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Mommies' girls get dresses, daddies' boys get toys. Gender preferences in Poland and their implications.

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Abstract:

We examine the relationship of child gender with family and economic outcomes using a large dataset from the Polish Household Budgets' Survey (PHBS) for years 2003-2009. Apart from studying the effects of gender on family stability, fertility and mothers' labor market outcomes, we take advantage of the PHBS' detailed expenditure module to examine effects of gender on consumption patterns. We find that a first born daughter is significantly less likely to be living with her father compared to a first born son and that the probability of having the second child is negatively correlated with a first born daughter. Using the context of the collective model we provide interpretation of these results from the perspective of individual parental gender preferences. We also examine the potential effects of sample selection bias which may affect the results and may be important for other findings in the literature. Labor supply of mothers and overall child-related consumption is not affected by gender of the first child, but the pattern of expenditure significantly varies between those with first born sons and first born daughters. One possible interpretation of the findings is that Polish fathers have preferences for sons and Polish mothers have preferences for daughters. Expenditure patterns suggest potential early determination of gender roles – mommies' girls get dresses and daddies' boys get toys.

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1. **Introduction**

Over the last decades we have seen diminishing degree of gender discrimination in many societies. Growing equality has been documented in many areas of public life (Orloff, 1993), in labor markets in general (Fortin, 2005) as well as in particular high-end jobs (Terjesen and Singh, 2008). Inequality with respect to gender, however, finds its expression also at the household level, and this type of reflection of gender driven outcomes has real and significant implications for the quality of life of both adults and children. One explanation of gender bias in this context is parents' tastes for the gender of their children, evidence for which has recently been growing, and there has been a number of studies documenting its implications (e.g. Dahl and Moretti, 2008; Barcellos et al., 2010; Ichino et al. 2011).

One key outcome related to children's gender which has been examined in the literature is partnership stability. As pointed out by Dahl and Moretti (2008) the correlation between gender composition of children and family status is also consistent with alternative hypotheses under unbiased gender preferences. These include the "role model" consequences on the welfare of children or different costs of raising boys and girls (e.g. Rosenzwig and Schultz, 1982) which may result in parental separation. The evidence so far does not allow for a clear identification of the mechanism behind the observed outcomes, and as Dahl and Moretti (2008) point out, "more than one explanation could very well be at play".

The predominant interpretation of the findings in the literature has been that the outcomes relate to specific parental preferences of one gender over another. Such interpretation has been supported by direct evidence on parental preferences over gender of their children found in survey declarations concerning the gender of children.[2] We argue however, that a direct interpretation of the correlation of family outcomes with kids' gender requires numerous additional assumptions, in particular if one wants to consider preferences of both parents separately.

The complexity of the issues involved is illustrated with reference to the collective model (Chiappori, 1992) which seems to be a natural context for the analysis of gender preferences and family outcomes. The outcomes we observe may well reflect "gender preferences", but additional assumptions are necessary if we are to specify whose preferences are identified. The assumptions relate to the nature of the bargaining power of parents, their minimum

[2] See for example Gallup Pools from 2000 and 2003 for the US in which individuals are directly asked what sort of gender and gender composition they prefer for their children.

acceptable utility level in marriage, as well as attitude to risk when a decision to have the next child is involved.

Behavioral patterns conditional on the gender of children may affect fertility and may lead to important consequences, including economic ones, like labor market activity or changes in consumption behavior (Behrman, 1988; Barro and Becker, 1989). Boy preferences have been linked to discriminatory childcare investment behavior towards daughters (Barcellos et al., 2010) or marriage instability (Dahl and Moretti, 2008). On the other hand, they may lead to increased labor supply of mothers (Chun and Oh, 2002) as well as fathers (Lundberg and Rose, 2002). Children's gender seems to affect also such outcomes as parents' voting behavior (Oswald and Powdthavee, 2010). Additionally, in its extreme expression, strong boy preferences may lead to an imbalance in the country's sex ratio (Sen, 1990) through large scale sex-selective abortion and infanticide (Jha et al., 2006).

Thus, it seems important from both the economic and sociological point of view to analyze and understand the relationship between children's gender and various family outcomes both at country level as well as at the level of geographical and cultural areas. "Gender preferences" for children have been present in both the demographic (e.g. Cleland et al., 1983; Hank and Kohler, 2000; Andresson et al., 2006) and economic (e.g. Ben-Porath and Welch, 1976; Dahl and Moretti, 2008; Ichino et al., 2011) research for a long time. The results point towards the fact that gender preferences for kids might yield conspicuous consequences not only for the particular households but also for the entire economy.

Empirical studies testing for gender preferences examine them by analyzing the relationship between various household-level outcomes and exogenous gender variation such as the gender of the oldest child or children. The usual interpretation of such results is that it is parents' preferences that are revealed in particular choices. The studies focus primarily on fertility data and fertility stopping rules but there is also growing literature on intra-household resource allocation and family stability. The common underlying framework assumes that if parents prefer boys to girls then the family will invest more resources and the parental relationship will be more stable once a boy rather than a girl is born to these parents. Assuming boy preferences, a couple with a girl as the first child is more likely to continue childbearing then a couple whose first born child is a boy. Parents with two girls are more likely to have a third child than those with two boys, other things being equal. Therefore, conditional on the number of boys (or girls) and the number of children, the transition probability of having an additional child given a fixed number of children is thus considered to be a simple fertility based test for gender preferences, but as we argue, on its own it is not sufficient for assigning gender preferences to any of the parents.

It is also worth noting that if we combine the preferences for two boys and two girls in the same variable then we may be able to determine the preferences for mixed sex offspring given the increased probability of subsequent childbearing (Angrist and Evans, 1998).[3] The literature, however, has so far not addressed the issue of which preferences are being reflected in the outcomes. Using the collective model's framework we argue that jumping from correlations to conclusions on "preferences" may be too much of a simplification, although additional assumptions may make such interpretation justified.

In this paper we investigate the relationship of children's gender and important social and economic outcomes in Poland. To our knowledge this is the first study examining "gender preferences" using exogenous variation of first children's gender done on data from Central and Eastern European countries. While Hank and Kohler (2000) provide an ordered probit analysis of sex preferences for 17 European countries (including Poland) using Fertility and Family Survey, their data come from the early 1990s and small sample sizes may be behind the fact that they find no evidence of gender preferences for many countries including Poland. Brockmann (2001) uses a hazard model to asses gender preferences in east and west Germany based on about 6000 observations from the German Socio-Economic Panel (GSOEP). Interestingly from the point of view of our findings he concludes that east German women prefer girls, and finds no evidence for gender preferences in west Germany. It suggests that different institutional history and cultural background may affect parents' gender preferences even within a single nation. A closer look at a country further to the east with a different social and cultural structure, like Poland, can in our view shed more light on the degree of variation in gender preferences between societies.

In this paper, using data from the Polish Household Budgets' Survey for years 2003-2009 we try to shed light on gender preferences not only in the context of family structure and labor market outcomes of parents, but look also from the point of view of family expenditure patterns. Additionally the paper presents a methodological extension in the way that we test for the effect of sample selection in the analysis of gender preferences and fertility decisions.

[3] For a formal theoretical model of gender preferences see Leung (1991).

The main results indicate that in many aspects of life of Polish families there is evidence for differentiated behavior conditional on the gender of children.. We find that there is a significant influence of the gender of the first-born child on marital stability. From the point of view of the collective model we outline in the Appendix these results, which are robust to a variety of specification tests, are consistent with fathers' boy preferences, but could also reflect alternative interpretations. In contrast to previous research (for example: Ben-Porath and Welch, 1976; Khan and Sirageldin, 1977; Park, 1983; Das, 1987), however, we find only weak evidence for the relationship between children's gender and fertility. Statistically significant effects of the gender of the first child on fertility are found only in the case of the probability to have the second child. Interestingly in this case we find that the probability of having the second child is higher if the first born is a boy. This seemingly contradicts our marital stability results but as we demonstrate, these results can be reconciled by correcting for sample selection out of marriage. The findings thus suggest that partnership stability and fertility increase if the first born is a boy. The usual interpretation of such findings would be that boy preferences drive partnership stability, while girl preferences determine fertility. Our approach, drawing on the collective model, suggests alternative interpretations.

Further to this we find that unlike in the advanced economies there is no evidence of the effects of first born child's gender on labor supply decisions of mothers in Poland through either direct or indirect channels. On the other hand gender of the first-born child significantly affects the pattern of household expenditure. While overall consumption on children's goods does not depend on their gender, what parents buy differs depending on whether their first born child was a girl or a boy. Parents spend less (by about 11%) on toys and more (by about 7%) on children's clothing and shoes if the first born child is a girl. The effects of such differences on the quality of children's lives is difficult to gauge, but it may reflect the early assignment of social roles and show parents' preferences for specific types of early investment in their offspring. Girls are to look nice, boys are to play, and thus girls get dresses, boys get toys.

The rest of the paper is organized as follows. In the next section we describe the fertility background and fertility developments in Poland over the last decades, and present the data we use in the estimation. In Section 3 we discuss our estimates showing the degree of gender preferences as expressed in marital stability and fertility. This is followed by studying indirect channels including fertility and labor supply decisions and household expenditure (Section 4).

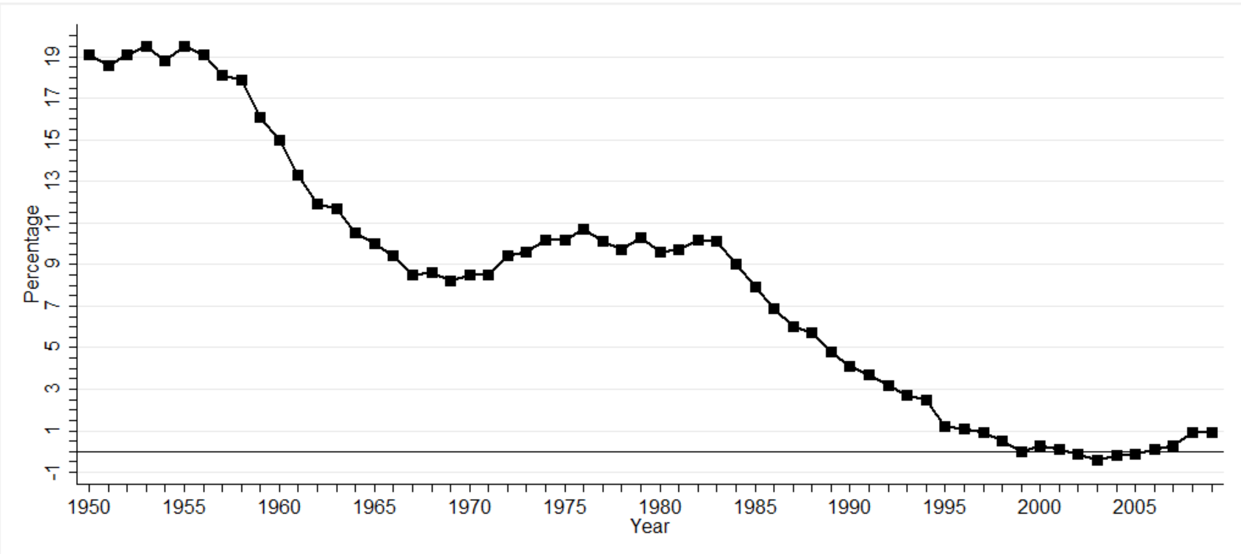
In Section 5 we examine the heterogeneity of our results by mothers' education group and cohort, and we conclude in Section 6.

2. Institutions, data and descriptive statistics

2.1 Fertility and sex-ratio at birth in Poland since 1950s

Poland is the 6th largest country by population and area in the European Union. It is also, to date, the largest and the most populous ex-communistic country that joined the EU. Prior to 1990 Poland experienced several baby booms, with the number of births per year in the 1950s exceeding 700,000 and 600,000 in 1970s compared to 400,000 in 1990s or 370,000 in 2000s. The communistic governments generally promoted large families as the foundations of the economic success of the nation. This was expressed through availability of public childcare facilities, easier access to publicly allocated housing for families with children, and high employment return rates for mothers after maternity leave. Since the end of the 1980s, however, the fertility rate in Poland declined rapidly, resulting most probably from a combination of high economic instability as well as changing attitudes towards marriage and family formation. Importantly, however, gender parity at birth has always been close to natural, even during communism when the abortion laws were much more lenient than in the last two decades.[4]

Figure 1. Population growth rate in Poland, 1950-2009

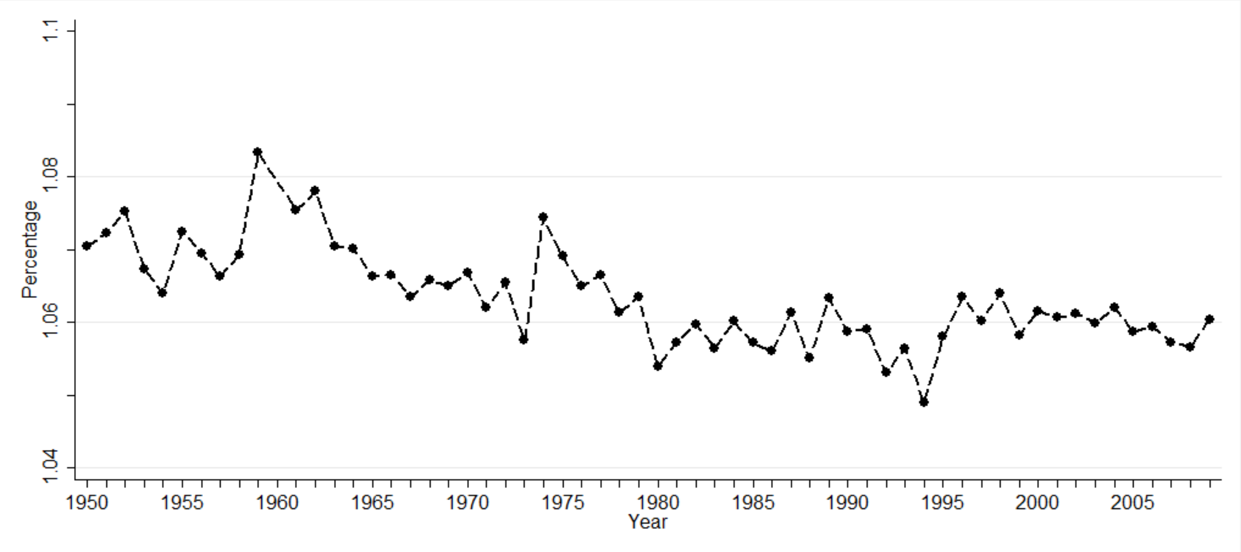


Source: Population growth rate based on the Polish Central Statistical Office birth and population registry (www.stat.gov.pl).

[4] Even under the regime the abortion laws in Poland were much stricter than in other communistic countries like Czechoslovakia or USSR. This might be attributed to a strong role of Roman Catholic Church during communism, which was one of the major forces uniting Polish society.

Figure 1 presents the population growth rate in Poland since 1950s. In the early 2000s Poland experienced negative population growth, although this seems to have returned to positive values in the recent years. More importantly the ratio of boy to girl living births has been stable for the past 60 years with the minimum of 1.05 in 1994 and the maximum of 1.08 in 1959 (Figure 2). The ratio has been stable around 1.06 since the early 1980s despite the advancement of early gender identification technology (ultra-sound became common in Poland in mid-1990s), and changes in abortion legislation introduced in 1993. This suggests that there is little evidence for sex-selective abortion in Poland, a phenomenon well-documented in the case of several Asian societies where gender ratios at birth are as high as 1.12 in India or 1.33 in China (Das Gupta, 2005; Hesketh et al., 2005). This type of reflection of gender preferences would of course affect the estimates which we present in Sections 3 and 4.

Figure 2. Live births gender ratio in Poland, 1950-2009



Source: Boys to girls gender ratio at birth based on the United Nations Demographic Yearbook (http://unstats.un.org/unsd/demographic/products/dyb/dyb2.htm).

2.2 Data and descriptive statistics

We use a dataset from the Polish Households' Budgets Survey (PHBS) for years 2003 – 2009. It is a nationally representative dataset collected every year by the Central Statistical Office in Poland.[5] The full data set includes information on 248 860 households and 749 160 individuals over the period of seven years. The size of the sample of the survey differs across years with around 37,000 households sampled every year since 2005 and around 32 000 households sampled before that, and is representative for the entire Polish population. Most of

[5] For more information on the methodology used by the Polish Central Statistical Office see: Barlik and Siwiak (2011). The methodology is approved and monitored by the EUROSTAT.

the analysis is performed on family level, where a family is defined as a single adult or a couple (married or cohabiting) with any dependent children which are matched on the basis of family relationship information in the survey. This approach implies that there may be more than one family in any particular household.

The data contain no retrospective fertility information and parents can only be matched with the children that live with them in the surveyed household. Because of that we restrict our sample to women younger than 41 and propose two subsamples conditional on the age of the oldest child. First, as Dahl and Moretti (2008) we use cutoff at 12 years of age and secondly, following Ichino et al. (2011), we apply the 15 years cutoff. Because of the sample size restrictions we use the larger sample for our main analysis and the smaller one for robustness testing.[6] Following previous research we also exclude widowed mothers from the main analysis (about 3% of the overall sample). The sample also excludes lone fathers, i.e. families in which mothers do not live with their children in the household. Since paternal custody is extremely rare in Poland (below 4% of custody decisions) there are only 275 such cases in the dataset with the above child and parental age restrictions. Any gender-bias in these rare paternal custody decisions could not be confirmed (see footnote 7 for details).

The descriptive statistics alongside the number of births in our samples are presented in Table 1. The main sample consist of 56 578 observations (families) within which 48 493 observations are families with married parents. The total sample restricted to the oldest child having at most 12 years old has 45 511 observations. The top panel of the table presents frequencies of families by the number of children. The bottom panel presents means and standard deviations of a selection of variables used in the analysis. Fertility indicators are naturally smaller in the sample with 12 year olds as these mothers are younger and thus more likely to have an incomplete fertility history. Importantly, however, the core dependent variables used in Dahl and Moretti (2008) do not differ much between the 15 and 12 years old

[6] Any resulting sample selection bias is likely to be very small since schooling in Poland is compulsory until the age of 18 and a large majority of children will live with their parents until at least that age. Additionally, Polish legislation strictly forbids employment of youths younger than 16 years old and allows it in limited amount for youths older than 16 years old conditional on post primary education. Since our sample selection limits the age of the mother at 40 there may also be selection bias resulting from the fact that some of these mothers may have kids who are no longer their dependent children, which would mean that we erroneously treat their second child as their first. Such cases will however be very rare, as they will apply only to mothers who: (a) had a child aged 21 or less (40-21 = 19) (b) whose first child, aged 19+ is no longer in education and thus does not count as a dependent child, and (c) had a second child at least four years later (i.e. the second child is a dependent child and fulfills our sample criteria).

cutoff samples. Moreover, the younger mothers are less likely to work or work for pay and have lower monthly labor income.

Table 1. Descriptive statistics

Number of births				
	All families		Married couples	
# children	Frequency	%	Frequency	%
1	25 656	45.35	20 252	41.76
2	22 490	39.75	20 551	42.38
3	6 378	11.27	5 843	12.05
4	1 412	2.50	1 283	2.65
5	424	0.75	364	0.75
6	151	0.27	135	0.28
7	40	0.07	40	0.08
8	21	0.04	19	0.04
9	3	0.01	3	0.01
10	1	0.00	1	0.00
11	1	0.00	1	0.00
12	1	0.00	1	0.00
Observations	56,578	100	48,493	100

Sample means on family level (standard deviations in brackets)		
	Oldest child at most 15 years old	Oldest child at most 12 years old
# children ever born	1.749 (0.867)	1.618 (0.767)
More than 1 child	0.537 (0.499)	0.473 (0.499)
More than 2 children	0.146 (0.353)	0.104 (0.306)
Girl first	0.486 (0.500)	0.484 (0.500)
Girl second	0.266 (0.442)	0.234 (0.423)
Two girls	0.131 (0.337)	0.114 (0.318)
Two boys	0.148 (0.355)	0.131 (0.338)
Age mother	31.07 (4.97)	29.90 (4.70)
Age at first birth	23.49 (3.71)	23.88 (3.85)
% living without a father	0.134 (0.341)	0.139 (0.346)
% never married	0.073 (0.261)	0.085 (0.279)
% separated or divorced	0.066 (0.248)	0.059 (0.236)
% custody	0.999 (0.038)	0.999 (0.035)
% married	0.857 (0.350)	0.852 (0.356)
Mother works	0.612 (0.487)	0.588 (0.492)
Mother works for pay	0.595 (0.491)	0.573 (0.495)
Mother’s labor income	649.03 (979.66)	633.42 (988.17)
Number of observations	56 578	45 511

Notes: The samples include families in which the mother is younger than 40 with at least one child in the family.
Source: authors’ own calculations based on the PHBS data (2003-2009).

3. Family outcomes in the context of gender preferences

3.1 Gender preferences and family stability

The first part of the analysis focuses on the examination of the model proposed by Dahl and Moretti (2008) in which we test if child gender affects family structure. We analyze three binomial family outcomes defined by the marital position of the mother:

- whether the child (children) currently lives without a father;
- whether the mother never marries (has always been single);

- whether the mother is currently separated or divorced.

We thus estimate the following model:

$$Y_i^j = (\text{First child girl}_i)'\alpha_1 + X_{1i}'\alpha_2 + X_{2i}'\alpha_3 + \varepsilon_i \tag{1}$$

where Y_i^j represents the indicator variable j for living without a father, mother being never married and mother being separated or divorced; X_1 contains mothers' socio demographic variables (mother's age polynomial, mother's age at first birth, and education dummies); X_2 includes five dummies for town size, regional controls for sixteen voivoidships and time dummies.

Significant coefficients on the "*first born girl*" variable has usually been considered in the literature as a reflection of the parents' gender preferences through its negative effect on the stability of parental partnerships. The sign of the coefficient will reflect either positive or negative influence of the first child being a girl. Interpreting these as reflections of preferences requires some caution, however. In the collective model's setting which we outline in the Appendix we show that, the crucial assumption that is needed concerns the minimum level of utility required in marriage by either of the partners to stay in the partnership. A significant estimate of the coefficient on "*first born girl*" is consistent with boy preferences of both partners, a boy preference of one combined with gender neutrality of the other as well as with opposite gender preferences of the parents. Whose preferences are "identified" will depend on the assumptions one is prepared to make concerning the acceptable minimum levels of utility in marriage. The identification relies also on the assumption that children's gender does not affect the relative bargaining power of the parents. Such effect of course cannot be completely ruled out and it is possible that it could also generate the observed correlations. If this was the case then the results of the estimations could not be given a "preference" interpretation as bargaining power is distinct from individual preferences. [7]

[7] Since in the analysis we are looking only at children living with their mothers one potential source of bias in the estimations could be gender biased custody decisions. In the Polish case this is an unlikely source of bias. In almost all cases of custody decisions in Poland custody is given to the mother. For example custodies were given to the father only in 3.6% cases in 2003 and in 3.9% in 2009. In addition to this using the PHBS data on all lone parents (mothers and fathers) we examined if there is any relationship between paternal or maternal custody and gender of the first child. The coefficient on the first child being a girl in this estimation is 0.00141 (p-value: 0.254) which we take as evidence that even in these limited number of cases of paternal custody there is no gender-bias in the decisions.

In Table 2 we present regression results for the model specified in equation (1) for the three dependent variables. All families in the sample are included in regressions where we examine the probability of living without a father or of mother never being married (columns 1 and 2 in Table 2), while in the case of looking at the probability of divorce or separation (column 3) we restrict the sample only to mothers which have ever been married.

Table 2. First child gender and the family status

VARIABLES	(1) Living without father	(2) Mother never married	(3) Mother separated or divorced
First child a girl	0.01044***	0.00628***	0.00483**
	(0.003)	(0.002)	(0.002)
First boy baseline	0.1291525	0.0702493	0.0634144
Percent effect	8.1	8.9	7.6
Observations	56,578	56,578	52,421
R-squared	0.080	0.122	0.029

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*
Families with children living at home aged between 0 and 15, mothers aged <41.
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

The results show that even in a sample which is much smaller in comparison to earlier studies (e.g. Dahland Moretti, 2008), we can confirm strong and statistically significant influence of the gender of the first born child on the family structure. A *first born girl* increases the probability of the children living without a father, the mother never marrying as well as the probability of divorce or separation. The coefficient in column (1) indicates that families in which the first born child is a girl are about one percentage point more likely to live without a father than families in which the first born child is a boy. This estimate provides the total effect on the probability of living without the father when the first born child is a girl versus a boy, including all the possible indirect effects that operate through subsequent fertility choices. The point estimate is much larger than in Dahl and Moretti (2008). To be able to compare the results across papers we also report the *first boy baseline*, a measure of the fraction of *first born boy* families without a resident father. Since we control for a number of characteristics of the mother and of the family, the first born baseline is calculated as the average predicated probability of having a non-resident father for *first born boy* families using the estimated coefficients on the control variables.

The percent effect, which is the odds ratio minus 1, reported in column (1) indicates that the probability of living without a father increases by 8.1% when comparing a family whose first child was a boy to a family whose first child was a girl. The effect for the sample with children aged 0-12 is 6.1% (Table A1), which is almost twice as high as the effect found in

Dahl and Moretti (2008), which was noted by the authors as a "surprisingly large effect". The probability of the mother never marrying (column 2) is also higher if the first born child is a girl, with a statistically significant effect and the percent effect of 8.9%. Column (3) of Table 2 reports the estimated coefficients when the divorce and separation dummy is regressed on the gender of the first child. This estimate is not affected by the endogeneity of family size as it provides the total effect on divorce of having a girl versus a boy as the first child, including any indirect effects that operate through differences in the subsequent fertility, gender birth order, or gender mix. The estimate shows that parents whose first child is a girl are 0.48 percentage points more likely to be divorced than those whose first child is a boy. The percent effect implies that the probability of divorce when moving from a family whose first child was a boy to a family whose first child was a girl increases by 7.6%. The effect estimated on the 0-12 sample - 2.4% (Table A1), which is again twice as high as the results presented in Dahl and Moretti (2008), but in our case, due to a smaller sample size, is not statistically significant. It is interesting to note the differences between the samples conditional on the age of the oldest child (0-15 or 0-12). It may indicate that a decision to separate or divorce is delayed beyond a certain age of the oldest child.

In Table A2 in the Appendix we also report results for a model extended to include controls for the gender of the first two children – whether the first two were girls or boys. These estimations are conducted on a sample with at least two children, which will naturally imply an endogeneity bias if marital/partnership status determine fertility. We estimate several specifications including and excluding the gender of the first child, as well as looking at the effect of mixed gender of the first two children. The results generally support the findings presented in Table 2, though the magnitude of the effects differs depending on the specification. The magnitude of the effect of having first two girls on separation or divorce is substantial - we find 1.1 percentage point effect for having two daughters first, i.e. 20.8% of the baseline two-boy divorce rate. When we turn to families with a mixed sex composition we actually find a negative and significant effect of 11%. This is in line with Angrist and Evans (1998) and Chun and Oh (2002), who argue in favour of mixed sex gender preferences in childbearing decisions at higher parities. Additionally, in the final panel of Table A2 we also present robustness checks for families in which the age of the oldest child is restricted to being greater than 4 (i.e. between 5 and 15) to control for the potential bias resulting from incomplete fertility histories. These results are not substantially different from those presented in Table 2.

For a more direct comparison with Ichino et al. (2011) the Appendix contains also estimates of probabilities of the mother being married (Table A3) estimated with the same controls for gender composition of children as the results in Tables A2 and for the four samples defined by the age of the oldest and youngest children. We find consistent coefficients on the *first born girl* across the samples with statistically significant negative effects of the first child being a girl, and a percentage effect of between 1.1 and 1.5 depending on the sample.

3.2 Gender of the first-born child and implications for total fertility

In the analysis above, we demonstrated evidence that in Poland boys increase the probability of families living with both parents either through higher probability of marriage or lower separation rates. At higher parities this effect might operate through mixed sex composition of children in the family. One of the consequences of lower marital stability in the case of *first born girl* may in turn be lower number of subsequent births and as a result lower total fertility. On the other hand, however, if there are boy preferences, a first born girl may imply higher fertility if the parents decide to have another child to have a desired son.

To examine the issue of the effect of first child's gender on fertility in more detail we estimate the following model:

$$C_i\text{[or More than j children]=(First child girl)}_i^{'}\alpha_1 + X_{1i}^{'}\alpha_2 + X_{2i}^{'}\alpha_3 + \varepsilon_i \qquad (2)$$

where X_1 and X_2 are defined as in equation (1) and C_i is the number of children in the family, while *More than j children* is the indicator variable of the j^{th} parity progression ratio.

The results of the estimations are presented in Table 3. The first panel of the table documents the relationship between the number of children in the family and the gender of the first child. In the sample of all women (column 1) a *first born girl* has a statistically significant negative effect on the number of children in the family. For married women (column 2) while insignificant, the coefficient is also negative. We need to remember though that fertility effects operate, at least partially, through family stability. Thus, if there are boy preferences reflected in the probability of parents being together, then total fertility may be reduced as a result of the implied instability. This is confirmed in additional specifications where we run the model on all families but with controls for being married (columns 3 and 4) and an interaction of being married with *first born girl* (column 4). In both cases the coefficient on the married dummy is positive and highly significant. The coefficients on *first born girl* and its interaction with marriage are insignificant, yet the effect of *first born girl* is still negative for both married and non-married mothers.

Table 3. Effects of first child's gender on fertility

VARIABLES	(1) All	(2) Married	(3) Marriage control	(4) Marriage interaction
	Total number of children			
First child a girl	-0.01049*	-0.00780	-0.00743	-0.00901
	(0.006)	(0.007)	(0.006)	(0.015)
Married mother			0.24661***	0.24569***
			(0.009)	(0.012)
First child a girl * Married mother				0.00183
				(0.017)
Observations	56,578	48,493	56,578	56,578
R-squared	0.293	0.297	0.302	0.302
	Probability of having two or more children			
First child a girl	-0.01267***	-0.01333***	-0.01029***	0.00454
	(0.004)	(0.004)	(0.004)	(0.009)
Married mother			0.19152***	0.20020***
			(0.005)	(0.007)
First child a girl * Married mother				-0.01730*
				(0.010)
Observations	56,578	48,493	56,578	56,578
R-squared	0.283	0.287	0.299	0.299
	Probability of having three or more children			
First child a girl	0.00164	0.00349	0.00217	-0.00618
	(0.003)	(0.003)	(0.003)	(0.006)
Married mother			0.04321***	0.03832***
			(0.004)	(0.005)
First child a girl * Married mother				0.00975
				(0.007)
Observations	56,578	48,493	56,578	56,578
R-squared	0.155	0.155	0.157	0.157
	Probability of having four or more children			
First child a girl	0.00051	0.00157	0.00060	-0.00507
	(0.002)	(0.002)	(0.002)	(0.003)
Married mother			0.00733***	0.00401
			(0.002)	(0.003)
First child a girl * Married mother				0.00661*
				(0.004)
Observations	56,578	48,493	56,578	56,578
R-squared	0.063	0.065	0.064	0.064
	Probability of having five or more children			
First child a girl	-0.00037	-0.00021	-0.00036	-0.00120
	(0.001)	(0.001)	(0.001)	(0.002)
Married mother			0.00126	0.00077
			(0.001)	(0.002)
First child a girl * Married mother				0.00098
				(0.002)
Observations	56,578	48,493	56,578	56,578
R-squared	0.029	0.029	0.029	0.029

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Families with children living at home aged between 0 and 15, mothers aged <41.*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

What is even more interesting is the fact that when we look at the second panel in which we present probability estimates of having two or more children the coefficients on first born girl is negative in columns (1)-(3), while in column (4) where we interact it also with the married dummy, the effect of *first born girl* for married mothers is negative and significant, while it is positive (though insignificant) for the non-married. The negative coefficients on *first born girl*, at first seem to contradict the findings we presented in Section 3.1. While under the condition we specify, lower family stability following a *first born girl* suggest boy preferences (at least of one of the parents), the usual reading of the negative coefficient on *first born girl* in fertility equations would point towards girl preferences. As we show below, a more careful analysis (Table 4) first of all demonstrates that such contradictory results may result from a sample selection bias. Secondly, we argue that in the collective model's framework in which individual preferences of parents are considered under certain conditions the negative fertility effect of *first born girl* may in fact be consistent with *boy preferences* of one of the partners.[8]

Table 4. Probability of two or more children under alternative assumptions of preferences of separated parents

VARIABLES	(1) All separated parents have boy preferences	(2) All separated parents have girl preferences	(3) Separated parents have either boy or girl preferences
First child a girl	0.02020***	-0.04471***	-0.01314***
	(0.004)	(0.004)	(0.004)
First boy baseline	0.5524072	0.5850391	0.5854044
Percent effect	3.7	-7.6	-2.2
Observations	56,578	56,578	56,578
R-squared	0.248	0.247	0.224

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Families with children living at home aged between 0 and 15; mothers aged <41.*
Imputations of children for separated families adjusted for the probability of having more than one child
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

The reason for the potential selection bias in the fertility estimations of the coefficient on *first born girl* is the fact that unlike in the case of married parents, for non-married mothers, if their fertility is affected by the separation, we do not observe their child preference as reflected in the number of children conditional on the gender of the first. To examine the potential extent of this bias, we estimate the role of gender of the first child with *assumed* gender preferences

[8] We need to note here that although we can observe the current marital status we do not observe the entire partnership history. This is a problem also common to other studies in the literature. For example it is possible that some of those women have been previously divorced. This may be problematic as women whose first child is a girl are more likely to get divorce and fertility of divorced women is generally lower. Thus, the relationship between child gender and fertility are biased towards finding a negative relationship between the first born girl indicator and fertility. In our case the coefficients for the married and the total sample are similar so the bias should not be too severe. We believe that this bias is indeed unlikely to be problematic as according to Central Statistical Office data only around 7.7% of divorced women (including those with and without kids) remarried in the years 2003 – 2009.

of parents who are no longer living together.[9] Table 4 presents the estimates of the effect of *first born girl* on the probability of having two or more children under such different assumptions. In the case of this exercise it is not relevant whose preferences are being assumed – mother's or father's – since it is the overall outcome of these preferences which is identified in the regression.

First we assume that all parents who no longer live together have "boy preferences", i.e. we assume that parents with the first born girl would have had another child had they stayed together (column 1). This is done by "imputing" another child to those separated parents who had a *first born girl*. Further we assume that all separated parents have "girl preferences", i.e. that those with a *first born boy* would have another child had they not separated (column 2). Finally, we assume that separated parents with a *first born girl* have "boy preferences", and those with a *first born boy* have "girl preferences". The latter case implies "imputing" an additional child to all separated parents (column 3).[10] In all three cases the imputation is adjusted by the probability of having another child, i.e. only those parents with higher than average probability of having another child (estimated on the sample of non-separated parents) are imputed an additional child.[11]

Results of the estimations using data with these imputed additional children adjusted by probability of having another child are presented in Table 4. They confirm the important role of the potential sample selection bias, and demonstrate that the negative effect of gender of the first child may turn positive (and statistically significant) under the assumption that all separated parents had "boy preferences", i.e. would have had another child if the first born was a girl (column 1). The assumption that generates these results is arguably very strong, and under the more natural one (column 3) the estimated coefficients still suggest overall "preferences" in favor of girls[12]. However, the exercise suggests that the seemingly contradictory conclusions we reach may just reflect revealed preferences of different types of

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[9] We are extremely grateful to Björn Öckert for this suggestion.

[10] Note that the standard approach taken in other studies, and estimated above (panel 1 of Table 3) also makes an assumption on preferences of separated parents, namely that parents of first born girls have girls preferences, and those of first born boys have boy preferences.

[11] Details of these estimations are available from the authors.

[12] In fact when we assume that 20% of those from the sample of "all separated parents have boy preferences" would have girl preferences then we no longer obtain positive and significant coefficient. Furthermore, if we assume that 35% of those parents have girl preferences then it yields negative and significant coefficient. Thus, we believe that in the fertility analysis when correcting for selection bias we can, under reasonable assumptions, accept the negative and significant coefficient on first-born girl as the true coefficient.

partners.[13] Several alternative explanations are also possible. For example if women assign a high value to partnership stability, then in the case of boy preferences of men and with the first born girl, they may decide not to have another child if the expectation is that a second girl would further increase the probability of partnership break up. In such a case men's boy preferences reduce fertility in response to a first born girl regardless of the women's gender preferences (see the discussion in the Appendix for an illustration).

From the point of view of the above discussion is it interesting to note that according to a survey conducted in 2001, both men and women in Poland reveal child gender preferences biased in favor of their own gender.[14] When asked about the preferred gender facing the possibility of having only one child, 56% Poles stated that the gender would not matter at all, 22% preferred boys and 19% preferred girls, only 3% were undecided. Like in many advanced economies, males in Poland would prefer to have male offspring (32%) rather than female offspring (11%). However, in contrast to the data for these countries Polish women are also characterized with gender discriminatory preferences - Polish mothers prefer to have girls (27%) rather than boys (11%). These declared preferences are in line with the interpretation of our findings above. The results are consistent with the fact that men prefer boys and women have a preference for girls, though as we pointed out under certain conditions in the light of the collective model men's preference for boys would be sufficient to generate the observed effects.

4. Labor supply and expenditure in the context of gender preferences

In this section the analysis focuses on economic outcomes in relation to the gender of children. First we follow some earlier papers which examined the effect of children's gender to mothers' labor market outcomes including employment and labor market earnings. Secondly, we examine the relationship of the gender of children on household expenditure. This we find to be an important extension of the literature, as so far any evidence on this relationship comes only form developing countries. For analysis of expenditure we use the detailed module of the PHBS and identify child-related items to examine the extent to which allocation of expenditure differs by the gender of children. In this context we discuss the

[13] Similar results – with even stronger effects of the assumed preferences – have been estimated on the sample of families with children aged 0-12. See Table A5 for details.

[14] The details can be found under the following URL: http://www.tnsglobal.pl/archive-report/id/447. The poll was conducted by TNS OBOP between 27th and 29th of January 2001 on countrywide, random and representative sample of 1096 individuals who where over 15 years old. The maximal statistical measurement error for this sample is estimated at the level +/- 3% with 95% confidence interval.

possible underlying processes that may lead to the observed outcomes. We believe that uncovering these empirical relationships is important on the one hand from the point of view of understanding the nature of the labor market, and on the other from the point of view of gender policy and social roles assigned to men and women in the Polish society.

4.1 Gender of the first-born child and mothers' labor supply.

The underlying econometric model we estimate in this section focuses on labor market outcomes of the mother and takes the following form:

$$\text{Work}_i[\text{or Work for pay}_i \text{ or Labor income}_i] = (\text{First child girl}_i)^{'}\alpha_1 + X_{1i}^{'}\alpha_2 + X_{2i}^{'}\alpha_3 + \varepsilon_i \quad (4)$$

where *Work* is an indicator variable if the mother is currently employed; *Work for pay* is an indicator variable if she is currently employed and obtains monetary compensation for her work, while *Labor income* is the value of the monetary compensation from work. The other variables are defined as in equation (1). Results of the estimations are presented in Table 5. The sample focuses on the one hand on non-widowed families (columns 1-3) and on the other hand examines families headed by widows (4-5). We estimate the model separately conditional on the age of oldest child. Column (1) reports results of model (4) estimated using the sample of non-widowed women whose oldest child is no more than 15 years old. Unlike Ichino et al. (2011) we do not find any evidence that gender of first-born child affects significantly any of the labor market outcomes. Even considering the size of the coefficients the effects would be relatively small. The effect is still insignificant and even smaller if we focus on married couples only (Table A7 in the Appendix). Restricting the age of the oldest child to the bandwidth used by Dahl and Moretti (2008) does not alter the picture (column (2) in Tables 5 and A7). Thus, in the case of Poland unlike in the advanced economies studied by Ichino et al. (2011) we reject the hypothesis that the sex of the first born child matters for the labor supply of mothers through indirect channels noted in Dahl and Moretti (2008) i.e. marital stability and increased fertility.

Columns (3)-(5) in Table 5 and column (3) in Table A5 explore the direct channel in which the gender of the first child might affect labor supply independent of fertility and marital stability. First, following Ichino et al. (2011) we study a sample of mothers whose first child is no more than two years old. Arguably in this case the majority of the women decide not to have another child, at least temporarily. We also analyze a sample of widowed mothers whose marriage ended through an exogenous shock. We do not find any significant effects for the sample of women with kids aged 0–2. The estimated coefficients are positive on the intensive margin and negative on the extensive margin for both full sample of women and for married women. Furthermore, they do not differ much quantitatively in terms of percent effect between these samples. We note that the coefficients are small and insignificant and one could conclude that there is indeed no effect of child gender on "fresh" mother's labor supply.

Table 5. Effect of first child's gender on mother's labor supply

	(1)	(2)	(3)	(4)	(5)
		All families		Widows	
VARIABLES	0-15	0-12	0-2	0-15	0-12
		Probability of working			
First child a girl	0.00510	0.00076	0.00407	0.02807	-0.04518
	(0.004)	(0.004)	(0.009)	(0.047)	(0.066)
First boy baseline	0.6090687	0.587888	0.4543179	0.6227671	0.6205053
Percent effect	0.8	0.1	0.9	4.5	-7.3
Observations	56,578	45,511	10,614	450	266
R-squared	0.142	0.144	0.164	0.164	0.185
		Probability of working for pay			
First child a girl	0.00344	-0.00010	0.00405	-0.01498	-0.11342*
	(0.004)	(0.004)	(0.009)	(0.048)	(0.066)
First boy baseline	0.5933139	0.5728129	0.4367084	0.5668244	0.5984888
Percent effect	0.6	-0.02	0.9	-2.6	-19.0
Observations	56,578	45,511	10,614	450	266
R-squared	0.140	0.143	0.165	0.178	0.190
		Monthly labor income			
First child a girl	-4.03431	-10.43508	-4.94694	-15.90319	-37.55947
	(7.011)	(7.896)	(18.387)	(58.928)	(76.913)
First boy baseline	650.9869	638.4631	518.8338	580.7095	614.3466
Percent effect	-0.6	-1.6	-1.0	-2.7	-6.1
Observations	56,578	45,511	10,614	450	266
R-squared	0.278	0.276	0.224	0.347	0.374

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Samples conditional on the age of oldest child; mothers aged <41; separately for not widowed and widowed families.*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

When we turn to the analysis of widows we also do not find any sizeable effects. The only significant coefficient is obtained for the sample of kids aged 0-12 and the probability of working for pay. It actually indicates that first-born girl rather than boy diminishes the mother's labor supply on the extensive margin. The effect is very large at the level of 19%, which we find rather implausible. For example Ichino et al. (2011) find an negative effect of 1.6% for boys. Given that we have 450 and 266 widows in the samples of 0-15 and 0-12 respectively we treat these estimates as rather less informative than these of mothers with kids age 0–2. In order to obtain more reliable estimates of widowhood we use the whole sample and the interaction term of widowhood and girl as first–born child. The results are presented in Table A8 in the Appendix. We do not find any significant effects of either *first born girl* or the interaction term on any of the labor market outcomes measures. Thus, it assures us that the barely significant negative coefficient from column (5) in Table 5 may be an artifact of low power of the widows sample. It is also worth noting that the probability of working for pay is reduced by 6.5 percentage points among widows in households where the oldest child is not older than 15 years old.

The combination of evidence presented above indicates that there is likely no direct or indirect effect of gender of the first born child on labor market outcomes of the mother. In Poland, like in the other countries, boys have higher incidence of congenital and non-congenital diseases as well as higher mortality in early childhood. In our sample we do not have, however, any health status indicators and thus although we note that such a channel might be presents, we are unable to credibly asses it.[15]

4.2 Gender of the first-born child and household expenditure

Research on gender discrimination in inputs dates back to the seminal papers by Behrman et al (1986) and Behrman (1988). In the former the authors develop a theoretical model and find that there is no empirical evidence for the US supporting the hypothesis that parental preferences favor boys. Instead their analysis indicates that parental preferences exhibit either equal concerns or slightly favor girls. Behrman (1988) finds that in India there are indeed pro-male preferences that manifest themselves especially during the lean season when the food is scarce. This picture points towards the fact that so long as resources are not limited there is no particular gender discrimination, however, when the household faces a shock to its budget it indeed invests more resources in (arguably more physically productive) male offspring.

The Polish Household Budgets' Survey contains detailed expenditure information of households collected over a period of a month. It includes details on over 400 specific consumption items and additionally separates spending on such items as shoes and clothing into adult (13+ years old) and child (<13) expenditures. On top of that we can identify such items as toys (the item is labeled as: "games, toys, hobby"), "education related books" (this does not include other books which are recorded separately), children's holidays and trips (the item is called "organized tourism for children"), as well as kindergarten and education

[15] Infant mortality is generally higher for boys than for girls. In 2009 the infant mortality sex ratio defined as deaths of boys to girls aged zero to four in Poland was 1.26. For further details see: http://demografia.stat.gov.pl/bazademografia/Tables.aspx.

expenditures. In what follows the five categories are labeled respectively as: “clothing”, “toys”, “books”, “trips”, “kindergarten”, and “school education”. Since generally schooling is paid for by the state in Poland the last category will include such items as additional classes and tutoring. The analysis presented below considers expenditures separately in each of the categories as well as in the form of “total spending”, which adds up the five child-related categories together.

The model we estimate in each case is:

$$E_i^{\,j} = (\text{First child girl}_i)'\alpha_1 + X_{1i}^{'}\alpha_2 + X_{2i}^{'}\alpha_3 + \varepsilon_i \qquad (5)$$

where E_i^j is the expenditure of household i in the group j and the remaining variables are defined as in equation (1). We restrict our attention to households where the oldest child is at most 12 years old and the mother is between 18-40 years old. The first restriction relates to the already mentioned splitting of clothing expenditure in the survey into adult/child expenses. Additionally, since consumption data is collected on household and not on family level, we restrict our analysis to households in which there is only one family with children so that all child expenses can be assigned to this family. Results, together with basic descriptive statistics on the expenditure items are presented in Table 6.

The analysis is conducted on three separate subsamples:

- the entire sample of families, including married couples, and single mothers with kids (excluding widows, these are considered separately in robustness checks in the Appendix, Table A9);
- those who have never been married, who got divorced as well as widows;
- the sample of married couples;
- the sample of widows.

Results of the estimation are presented in Table 6 for the total child-related expenditure (column 1) and the other specific items (2-7). Each of the panels of Table 6 includes descriptive statistics indicating the mean expenditure split by gender of the first child for a given group of goods as well as the share of the households in the sample that record positive expenditure in this group. The difference row indicates the results of statistical difference mean test. First panel presents the results for all families in the sample, while the second focuses on the sample of married couples. Additionally in the Appendix in Table A9 we show estimates for an extended sample which includes also widow-headed families and the separate estimates for the widows' sample. The focus on the latter serves to proxy a sample affected by an exogenous shock to resources to see if there is any evidence on differentiated consumption patterns by the gender of the first child in response to such a shock. Finally we also present analysis of effects of first child's gender on consumption patterns split by the age of the oldest child (Table A10 in the Appendix).

As Table 6 demonstrates we find several important effects in terms of how first child's gender affect consumption. In particular there is no evidence on any differentiation of total child-related spending by gender in the full sample as well as in the sample of married couples. This suggests that the overall level of resources spent on girls and on boys is about the same in Poland. On the other hand, we find large and statistically significant effects in terms of pattern of spending depending on gender of the first child. This can be seen in columns (2) and (3), which demonstrate the estimates of expenditure on "clothing" and "toys". If the first born child is a girl parents spend 6.5% more on children's clothing, while if it is a boy by 11% more on toys and games. Furthermore, the married couples seem to show a greater bias towards girls as in response to female offspring they spend even more on clothing. It is unclear how such a differentiation may affect the overall quality of children's lives, but it can be interpreted as a reflection of potential early assignment to social role models. It can also be considered as a consequence of parental decisions concerning differential investment of resources in boys and girls.

Importantly, we do find some evidence of differentiation of allocation of resources in the case of the widows' sample. The results presented in Table A9 show that widowhood implies lower spending on educational books if the first born child is a girl by a substantial 51% compared to the situation of the first born being a boy. There is also evidence on differential total spending on children among widows conditional on gender with total child related spending being as much as 25% higher when the first born child is a boy. This effect, however, is only significant at 10% level. These results do not hold quantitatively if we consider the sample of widows alone. The coefficients have identical signs, however, they are insignificant. Like in columns (4) and (5) in Table 5 we attribute this to small sample size and the resulting lack of precision of estimation.

Table 6. First child gender and child related expenditures

VARIABLES	(1) Total	(2) Clothing	(3) Toys	(4) Books	(5) Trips	(6) Kidergarden	(7) Education
			All families (excluding widows)				
Mean expend. Girls	134.818	61.75149	18.86881	20.10114	6.661954	26.45739	0.9771741
Mean expend. Boys	132.6612	57.64827	21.07968	19.5528	6.174718	27.34439	0.8613218
Different	No	Yes (1%)	Yes (1%)	No	No	No	No
% of HH with + expenditures	84.11	66.87	39.02	35.86	7.84	13.57	0.99
First child a girl	1.12990	3.74568***	-2.29064***	0.24703	0.30096	-0.95101	0.07789
	(1.663)	(0.868)	(0.536)	(0.596)	(0.442)	(0.813)	(0.128)
First boy baseline	133.1578	57.82118	21.11826	19.69852	6.264802	27.37534	0.8796824
Percent effect	0.9	6.5	-10.8	1.3	4.8	-3.5	8.9
Observations	41,811	41,811	41,811	41,811	41,811	41,811	41,811
R-squared	0.126	0.055	0.048	0.067	0.035	0.075	0.012
			Married couples				
Mean expend. Girls	139.2753	63.8586	19.97326	20.52861	6.593698	27.32698	0.9941668
Mean expend. Boys	135.8504	58.89901	21.85317	19.96726	6.07534	28.15987	0.8957928
Different	Yes (10%)	Yes (1%)	Yes (1%)	No	No	No	No
% of HH with + expenditures	85.04	67.85	40.07	36.46	7.94	13.92	1.03
First child a girl	1.73795	4.30225***	-2.05264***	0.14701	0.31309	-1.02722	0.05545
	(1.785)	(0.935)	(0.584)	(0.638)	(0.467)	(0.873)	(0.137)
First boy baseline	136.6628	59.21557	21.93635	20.16679	6.174191	28.25345	0.9164624
Percent effect	1.3	7.3	-9.4	0.7	5.1	-3.6	6.1
Observations	37,321	37,321	37,321	37,321	37,321	37,321	37,321
R-squared	0.131	0.056	0.050	0.069	0.035	0.079	0.013

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 12; mothers aged <41; samples restricted to households with only one family with dependent children.*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

The differential consumption patterns by the gender of the first child can be identified also when we split the sample by the age of the oldest child (Table A10). Our estimates show that the higher spending on children's clothing in the case of having a first born girl is almost the same for families with the oldest child aged 0-6 and 7-12 (percent effect 5.6% and 7.3% respectively), but the effect on toys grows strongly with the age of the oldest child from negative 6.9% in the younger group to negative 16.4% among those aged 7-12.

5. Effects of child's gender by education group and cohort

To summarize the results of the previous two sections we can say that there is evidence in the Polish data of the effect of child's gender on several important outcomes. These include partnership stability in which we find evidence of positive effects of boys on the likelihood of parents living together, and evidence of a negative effect on the probability of having more than one child following a *first born girl* among married couples. Gender of the first child is not correlated with mother's labor market outcomes but it does determine the pattern of child-related consumption – while parents spend more on girls' clothing, boys are more likely to get toys.

In this section we examine if the gender effects differ across mothers' highest education status and birth cohorts. The results are presented in Tables 7 and 8 respectively and in each case we distinguish three sub-samples. A note of caution is needed here concerning the education classification as in some cases mothers may still be in full-time (or part-time) education. As far as the cohort sub-samples are concerned one has to bear in mind that in these cases the estimated effects result both from different maternal cohorts and form the age of children related to these cohorts. This is to some extent mitigated by the long span of the data we use, but it by no means solves the problem entirely as we only use data for seven years.

The tables examine the main variables used in the analysis – whether there are two or more children in the family ("2 or more kids"), if the father does not live together with the mother and children ("No dad"), if the mother is separated or divorced ("Mother sep/div"), if she works ("Work mom"), the level of her work income ("Income mom"), total child-related consumption ("Total cons."), expenditure on children's clothes ("Clothing cons."), expenditure on toys and games ("Toys cons") and on educational books ("Books cons.").

Table 7. Heterogeneity in the effect of first child's gender by mother's education

VARIABLES	(1) 2 or more kids	(2) No dad	(3) Mother sep/div	(4) Work mom	(5) Income mom	(6) Total child cons.	(7) Clothing cons.	(8) Toys cons.	(9) Books cons.
					Above secondary				
First child a girl	-0.01877**	-0.00265	-0.00270	-0.00592	-32.99472	4.14571	5.58299***	-3.82337***	1.59906
	(0.008)	(0.005)	(0.004)	(0.007)	(22.764)	(4.172)	(2.054)	(1.434)	(1.040)
First boy baseline	-	0.0946796	0.0499261	0.7792806	1321.4	191.4265	76.49856	35.29595	17.3604
Percent effect	-	-2.8	-5.4	-0.8	-2.5	2.2	7.3	-10.8	9.2
Observations	11,940	11,940	11,378	11,940	11,940	11,410	11,410	11,410	11,410
R-squared	0.224	0.029	0.030	0.088	0.175	0.121	0.048	0.035	0.090
					Secondary				
First child a girl	-0.01261*	0.01334***	0.00040	-0.00617	-5.40172	2.19809	4.30849***	-1.56456*	0.13310
	(0.007)	(0.005)	(0.004)	(0.007)	(11.615)	(2.549)	(1.395)	(0.813)	(0.942)
First boy baseline	-	0.1292317	0.0610431	0.587353	539.5085	128.9251	56.94562	19.54086	19.21891
Percent effect	-	10.3	0.7	-1.1	-1.0	1.7	7.6	-8.0	0.7
Observations	16,691	16,691	15,367	16,691	16,691	15,319	15,319	15,319	15,319
R-squared	0.256	0.061	0.028	0.089	0.112	0.079	0.033	0.019	0.072
					Below secondary				
First child a girl	-0.00326	0.01049*	0.00600	0.01202*	-0.22937	-2.78714	1.65576	-1.92066***	-0.75253
	(0.007)	(0.005)	(0.004)	(0.007)	(6.883)	(2.081)	(1.167)	(0.589)	(1.089)
First boy baseline	-	0.1699433	0.0615586	0.4532117	253.7422	93.62782	44.6345	12.02836	21.9924
Percent effect	-	6.2	9.7	2.7	-0.1	-3.0	3.7	-16.0	-3.4
Observations	16,880	16,880	14,880	16,880	16,880	15,082	15,082	15,082	15,082
R-squared	0.266	0.131	0.033	0.101	0.084	0.061	0.037	0.021	0.056

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 12; mothers aged <41; in case of consumption outcomes (columns 6-9) samples restricted to households with only one family with dependent children.. In column (3) sample conditional on mother ever being married. "Total child cons" – the sum of child related consumption (child clothing, toys, books, kindergarten, trips and education.). Within broad education categories additional education indicators are included.*

Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

The estimations show notable patterns both by education levels and by mothers' cohort. First of all the effect of a *first born girl* on the probability of having two or more children (column 1 in Tables 7 and 8) are present only for the better educated mothers and for the older mothers, although the signs are also negative for mothers with less than secondary education and those born after 1980. Gender of the first child seems to affect marital stability only for mothers with secondary education or lower, however there is no pattern by cohort. The effects among youngest and oldest mothers are very similar and we do not find any significant effects among those born between 1971 and 1980. From this point of view it might thus be surprising that the effect of child gender on child-related spending is almost as strong among the highest educated and those with secondary education. It is only as it comes to expenditure on toys that the pattern is strongest among the lowest educated families compared to the better educated. Interestingly, the expenditure pattern differs significantly by mothers' cohort, although in this case the effect of child's age and potentially of mothers' better financial status due to her age might also play a role. The percentage effect of gender of the first born child on spending on clothing is almost three times larger among families with mothers born before 1971 compared to those born between 1971 and 1980. The effect on toys spending is over 6 percentage points higher, and both effects are weakest among the youngest cohorts of mother.

These differentiated effects on consumption patterns may be reflections of different underlying processes. On the one hand, these may be cohort effects showing changes in parental attitudes towards expenditure patterns by gender of children. Secondly, they may reflect the increasing gender differentiation of expenditures with children's age which could suggest increasing influence of "gender roles" as children get older. It could also be a reflection of consumption driven by children's preferences as they get older and play an increasing role in determining expenditure patterns. We must remember however, that our sample includes only children aged at most 12 years old, and so perhaps such strong influence of children' age would be unlikely, in which case the dominant effect would be that of changing consumption patterns by cohort which seem to be getting more balanced with time.

Table 8. Heterogeneity in the impact of first child gender by mother's cohort

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	2 or more kids	No dad	Mother sep/div	Work mom	Income mom	Total cons.	Clothing cons.	Toys cons.	Books cons.
					Born before 1971				
First child a girl	-0.02549**	0.01822**	0.00908	-0.01267	-41.96006*	3.04268	8.73359***	-3.36146**	-2.96151
	(0.012)	(0.008)	(0.007)	(0.011)	(23.672)	(5.190)	(2.557)	(1.560)	(2.000)
First boy baseline	-	0.0894217	0.0628092	0.7283765	901.3299	158.6138	62.30407	19.87473	34.12141
Percent effect	-	20.4	14.5	-1.7	-4.7	1.9	14.0	-16.9	-8.7
Observations	6,041	6,041	5,839	6,041	6,041	5,951	5,951	5,951	5,951
R-squared	0.159	0.033	0.024	0.113	0.328	0.118	0.052	0.058	0.040
					Born between 1971 and 1980				
First child a girl	-0.00901*	0.00246	-0.00089	0.00495	-11.13796	1.34927	2.87792***	-2.26088***	0.73169
	(0.005)	(0.004)	(0.003)	(0.005)	(9.678)	(2.017)	(1.060)	(0.631)	(0.737)
First boy baseline	-	0.1127376	0.061504	0.6179221	679.1063	137.7293	60.23551	21.23145	20.19941
Percent effect	-	2.2	-1.5	0.8	-1.6	1.0	4.8	-10.6	3.6
Observations	30,380	30,380	28,670	30,380	30,380	28,794	28,794	28,794	28,794
R-squared	0.236	0.044	0.031	0.109	0.280	0.122	0.053	0.051	0.062
					Born after 1980				
First child a girl	-0.00267	0.02083**	0.00299	-0.00324	23.37431	0.53423	3.38689*	-1.25479	0.90599
	(0.008)	(0.009)	(0.005)	(0.010)	(16.256)	(3.187)	(1.804)	(1.304)	(0.802)
First boy baseline	-	0.2405591	0.0420124	0.3937347	323.3754	92.1451	43.99809	21.59624	5.583789
Percent effect	-	8.7	7.1	-0.8	7.2	0.6	7.7	-5.8	16.2
Observations	9,090	9,090	7,116	9,090	9,090	7,066	7,066	7,066	7,066
R-squared	0.258	0.128	0.034	0.103	0.129	0.117	0.049	0.038	0.061

Notes: see notes for Table 7.

Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

6. Conclusions

We have demonstrated in this paper that child gender affects many important outcomes of Polish parents and children. Looking at the relationship between gender of the first born child and family outcomes such as marital stability and fertility, we found evidence for statistically significant effects in both cases. Since gender of the first born child can be treated as exogenous these effects can be given a causal interpretation. Taking the collective model (Chiappori, 1992) as the theoretical background for the analysis, we argued, however, that making the link from the identified relationships to parental preferences is far from straightforward. While negative relationship between the first born girl and partnership stability, which we find in the Polish data, has been usually given the interpretation of parental "boy preferences", we argued that numerous preference-related interpretations of this finding are possible, and they rely on further assumptions, such as for example, that the gender of the first child does not affect the relative bargaining power of the parents. The fact that a first born girl reduces partnership stability can be reconciled with boy preferences of both parents, or of one of them only, as well as with opposite gender preferences of the parents. If we are prepared to assume that the minimum required utility level among men to remain in the relationship is lower than among women, then conditional on the relative bargaining power of partners, men's boy preferences on their own may result in partnership break-up.

The degree of an influence of first child's gender on partnership stability is quite astonishing. We find it to be much higher than comparable estimates for the US. We find that girls are substantially more likely to live without a father, in families where mother was never married or in dissolved families. Additionally, mothers of first born girls are less likely to get married. Effects of gender on marital stability are only significant among parents with secondary or lower education and there is no evidence for any clear time-related pattern.

We find that among married couples the probability of having the second child is strongly affected by gender of the first child, and that at higher parities fertility patterns reflect a desire for mixed gender of children. Correcting for the possible influence of sample selection on observed fertility patterns we show that these findings are not inconsistent with the negative relationship of the *first born girl* with marital stability. Additionally, once again with reference to the collective model, we argue that the fertility outcomes we find may be consistent with preferences for girls of either of the parents, but also that they could be in line with gender preferences for boys among fathers. This would be the case if following a first born girl mothers preferred not to have the second child to avoid divorce in case it also turned out to be a girl (and the utility level of the father was further reduced as a result, see the discussion in the Appendix for details).

Our results show also that that in Poland women, whose first born child is a girl, do not experience any negative labor market consequences in comparison to women with first born boys. Unlike in advanced economies, we reject both the indirect effect operating through marital stability and the direct effect studied using subsamples of population in which fertility and marital stability are unlikely to explain the observed labor market outcomes. Finally, we add to the recent literature the analysis of "gender preferences" manifested in household consumption. On the one hand, when we consider total child-related expenditure in these analyses, we do not find any support for any gender bias. On the other hand, we do reveal traditional gender roles perception of Polish parents. A *first born girl* increases expenditures on child clothing, while a first born boy increases expenditures on toys.

Clearly, as with other studies in this literature there is ample room for different interpretation of our results, in particular if one takes the individual approach to parental preferences. It is very interesting though to note the distinct pattern of results found for Poland in this paper, as it is different both from advanced economies and from developing countries. The results are also important from the point of view of socio-economic policy in Poland, and potentially also in other countries. We found a very high degree of the effect of children's gender on marital stability, and strong differential patterns of child-related expenditure. Marital stability has been demonstrated to have significant negative consequences on a number of child outcomes (Demo and Acock, 1988; Seltzer, 1994; Amato, 2000). Differential expenditure patterns may act to put girls (or boys) at a disadvantage later in life. Since both of these channels may reflect preference for children of a specific gender, our results suggest that the outcomes could be affected by changes in the approach to gender issues and more gender equality, and as such support the important role of policies focusing on gender equality.

Bibliography

Amato R. P., "The consequences of divorce for adults and children", *Journal of Marriage and Family*, 2000, 62, pp. 1269-1287

Andersson G., Hank K., Ronsen M., Vikat A., "Gendering family composition: preferences for children and childbearing behavior in the Nordic countries", *Demography*, 2006, 43(2), pp. 255-267

Angrist D. J., Evans N. W., "Children and their parents' labor supply: evidence from exogenous variation in family size", *American Economic Review*, 88 (3), 1998, pp. 450-477

Baldez L., "The pros and cons of gender quota laws: what happens when you kick men out and let women in?", *Politics and Gender*, 2006, 2, pp. 101-128

Barcellos H. S., Carvalho L., Muney-Lleras A., "Child gender and parental investments in India: Are boys and girls treated differently?", 2010, *WP*

Barlik M., Siwiak K., "Metodologia badania budżetów gospodarstw domowych", *Zeszyty Metodologiczne GUS*; 2011

Barro J. R., Becker S. G., "Fertility choice in the model of economic growth", *Econometrica*, 1989, 57(2), pp. 481-501

Bedard K., Deschense O., "Sex preferences, marital dissolution, and the economic status of women", *Journal of Human Resources*, 40(2), 2005, pp. 411-434

Behrman R. J., Pollak A. R., Taubman P., "Do parents favor boys?", *International Economic Review*, 1986, 27(1), pp. 33-54

Behrman R. J., "Intrahousehold allocation of nutrients in rural India: Are boys favored? Do parents exhibit inequality aversion?", *Oxford Economic Papers New Series*, 1988, 40(1), pp. 32-54

Ben-Porath Y., Welch F., "Do sex preferences really matter", *Quarterly Journal of Economics*, 90 (2), 1976, pp. 285-307

Brockmann H., "Girls preferred? Changing patterns of sex preferences in the two German states", *European Sociological Review*, 2001, 17(2), pp. 189-202

Chiappori, P-A., "Collective labor supply and welfare", *Journal of Political Economy*, 1992, 100(3), pp. 437-467

Chun H., Oh J., "An instrumental variable estimate of the effect of fertility on the labour force participation of married women", *Applied Economics Letters*, 2002, 9 (10), pp. 631-634

Cleland J., Verrall J., Vaessen M., "Preferences for the sex of children and their influence on reproductive behavior", *World Fertility Surveys Comparative Studies*, 27, 1983

Dahl G.B., Moretti E., “The demand for sons”, *Review of Economic Studies*, 75, 2008, pp. 1085-1120

Das N., “Sex preferences and fertility behavior: A study of recent Indian data”, *Demography*, 1987, 24(4), pp. 517-530

Das Gupta M., “Explaining Asia’s missing women: A new look at the data”, *Population and Development Review*, 2005, 31(3), pp. 529-535

Demo H. D., Acock C. A., “The impact of divorce on children”, *Journal of Marriage and Family*, 1988, 50(3), pp. 619-648

Fortin M. N., “Gender role attitudes and the labour – market outcomes of women across OECD countries”, *Oxford Review of Economic Policy*, 2005, 21(3), pp. 416-438

Hank K., Kohler H.-P., “Gender preference for children in Europe: Empirical results from 17 FFS countries”, *Demographic Research*, 2(1), 2000

Hesketh T., Lu L., Xing W. Z., “The effect of China’s one – child family policy after 25 years”, *New England Journal of Medicine*, 2005, 353(11), pp. 1171-1176

Ichino A., Lindstrom E.-A., Viviano E., ”Hidden consequences of a first-born boy for mothers. New evidence and a critical assessment of the literature”, 2010, *WP*

Jha P., Kumar R., Vasa P., Dhingra N., Thiruchelvam D., Moineddin R., ”Low male-to-female sex ratio of children born in India: national survey of 1.1 million households”, *Lancet*, 367, 2006, pp. 211-218

Khan A. M., Sirageldin I., “Son preference and the demand for additional children in Pakistan”, *Demography*, 1977, 14(4), pp. 481-495

Leung F. S., “A stochastic dynamic model of parental sex preferences and fertility”, *Quarterly Journal of Economics*, 1991, 106(4), pp. 1063-1088

Lundberg S., Rose E., “The effects of sons and daughters on men’s labor supply and wages”, *Review of Economics and Statistics*, 84(2), 2002, pp. 251-268

Orloff S. A., “Gender and the social rights of citizenship: The comparative analysis of gender relations and welfare states”, *American Sociological Review*, 1993, 58(3), pp. 303-328

Oswald J.A., Powdthavee N., “Daughters and left-wing voting”, *Review of Economics and Statistics*, 2010, 92 (2), pp. 213-227

Park B. C., “Preference for sons, family size, and sex ratio: An empirical study in Korea”, *Demography*, 1983, 20(3), pp. 333-352

Rosenzwig R. M., Schultz T. P., “Market opportunities, genetic endowments, and intrafamily resource distribution: child survival in rural India”, *American Economic Review*, 1982, 72(4), pp. 803-815

Seltzer A. J., “Consequences of marital dissolution for children”, *Annual Review of Sociology*, 1994, 20, pp. 235-266

Sen A., “More than 100 million women are missing”, *New York Review of Books*, 37(20), 1990, pp. 61-66

Terjesen S., Singh V., “Female presence on corporate boards: a multi country study of environmental context”, *Journal of Business Ethics*, 2008, 83, pp. 55-63

Appendix

Model

Interpreting gender preferences in the framework of the collective model

Below we describe a simple framework within which one can interpret our results. In the literature so far (e.g. Dahl and Moretti, 2008) the interpretation of "preferences" has not been well specified, in that parents' preferences were treated jointly. In this type of framework it is then difficult to discuss the issues of fertility and separation decisions, and – as generally in the unitary approach - it is unclear whose preferences one is identifying. In our approach we draw on the collective model (Chiappori, 1992) and allow each of the parents to have their own preferences concerning consumption goods and children – including child's gender. In the discussion below we present a simple application of the collective model and demonstrate under what conditions we can give clearest interpretation of our results.

First – borrowing the notation from Dahl and Moretti (2008), let's assume that parents have the following utility function:

$$U_j(B_t, G_t, X_{j,t}, Z_{j,t}, i) = U_j(K^i_{j,t}, X_{j,t}, Z_{j,t}, i) \tag{1}$$

where

$$U_{i,j}(K^i_{j,t}, X^i_{j,t}, Z^i_{j,t}) = \Pi^k_{i,j}(\alpha^i_j B_t + \beta^i_j G_t) + \Pi^c_{i,j}(\mu_j X^i_{j,t}, \nu_j Z^i_{j,t}) \tag{2}$$

where $j = m, f$ for male and female, and $i = M, D$ for married or divorced. $\Pi^k_{i,j}$ is a subutility function deriving from having children, while $\Pi^c_{i,j}$ is a subutility function deriving from personal consumption of goods X and Z, and the subutilities are additively separable. B stands for boys and G stands for girls and as we can see valuations of boys and girls may vary over j, i.e. men and women may have a preference for either gender. Valuations of boys and girls may also vary over state (married or divorce), while valuation of consumption is independent of marital state.

The principal assumption of the collective model is that marriage is defined as a state where individuals generate a Pareto efficient allocation of resources (Chiappori, 1992). This means that for any level of utility of one partner, the other will be allowed to allocate resources in such a way so that the combination of utility outcomes of both partners is Pareto efficient. Taking the couple's budget constraint to be:

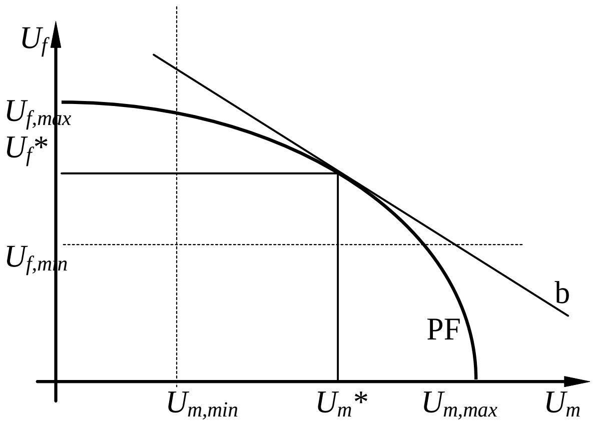
$$pB_t + qG_t + rX_t + sZ_t = Y_t \qquad (3)$$

we can define the maximization problem of the women at each point of the utility space of the man to be to maximize her utility: $U_{M,f}(K^M_{f,t}, X^M_{f,t}, Z^M_{f,t})$, subject to the following conditions:

$$\begin{cases} U_{M,m}(K^M_{m,t}, X^M_{m,t}, Z^M_{m,t}) \geq U^{\varpi}_{m,t} \\ pB_t + qG_t + rX_t + sZ_t = Y_t \end{cases} \qquad (4)$$

where ϖ defines a particular point in the utility space of the man which can be achieved in the married state. This is illustrated in Figure A1. The solution final of the optimization problem will eventually depend on the bargaining power of the partners represented by the slope of the function "*b*" (the steeper it is the higher is the bargaining power of the man), and whether a marriage continues or not will be a function of the minimum level of utility each of the partners is willing to accept (referred to as the "divorce threshold", respectively $U_{m,min}$ and $U_{f,min}$).

Figure A1. Male and Female utility in the collective model.

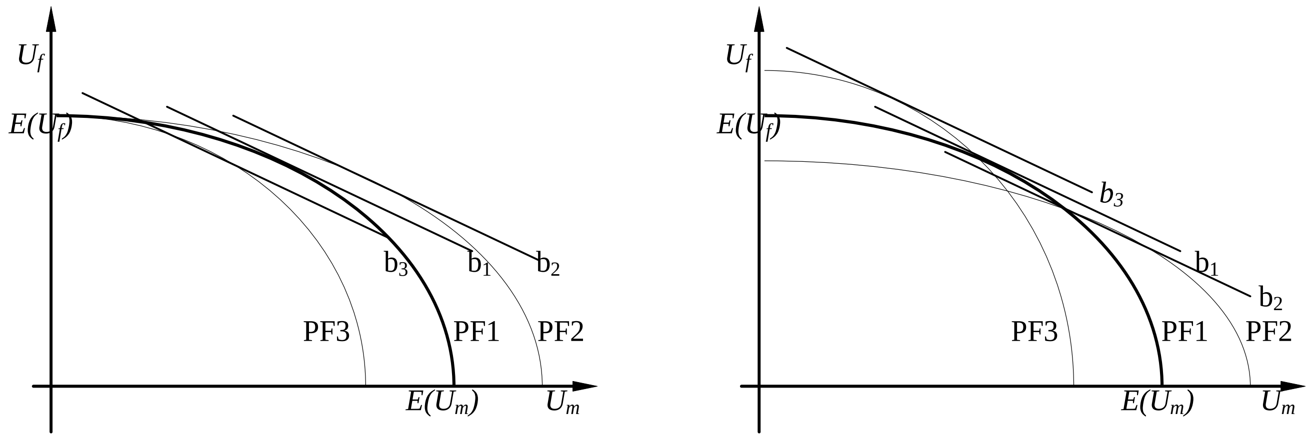


Now let us consider the optimization process over three periods of time, t_1, t_2, and t_3. At the beginning of t_1 the couple knows their budget constraint, and knows that in each of the period they can have one child, a boy or a girl (with known probabilities). The children are born at the end of t_1 and possibly also t_2, and for simplicity we assume that all couples will have a child in t_1. Since the gender of the children is not known before they are born, the parents make their fertility plans (i.e. whether to have just one child or two) initially on the basis of expected utilities over the two births at the beginning of t_1, and then with known gender of the first child, but unknown gender of the second at the beginning of t_2. At the end of t_1 and at the end of t_2 the couple may decide to get divorced (we assume the possibility of unilateral divorce). Thus, given that we assume that all couples will have a child in period t_1, the final fertility decision is taken at the beginning of t_2 with known gender of the first child.

For simplicity let us only consider the maximization problem over periods t_1 and t_2, i.e. without regard to the utility in t_3 (in which the couple may be divorced or married, but in which no further fertility choices are made). First, let us consider what happens at the end of period t_1. This is illustrated in Figure A2 for two different preference assumptions, where we show what happens to the couple's two-period opportunity set (bounded by the Pareto frontiers), once the gender of the first child is revealed. If either of the parents have non-neutral gender preferences, then the couple's two-period opportunity set will change once the gender of each child is revealed. This is illustrated for a scenario where women have gender neutral preferences, and men have boy preferences (Figure A2.A), and for a scenario where women have girl preferences and men have boy preferences (Figure A2.B).

Figure A2. Gender preferences and opportunity sets in the collective model

A. Men: boy preferences, women: neutral **B. Men: boy preferences, women: girl preferences**



Notes: PF1 – expected Pareto frontier before birth (and under gender neutrality of both parents); PF2 – Pareto frontier if a boy is born; PF3 – Pareto frontier if a girl is born; b1, b2, b3 – functions representing relative bargaining power of partners.

In each case of non-neutral preferences the opportunity set after the first birth changes depending on the preferences of each partner. This *"t1 revealed"* opportunity set is the opportunity set under continued uncertainty of the gender of the potential second child. Whether the couple decides to have the second child will depend on the overall preferences and the relative bargaining power, i.e. on the solution at the tangency of PF2 and b2 or PF3 and b3. Note that since the couple re-optimizes at the end of t_1 the fertility decision at the beginning of t_2 may be different from that in the original fertility plan at the beginning of t_1.

Of course once the gender of the first child is known parents also re-optimize with respect to the consumption of X and Z (since prices of boys and girls may be different). Importantly, if the outcome falls below the "divorce threshold" of any of the partners then divorce will be the consequence at the end of period t_1, and the couple will not have the second child.[16]

The model illustrates that in each of the scenarios, men's boy preferences imply lower utility once the first born is a girl, and if the outcome is such that the utility level falls below men's "divorce threshold" they will get divorced (or not get married). However, since the same holds in the case of women's preferences (i.e. if women have boy preferences then once again divorce probability will be higher if the first born is a girl), the sole observation that living in a couple is less likely if the first born was a girl, does not lead to any conclusions concerning preferences of either of the partner. In fact boy preferences of both parents will also imply lower utility (and thus higher probability of break up) if the first born is a girl. Until now the model therefore only suggests that whenever there are preferences for a specific gender of one or of both partners, divorce will be more likely if the first born is of the other gender. This will be particularly the case if partners have opposing gender preferences.

In order to draw more specific conclusions and to be able to point to specific preferences an additional condition is necessary. We refer to this condition as "divorce dominance". The "divorce dominant" partner is the partner whose divorce utility threshold is - in relative terms to the maximum utility in marriage - higher. In the case of male "divorce dominance" if observed outcomes show higher probability of divorce if first born is a girl, then the model rules out the following:

- both men and women are gender neutral;
- both men and women have preferences for girls;
- men have preferences for girls and women are preference neutral or have preferences for boys (opposite of scenario 2 or 3);

Therefore with a "divorce dominant" partner (men) higher divorce after first born girl is consistent with men's preferences for boys. Assuming "divorce dominance" allows to assign

[16] Note that we assume here that the bargaining power does not depend on the gender of the first child.

gender preferences to the divorce dominant partner (men have preferences for boys). However, the approach still does not allow us to identify preferences of the other partner.

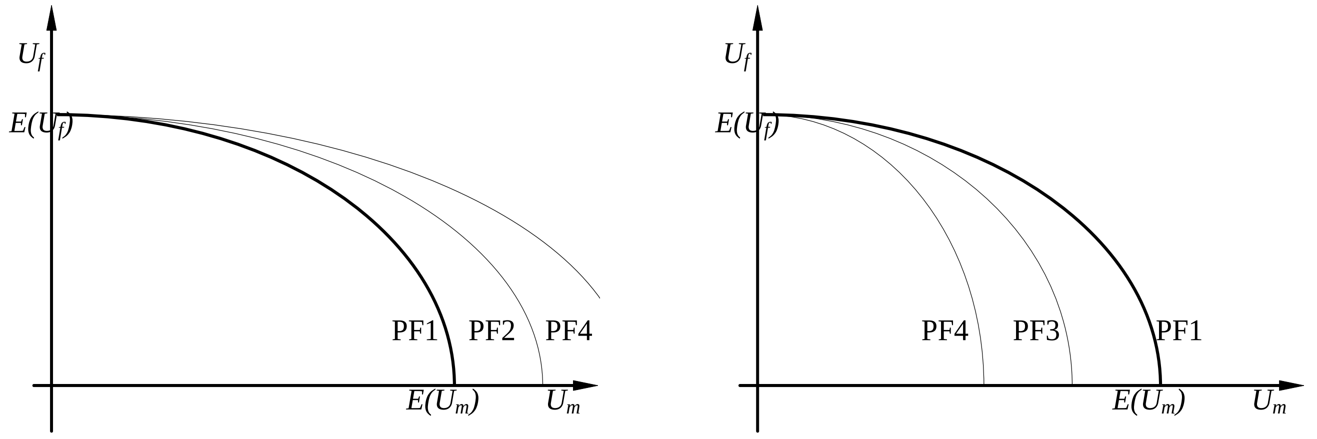
Fertility decisions in period t_2:

Now let us consider what happens at the beginning of period t_2. The partners now know the gender of the first child, and so know their "t_1 revealed" opportunity set. Let's consider two situations in which the gender of the first child is a boy or a girl, and let's analyze what decision the couple might take using the scenario in which men have boy preferences and women are gender neutral. The current solution to the couple's choice (with continued uncertainty over the gender of the potential second child) lies on the Pareto frontier PF2 if the first born was a boy or on PF3 if the first born was a girl. The couple now decides on whether to have the second child, and this is determined by their location on the respective Pareto frontiers. Without knowing specific preference parameters it is difficult to determine the final fertility choice. Note that in this set-up, if they decide to have the second child and if this is consistent with their t_1 fertility plan, and if the couple have boy following a girl, or a girl following a boy the final outcome will be located on the initial expected PF (assuming that they do not have preferences over the sequence).

If we are willing to continue to assume "divorce dominance" of men, then in the scenario in which the couple have a first born girl (A3.B), the solution will depend also on whether the second girl might shift the opportunity set in such a way as to imply a utility level for the man that would be below his divorce threshold. If that is the case women may be unwilling to take the risk to have the second child following a girl, but may be willing to have the second child if the first is a boy. On top of that, if men are gender neutral and women have preferences for girls, a first born girl might reduce the willingness to have the second child. The above implies that an observed lower probability of the second child following a first born girl would be consistent not only with girl preferences (of either parents) but also with boy preferences of men if we are willing to assume male "divorce dominance".

Figure A3. First-born boy and fertility choices in t_2

A. Men: boy preferences, women: neutral, first born boy **B. Men: boy preferences, women: neutral, first born girl**



Notes: PF1 – expected Pareto frontier before birth (and under gender neutrality of both parents); PF2 – Pareto frontier if a boy is born; PF3 – Pareto frontier if a girl is born; b1, b2, b3 – functions representing relative bargaining power of partners.

Regressions

Table A1. First child gender and the family status. Additional estimates 1.

VARIABLES	(1) Living without father	(2) Mother never married	(3) Mother separated or divorced
	First child a girl		
First child a girl	0.00819***	0.00719***	0.00141
	(0.003)	(0.002)	(0.002)
First boy baseline	0.1351928	0.0817785	0.0582502
Percent effect	6.1	8.8	2.4
Observations	45,511	45,511	41,625
R-squared	0.087	0.123	0.027
	First two children of the same sex		
First child a girl	0.00796	0.00120	0.00669
	(0.005)	(0.003)	(0.004)
First two children boys	0.00058	-0.00460	0.00505
	(0.005)	(0.003)	(0.004)
First two children girls	-0.00045	0.00144	-0.00156
	(0.005)	(0.003)	(0.004)
First two boys baseline	0.0772957	0.0314569	0.0472665
Percent effect	-0.6	4.6	-3.3
R-squared	0.067	0.082	0.027
	First two children of the same sex without controlling for first child gender		
First two children boys	-0.00336	-0.00519**	0.00174
	(0.004)	(0.003)	(0.003)
First two children girls	0.00358	0.00204	0.00183
	(0.004)	(0.003)	(0.004)
First two boys baseline	0.0763409	0.0313133	0.0464637
Percent effect	4.7	6.5	3.9
R-squared	0.067	0.082	0.027
	First two children of different sex		
First child a girl	0.00744**	0.00422*	0.00339
	(0.003)	(0.002)	(0.003)
Second child a girl	-0.00051	0.00302	-0.00331
	(0.004)	(0.002)	(0.003)
First two children mix sex	-0.00007	0.00158	-0.00174
	(0.003)	(0.002)	(0.003)
First two children same sex baseline	0.0772218	0.0310208	0.0477509
Percent effect	-0.08	5.1	-3.7
R-squared	0.067	0.082	0.027
Observations	21,920	21,920	21,217
	First child a girl. Sample restricted to oldest child being between 5 and 12.		
First child a girl	0.00686*	0.00580**	0.00138
	(0.004)	(0.003)	(0.003)
First boy baseline	0.1191642	0.0493855	0.0735102
Percent effect	5.8	11.7	1.9
Observations	27,970	27,970	26,504
R-squared	0.055	0.056	0.026

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 12 or 5-12 if specified; mothers aged <41;*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A2. First child gender and the family status. Additional estimates 2.

VARIABLES	(1) Living without father	(2) Mother never married	(3) Mother separated or divorced
	First two children of the same sex		
First child a girl	0.00840**	0.00216	0.00635*
	(0.004)	(0.003)	(0.004)
First two children boys	0.00282	-0.00262	0.00534
	(0.004)	(0.002)	(0.004)
First two children girls	0.00837*	0.00108	0.00775**
	(0.004)	(0.003)	(0.004)
First two boys baseline	0.078553	0.0265188	0.0534267
Percent effect	10.7	4.1	14.5
R-squared	0.059	0.073	0.030
	First two children of the same sex without controlling for first child gender		
First two children boys	-0.00135	-0.00369*	0.00219
	(0.004)	(0.002)	(0.003)
First two children girls	0.01260***	0.00217	0.01096***
	(0.004)	(0.002)	(0.003)
First two boys baseline	0.07754	0.0262579	0.0526605
Percent effect	16.3	8.3	20.8
R-squared	0.059	0.073	0.030
	First two children of different sex		
First child a girl	0.01117***	0.00401**	0.00755***
	(0.003)	(0.002)	(0.003)
Second child a girl	0.00278	0.00185	0.00120
	(0.003)	(0.002)	(0.003)
First two children mix sex	-0.00560*	0.00077	-0.00655**
	(0.003)	(0.002)	(0.003)
First two children same sex baseline	0.0832971	0.0264008	0.0584809
Percent effect	-6.7	2.9	-11.2
R-squared	0.059	0.073	0.030
Observations	30,922	30,922	30,084
	First child a girl. Sample restricted to oldest child being between 5 and 15.		
First child a girl	0.01065***	0.00513**	0.00614**
	(0.003)	(0.002)	(0.003)
First boy baseline	0.114873	0.0417374	0.0763702
Percent effect	9.3	12.3	8.0
Observations	39,037	39,037	37,300
R-squared	0.052	0.054	0.027

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 15 or 5-15 if specified; mothers aged <41;*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A3. First child gender and the family status. Additional estimates 3. probability of the mother being married by age of children

VARIABLES	(1) 0-15	(2) 0-12	(3) 5-15	(4) 5-12
	First child a girl			
First child a girl	-0.01241***	-0.00971***	-0.01277***	-0.00830**
	(0.003)	(0.003)	(0.003)	(0.004)
First boy baseline	0.8631271	0.856336	0.8786557	0.8736338
Percent effect	-1.4	-1.1	-1.5	-1.0
Observations	56,578	45,511	39,037	27,970
R-squared	0.081	0.087	0.055	0.057
	First two children of the same sex			
First child a girl	-0.01048**	-0.00898*	-0.00900*	-0.00642
	(0.004)	(0.005)	(0.005)	(0.006)
First two children boys	-0.00179	0.00023	-0.00136	0.00127
	(0.004)	(0.005)	(0.004)	(0.005)
First two children girls	-0.00719	0.00091	-0.00845*	0.00089
	(0.005)	(0.005)	(0.005)	(0.006)
First two boys baseline	0.9150187	0.91639	0.916241	0.9183979
Percent effect	-0.8	0.1	-0.9	0.1
Observations	30,922	21,920	27,419	18,417
R-squared	0.063	0.071	0.055	0.058
	First two children of the same sex without controlling for first child gender			
First two children boys	0.00342	0.00467	0.00312	0.00445
	(0.004)	(0.004)	(0.004)	(0.005)
First two children girls	-0.01247***	-0.00363	-0.01298***	-0.00236
	(0.004)	(0.005)	(0.004)	(0.005)
First two boys baseline	0.9162837	0.9174675	0.9173252	0.9191652
Percent effect	-1.4	-0.4	-1.4	-0.3
Observations	30,922	21,920	27,419	18,417
R-squared	0.063	0.070	0.055	0.058
	First two children of different sex			
First child a girl	-0.01318***	-0.00864**	-0.01254***	-0.00661*
	(0.003)	(0.004)	(0.003)	(0.004)
Second child a girl	-0.00270	0.00034	-0.00354	-0.00019
	(0.003)	(0.004)	(0.003)	(0.004)
First two children mix sex	0.00449	-0.00057	0.00490	-0.00108
	(0.003)	(0.004)	(0.003)	(0.004)
First two children same sex baseline	0.9111004	0.9168857	0.9118159	0.9191393
Percent effect	0.5	-0.06	0.5	-0.1
Observations	30,922	21,920	27,419	18,417
R-squared	0.063	0.071	0.055	0.058

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 15; mothers aged <41;*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A4. Effects of first child's gender on fertility. Additional estimates 1.

VARIABLES	(1) All	(2) Married	(3) Marriage control	(4) Marriage interaction
		Total number of children		
First child a girl	-0.00706	-0.00321	-0.00467	-0.01707
	(0.006)	(0.007)	(0.006)	(0.015)
Married mother			0.24599***	0.23879***
			(0.009)	(0.012)
First child a girl * Married mother				0.01456
				(0.016)
Observations	45,511	38,759	45,511	45,511
R-squared	0.276	0.285	0.288	0.288
		Probability of having two or more children		
First child a girl	-0.01115***	-0.01237***	-0.00923**	0.00516
	(0.004)	(0.004)	(0.004)	(0.010)
Married mother			0.19733***	0.20569***
			(0.006)	(0.008)
First child a girl * Married mother				-0.01690
				(0.011)
Observations	45,511	38,759	45,511	45,511
R-squared	0.265	0.274	0.283	0.283
		Probability of having three or more children		
First child a girl	0.00213	0.00491	0.00255	-0.01163**
	(0.003)	(0.003)	(0.003)	(0.005)
Married mother			0.04322***	0.03500***
			(0.003)	(0.005)
First child a girl * Married mother				0.01664***
				(0.006)
Observations	45,511	38,759	45,511	45,511
R-squared	0.124	0.127	0.126	0.127
		Probability of having four or more children		
First child a girl	0.00084	0.00199	0.00089	-0.00528*
	(0.001)	(0.001)	(0.001)	(0.003)
Married mother			0.00491***	0.00133
			(0.002)	(0.003)
First child a girl * Married mother				0.00724**
				(0.003)
Observations	45,511	38,759	45,511	45,511
R-squared	0.047	0.047	0.047	0.047
		Probability of having five or more children		
First child a girl	0.00035	0.00097	0.00034	-0.00321*
	(0.001)	(0.001)	(0.001)	(0.002)
Married mother			-0.00035	-0.00241
			(0.001)	(0.002)
First child a girl * Married mother				0.00417**
				(0.002)
Observations	45,511	38,759	45,511	45,511
R-squared	0.020	0.019	0.020	0.021

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 12; mothers aged <41;*

Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A5. Probability of two or more children under alternative assumptions of preferences of separated parents

VARIABLES	(1) Scenario 1 All separated parents have boy preferences	(2) Scenario 2 All separated parents have girl preferences	(3) Scenario 3 Separated parents have wither boy or girl preferences
First child a girl	0.05459***	-0.07416***	-0.01036**
	(0.004)	(0.004)	(0.004)
First boy baseline	0.4868408	0.550311	0.5510518
Percent effect	11.2	-13.5	-1.9
Observations	45,511	45,511	45,511
R-squared	0.233	0.232	0.209

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Families with children living at home aged between 0 and 12; mothers aged <41.*
Imputations of children for separated families adjusted for the probability of having more than one child
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A6. Effects of first child's gender on fertility. Additional estimates 3. Effect of first two children's gender

	(1)	(2)	(3)	(4)
	0-15		0-12	
VARIABLES	All	Married	All	Married
	Total number of children			
First child a girl	0.02526**	0.03114***	0.01997*	0.02860**
	(0.011)	(0.011)	(0.011)	(0.011)
First two children girls	0.03327***	0.03681***	0.02057*	0.02163*
	(0.011)	(0.012)	(0.011)	(0.012)
First two children boys	0.06180***	0.06658***	0.03402***	0.03600***
	(0.011)	(0.011)	(0.011)	(0.011)
Observations	30,922	28,241	21,920	20,092
R-squared	0.129	0.128	0.116	0.113
	Probability of having three or more children			
First child a girl	0.01277*	0.01230*	0.01446*	0.01668**
	(0.007)	(0.007)	(0.007)	(0.008)
First two children girls	0.02970***	0.03462***	0.02037***	0.02393***
	(0.007)	(0.007)	(0.008)	(0.008)
First two children boys	0.03830***	0.03692***	0.03235***	0.03167***
	(0.007)	(0.007)	(0.007)	(0.008)
Observations	30,922	28,241	21,920	20,092
R-squared	0.121	0.120	0.106	0.104
	Probability of having four or more children			
First child a girl	0.00226	0.00546	0.00038	0.00307
	(0.004)	(0.004)	(0.004)	(0.004)
First two children girls	0.00969**	0.00900**	0.00376	0.00267
	(0.004)	(0.004)	(0.004)	(0.004)
First two children boys	0.01032***	0.01241***	0.00007	0.00059
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	30,922	28,241	21,920	20,092
R-squared	0.068	0.068	0.056	0.054
	Probability of having five or more children			
First child a girl	0.00342	0.00490**	0.00258	0.00467**
	(0.002)	(0.002)	(0.002)	(0.002)
First two children girls	-0.00112	-0.00161	-0.00243	-0.00358
	(0.002)	(0.002)	(0.002)	(0.002)
First two children boys	0.00636***	0.00825***	0.00097	0.00185
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	30,922	28,241	21,920	20,092
R-squared	0.035	0.034	0.028	0.025

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 15; mothers aged <41;*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A7. Effect of first child gender on mother's labor supply. Additional estimates 1. Married couples.

VARIABLES	(1) 0-15	(2) 0-12	(3) 0-2
	Probability of working		
First child a girl	0.00156	-0.00251	0.00464
	(0.004)	(0.005)	(0.010)
First boy baseline	0.6252534	0.6050175	0.4905834
Percent effect	0.3	-0.4	0.9
Observations	48,493	38,759	8,628
R-squared	0.129	0.129	0.152
	Probability of working for pay		
First child a girl	0.00108	-0.00215	0.00482
	(0.004)	(0.005)	(0.010)
First boy baseline	0.6094244	0.5898038	0.4724119
Percent effect	0.2	-0.4	1.0
Observations	48,493	38,759	8,628
R-squared	0.126	0.127	0.152
	Monthly labor income		
First child a girl	-6.20816	-14.10777	-7.36586
	(7.731)	(8.777)	(21.596)
First boy baseline	659.8525	652.1509	567.2365
Percent effect	-0.9	-2.2	-1.3
Observations	48,493	38,759	8,628
R-squared	0.270	0.268	0.211

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 15; mothers aged <41;*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A8. Effects of first child gender on mother's labor supply. Additional estimates 2. Sample including widows.

VARIABLES	(1) Work	(2) Work for pay	(3) Income
	Children aged 0-15		
First child a girl	0.00511	0.00346	-4.01700
	(0.004)	(0.004)	(7.011)
Widow	-0.02159	-0.06524**	-42.31012
	(0.030)	(0.030)	(41.159)
First child a girl * Widow	0.02346	-0.00675	-36.32359
	(0.044)	(0.045)	(58.709)
First boy baseline	0.6092534	0.5930273	650.3813
Percent effect	0.8	0.6	-0.6
Observations	57,028	57,028	57,028
R-squared	0.142	0.139	0.278
	Children aged 0-12		
First child a girl	0.00078	-0.00007	-10.40359
	(0.004)	(0.004)	(7.896)
Widow	-0.00444	-0.01979	-1.15037
	(0.041)	(0.041)	(57.832)
First child a girl * Widow	-0.03533	-0.08663	-91.04545
	(0.059)	(0.059)	(78.210)
First boy baseline	0.5879309	0.5726162	638.2284
Percent effect	0.1	-0.01	-1.6
Observations	45,777	45,777	45,777
R-squared	0.143	0.142	0.276

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 15 or 0-12 as specified; mothers aged <41;*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.

Table A9. First child gender and the expenditures and consumption. Additional estimates 1. Sample including widows.

VARIABLES	(1) Total	(2) Clothing	(3) Toys	(4) Books	(5) Trips	(6) Kidergarden	(7) Education
			All families				
Mean expend. girls	134.6513	61.71016	18.80984	20.09422	6.677403	26.38332	0.9763735
Mean expend. boys	132.6884	57.63712	21.0069	19.66154	6.230878	27.29183	0.8601741
Different	No	Yes (5%)	Yes (5%)	No	No	No	No
% of HH with + expenditures	84.11	66.87	38.95	35.95	7.85	13.56	0.99
First child a girl	0.91789	3.70565***	-2.28150***	0.13307	0.26110	-0.97971	0.07927
	(1.658)	(0.865)	(0.533)	(0.595)	(0.442)	(0.809)	(0.127)
First boy baseline	133.1939	57.81484	21.04775	19.80647	6.320573	27.32627	0.8780361
Percent effect	0.7	6.4	-10.8	0.7	4.1	-3.6	9.0
Observations	42,046	42,046	42,046	42,046	42,046	42,046	42,046
R-squared	0.125	0.054	0.048	0.067	0.035	0.074	0.012
			Widows				
Mean expend. girls	106.3377	54.68773	8.790672	18.91832	9.302353	13.79832	0.8403361
Mean expend. boys	137.762	55.56121	7.460517	39.90034	16.68388	17.50948	0.6465517
Different	No	No	No	Yes (5%)	No	No	No
% of HH with + expenditures	84.26	67.66	25.11	51.91	9.79	11.49	0.85
First child a girl	-16.52953	-1.43187	0.46790	-14.52827	0.11968	-1.43456	0.27759
	(20.014)	(10.002)	(3.657)	(9.485)	(7.516)	(6.670)	(1.258)
First boy baseline	130.2196	55.84397	7.897149	36.63227	12.8854	16.35665	0.6041123
Percent effect	-12.7	-2.6	5.9	-39.7	0.9	-8.8	46.0
Observations	235	235	235	235	235	235	235
R-squared	0.234	0.182	0.152	0.194	0.196	0.265	0.228
			All families interaction				
First child a girl	1.13167	3.74516***	-2.29007***	0.24931	0.29996	-0.95101	0.07832
	(1.663)	(0.868)	(0.536)	(0.596)	(0.442)	(0.813)	(0.128)
Widow	-2.83971	-4.23685	-9.11452***	10.06045	6.08693	-4.64230	-0.99343
	(17.285)	(6.815)	(1.889)	(9.101)	(7.636)	(5.406)	(0.668)
First child a girl*Widow	-36.39786*	-6.42472	2.20888	-20.73247**	-7.15272	-4.54032	0.24349
	(20.567)	(9.009)	(3.219)	(10.153)	(8.846)	(6.894)	(1.074)
First boy baseline (girl)	133.1935	57.81391	21.04564	19.80892	6.322019	27.32524	0.8778065
Percent effect (girl)	0.7	6.4	-10.8	0.7	4.1	-3.6	9.1
First boy baseline (interaction)	140.2805	58.37226	7.015545	39.77397	16.56801	17.92936	0.6213838
Percent effect (interaction)	-25.9	-11.0	31.5	-52.1	-43.2	-25.3	39.2
R-squared	42,046	42,046	42,046	42,046	42,046	42,046	42,046
Observations	0.126	0.054	0.048	0.067	0.036	0.075	0.012

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 12; mothers aged <41; samples restricted to households with only one family with dependent children..*
Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009

.**Table A10. First child gender and the expenditures and consumption. Additional estimates 2. By age group of oldest child.**

VARIABLES	(1) Total	(2) Clothing	(3) Toys	(4) Books	(5) Trips	(6) Kidergarden	(7) Education
			Oldest child 0 – 6				
Mean expend. Girls	120.3771	54.20884	22.91887	4.605613	.5411371	38.07466	0.02794
Mean expend. Boys	119.2143	51.44412	24.52832	4.176368	.4844021	38.56091	0.020184
Different	No	Yes (5%)	Yes (5%)	No	No	No	No
% of HH with + expenditures	80.75	66.22	46.30	12.09	1.09	18.25	0.04
First child a girl	1.96468	2.81503***	-1.69248**	0.53567*	0.06165	0.24115	0.00366
	(2.132)	(1.090)	(0.785)	(0.301)	(0.189)	(1.311)	(0.024)
First boy baseline							
	118.8306	51.42005	24.56805	4.125449	.4820501	38.21288	0.0221426
Percent effect	1.7	5.6	-6.9	13.0	12.8	0.6	16.5
Observations	21,469	21,469	21,469	21,469	21,469	21,469	21,469
R-squared	0.189	0.066	0.053	0.030	0.003	0.166	0.004
			Oldest child 7 – 12				
Mean expend. Girls	149.7292	69.53979	14.68684	36.10135	12.98212	14.46175	1.957324
Mean expend. Boys	147.1469	64.33174	17.3646	36.11716	12.30465	15.26133	1.767443
Different	No	Yes (1%)	Yes (1%)	No	No	No	No
% of HH with + expenditures	87.65	67.56	31.34	60.95	14.96	8.62	1.99
First child a girl	1.22095	4.69908***	-2.85777***	-0.26057	0.44972	-0.93943	0.12990
	(2.542)	(1.365)	(0.725)	(1.176)	(0.878)	(0.797)	(0.262)
First boy baseline	147.8126	64.58065	17.45263	36.23686	12.41603	15.32972	1.796774
Percent effect	0.8	7.3	-16.4	-0.7	3.6	-6.1	7.2
Observations	20,342	20,342	20,342	20,342	20,342	20,342	20,342
R-squared	0.087	0.039	0.038	0.012	0.035	0.060	0.014

*Notes: Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Children living at home aged between 0 and 12; mothers aged <41; samples restricted to households with only one family with dependent children..*

Source: authors' own calculations based on the Polish Household Budgets' Survey data, 2003-2009.