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Do Couples Bargain over Fertility? New Evidence Based on Child Preference Data

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Theoretical and empirical research has shown that households should not be considered as single decision units, but as consisting of heterogeneous individuals who bargain over household resource allocations. In contrast to earlier tests of bargaining models, our empirical approach makes use of preference data and the public good fertility and we exploit the different predictions of the models in the case of conflicting child preferences. In this paper we present evidence that couples do not only bargain over private consumption but also over fertility. Our results are heterogeneous with respect to the number of children already in the family. In an extension, we find that the ability to commit to household resource allocations depends on the gender composition of the preference conflict. A policy implication of our findings is that the effect of child benefits on fertility could be enhanced by directing transfers to women, as women more often have lower incomes and higher child preferences than men.

JEL classification: D01, D13, J13, J18

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1 Introduction

In recent decades, many governments undertook major reforms to child-contingent benefits with the aim of stimulating fertility and battling child poverty. But do child benefit payments really affect fertility? Suppose couples have heterogeneous preferences about how many children to have and how much money to spend on them. In a unitary model of household behavior (Samuelson, 1956; Becker, 1960), child benefits and allowances would raise the demand for children through both a positive income effect and a positive own price effect. Moreover, there is nothing to be gained by choosing a particular recipient of the benefit. If, by contrast, the allocation of resources within the family is resolved through a process of bargaining (Manser and Brown, 1980; McElroy and Horney, 1981; Chiappori, 1992), then who receives the benefit matters because the recipient's bargaining power gets stronger. To see this, suppose that the allocation of bargaining power within the family depends on relative incomes, and that the female partner has a higher preference for children than the male partner. Then the effect of child benefits on fertility outcomes is larger if they are paid to the female partner directly.

This paper's principal contribution is to circumvent the assignability problem of empirical evaluations of bargaining models by relying on preference data and ultimately to test whether couples bargain over the public good fertility. The existing literature of family bargaining tests concentrates on private goods and relies on an assignability assumption for identification due to data limitations. Consumption is usually observed at the household level which makes it cumbersome to test whose consumption reacts to changes in the bargaining power, so the researcher is forced to find goods that are assignable to one spouse only, i.e., they are useless to the other. An effect of bargaining power on assignable private consumption with total income held constant can be interpreted as evidence for a bargaining process. A classical example of bargaining tests is sex-specific clothing that is only valued by a single person (Browning, 1994; Lundberg *et al.*, 1997). Assigning a good to an individual makes theoretical sense as long as the partner does not care more about her (respectively, his) partner's apparel than he (respectively, she) about his own clothing. But if goods are not fully private and preferences are unknown, the tests could yield false results. Ermisch and Pronzato (2008) convincingly circumvent the problem of assignability by looking at child support payments of separated, non-custodial fathers with new relationships. Using BHPS data they find that relative income within the new

household has an effect on spending on the child. To make inference they just need to ensure that the new partner puts no high weight on the father's child's welfare.

We circumvent the assignability problem by relying on self-reported preference data for a public good from the German Socio-Economic Panel (GSOEP) and exploit the theoretical prediction that only in the case of a preference conflict there can be a bargaining power effect. This approach has three advantages: i) we are able to test bargaining for a public good and thus, in our paper, fertility, ii) the use of fertility makes sure that our outcome variable is of as much importance to family decisions as a whole that bargaining would be relevant and iii) we can exclude the possibility of a confounding preference shift in the same direction as the bargaining power effect or a correlation of the two. For our empirical analysis we construct a treatment group of couples with heterogeneous and a control group of couples with homogeneous self-reported child preferences in a repeated cross-section. The commonly used relative income within a partnership acts as an indicator of bargaining power. We compare whether relative income affects fertility differently between the homogeneous and the heterogeneous preference groups.

The central finding from our econometric analysis is that couples appear to bargain over fertility. We find clear indication of differential effects of bargaining power on fertility between couples with homogeneous and heterogeneous preferences. For couples in which the woman has higher child preferences than her partner, fertility increases with her bargaining power, as captured by her relative income. The effect stems mainly from first births. This in turn means that the small positive effect of child benefits on fertility can be enhanced by directing benefits to women. It would not only *reach* the group with higher child preferences, but also *improve* the bargaining position of members of the target group. In an extension to our analysis, we also find evidence that mothers with higher child preferences than their partners can better commit to ex ante resource allocations than mothers with lower child preferences, who are more prone to renegotiate the terms of bargaining after a first birth. This implies that mothers who cut working hours due to child caring and the like may lose bargaining power and say in household decisions. However, the results are heterogeneous, i.e., this is only true if women have lower child preferences than their partners.

Our approach carries some potential caveats. We cannot be sure that the two groups do not differ besides their reported preferences and what we can control for with socio-economic variables. If there is endogenous selection in the relationship matching process

that produces the prediction of a bargaining model, our results could be confounded. Moreover, relative income is not exogenous and heterogeneous partnerships could be more unstable. We try to dispel doubts when discussing the empirical strategy.

This paper is related to several strands of the family economics literature. Clearly it aligns with econometric work seeking to identify whether family members bargain over resource allocations, which finds evidence for that from assignable goods (Browning, 1994; Lundberg *et al.*, 1997; Ermisch and Pronzato, 2008). A related strand of empirical literature deals with gender-specific child outcomes that find family bargaining as one explanation (Thomas, 1994), also when using natural experiments of positive income shocks to females due to pension reform in South Africa (Duflo, 2003) and tea prices in China (Qian, 2008). None of these papers uses preference data, while all assume gender-specific preferences to explain the results with bargaining. By showing that relative income also matters for fertility decisions and that it is consistent with child preference data, the present paper provides further evidence that household decision-making depends on how intra-family bargains play out.

This paper is also connected to empirical literature on the impact of family policies on fertility. The estimated effect on fertility, which is analyzed in numerous articles using macro-level data, can be summed up to be positive but small (Gauthier, 2007). This is especially true for cash child benefits as found for 22 OECD countries (Gauthier and Hatzius, 1997). Studies based on micro-level data find differential effects for first, second or third children as well as effects on the timing of births (Cigno and Ermisch, 1989; Genosko and Weber, 1992; Althammer, 2000; Cigno *et al.*, 2003; Laroque and Salanié, 2004). Findings from this paper contribute to that literature by providing an explanation for the heterogeneous effects of child benefits usually found.

Furthermore, this paper connects to the small strand of literature on child preferences and fertility. Preference data has been incorporated in bargaining models of fertility to test commitment versus non-commitment models for Malaysian couples (Rasul, 2008). In contrast, this paper discusses the role of preferences for bargaining and unitary models as well as for the effect of public policy. Similarly, the test of commitment to household resource allocations is related to the endogenous bargaining power literature, which captures dynamics in household decision-making (Ligon, 2002; Lundberg and Pollak, 2003; Basu, 2006; Iyigun and Walsh, 2007).

The remainder of the paper is organized as follows. In section 2 we discuss some

theoretical background to family decision-making and generate testable predictions. In section 3 we describe the data and some basic facts on child benefit policy in Germany. We lay out the estimation strategy in section 4 and present the results in section 5. In section 6 we offer concluding remarks.

2 Theoretical Considerations

The first key feature of the bargaining approach to household decision-making is that it does not rely on the income pooling hypothesis. Indeed, individual incomes are not converted into a single household budget constraint as in the unitary approach, but either form the basis of an individual budget constraint or determine how pooled household income is allocated among family members. One way of testing whether couples bargain over the allocation of household resources is to look at whether changes in the relative incomes of family members alter fertility decisions while holding the sum of incomes constant. The second key feature concerns how the allocation of bargaining power shapes intra-family resource allocation. Employing a cooperative bargaining framework, McElroy and Horney (1981) assume that the allocation of intra-family bargaining power depends on divorce threat points. Lundberg and Pollak (1993), in contrast, suggest a non-cooperative household equilibrium as an internal threat point in household bargaining. As child benefits are paid to the custodian in the event of divorce, changing the recipient within marriage should theoretically not alter family resource allocations in the divorce-threat bargaining model. The case of a non-cooperative household equilibrium as the fall-back position is thus more relevant to our analysis. In this section, we briefly discuss demand for children in the simple unitary model and a multi-preference family model.

2.1 Family Decision-Making in a Static Framework

In the unitary model (Samuelson, 1956; Becker, 1960), household demand functions are derived through maximization of a household utility function U subject to the household budget constraint. Suppose the household is comprised of two people, say a wife w and a husband h . Household expenditure is allocated between a good q^w , privately consumed by w , a good q^h , privately consumed by h , and a household public good Q . Children are assumed to be the public good, because of their non-rivalry in consumption. The

maximization problem thus becomes $\max_{q^w, q^h, Q} U(q^w, q^h, Q)$, s.t. $p'(q^w + q^h + Q) = I^T$, with p' being the vector of goods prices and $I^T = I^w + I^h$ as total household income. Demand for the three types of goods is $D(q^w, q^h, Q) = f(p', I^T)$. Demand depends on goods prices and total income, but is independent of individual incomes I^w and I^h or relative income $I^w/(I^h + I^w)$ when controlling for total income. This leads to our first testable prediction:

Prediction 1. *In the unitary model, relative income has no influence on the demand for children if total income is held constant.*

Empirically, there is robust evidence that relative income matters for assignable goods (Browning, 1994; Lundberg *et al.*, 1997). However, results based on the assignability of goods are dependent on the functional form of individual utility functions, i.e., whether selfish, caring or altruistic preferences are assumed. Leisure can clearly not be consumed by another person, but with altruistic preferences the partner may be concerned about the other's work-life-balance. Even a selfish person may regard her partner's leisure as complementary. The clothing example comes also into play again, where one cannot be sure that a partner does not care about the other's looks. Without knowing the underlying preferences, it might even be possible that the one cares more about the partner's looks than about her own. If one has very low preferences for clothes in contrast to her partner and both are altruistic, results of income pooling tests would be flawed. We circumvent this assignability problem by directly using child preference data and by interpreting the demand for children as the public good.¹ With different preferences between partners, relative incomes can affect fertility behavior, but only if couples are engaged in a process of bargaining. Heterogeneous preferences are not accounted for in the unitary model and, thus, cannot affect the decision.

The alternative to the unitary approach is the collective model or the related bargaining approach. In these frameworks, relative income becomes a key factor determining intra-household decisions. Separate utility functions U^w and U^h , which are defined by their arguments for private good consumption and the public good at $U^w(q^w, Q)$ and $U^h(q^h, Q)$, are used to derive household demand functions. In a collective model à la Chiappori (1988, 1992) the household maximizes $\theta U^w(q^w, Q) + (1 - \theta)U^h(q^h, Q)$ with

¹When focusing on a public good, the functional form becomes less important. Both partners care for the public good according to their preferences, and the results are less sensitive to altruism and caring preferences.

respect to the joint budget $p'(q^w + q^h + Q) = I^w + I^h$ instead of maximizing household utility.² The parameter θ indicates the balance of power in the household. Thus, if θ increases, the bargaining power of the woman increases. The parameter θ in turn may depend on other parameters such as individual income. With relative incomes influencing the weighting of utilities to be maximized, this bargaining power determines what fractions are spent on assignable goods and on children with respect to individual preferences. The key difference to the unitary model becomes apparent here. Suppose the woman has higher preferences for children than her partner. An increase in her income relative to total household income shifts the household's expenditure towards children and raises fertility. No such bargaining power effect appears in the unitary framework. This implies:

Prediction 2. *Suppose couples bargain over fertility and have heterogeneous child preferences. Then bargaining power—as captured by relative income—affects the demand for children.*

Taking child benefits into account leads to a similar prediction of the model. As before, suppose the woman has higher child preferences than her partner. An increase in child benefits as an exogenous income shock raises fertility irrespective of the model framework. However, in the bargaining framework the effect varies according to relative incomes and the preference difference. The effect escalates if the woman with the higher preferences has a higher bargaining power.

Prediction 3. *Suppose couples bargain over fertility and have heterogeneous child preferences. Then the effect of child benefits on demand for children depends on relative income.*

3 The Data

Our data source is the German Socio-Economic Panel (GSOEP), which includes information of the socio-economic background of individuals, households and their intra-family relations. Partners can be matched easily by their identifiers so that we get a sample

²It is recognized that Nash bargaining models as developed by Manser and Brown (1980) and McElroy and Horney (1981) are special cases of the collective approach to the household. We abstain from discussing them explicitly, as results are qualitatively comparable.

of couples with each partner’s individual socio-economic characteristics. In our analysis, we exclude GSOEP sample G, which comprises high-income households only and we are constrained to the waves from 1990 to 2004, in which child preferences are reported.

The dependent variable in our empirical analysis of the family bargaining process is the probability of birth in period $t + 1$. We use this time lead against the control variables to capture the relevant socio-economic condition, when a decision over fertility is arguably made. As we can only observe the completed births of one year in the following panel wave, and we additionally assume the time lead and use births in $t + 1$, the two latest waves are lost in the estimation. Descriptive statistics for the estimation sample are depicted in Table 1. The low mean in the binary variable $Birth(t + 1)$ of 0.06 can be interpreted as 60 births per 1000 fertile women each year or a hypothetical fertility rate of 1.2, which is close to actual nationwide measures.

Table 1: Descriptive statistics from women’s perspective

	Whole sample	Women’s Child Preferences		
		Equal	Higher	Lower
Birth (t+1)	0.06	0.07	0.06	0.05
Preference	1.48	1.39	1.23	2.48
Partner’s pref.	1.61	1.39	2.37	1.38
Pref. interpolated	1.44	1.34	1.25	2.22
Partner’s pref. interpol.	1.57	1.34	2.08	1.42
Conflict (higher)	0.34	0.00	1.00	
Conflict (lower)	0.20	0.00		1.00
γ^R	0.26	0.25	0.28	0.31
Child benefits	1224.4	1211.74	1242.21	1237.51
Age	32.36	32.45	32.36	32.04
Catholic	0.09	0.09	0.09	0.08
Native	0.92	0.91	0.93	0.93
Income	520.83	476.17	545.63	645.31
Partner’s income	1488.34	1496.48	1468.43	1497.31
Not enrolled	0.93	0.94	0.93	0.92
ISCED	3.60	3.60	3.58	3.60
GDP growth	1.91	1.95	1.84	1.91
Birth (t)	0.07	0.08	0.07	0.05
Worries	2.03	2.02	2.03	2.09

The first key variable of interest is the child preference of women and their partners. Child preferences in the GSOEP are obtained by asking the participants for the importance of having children. Possible answers are: very important (1), important (2),

not very important (3) and unimportant (4).³ Descriptive statistics of the variable *Child preference* are shown in Table 1. Women's child preferences have a lower mean, so women have higher preferences than their partners on average. As only four waves contain this variable,⁴ we interpolate the data linearly in between to get a sufficiently large sample. This can imply measurement error if child preferences fluctuate a lot. The implicit assumption is that these preferences are relatively stable over time, so we can still distinguish between couples with and without preference conflicts.⁵ Interpolation does not change the overall descriptive statistics significantly. As a robustness check we test our model with the original data. The preference relation within couples determines whether women belong to the treatment group used to identify whether couples bargain over fertility. The variable *Conflict (higher)* takes on a value of unity if women have higher child preferences than their partners, and zero if preferences are equal. Accordingly, women have higher preferences in 34 percent of included observations. The group of women with lower child preferences than men, *Conflict (lower)*, is smaller, representing only 20 percent of the included observations. We have 4453 person-year observations in the treatment group of women with higher preferences than their partners in our data and 2169 observations for women with lower preferences. The control group of couples with homogeneous child preferences comprises 8515 person-year observations. Table 2 shows the fractions of answers to the child preference question the original separately for men and women. We distinguish three categories, all couples, childless couples, and parents. 65 percent of the women think it is very important to have children, whereas this is true for only 55 percent of the men. This difference trickles down to lower preferences, while the lowest category unimportant is rare. The same gender pattern is noticed for childless couples and parents, who report high preferences more often. On average women value having children more than men do.

The second key variable of interest is relative income as a determinant of individual bargaining power. The variable Y^R is defined as the fraction of individual earned gross income to total household gross income $\left(\frac{Y_i}{Y_i+Y_j}\right)$. Women contribute on average 26 percent to total income, thus their bargaining power is on average much lower than the

³The precise question is: "Are the following things currently ... for you?" We use answers to the category "Have children".

⁴The questionnaires of 1990, 1992, 1995, 2004, and 2008 contain the preference item. We cannot use the latest 2008 wave, as it is the newest available data and we lose the two latest waves due to the time lead in births and the ex-post construction of the completed fertility for one year.

⁵About two-thirds of reported preferences are stable between the surveys.

Table 2: Fractions of answers to importance of having children

	Whole sample	Childless couples	Parents
<hr/> Females <hr/>			
Very important	0.6481	0.2680	0.7657
Important	0.2467	0.3587	0.2120
Not very important	0.0807	0.2807	0.0188
Unimportant	0.0246	0.0927	0.0035
<hr/> Males <hr/>			
Very important	0.5496	0.1920	0.6603
Important	0.3225	0.3853	0.3030
Not very important	0.1012	0.3240	0.0322
Unimportant	0.0268	0.0987	0.0045

men's bargaining power.

The third key variable is child benefits. In Germany, child benefits were introduced in 1955 for parents with at least three children and were fixed at around 13 euros. In 1975 eligibility criteria were reduced to having at least one child. Per child transfers increased with the number of children with changing discrepancies. Maximum income limits from the early years were abolished later. The most significant changes in child benefits occurred after 1990. Besides the cash benefit, there is a child allowance that decreases the tax base for the income tax. The allowance could be charged additionally to the child benefits until 1996. Afterwards, parents get either the tax allowance or cash benefits depending on which gives a greater gain. Therefore, only high income earners had an incentive to make use of the allowance. Combining these two measures, we obtain within-individual variation in child related payments over time and by earned income. We use the tax scheme for married couples and reduce gross income by the general amount of deductible income-related expenses. The variable for child related benefits for first children, henceforth called child benefits for simplicity, is computed for all couples under the assumption that they are married, as marrying minimizes taxes paid.⁶ The appropriate child payment is chosen regarding their income. Descriptive statistics for *Child benefits* are found in Table 1.

⁶In Germany, married couples may split incomes equally to reduce the marginal and average tax rates from the progressive tax system.

Descriptive statistics of additional control variables are shown in Table 1. The variable *Age* is bounded by the restriction on 20- to 39-year-olds. We constrain ourselves to women in the child-bearing age, in order to circumvent increasing numbers of completed fertility histories. The variable *Catholic* takes on a value of unity for catholics, and is zero otherwise. The variable *Native* is zero for foreign born women and unity for natives, indicating that the sample comprises 92 percent natives. Real net earned income, based on consumer price indices from the Federal Statistical Office, denoted by *Income*, averages at around 520 euro and shows a significantly lower median, which is explained by the mass of women in the data, who do not work at all. The mean earned income of the male partner, *Partner's income*, is about threefold that of the women, while its median-average spread is smaller. The variable *Not enrolled* equals one if the person does not participate in education or further training and zero otherwise, so less than seven percent are in education. The variable *ISCED* denotes the level of educational attainment in ISCED-1997-classification. *GDP growth* is the annual growth rate, reflecting the overall economic situation. *Birth (t)* in the current period is inserted to control for the biological constraint that makes two births in successive years unlikely. The variable *Worries* describes worries about the own economic situation on a decreasing scale.⁷

4 Estimation Strategy

Our main aim is to provide evidence on whether or not couples bargain over fertility. To that end, we estimate the effect of relative income as a determinant of bargaining power on birth probability by comparing the effect between two groups indicated by the interaction of relative income and a conflicting preference dummy. According to bargaining theory, relative income should only matter for fertility in the presence of child preference heterogeneity. Conversely, if partners have identical child preferences, then birth probability should be unaffected by relative income. Our estimation approach uses a control-group design to make inferences about the impact of relative income on birth probabilities. The treatment group comprises persons with higher child preferences than their partners, while the control group is made up of couples with homogeneous child preferences. Our identification of bargaining over fertility relies on the predicted difference in the effect of relative income between the two groups. If preferences are

⁷Very concerned is denoted by 1, somewhat concerned by 2 and not concerned at all by 3.

homogeneous, bargaining power will have no effect on fertility decisions. But for a person with higher preferences than her partner a positive effect of her relative income on fertility should be found. Thus, the interaction between the preference conflict dummy and relative income $Conflict \times Y^R$ allows us to tease out the extent to which relative income matters in the presence of child preference heterogeneity. A positive effect would then only be consistent with the bargaining approach.

Our identifying assumption is that the two groups do not differ in a way that affects the relative income effect on fertility except for the child preferences after controlling for other socio-economic variables. This implies that there may not be a differential selection into the groups based on unobserved variables that also affect fertility. However, a difference in the group mean of fertility is allowed so that self-selection based on relative income is not a concern. Results could be confounded if partners with heterogeneous preferences were reacting differently to relative income not because they have no preference conflict but because they are different in an unobserved way. A possibility would be that people seeking for harmonic relations would self-select into partnerships with homogeneous child preferences and abstain from bargaining. This could cause problems for identification if need for harmony was correlated with relative income. Given that the harmonic people would be self-selected into homogeneous partnerships, relative income may not be different between the groups in order to be able to identify the effect, but descriptive statistics show that this is not the case or that they are not quantitatively important. If the correlation is non-existent we would just have an alternative explanation to the bargaining story. A correlation between assertiveness and relative income may also be present. Then we would capture more of the bargaining power than the part that is explained by relative income. As relative income is not exogenous in our data, partners with a preference conflict could try to increase their bargaining power by working more and bringing home a higher income share. The difference in the effect of relative income on birth probability between the control and treatment group would still be informative. Moreover, both partners in these couples have incentives to increase their bargaining power. Only if those in the heterogenous preference group that have higher birth probabilities would increase their relative income more than others, the effect could be confounding. Yet, the mean statistics for relative income are not very different between the groups.

There is also a potential attrition problem for the conflict group if couples with dif-

ferent preferences were more likely to separate and the remaining couples had a higher probability of child birth. Separated couples would drop out of the sample so that the remaining may just be those, who have higher commitment levels and higher birth probabilities. This is controlled for with the different levels of birth probability between the conflict and homogenous preference groups. A problem for identification only arises if the separation function of conflicting preferences was negatively correlated with female relative income, i.e., if higher female earnings would imply a lower reaction in separation to conflicting preferences. Then the remaining couples would have higher female relative incomes and higher birth probabilities due to unobserved heterogeneity. This would confound a bargaining result. If higher earnings would lead to higher separation probability in case of conflicting preferences, we would estimate a lower bound, because the remaining couples would have lower female bargaining power but higher birth probabilities due to unobserved characteristics, which contradicts our prediction and leads to a downward bias. The latter case is more relevant theoretically as the gain from marriage usually decreases with female earnings or the female outside option increases and, thus, separations become more likely if women earn a larger share. Therefore, our estimates are likely to be lower bounds of the bargaining power effect. Moreover, we exclude the possibility of partner switches in our sample. All included women stay with the same man.

In an extension, we test whether couples commit to household resource allocations. For couples, who already have children, we define two relative income measures: their ex ante relative income before they had children, Y_0^R , and the current relative income, Y_t^R . If there is commitment, the pre-children allocation should affect the couples' behavior, i.e., they rely on the relative income obtained before they had the first child and do not ascertain a new bargaining power allocation afterwards. On the contrary, higher explanatory power of the current relative income in each period would indicate that repeated renegotiations occur and that bargaining power is rather endogenous, because the past decision to have a child alters individual incomes. This test is valid as long as it is true that for the counterfactual case, i.e., a couple had not chosen to have children, their bargaining power relation would not change over time.

In the section of robustness checks, we look for further evidence by considering child benefits in two respects. First, a varying effect of child benefits on fertility with preference heterogeneity can only occur if couples bargain over resource allocations. And second,

Prediction 3 includes child benefits: their effect on fertility depends on bargaining power and preference heterogeneity if couples bargain over fertility. Essentially, we apply two additional tests of family bargaining. Moreover, if we find that couples bargain over fertility, this can have potentially large effects for public policy, e.g., for specifying the recipient of child benefits. Considering child benefits in the regressions can help us understand immediately how their effect on fertility depends on the underlying decision process in the household. Thus, the interaction of treatment and the exogenous income from child benefits, $Conflict \times Benefit$, is introduced in a further specification. In the unitary model, changes in child benefits would increase fertility independent of preference heterogeneity. Conversely, the bargaining model can predict differential effects of these changes on fertility for the conflict- and control-group. If there is a different effect for the conflict-group, it indicates the presence of bargaining, although we will not detect if it is driven by relative incomes.

Accordingly, in a final specification the interaction of all three variables $Conflict \times Benefit \times Y^R$ is introduced to test whether effects of benefits are influenced by the division of income and the treatment group dummy simultaneously. Intuitively, raising child benefits yields a greater effect on fertility if the person with higher preferences has greater bargaining power. Thus, we run a cross-section individual-level linear probability regression with different numbers of interaction terms of the equation

$$\begin{aligned}
Birth_{i,t+1} = & \alpha + \beta_1(Conflict \times Y^R)_{i,t} + \beta_2(Conflict \times Benefit)_{i,t} \\
& + \beta_3(Benefit \times Y^R)_{i,t} + \beta_4(Conflict \times Benefit \times Y^R)_{i,t} \\
& + X'_{i,t}\gamma + \epsilon_{i,t},
\end{aligned} \tag{1}$$

where $X_{i,t}$ are the remaining control variables of couple i in period t and ϵ is an i.i.d. error term.

5 Empirical Results

In this section, we apply our specified equation to address the question of whether couples bargain over fertility or not. We report coefficients from pooled linear probability estimations with panel robust standard errors that are clustered at the individual level and control for both serial correlation and heteroskedasticity. Coefficients may, thus,

be interpreted as marginal effects. In the baseline regression, the key coefficient is the interaction of the conflict dummy and relative income. On the left side of the regression tables we report tests for the conflict group with higher female child preferences than their partners and on the right estimations for women with lower preferences are shown. Subsamples are composed of childless couples and parents.

5.1 Baseline results

We find a strong positive relation between birth probability and relative income in the first column of Table 3 for couples with conflicting child preferences if the woman has higher child preferences than her partner. The interaction, $Conflict \times Y^R$, composed of the conflict dummy and relative income, indicates that relative income has a different effect on birth probability for couples with conflicting preferences compared to agreeing couples. In numbers this means, a woman with higher preferences than her partner, who increases her relative income from zero to one, would increase the probability of child birth by 4.5 percentage points more than a woman in a homogenous preference couple, all else equal. Or, put differently, the negative effect of higher female incomes in homogenous preference couples is about compensated. A ten percentage points increase in relative income in partnerships with conflicting preferences increases birth probability by about half a percentage point compared to the control group. As the overall probability is about 6 percent, we find an economically significant effect. This positive relation corresponds to what we summed up in *Prediction 2* in the theoretical part. If the woman has higher child preferences than her partner, her relative income generates a positive effect on the probability of birth. Put differently, a higher relative income implies that she has "more say" in fertility decisions. Although this is not necessarily a causal effect, as unobserved differences between homogeneous and heterogeneous preference couples could drive the correlation, the results point towards the occurrence of bargaining over fertility within couples.

In the right half of Table 3 the conflict is described by the female partner having lower child preferences than her male counterpart. The coefficient for the interaction, $Conflict \times Y^R$, turns out negative as expected, though the effect is not significant and smaller than for higher female preferences. This nonlinearity in the effect of "more say" in the household decision implies that a woman can more easily convince her partner of having more children with increasing bargaining power than prevent family expansion if

they wish to. An equivalent interpretation is that men with higher preferences are unable to translate higher bargaining power in more children. This could be due to the fact that women ultimately control the family’s fertility. Furthermore, only women are able to cheat in the fertility decision without being noticed, i.e., using contraceptives to avoid pregnancies if they want fewer children than their partners. The estimates for women with lower preferences may thus be downward biased if decisions can be deceived.

Table 3: Baseline regression

Variables	Higher Child Preference			Lower Child Preference		
	All	Childless	Parents	All	Childless	Parents
$Conflict \times Y^R$	0.0445** (0.0180)	0.1413** (0.0618)	0.0145 (0.0165)	-0.0175 (0.0207)	0.0545 (0.0689)	-0.0284 (0.0184)
Y^R	-0.0440*** (0.0139)	-0.0851* (0.0453)	-0.0315** (0.0135)	-0.0525*** (0.0144)	-0.1007** (0.0416)	-0.0303** (0.0143)
$Conflict$	-0.0151** (0.0066)	-0.0540* (0.0317)	-0.0110* (0.0064)	-0.0134 (0.0091)	-0.0681** (0.0341)	-0.0077 (0.0091)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11893	1882	10011	9710	1680	8030

Cluster-robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: Reported coefficients are from linear probability model with the dependent variable of birth in the following period. Panel robust standard errors are computed. Control variables are age, catholic denomination, native origin, individual labor income, household labor income, enrollment, ISCED1997 dummies, GDP growth, a birth dummy and financial worries.

Interestingly, the effect of bargaining power is not constant over different family statuses in the baseline regression. For childless women with higher child preferences the effect is very strong, while it becomes insignificant for parents. For the lower child preference women the negative coefficient in the parents-sample shows the smallest standard error on the table’s right, although we do not see a comparably clear pattern. There is a time profile behind this heterogeneity that may tell an interesting story about the endogeneity of bargaining power. The earnings relations of the family members may change in response to family expansions. We consider this in more detail in the following subsection.

Common to all samples are the effects of the control variables. Components of interaction terms, which separately enter the estimation, must be understood as the effect when the other interacted component is null. Relative income, Y^R , itself has a negative

effect on birth probability, given the interacted variables are zero, i.e., female relative income negatively affects birth probability in homogeneous preference couples. This is at odds with our theoretical consideration, nevertheless there are two possible explanations. First, relative income can, in some cases, be multicollinear with individual net earned income so that it may partly capture the opportunity cost effect of income foregone for childbearing and childrearing. In fact, when including the relative income variable in the estimation, relative income takes over the negative effect of female individual income on birth probability. As our identification relies on the difference between couples with heterogeneous and homogeneous child preferences, the estimates are not compromised by an effect of relative income in the control group. Second, equality in reported preferences from our roughly measured four categories does not rule out that preferences may be approximately similar but still heterogeneous, but the overall negative coefficients disqualify this explanation. The coefficient of the conflict group dummy for heterogeneous preference couples, *Conflict*, turns out negative, as conflicts over fertility arguably decrease birth probabilities.

5.2 Results for a Simple Dynamic Bargaining

As our results of bargaining power on fertility are very different between childless couples and parents, we consider an explanation of endogenous bargaining power for this phenomenon. Suppose a couple with conflicting child preferences and equal individual earned incomes decides to have a child. Later, the wife works part-time and earns less, while her child preferences are still higher than her husband's. Provided the partners commit to the resource allocation they had before the first child was born, they will arrive at similar fertility choices as before, when deciding over having a second child. If they do not commit to that allocation of resources, a new bargain over fertility is carried out with lower bargaining power of the wife. This in turn means that a second child becomes less likely. Committing to resource allocations is immanent in collective models with Pareto optimal outcomes and makes sense if we think of marriage as a complete contract. However, it is unclear whether couples are able and willing to make such commitments. In a dynamic framework of household decisions (Ligon, 2002; Lundberg and Pollak, 2003; Basu, 2006; Iyigun and Walsh, 2007), renegotiations are allowed. Bargaining power then becomes endogenous, i.e., it can be influenced by household decisions.

In an extended specification of our baseline regression, we capture the effect of an

Table 4: Dynamic bargaining—couples with at least one child and ex ante bargaining power

	Higher Child Preference	Lower Child Preference
$Conflict \times Y_0^R$	0.0895* (0.0482)	-0.0020 (0.0473)
Y_0^R	-0.0249 (0.0297)	-0.0266 (0.0290)
$Conflict \times Y_t^R$	0.0407 (0.0448)	-0.1159** (0.0453)
Y_t^R	-0.1040*** (0.0355)	-0.0699** (0.0327)
$Conflict$	-0.0528** (0.0237)	-0.0102 (0.0289)
Controls	Yes	Yes
Observations	3001	2401

Cluster-robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Couples in the sample have at least one child. Relative income before children were born imposes that only couples, who get the first child within the sample period, are included. Reported coefficients are from linear probability model with the dependent variable of birth in the following period. Panel robust standard errors are computed. Control variables are age, catholic denomination, native origin, individual labor income, household labor income, enrollment, ISCED1997 dummies, GDP growth, a birth dummy and financial worries.

ex ante income. Concerning this matter, we introduce a new relative income variable, Y_0^R , which is the relative income in the period before a couple had its first child. We understand this measure as the bargaining status a couple may commit to if it decides to not let family developments interfere in their future decisions. It may also be seen as the relative income that determines the lifetime fertility decision. This ex ante relative income, Y_0^R , is interacted with the preference conflict dummy and estimated along with the previous income measure.

Table 4 reveals an interesting heterogeneity with respect to higher and lower female preferences. The samples comprise only women, who have at least one child and were already in the data before their first child was born. For women with higher preferences, we find the interaction effect with her commitment bargaining measure, the ex ante relative income, to be positive and significant. The interaction with their current income, $Conflict \times Y_t^R$, is insignificant as in the baseline estimation. The ex ante relative income still matters for the decision about a further child if the woman has higher preferences.

She can thus still argue with her supposedly higher bargaining power she had before she became a mother, which means here that she will have an easier job to come to the conclusion with her partner to get another child. If she has higher child preferences, the couple commits to the ex ante resource allocation.

In the right half of Table 4 the female partner has lower child preferences in the case of conflict. In contrast to the previous results the ex ante relative income has no significant effect, yet we find a significant and negative effect of the current relative income. If the woman has lower preferences, she cannot commit to the resource allocation she had before the first child was born. Though, the current bargaining power matters, i.e., the higher her income share, the less likely is another child.

This heterogeneity in the underlying decision process provides an interesting insight. If the female partner wants more children, she can commit to an early bargaining power that is most probably superior to her later state, when she has children. She is able to preserve say in the decision and get more children. On the contrary, if she wants less children than her partner, but has already "lost" the decision in the first instance and became a mother, her presumably worsened bargaining position further decreases her say in the decision about another child. If she loses income relative to her partner, another child becomes more likely. We could suggest that this unfavorable process for her is driven by another male dominance in the partnership that exacerbates when her bargaining position worsens as a mother.

5.3 Robustness Checks

As a check for robustness of our previous estimates, we introduce additional interaction terms that include child benefits. These can also provide insight into the effect of benefit payments on fertility within a bargaining framework. We report the results in Table 5 in the same style as above, with higher female child preferences on the left side and lower preferences compared to the partner on the right side of the table.

In the first columns in each part of Table 5 we consider differential effects of child benefits between the groups, which are captured by the interaction term of the conflict dummy and child benefits, $Conflict \times Benefit$. For higher female preferences the effect is significant and positive. Thus, child benefits generate greater effects for the heterogeneous preference couples if the woman has higher child preferences. This could be driven by group differences, if the conflict group had a different average in child preferences. How-

Table 5: Extended interaction terms

Variables	Higher Child Preference			Lower Child Preference		
	All	All	All	All	All	All
$Conflict \times Y^R$	0.0448** (0.0180)	0.0439** (0.0180)	0.1414** (0.0694)	-0.0177 (0.0207)	-0.0186 (0.0206)	-0.0731 (0.0734)
$Conflict \times Benefit$	0.0428*** (0.0158)	0.0421*** (0.0158)	0.0631*** (0.0202)	0.0103 (0.0173)	0.0046 (0.0172)	-0.0095 (0.0252)
$Benefit \times Y^R$		0.0391 (0.0239)	0.0670** (0.0264)		0.0743*** (0.0238)	0.0656** (0.0264)
$Conflict \times Benefit \times Y^R$			-0.0809 (0.0549)			0.0454 (0.0568)
Y^R	-0.0437*** (0.0140)	-0.0865*** (0.0301)	-0.1202*** (0.0330)	-0.0523*** (0.0144)	-0.1346*** (0.0296)	-0.1242*** (0.0328)
$Conflict$	-0.0680*** (0.0207)	-0.0667*** (0.0206)	-0.0920*** (0.0258)	-0.0260 (0.0245)	-0.0187 (0.0244)	-0.0017 (0.0339)
$Benefit$	-0.0069 (0.0093)	-0.0167 (0.0115)	-0.0237** (0.0121)	-0.0172* (0.0095)	-0.0362*** (0.0119)	-0.0341*** (0.0123)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11893	11893	11893	9710	9710	9710

Cluster-robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Reported coefficients are from linear probability model with the dependent variable of birth in the following period. Panel robust standard errors are computed. Control variables are age, catholic denomination, native origin, individual labor income, household labor income, enrollment, ISCED1997 dummies, GDP growth, a birth dummy and financial worries.

ever, the results hold even after controlling for individual and the partners' preferences, though, tables are omitted here. The effect of the variable of interest, $Conflict \times Y^R$, is comparable to the baseline estimation. For women with lower child preferences than their partner neither of the two effects is significant. In sum, women with higher preferences in conflict couples are notably more responsive to child benefits.

An interaction term of child benefits and relative income, which is not exclusive to the conflict or the homogeneous preferences group, controls for common effects of child benefits on birth probability that vary with relative incomes. The variables of interest remain largely unchanged.

In column four a triple interaction term of relative income, treatment and benefits, denoted by $Conflict \times Benefit \times Y^R$, is included. The triple interaction term should have a positive effect, as we expect an increasing effect of child benefits on birth probability with relative income if child preferences are heterogeneous and bargaining over fertility

occurs. In other words, the marginal effect indicates by how much fertility is raised on average when increasing benefits by one unit compared to women in homogeneous preference couples or without any bargaining power. Each of the interacted components should have a positive effect on birth probability, given the other two components are held constant. However, the effect turns out insignificant, while the other variables of interest are not altered much. The negative and significant effect of child benefits seems odd, though it only denotes that for couples with homogeneous preferences and zero income of the female partner child benefits do not operate as expected. For women with lower preferences than their partners the effect is not significant either. However, this is not a test of directing transfers to a particular person. Child benefits can be received by the claimant whoever that is and we cannot observe which parent claims the benefits.

Table 6: Regression without interpolated preference data

Variables	Higher Child Preference			Lower Child Preference		
	All	Childless	Parents	All	Childless	Parents
$Conflict \times Y^R$	0.0565* (0.0308)	0.0637 (0.0869)	0.0450 (0.0281)	-0.0001 (0.0403)	0.1318 (0.0992)	-0.0422 (0.0383)
Y^R	-0.0443** (0.0223)	-0.0328 (0.0576)	-0.0336 (0.0240)	-0.0541** (0.0228)	-0.1079** (0.0535)	-0.0165 (0.0235)
$Conflict$	-0.0193* (0.0116)	-0.0108 (0.0451)	-0.0222** (0.0109)	-0.0133 (0.0170)	-0.0877* (0.0473)	0.0018 (0.0185)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4971	1054	3917	4355	929	3426

Cluster-robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: Reported coefficients are from linear probability model with the dependent variable of birth in the following period. Panel robust standard errors are computed. Control variables are age, catholic denomination, native origin, individual labor income, household labor income, enrollment, ISCED1997 dummies, GDP growth, a birth dummy and financial worries.

Our assumption regarding the preferences was that these are relatively stable over time. Linear interpolation might otherwise indicate preference conflicts in all years between two survey periods, although the change in preferences occurred in a later period, if preferences were homogeneous at first. We therefore run the regression with just the four surveyed periods for comparison with our baseline result. As is evident from Table 6 the number of observations is more than halved. We can find a significant effect for bargaining power on birth probability even in this reduced sample, when women have

higher preferences than their partners and we use all observations. The subsample results become insignificant, as the results for women with lower preferences still are. The estimates are imprecisely measured compared to our baseline results due to the smaller sample and although the groups with interpolated preferences are blurred to some extent. Magnitudes are reasonably close to our baseline results for women with higher preferences. Positive effects of bargaining power on birth probability for women with lower preferences contradict our prediction, however, the coefficient in the middle of the right hand side of Table 6 is based on only 24 births in the conflict group and is insignificant.

Table 7: Different estimation approaches

Variables	Higher Child Preference		
	Probit	Logit	FE
$Conflict \times Y^R$	0.0470** (0.0178)	0.0502** (0.0188)	0.0558*** (0.0189)
Y^R	-0.4370*** (0.1423)	-1.0025*** (0.2894)	-0.0500*** (0.0145)
$Conflict$	-0.1462** (0.0589)	-0.3095** (0.1237)	-0.0204*** (0.0070)
Controls	Yes	Yes	Yes
Observations	11892	11892	11893
Standard errors as displayed in stata in parentheses, *** p<0.01, ** p<0.05, * p<0.1			
Notes: Control variables are age, catholic denomination, native origin, individual labor income, household labor income, enrollment, ISCED1997 dummies, GDP growth, a birth dummy and financial worries.			

As the outcome variable birth in the following period is discontinuous, a linear index model such as the probit or logit would be more efficient but computationally cumbersome with the several interaction terms included. In table 7 we show that the estimation method does not change the basic result for higher preference women. With probit and logit estimators the effects of bargaining power on fertility are comparably large and significant as in our baseline model. The reported coefficient for the interaction term is the marginal effect and standard errors are computed as proposed by Ai and Norton (2003). The other coefficients are not interpretable. A last estimator in the third row of table 7 uses the demeaning fixed effects estimation with OLS. By that we can control for unobservable, time-constant characteristics that may be correlated with independent

variables, although we cannot compare those who do not get a child with those who do get one anymore. Unobservable fixed effects seem not to be a concern as the result is very close to our baseline estimate.

6 Concluding Remarks

Our results suggest that a bargaining framework can better explain couples' fertility decisions than the unitary model. Relative income plays a key role for decision-making as it determines the bargaining power. Introducing child preferences in the estimation and drawing on theoretical considerations about preference heterogeneity, we are able to assess the one most important family decision—fertility—and lay out a framework for testing bargaining over public goods. Our results show that couples bargain over fertility and that the largest effects of bargaining power appear at first births if women have higher preferences than their partners. Commitment to ex ante resource allocations is gender specific—commitment appears if women have higher preferences than their partners and renegotiations take place if their preferences are lower.

Our results have direct implications for policy. Who receives the child benefit can affect its impact on fertility. If benefits are directed to the individual with higher child preferences than her partner, then we should expect positive effects on fertility. Descriptive statistics suggest that on average women have higher child preferences. Furthermore, couples seem not always to be able to commit to ex ante household resource allocations. This in turn means that women, who bear a greater burden of raising children, are penalized by losing bargaining power in future decisions. Transfers directed to women and policies to empower women in the labor market, e.g., with better child care supply, are immediate recommendations to secure equal gender opportunities. Besides, except for a possible endogenous increase of recipients, redirecting child benefits is essentially costless. Our recommendations are at odds with the well-known perception, as e.g., in Iyigun and Walsh (2007), that empowering women lowers fertility. We have shown that in some cases this result can be reversed.

In the presence of bargaining, the second policy goal of child benefits, the improvement of the well-being of children, may also be influenced. Though not tested explicitly, as Lundberg *et al.* (1997) suggest, women may be more concerned about the quality of children, i.e., the children's well-being. Our results on fertility could then also be valid

for child quality. Women should thus receive the benefits directly, as long as they live with their children.

The consequences of bargaining mechanisms in the decision-making of couples are important to family policy and thus further research would be advisable in a number of respects. First, better data could help to identify the group with higher child preferences accurately. As of now, our belief is that women more often have higher preferences. Second, commitment to household resource allocations is a key feature in marriage. Relying on cooperative bargaining models hitherto seems reasonable, as marriage is all about commitment. If commitment does not hold, as our results partly suggest, elaborate models are in need. Third, household-level fertility models that incorporate preferences are rare. These would help to find more specific testable assumptions. And fourth, very little is known about how preferences behave over time within marriage. Endogenous preferences could alter the results tremendously.

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