to those in the baseline scenario. Column 3 presents the results for much larger labor supply adjustments estimated by Golosov et al. (2024) in the U.S., which can be interpreted as the upper bound of labor supply responses (Gromadzki, 2024, estimates similar earnings responses to the Polish child benefit for low socioeconomic households). In addition to stronger direct labor supply effects, larger MPEs imply larger contributions of the interaction of labor supply and fertility adjustments. However, even with an MPE equal to -0.5, poverty reduction would be only slightly diminished by labor supply and fertility adjustments. Sensitivity of poverty reduction to labor supply adjustments increases considerably for MPEs closer to -1 (Figure 7).

This is primarily due to the exceptional generosity of the program. The monthly transfer amount is 500 PLN, while the poverty line ranged from 706 PLN in 2013 to 734 PLN in 2015. This implies that households with four or more children would have an equivalized income above the poverty line even if the child benefit were their only source of income (in the simulated program, households with four children receive 2000 PLN, and their equivalent

Table 5: Microsimulation results

	Gromadzki (2024): Poland MPE: -0.25 (1)	Cesarini et al. (2017): Sweden MPE: -0.17 (2)	Golosov et al. (2024): U.S. MPE: -0.50 (3)
Actual poverty rate	0.1361	0.1361	0.1361
Direct effect	-0.1056	-0.1056	-0.1056
Labor supply	0.0037	0.0031	0.0101
Fertility	0.0030	0.0030	0.0030
Interaction	0.0004	0.0003	0.0010
Counterfactual poverty rate	0.0375	0.0369	0.0446

Notes: Table shows the results of the microsimulation for three values of the marginal propensity to earn out of unearned income. Column 1 shows the results for the MPE value estimated by Gromadzki (2024) (effects of the Polish universal child benefit). Column 2 shows the results for the MPE value estimated by Cesarini et al. (2017) (effects of lotteries in Sweden). Column 3 shows the results for the MPE value estimated by Golosov et al. (2024) (effects of lotteries in the U.S.).
* $p < .10$; ** $p < .05$; *** $p < .01$

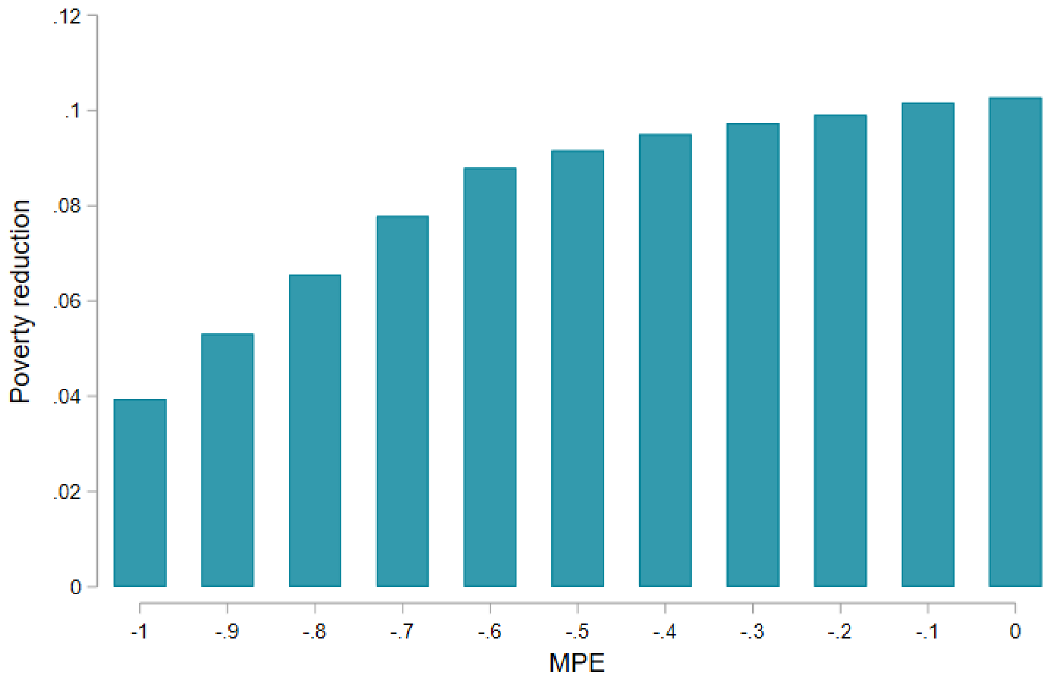


Figure 7: Marginal propensity to earn out of unearned income and poverty reduction

Notes: Figure shows the extent of poverty reduction (the difference between the actual poverty rate and the poverty rate in a scenario with both fertility and labor supply adjustments; vertical axis) depending on the value of marginal propensity to earn out of unearned income (horizontal axis).

size according to the OECD equivalence scale is 2.7). Although only 1 in 10 children was raised in a family with four or more children, one-third of children living in poverty before the program's introduction were raised in such families. Therefore, 45 percent of the poverty reduction would occur even with an MPE equal to -1 (Figure 7).

The microsimulation results presented above may mask more significant contributions of behavioral adjustments in other parts of the distribution. Figure 8 shows the percentage reductions in the share of children in families with equivalized incomes below thresholds defined as multiples of the poverty line. The direct effect of the child benefit reduces the share of children in families with incomes below half of the poverty line by almost 90 percent, and these reductions are virtually unaffected by behavioral responses. This is again driven by the exceptional generosity of the cash transfer and the low levels of earnings at the bottom of the income distribution.

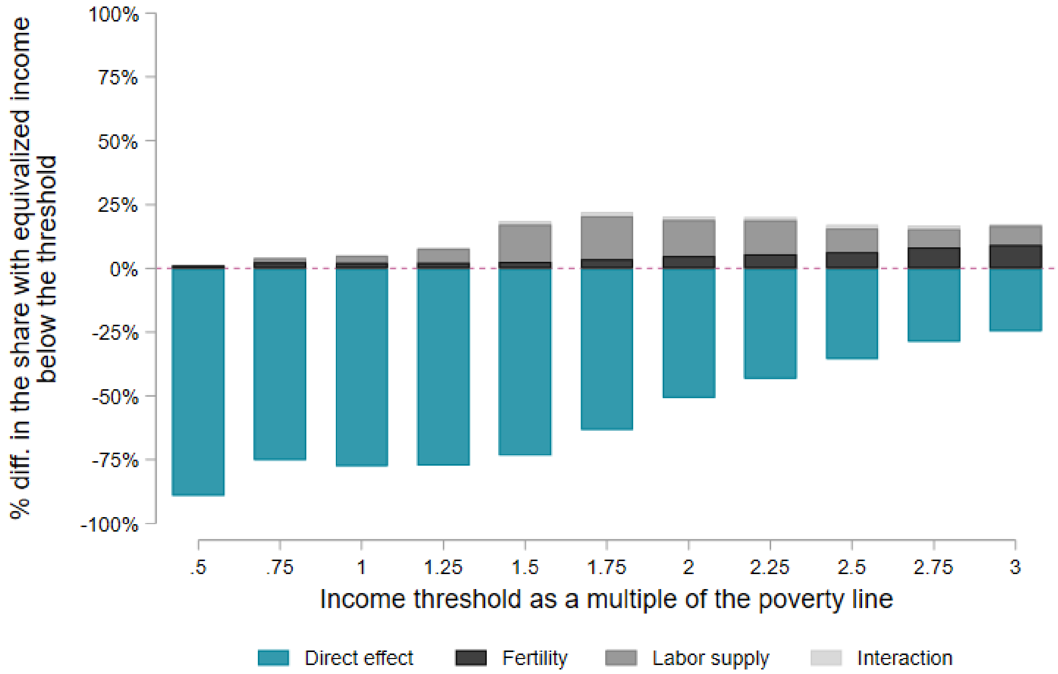


Figure 8: Microsimulation: alternative income thresholds

Notes: Figure shows the percentage change in the share of children raised in families with equivalized incomes below various thresholds, defined as multiples of the poverty line (e.g., a threshold value of two represents an income equal to twice the poverty line). The median equivalized income before the transfer was approximately 2.32 times the poverty line, while the average equivalized income was about 2.67 times the poverty line. Marginal propensity to earn out of unearned income is set to -0.25.

While the direct effects of the child benefit gradually decline at higher income thresholds, behavioral responses become more pronounced and offset an increasingly larger portion of the program's direct effects. For a threshold equal to twice the poverty line, the program directly reduces the share of children in families below this income level by 50 percent (compared to a 79 percent reduction at the poverty line). Fertility adjustments reduce 10 percent of this direct effect, and labor supply adjustments reduce an additional 26 percent. For a threshold equal to three times the poverty line, behavioral adjustments combined offset more than two-thirds of the direct effect.

Conclusion

One of the goals of universal child benefits is to raise fertility rates. A monthly cash transfer compensates for a share of costs associated with having a child, thereby increasing the demand for children. I study the introduction of the largest child benefit program in high-income countries, the Polish child benefit program, and find that nine months after the program was announced, the number of births increased by approximately six percent. This implies a very high fiscal cost of an additional child (389,000 dollars), which is significantly higher than the costs previously estimated for smaller one-time transfers.

The goal of raising fertility may conflict with the primary goal of the child benefits: poverty reduction. Since the cost of a child is lowest for low-income couples, universal child benefits compensate for a larger share of child costs for low-income couples compared to high-income couples. Consequently, fertility incentives are strongest for low-income families, including those at risk of poverty. In line with this mechanism, I observe a substantial and permanent shift in birth shares from the upper half to the lower half of the income distribution following the introduction of the program. Nevertheless, microsimulation results indicate that the impact of these fertility adjustments on poverty reduction is very small.

Despite the minor role of fertility adjustments in poverty reduction, this study documents a policy trade-off: while child benefits increase fertility, these additional children are primarily born into low-income families. Moreover, this trade-off extends beyond monetary measures. Birth rates increase strongest among parents with low levels of education and those smoking cigarettes. Hence, while there is rich evidence showing the large positive effects of cash transfer on children's outcomes in adulthood (Aizer et al., 2022), it is crucial to study effects of cash transfers on birth composition. In addition to limiting the scope for poverty reductions, large fertility effects among low-income families would likely increase income inequality and reduce social mobility (Daruich and Kozlowski, 2020). In this context, the finding of this study that even an extremely generous cash transfer did not radically increase fertility may be seen as a favorable outcome.

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Appendix A Additional Figures and Tables

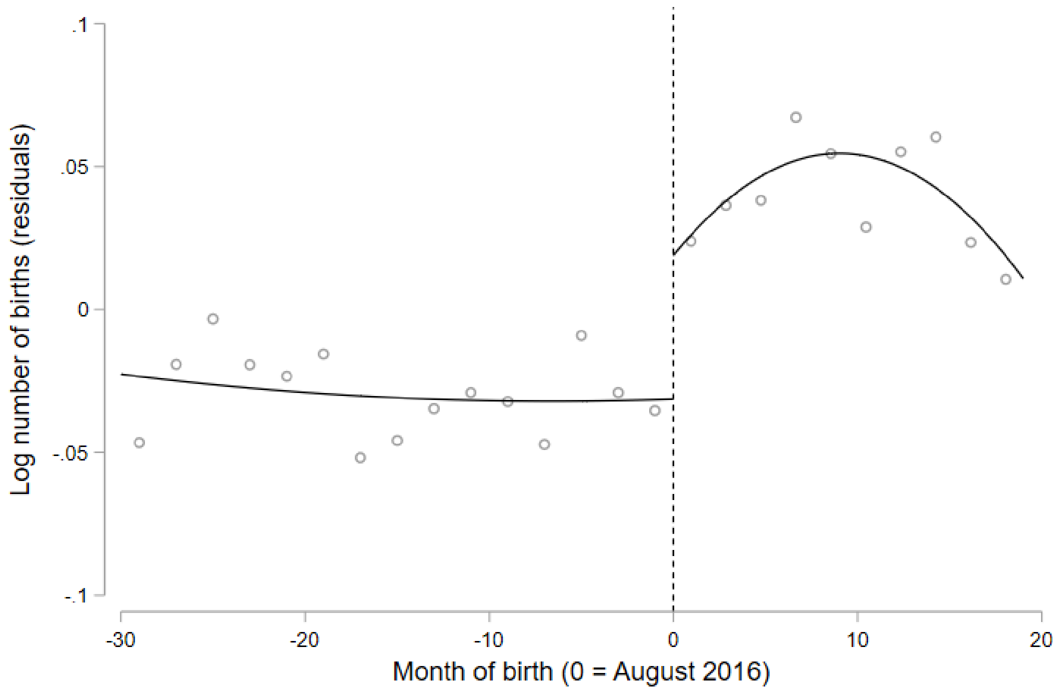


Figure A.1: Short-term effects on births, quadratic trend

Notes: Notes: Figure shows the dependent variable in bimonthly bins. The line denotes quadratic trend estimated on both sides of the cutoff month.

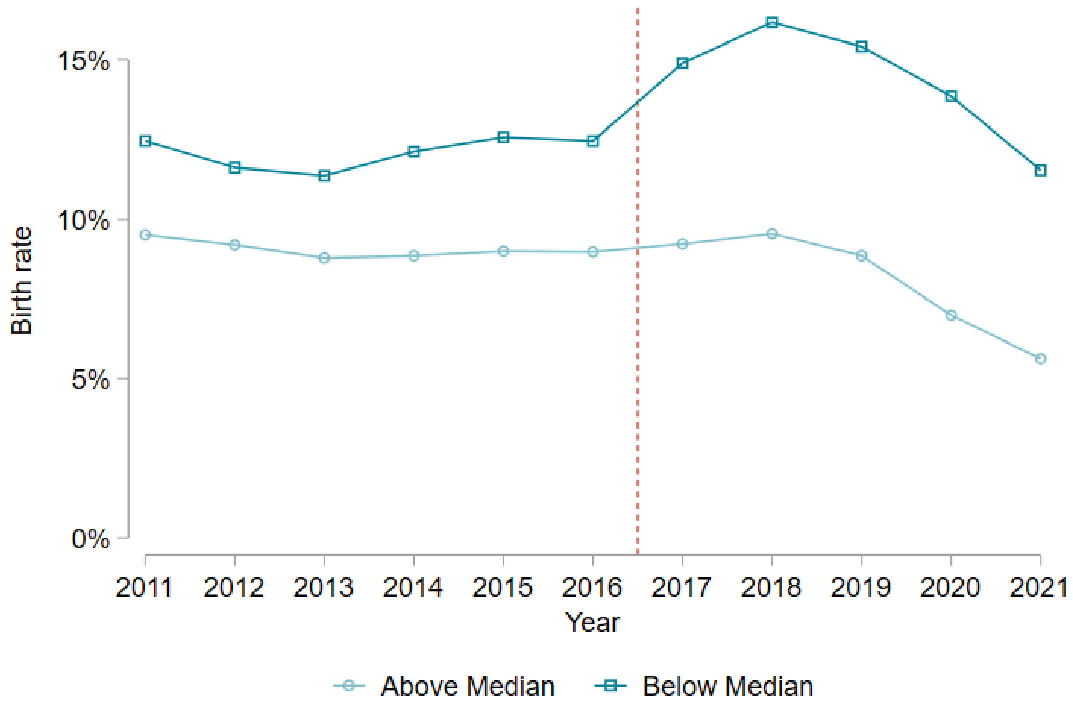


Figure A.2: Birth rates by total couple earnings

Notes: Figure shows the birth rates for couples with total couple earnings equal or above the median and birth rates for couples with total earnings below the median.

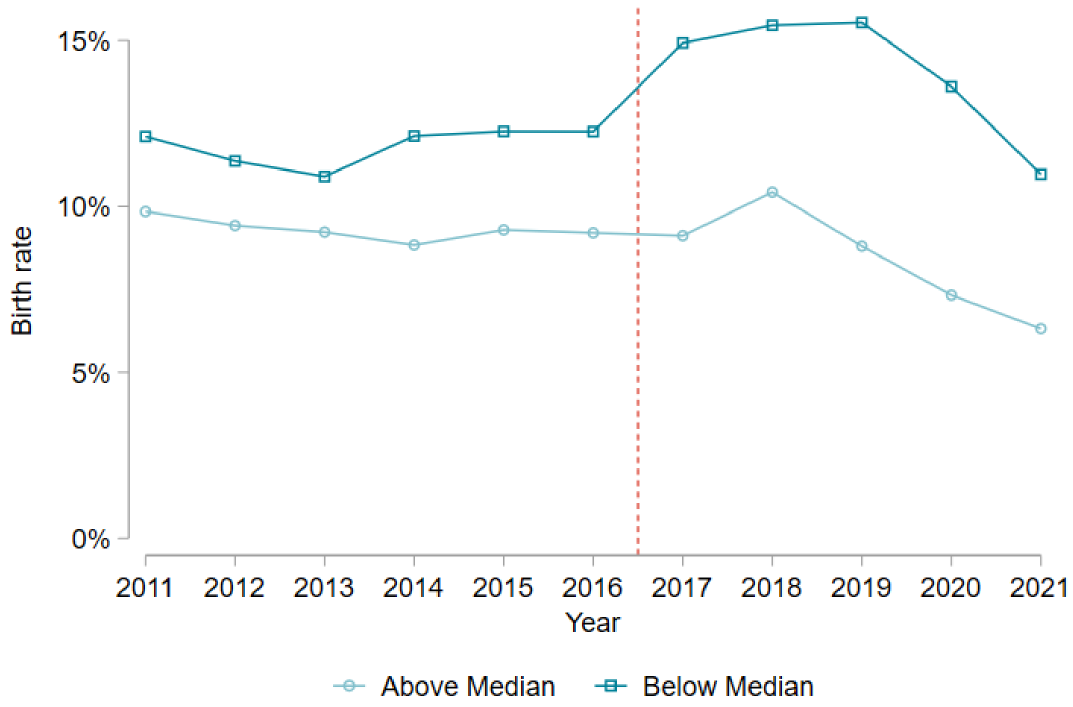


Figure A.3: Birth rates by total household earnings

Notes: Figure shows the birth rates for couples with total household earnings (the sum of earnings of all household members) equal or above the median and birth rates for couples with total earnings below the median.

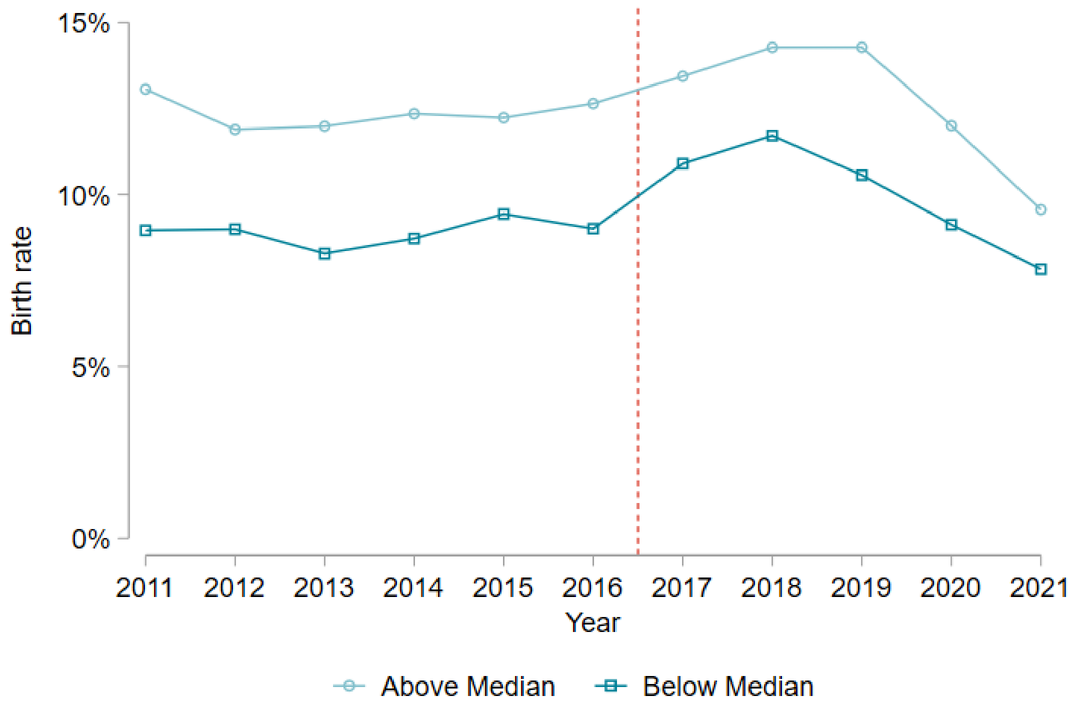
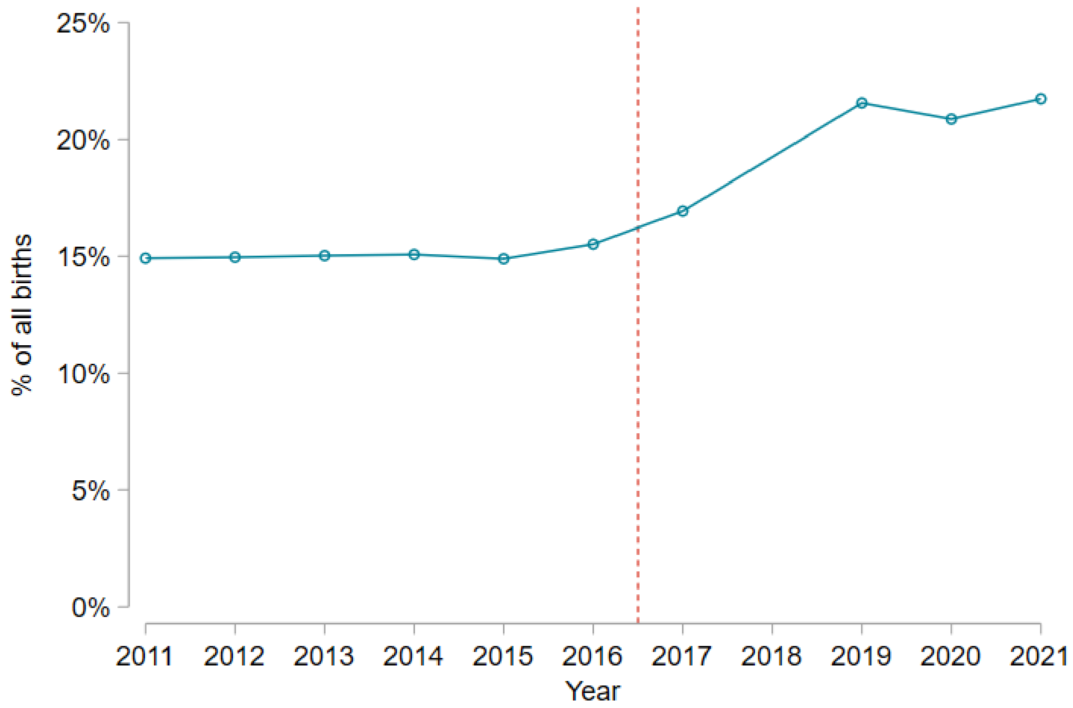


Figure A.4: Birth rates by equivalized partner's earnings

Notes: Figure shows the birth rates for couples with male partner's earnings equal or above the median and birth rates for couples with male partner's earnings below the median.

Figure A.5: Births by birth order: third child or higher



Notes: Figure shows births of third or higher order as a percentage of all births. Data is based on an administrative registers. In 2018, the birth certificate template was changed and this led to many errors made by physicians. Hence, the data on births according to the birth order for 2018 is not available.
Source: Demographic Yearbook of Poland, Statistics Poland.

(a) Extensive margin (b) Intensive margin

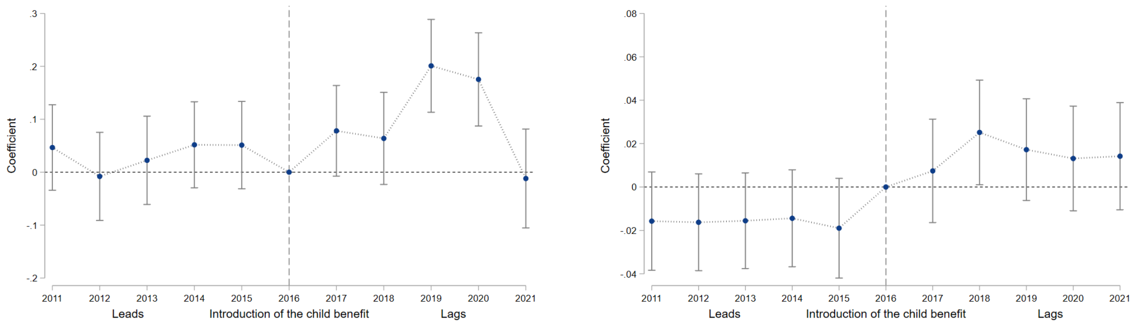


Figure A.6: Birth rates and couple earnings, intensive and extensive margin.

Notes: Figure shows coefficients and 95% confidence intervals of the interaction of year fixed effects, and a dummy that equals one for couples with earnings below median and zero otherwise. In Figure A.6a, the dependent variable is equal to one if the couple gave birth to their first child and zero otherwise (the sample is restricted to couples who had no children 12 months before). In Figure A.6b, the dependent variable is equal to one if the couple gave birth to their second or higher parity child and zero otherwise (the sample is restricted to couples who had at least one child 12 months before). Standard errors are clustered at the level of the household.

Table A.1: Short-term Effects on births, 2010 as reference year

	10 years (1)	5 years (2)	12-12m (3)	9-9m (4)	3-3m (5)
Births	0.080***	0.072***	0.056***	0.070***	0.037
	(0.013)	(0.019)	(0.020)	(0.018)	(0.051)
Observations	121	61	25	19	7
Years included	2010-2019	2014-2018	2015-2017	2015-2017	2016
Linear trend in m	Y	Y	Y	Y	Y
Quadratic trend in m	Y	Y	Y	N	N

Notes: Table shows RD estimates with various bandwidths. The dependent variable is the log number of births measured as a difference from the 2010 month-of-the-year (e.g., the value of the dependent variable in August 2016 is the difference between log number of births per day in August 2016 and the log number of births per day in August 2010). The "m" stands for months. In all regressions, I include a linear trend of the running variable. For bandwidths longer than 9 months, I additionally include a quadratic trend. Heteroskedasticity-robust standard errors are reported.

Table A.2: Short-term effects on births, annual growth rate

	10 years	5 years	12-12m	9-9m	3-3m
	(1)	(2)	(3)	(4)	(5)
Births	0.046***	0.027	0.062***	0.047***	0.067***
	(0.015)	(0.016)	(0.021)	(0.017)	(0.023)
Observations	80	43	25	19	7
Years included	2011-2018	2014-2018	2015-2017	2015-2017	2016
Linear trend in m	Y	Y	Y	Y	Y
Quadratic trend in m	Y	Y	Y	N	N

Notes: Table shows RD estimates with various bandwidths. The dependent variable is the log number of births measured as an annual difference (e.g., the value of the dependent variable in August 2016 is the difference between log number of births per day in August 2016 and the log number of births per day in August 2015). I include at maximum 12 months after the cutoff date, as the introduction should not affect growth rates in the long-term. The "m" stands for months. In all regressions, I include a linear trend of the running variable. For bandwidths longer than 9 months, I additionally include a quadratic trend. Heteroskedasticity-robust standard errors are reported.

Table A.3: Cost of a child, at least one child

	Total	Food	Education	Child clothes	Health	Utilities	Personal care
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Panel A. 2013-2015			
Number of Children	291.763***	125.944***	59.193***	38.284***	19.189***	39.268***	9.885***
	(16.541)	(8.343)	(5.897)	(3.026)	(6.011)	(3.652)	(3.208)
Earnings Below Median × Number of Children	-163.649***	-46.730***	-48.403***	-23.998***	-22.327***	-17.485***	-4.706
	(18.194)	(9.620)	(6.089)	(3.354)	(6.365)	(4.370)	(3.435)
Adj. R-Squared	0.22	0.11	0.12	0.08	0.10	0.06	0.16
Mean of outcome	1604.20	867.50	84.15	87.34	159.90	265.99	139.32
Observations	15,648	15,648	15,648	15,648	15,648	15,648	15,648
				Panel B. 2017-2019			
Number of Children	341.356***	138.026***	73.051***	48.256***	31.008***	36.694***	14.321***
	(18.834)	(9.418)	(6.286)	(3.475)	(6.172)	(3.632)	(3.651)
Earnings Below Median × Number of Children	-131.112***	-34.845***	-50.137***	-17.580***	-19.361***	-5.812	-3.378
	(20.811)	(11.043)	(6.643)	(4.048)	(6.736)	(4.581)	(3.959)
Adj. R-Squared	0.16	0.10	0.11	0.07	0.06	0.08	0.10
Mean of outcome	1802.09	985.89	89.08	100.20	177.37	291.10	158.44
Observations	15,135	15,135	15,135	15,135	15,135	15,135	15,135
Year FE	✓	✓	✓	✓	✓	✓	✓
Region FE	✓	✓	✓	✓	✓	✓	✓
Age, education, urban area	✓	✓	✓	✓	✓	✓	✓

Notes: Table shows the coefficients from OLS regressions of selected categories of household expenditure on the number of children interacted with a dummy variable denoting the bottom half of equivalized couple earnings distribution. I control for year fixed effects, region fixed effects, urban area dummy, as well as female and male partner's education and age. The sample consists of households with partnered women aged 25-39 and at least one child under the age of 18. Standard errors are clustered at the level of the household.
* $p < .10$; ** $p < .05$; *** $p < .01$