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## *Gender preferences in Central and Eastern Europe as reflected in partnership and fertility outcomes*

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The decisions of parents following the birth of their first child concerning subsequent fertility, and the stability of their relationship can be used as a reflection of broader gender preferences. We study these decisions to identify gender preferences in six Central and Eastern European countries, which vary with respect to their current political and economic conditions, but share a common experience of past communist rule. Using subsamples of census data collected in the IPUMS-International inventory around 2000 and 2010, we examine the effect of the gender of the first-born child(ren) on the fertility and relationship stability of their parents. Only in the case of Romania do our results consistently point towards boy preferences, while in Russia boy preferences can be detected in families with two or more children. Importantly, in four out of six countries (Belarus, Poland, Russia and Ukraine) parents are more likely to have a second child if the first-born was a boy, indicating girl preferences. These preferences could be interpreted as a reflection of concern regarding future care support for parents.

Keywords: gender preferences, fertility, family structure, transition countries.

JEL codes: J13, J16

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# Gender preferences in Central and Eastern Europe as reflected in partnership and fertility outcomes[1]

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## Abstract

The decisions of parents following the birth of their first child concerning subsequent fertility, and the stability of their relationship can be used as a reflection of broader gender preferences. We study these decisions to identify gender preferences in six Central and Eastern European countries, which vary with respect to their current political and economic conditions, but share a common experience of past communist rule. Using subsamples of census data collected in the IPUMS-International inventory around 2000 and 2010, we examine the effect of the gender of the first-born child(ren) on the fertility and relationship stability of their parents. Only in the case of Romania do our results consistently point towards boy preferences, while in Russia boy preferences can be detected in families with two or more children. Importantly, in four out of six countries (Belarus, Poland, Russia and Ukraine) parents are more likely to have a second child if the first-born was a boy, indicating girl preferences. These preferences could be interpreted as a reflection of concern regarding future care support for parents.

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# 1. Introduction

While the most often discussed forms of gender discrimination are different expressions of bias on the labour market, in most countries gender inequalities reach far deeper than unequal pay or disparities in the likelihood of employment. Importantly, they can also be discerned at the earlier stages of life, long before individuals reach adulthood and join the labour market. Discrimination may result in unequal access to health care, schooling, nutrition, and other forms of resources in childhood (Chen et al., 1981; Hazarika, 2000; Hill and Upchurch, 1995; Murthi et al., 1995; Sen and Sengupta, 1983; Timaeus et al., 1998). Such early-life discrimination, exacerbated by further unequal treatment in adulthood, results in substantial discrepancies in broad welfare outcomes including those related to labour market activity and material resources (Dahl and Moretti, 2008). Gender inequalities are deeply rooted in social and cultural norms and in stereotypical attitudes to social obligations, which vary substantially across countries, as confirmed by the data from the European or World Values Survey. Yet, while the diversity in declared values can easily be observed in these surveys, the extent to which they translate into major decisions over the life cycle and as a consequence into unequal welfare outcomes for men and women, is far from straightforward.

Recent literature has brought to light evidence on some of the most severe forms of gender bias in the form of deviations from the natural gender ratio at birth. Since the introduction of pre-natal ultrasound technology, this extreme type of expression for gender preferences has been confirmed in such countries as Albania, Armenia, Azerbaijan, China, Georgia, Hong Kong, India, Montenegro, South Korea, Taiwan, Tunisia, and Vietnam (Chao et al., 2019, Gupta et al., 2003). Sex-selective abortions, which are the cause of these outcomes, are rare enough in most other countries that the gender ratio at birth does not deviate significantly from the natural rate of about 105 boys to 100 girls (World Health Organization, 2019).[2] However, a number of papers have shown that other less extreme expressions of gender bias can be discerned from socio-demographic data on partnership stability and fertility decisions (Dahl and Moretti, 2008;

[2] Orzack et al. (2015) show in a study on trajectory of the gender ratio between conception and birth that while the ratio at the initial stage is equal, female morality throughout pregnancy is slightly higher than male, which results in higher probability of males being born. Some external factors may cause both higher and lower bias in the biological gender birth ratio. For example stressful events (e.g. 9/11 attacks) may cause slightly lower sex ratio at birth (more girls were born to New York residents in late 2001 than it would have been naturally expected, Catalano et al., (2006)), and wars can elicit the opposite effect (Ellis and Bonin, 2004; Graffelman and Hoekstra, 2000; MacMahon and Pugh, 1954; Mathews and Hamilton, 2005).

Filmer et al., 2012; Giuliano, 2007; Lundberg and Rose, 2003; Morgan et al., 1988). As they relate to fundamental life-course decisions, such findings are significant reflections of the broader context of discrimination, providing a background against which we can interpret subjective declarations from value surveys. In this paper we draw on the contributions to this literature focusing on six countries from Central and Eastern Europe (CEE), a region of particular interest from the point of view of gender discrimination given the shared history of communist rule with its declared commitment to equality (Grogan, 2013; Harsch, 2014; Pollert, 2003).

Using a unique data repository from IPUMS-International we examine the implications of parental gender preferences from the perspective of several family outcomes, looking at the relationship between partnership stability and fertility decisions conditional on the gender of the first-born child or two first-born children. The IPUMS-International data repository allows us to conduct the exercise using large datasets drawn from national censuses from six countries in the CEE region: Belarus, Hungary, Poland, Romania, Russia and Ukraine, with data available for two points in time in the first five countries (early 2000s and 2010s), and for 2001 in Ukraine. For the three countries which were not part of the Soviet Union (Hungary, Poland and Romania), we compare results based on the most recent data with analysis based on older census waves conducted before the collapse of the communist regimes.

While the countries examined here share a communist past, they are heterogenous with regard to cultural and religious backgrounds, and they have followed significantly differentiated paths of political and economic development in the last three decades. The urgent need for deep reforms after 1989 created new challenges, causing economic insecurity and socio-economic reshuffles, often leading to increasing inequality. From the perspective of gender equality some countries fared better than others, and while employment gaps between men and women in the six studied countries have not increased significantly, the gender pay gap in Belarus, Russia and Ukraine remains substantially higher in comparison to the levels in Hungary, Poland and Romania (OECD, 2021). What is particularly striking is the fact that despite decades of communist rule and women's emancipation on the labour market, declared values concerning the roles and obligations of men and women in society tend to reflect traditionalist, conservative views. In Figures 1A-C we show some examples of cross-country differences in attitudes towards gender roles collected in the European Values Survey. The six CEE countries of interest are compared with gender equality leaders from Scandinavia and three Western European examples – Belgium, Germany and Great Britain. As many as 92% of men and 84%

of women in Ukraine agree with the statement that '*A job is alright but what most women really want is a home and children*' (Figure 1A), and the rates are around 85% in Russia and Romania for both men and women. While in Belarus the proportions are lower (62% and 52% respectively), they are still far higher compared to Sweden (36% and 27%) or Denmark (12% and 11%). The results concerning a further statement – '*When jobs are scarce, men should have more right to a job than women*', also reflect striking country differences (Figure 1B). Almost 40% of men and 25% of women in Russia and Ukraine expressed such views, compared to less than 3% of Danes, Finns, Norwegians and Swedes, regardless of gender. In contrast to these preferences, the communist experience seems to be strongly reflected in preferences which regard the expectations of contributions towards household income. Although in the six CEE countries men are considered to have greater rights to a job, a very high proportion of both men and women agree that '*Both the husband and wife should contribute to household income*' (Figure 1C).[3]

<Figure 1A-C about here>

In none of the examined countries do these views translate into the extreme expressions of gender bias against girls as reflected in substantially higher values of the gender ratio at birth (see Figure A1 in the Appendix). The question we ask in this paper is whether we can confirm expressions of gender bias in other forms of socio-demographic data – those regarding key life decisions related to partnership stability and fertility decisions. The subsamples of census data provided by IPUMS-International are clearly the most suitable resources to address these questions. We use all the datasets available in this repository for countries of Central and Eastern Europe and focus on the waves of data collected around 2000 and 2010. Despite the significant biases in social norms as expressed it the European Values Survey, we show that explicit boy preferences as reflected in partnership stability and fertility decisions can be confirmed only in Romania and Russia, and in the latter country this can be confirmed only among families with two or more children. We find no effects of the gender of the first child(ren) on partnership stability in Belarus, Poland and Ukraine and in these countries (and also in Russia) parents are more likely to have a second child if their first was a boy, suggesting a preference for girls. One way to interpret these preferences is as a reflection of concern

[3] It is worth noting that while the cited norms point towards strong conservative views among the populations of the examined CEE countries, in some areas, such as performance in mathematics and chess, there is evidence of positive aspects of the Soviet legacy for gender equality (Dilmaghani, 2020; Lippmann and Senik, 2018).

regarding future care support for the parents and their expectation that daughters would be more likely to provide such support compared to sons (Brockmann, 2001; Miranda et al., 2018). If correct, such an interpretation could hardly be seen as a sign of discrimination against boys.

With regard to the composition of larger families, we find that the gender composition of the first two children has tangible implications for parental fertility decisions in all six countries. In the 2000s parents show strong preferences for gender parity across the board, in that they are much less likely to have a third child if the first two are a boy and a girl (or vice versa). In all six countries the probability of having the third child is higher if the first two are girls (compared to two boys), but this difference is only statistically significant in Romania and Russia.

The evidence presented in this paper suggests that despite the heavily skewed social gender roles in the countries of Central and Eastern Europe as expressed in the values surveys, gender preferences in favour of boys are not sufficiently strong to have a discernible effect on partnership stability or fertility decisions.[4] What is also worth stressing is that just as the declarations in values surveys over time become less discriminatory in the countries of the region (Myck and Roine, 2020), so the expressions of bias examined in this paper also generally reflect changes towards greater equality.

We begin this paper with a brief description of the methodological approach to the identification of the role of the gender of the first child (or children) on the examined outcomes (Section 2). This is followed by a presentation of the data we use and the sample restrictions we apply in Section 3 and the results of our analysis in Section 4. Discussion of the findings in Section 5 concludes the paper.

## 2. Identifying gender preferences from socio-demographic data

Although the social consequences of gender preferences as expressed through partnership stability or fertility decisions are not as severe as those of sex-selective abortion (Bongaarts and Guilmoto, 2015; Hesketh et al., 2011; Hesketh and Xing, 2006; Lai-wan et al., 2006; Sen, 1990; Sudha and Rajan, 1999), evidence of their existence can be considered as a strong reflection of a broader context of gender inequality. Moreover, these expressions of preferences might also have severe implications for socio-economic development. Preferences for boys expressed through the stoppage of subsequent childbearing would result in gender imbalances, while if

[4] These findings contrast with the survey-based evidence from several post-Soviet countries from the Caucasus and Central Asia where fertility, family structure and women's labour market behaviour have been shown to depend strongly on the gender of their first child (Grogan, 2013).

expressed through partnership stability would increase the likelihood of girls growing up in a lone-parent family with consequences such as a higher risk of poverty, lower self-esteem, or adverse physical and psychological health outcomes (Dahl and Moretti, 2008; Guilmoto, 2015). Empirical evidence concerning these expressions of gender preferences is mixed, and there are examples in the literature of both boy and girl preferences in the same countries or groups of countries (Dahl and Moretti, 2008; Grogan, 2013; Guilmoto, 2015; Hank and Kohler, 2003, 2000; Mills and Begall, 2010). One consistent result present in numerous studies on gender preferences is that in developed countries parents express a preference for at least one child of each sex (Andersson et al., 2007; Hank and Kohler, 2000; Mills and Begall, 2010; Sobotka and Beaujouan, 2014). The common point for all studies is that when it comes to making fertility decisions, parity matters (Guilmoto, 2015; Hank, 2007), and sex composition of previously born children is very important (Hank and Kohler, 2003; Mills and Begall, 2010).

To our knowledge this paper is the first to apply the common methodology to identify gender preferences used in the literature to an international set of census data from Central and Eastern Europe available in the IPUMS repository, though similar studies based on IPUMS are already available for other regions (e.g. for the US, China, Colombia, Kenya, Mexico and Vietnam: (Dahl and Moretti, 2008); for the US on more recent data: (Blau et al., 2017); for Armenia and the Kyrgyz Republic: (Brainerd, 2013); (Grogan, 2013) uses IPUMS data for Armenia, Kyrgyz Republic and Belarus as sensitivity analysis). We examine the most recent available census waves from IPUMS and supplement the analysis with a more detailed examination of the data for Romania as well as older, pre-transition waves of the data available for Hungary, Poland and Romania. The IPUMS repository datasets we use are random subsamples of full national censuses and represent between five and ten percent of the countries' population. The large size of the data facilitates the analysis of gender preferences in the CEE countries which has so far been scarce.[5]

[5] Hank and Kohler (2000) include several CEE countries in an analysis based on the Fertility and Family Survey. Most of their results are inconclusive, though it is unclear if this is because of lack of gender preferences or due to lack of power of the small samples. Looking at partnership status of mothers, Karbownik and Myck (2017) find evidence for boy preferences in analysis based on nine years of the Polish Household Budgets Survey, but show that a first-born girl has a negative effect on decisions to have a second child, suggesting girl preference. (Grogan, 2013) uses international survey data and focuses on family structure and fertility in Central Asian, Caucasus and several East European countries, most of which were Soviet republics before the collapse of the Soviet Union. The author shows strong preferences for boys in countries with strong patrilocal traditions such as Albania, Armenia, Azerbaijan, Tajikistan. Grogan's sensitivity analysis includes also IPUMS 2000s samples from Armenia, Kyrgyzstan and Belarus. The last one is also used in this paper.

Following earlier studies we investigate whether there is a difference in the impact of the gender of the first child on a number of outcomes: presence of a father in the family, progression to the second child and spacing between subsequent children. Since it has been argued that behaviourally relevant sex preferences may not be fully revealed at the lowest parities (Hank, 2007), we extend the analysis to identify the influence of gender composition of the first two children in two- and three-child families. In the latter case we also examine if the gender composition of the first two children affects the probability of the presence of the father in the family, as well as progression to the third child. Formally, the estimated model takes the following form:

$$y_i = \beta_1' X_i + \varepsilon_i, \qquad (1)$$

where $y_i$ is one of the outcomes measured at the family level, such as presence of the father, progression to the second/third child or spacing between children, and $X_i$ is either a dummy variable for the gender of the first child or a vector of dummies reflecting the gender composition of the first two children. $\varepsilon_i$ is the family-specific residual. We estimate the equation using OLS with robust standard errors.

The identification strategy requires the assumption that the child's gender at first birth is random, the validity of which has sometimes been questioned (Dahl and Moretti, 2008; Gupta, 2005; Hesketh et al., 2005). While we cannot confirm the sex ratio at birth for first-born children in official statistics of the analysed countries, available data on the overall sex ratio at birth show relatively stable patterns in the range between 105 and 107 in the last decades, with most countries converging on about 106 in recent years. The data presented in Figure A1 in the Appendix suggests that in the countries examined sex selective abortions and other factors which could have influenced the natural sex ratio at birth – if present – were not significant enough to substantially affect it (Catalano et al., 2006; Catalano, 2003; Ellis and Bonin, 2004; Graffelman and Hoekstra, 2000; Grant, 2009; MacMahon and Pugh, 1954). For comparison, Figure A1 includes also statistics on the sex ratio at birth in Armenia, a country which, like Russia, Ukraine and Belarus, was a Soviet Republic until 1991, and for which census-based data is also available in the IPUMS repository. As we can see, the sex ratio at birth in Armenia skyrocketed in the early 1990s to reach a level of 117.5 in 2000, clear evidence of an extreme gender bias against girls which can be explained only through sex-selective abortions.[6] For this

[6] For detailed analysis of the Armenian sex ratio at birth see for example: (Duthé et al., 2012; Guilmoto, 2016), while (Brainerd, 2013) and (Grogan, 2013) show evidence for biased fertility behaviour of Armenian parents based on IPUMS data.

reason, since we cannot be confident that the birth of the first child in Armenia can be treated as random, we decided to exclude it from our analysis (the same argument applies to another former Soviet country with data available in IPUMS - the Kyrgyz Republic). Another reason why the gender of the first child may not be random is related to the possible choice of the child's gender in the process of invitro fertilisation. However, although availability of invitro fertilization and other reproductive treatments increased substantially in recent years, over the period of our analysis its use in the six considered countries was very limited due to high costs (Prag and Mills, 2017). Throughout the analysis we thus assume that the gender of the first child(ren) at birth in the countries analysed can be considered as random.

## 3. Socio-demographic data from the IPUMS-International repository

### 3.1 Samples and sample selection

Since the magnitude of the effects of gender preferences on analysed outcomes is usually small, implications of gender bias are not easily identified in small-scale survey data. From this point of view the subsamples of census data from the IPUMS-International repository, provided by the Institute for Social Research and Data Innovation at the University of Minnesota (Minnesota Population Center, 2019), offer a unique opportunity to address the considered relationships. The repository provides data on six countries from the region of Central and Eastern Europe: Belarus, Hungary, Poland, Romania, Russia and Ukraine. Census subsamples available for Belarus, Poland, Romania and Ukraine cover 10 percent of the population, whereas in the case of Hungary and Russia the IPUMS samples represent 5 percent of the population. Since for Belarus, Russia and Ukraine the IPUMS data is not available for the period before the collapse of the Soviet Union, our main results are reported for more recent waves – around the years 2000 and 2010. In the Appendix we supplement these results with analysis of the data from Hungary, Poland and Romania for several pre-transition waves of the IPUMS data going back to the 1970s. In Table 1 we provide basic information on the overall sample sizes of the data for the six countries as well as the numbers of observations included in our final analysis. The census data used in the paper in different countries was collected between 1999-2001 and 2009-2011. We treat these three-year windows as two distinct periods and report the results below for '2000s' and '2010s' respectively.

<Table 1 about here>

The IPUMS data contains the basic demographic information on all individuals, as well as details on the relationship between members of the household which is necessary to match mothers, fathers and their children. Since we want to consider the fertility cycle of a family as closed and to ensure that all children of a mother live in a specific household, we limit the age range of the mothers to between 18 and 40 years, and consider families with up to three children in the age-range between 5-17 years. Fathers are identified based on the link with the first and the oldest child in a family. The minimum age difference between parents and children is assumed at 18 years. We exclude families with multiple births identified on the basis of same-aged children and remove families with foster or adopted children as their sex is more likely to be endogenous with respect to parental preferences.[7] After applying these sample selection criteria we end up with the total of about 1.4 million families with over 2 million children (Table 1). The samples range between 12.4 thousand families in Hungary (2011) and 348.8 thousand families in Russia (2002). In both of these cases the total IPUMS samples (respectively 0.50m and 7.05m observations) represent 5 percent of the total population.

The average number of children per mother in the 2000s varies between 1.38 in Russia and 1.71 in Poland, and for all five countries for which we have data in the 2010s we see a drop in these values, down to 1.28 and 1.57 for Russia and Poland respectively. Over these ten years we also observe a substantial change in the level of mothers' education. The shares of mothers with a university education in our samples grow from 6.0 percent to 16.4 percent in Romania and from 22.1 to 33.2 in Russia. In selected datasets we can also identify if people lived in urban or rural areas. For the 2000s the shares of rural residents varied between 22.1 percent in Belarus to 39.0 percent in Romania. Somewhat surprisingly, the proportion of mothers living in rural areas in Romania increased by 2011 to nearly 50 percent. It needs to be noted though that educational and residential classifications can be significantly determined by application of different categories and definitions at different points in time.

### 3.2 Family structure and fertility patterns in the CEE region over time

[7] According to the IPUMS-International methodology, the quality of the provided intra-household links depends on underlying data (Sobek and Kennedy, 2009). Only in case of Belarus and Romania these links were available already in the source data, in other instances child-parent links were established based on demographic, childbearing and other characteristics using a common algorithm. For two samples, Poland in 2011 and Ukraine in 2001, IPUMS does not supply information on intra-family relations. This requires additional assumptions on possible parent-child relationships based on gender and age of individuals. For example, we excluded families with more than one female who met the age criteria, and made additional assumptions on the age difference between the mother and the father to match parents to children. We cross-validated these assumptions in the samples with existing intra-family relations and found only minor discrepancies in identification. For example when using the same assumptions on the Polish sample from year 2002 less than 8% families were incorrectly identified.

In Table 2 we provide a comparison of descriptive statistics concerning family composition derived from the samples in each country for the 2000s and 2010s. In all countries but Hungary the shares of families with two and three children decreased over time. These trends, together with the increase in the proportion of families without children (not reported here) are the most obvious reflections of the falling levels of fertility in the region observed in other studies (Sobotka and Beaujouan, 2014). As we can see, Belarus experienced a dramatic drop of almost 20.0 percentage points (pp) in the share of two-child families, with a corresponding increase in the share of one-child families. On the other hand, in Poland a 9.3pp increase in the share of single-child families occurred in conjunction with a 4.8pp decline in share of two-child families, and a drop in the share of three-child families that was almost just as high. An outlier in these statistics is Hungary, where an almost 10pp drop in the share of two-child families was accompanied by a rise in the share of one-child families and a slight increase (0.8pp) in the share of three-child families.

<Table 2 about here>

Additionally, with the exception of Romania, in the analysed span of only 10 years, the shares of families with unmarried or divorced mothers and those living without fathers increased dramatically. In Hungary in the 2010s nearly 40% of mothers were either unmarried or divorced, and while the proportion of divorced mothers was similar to that in the three former Soviet Union republics, the share of those who never married was significantly higher than in all other countries. On the other hand, Romanian families had the lowest rates of mothers who never married, got divorced or lived without their children's fathers. Romania is also the only country where these shares diminished over the analysed decade.

In Table 2 we also present the changes in shares of daughters at different parities, which can be indicative of raw gender preferences. In all countries and families in the sample, independent of the number of children, the rate of first born girls oscillated around the expected gender birth ratio (biological birth ratio of 105 boys per 100 girls means that girls should comprise circa 48.8% of children). However, when we look at the shares of daughters in one-child families we can see that these are slightly higher in all countries except for Romania, and that the pattern is much less consistent at higher parities. Since it has been argued that parental gender preferences ought to be analysed considering higher parities (Hank, 2007), in Table 2 we complement the above analysis by looking at the gender composition of the first two children in three-child

families. We find some indication of the preference for mixed-gender offspring, since families with same-sex children were more likely to have the third child than the ones that already had both a boy and a girl, irrespective whether a boy or a girl came first. This trend seems to be getting weaker over time as the distribution of different combinations of gender pairs was more even in the samples from the 2010s.

## 4. Results

In Tables 3-6 we present the regression results from the model specified in equation (1), where the coefficient ($\beta_1$ ) indicates the effect of the gender of the first child or the first two children ($X_i$) on one of the respective outcomes ($y_i$): living with a father, progression to the second/third child and spacing between the first two children (in years). We estimate this regression for each country-year sample separately. In the Tables we report the $\beta_1$ coefficients together with robust standard errors (in brackets) and percentage effects [in square brackets].

### 4.1 Gender of the first child and presence of a father in the family

One of the most powerful expressions of gender preferences which can be discerned from the data on family structure is the relationship between the gender of the first child and the partnership stability of the parents. In Table 3 we show the estimates of the effect of the first-born boy relative to the first-born girl on the probability of living with a father in one-child and in larger families (with two or three children). We find that in the majority of cases having a first-born boy does not translate into a higher (or lower) probability of living with the father. In the data for Romania and Russia we do find evidence for boy preferences, although the results are not consistent over time and across families with one and more children. Both in one-child and in larger families we find statistically significant preferences for boys in Romania in the 2000s, but the findings are no longer confirmed in the data ten years later. Moreover, the effects are relatively small – a first born boy in the 2000s increases the probability of living with the father by 1.1 percent compared to a first-born girl. In Russia among families with two or three children the presence of the father is more likely if the first-born child was a boy. The magnitude of the effect in the 2000s is 1.1 percent and 1.7 percent in the 2010s. Similar effects cannot be identified in Russia in the case of one child families. The only dataset where we find evidence of a girl preference is in Hungary in the 2010s. A first-born boy has a negative effect on the presence of the father (compared to a first-born girl) and the magnitude of the effect is as high as 3.9 percent. This evidence, however, could not be confirmed either in the earlier dataset for the 2000s or for the samples with two or three children.

<Table 3 about here>

### 4.2 Gender of first children and subsequent fertility

Next we turn to an analysis of the effect of gender of the first child or the first two children on subsequent fertility, respectively in families with one or two and in families with two or three children. In the first case, preferences for a specific gender would be expressed if parents were more likely to have a second child conditional on the gender of the first one being the less preferred. In the second case preferences may, on the one hand, relate to having a child of the opposite gender following two first births of boys or first births of girls. On the other hand, however, if parents on average have a preference for a specific gender, say for boys, then they would be more likely to have the third child following two births of girls, compared to two boys. In this case the likelihood of the decision to have a third child would be higher among those with two girls than among those with two boys.

Our results are presented in Table 4. The first two columns show the effect of a first-born boy as compared to a first-born girl on the decision to have a second child. These results suggest that in Belarus, Poland, Russia and Ukraine families have a preference for girls, as they are more likely to have a second child conditional on the first one being a boy. Moreover, in the countries for which we have data for both the 2000s and 2010s, the magnitude of the effect is much higher in the later dataset. For example, in Belarus it grows from 2.1 percent to 5.8 percent and in Russia from 2.3 percent to 5.2 percent. Only in Romania can we confirm a preference for boys consistent with results presented in Table 3. In the 2000s the probability of having a second child is lower by as much as 4.1 percent conditional on the first child being a boy. The coefficient is still negative in the 2010s, but the effect is smaller (1.7 percent) and not statistically significant.

<Table 4 about here>

To examine the differences in the propensity to have a third child for different gender pairs of the first two children for two- and three-child families, in columns (3) and (9) we first show the estimates of the impact of the same-sex gender pairs as compared to different-sex pairs for the probability to have a third child (Model 1). Subsequently (Model 2), we divide the effects of the same-sex child compositions for the probability to have a third child into separate effects of having two boys (columns 6 and 10) or two girls (columns 7 and 11) relative to mixed offspring. This approach first tests if parents have a preference for mixed-gender offspring, and second,

by comparing the values of coefficients on two boys and two girls in Model 2, we can identify if parents have a preference for a specific gender. The statistical significance of this difference is reported in columns (8) and (12).

As we can see in columns (3) and (9) there is generally a strong preference for a gender mix of children. We identify these effects in all countries in the data for the 2000s, and the only country where we find no such preference in the 2010s is Belarus. It is worth pointing out that the magnitude of the implication of these preferences is very high. For example, in the data for the 2000s in Belarus, Hungary, Russia and Ukraine parents are over 30 percent more likely to have the third child if their first two children are of the same gender. The effects are weaker but still substantial in Poland (15.8 percent) and Romania (25.7 percent). In Hungary the magnitude of this effect falls in the 2010s to 15.0 percent, and in Belarus it is statistically insignificant. The latter result might be related to the significant drop in the number of families with three children in Belarus in the 2010s and an already relatively low number of these families in the 2000s (see Table 2).

Comparing the implications of having two boys versus two girls for the likelihood of having a third child we find further evidence of boy preferences in Romania and Russia. In the 2000s Russian parents of two girls were 37.7 percent more likely to have a third child than parents of a girl and a boy, while those of two boys were only 25.7 percent more likely to have a third child. The numbers for Romania were respectively 34.4 percent and 17.5 percent. In terms of the magnitude, these effects are similar ten years later and the difference is still statistically significant.

### 4.3 Gender of the first child and spacing between subsequent children

The last examined expression of gender preferences is the spacing between first-born and second-born children. We analyse if having a first-born boy or a first-born girl affects the time span until parents decide to have the second child. Two important notes of caution here are: first, that the sample is narrowed down to families with two children, and second, that for most samples the spacing is calculated from the age of children due to a lack of birth month information in the data.

<Table 5 about here>

With these limitations in mind, our results – presented in Table 5 – show once again evidence of boy preferences in Romania, Russia and Ukraine. In these three countries parents waited longer to have the second child conditional on having a first-born boy, although the magnitude of the effects is not very large. For example in Romania, where the effects are largest, parents waited on average only about a month longer to have the second child if the first one was a boy (20 days in the 2000s and 42 days in the 2010s). While reasons other than gender preferences might be behind these decisions, the fact that the effects are largest for Romania seems consistent with other findings for this country presented in Tables 3 and 4.[8]

### 4.4 Within-country differences in gender preferences: Romanian example

The size and content of the IPUMS datasets allow us to conduct different forms of within-country comparisons of gender preferences by subgroups of the population. For the countries for which we found no strong evidence of boy or girl preferences we could not identify any regular patterns of preferences by either of these characteristics (results available from the authors on request). In this section we report selected results of within-country analysis for Romania, a country where we find the most consistent evidence of boy preferences. The reported results focus on differences by ethnicity and education and are presented in a sequence similar to that above: first for the presence of father in the family conditional on the gender of the first child, then for fertility choices and finally for spacing between the first and second child in two-child families. Results are presented in Tables 6, 7 and 8. According to the 2011 census, the main minorities in Romania were Hungarians (6.1 percent) and Roma (3.0 percent).[9] As we show in Table 1, in our sample the proportion of mothers with university education in Romania was only 6.0 percent in 2002 and grew to 16.4 percent by 2011. We further split the sample by education into completed primary or less (respectively 27.9 and 30.2 percent) and completed secondary education (66.1 and 53.4 percent).[10]

In the analysis in which we distinguish different ethnic groups we find that the likelihood of having the father present in the household conditional on the gender of the first child (Table 6) is significantly higher for the Roma minority, although the results only hold for one-child

[8] Note that a similar exercise could be conducted for spacing between the second and third child in families with three children. However, as we showed in Table 4, the sample of families with three children is heavily biased with respect to the gender of the first two children. Thus, it would be difficult to give these results a straightforward interpretation.

[9] NB: official estimates of the actual size of Roma population in Romania vary greatly. Recent estimates by European Commission are as high as 8.3 percent (Council of Europe, 2020). In our samples Roma constitute only 1.3 percent of Romanian population in 2002 and 2.5 percent in 2011.

[10] The high proportion of individuals in the sample with primary education or less might result from lowering compulsory education to 8 years after 1989 (it was increased to 10 years in 2003 (UNICEF, 2008)).

families and only in the 2002 sample. This result, however, is not responsible for the findings presented for the full Romanian sample in Table 3. The estimates for the Romanian majority (91.5 percent of the sample in 2002 and 85.7 percent in 2011) are nearly identical to those for the country as a whole and show that it is not only specific attitudes and norms among minority groups that determine the reported results. This is confirmed in the results regarding fertility decisions (Table 7) and spacing between the first and second child (Table 8). We also find that boy preferences are stronger among the lower educated groups. The effect of gender on the presence of the father in a family was statistically significant only in the 2000 sample of families with mothers with completed secondary education (Table 6). The results in Table 7 suggest that these families also had a lower probability of conceiving the second child if the first one was a boy (though a similar preference with an even stronger magnitude was found for families of mothers with a university degree). In the 2000s families where mothers had primary education or less and secondary education had a significantly higher probability of having a third child if the first two children were girls. In the 2010s the difference was statistically significant only for those with primary education or less.

<Table 6 about here>

<Table 7 about here>

<Table 8 about here>

### 4.5 Gender preferences in the pre-transition period

For the three countries from our sample which were not part of the Soviet Union, the IPUMS repository also contains data for earlier years, including the period before the collapse of the communist regimes or just after the political transition. For Hungary the data is available for 1970, 1980 and 1990, for Poland for 1978 and 1988 and for Romania for 1977 and 1992. Analysis using this data, which we report in the Appendix (Tables A1, A2 and A3) shows weaker gender preferences as expressed in the analysed outcomes. For example, in the 1980s and 1990s we find no effects of the gender of the first child on the presence of a father in families with one child and no effects on the probability of having the second child in families with one or two children. Moreover, while the differences are small and statistically insignificant, the probability of having a third child in Hungary and Poland in the 1980s and 1990s is higher if the first two children are boys rather than girls. In Romania on the other hand,

the differences in the 1980s and 1990s already suggest a strong and statistically significant preference for boys (Table A2), which is also reflected in the analysis of spacing between children (Table A3).

## 5. Conclusion

In this paper we examine expressions of gender preferences of parents in the form of family structure and fertility decisions in six Central and Eastern European countries: Belarus, Hungary, Poland, Romania, Russia and Ukraine. We take advantage of subsamples of census data from these countries provided by the IPUMS-International data repository. The size of the datasets and the demographic information provided in the data allow us to investigate the influence of parental gender preferences on several family-related outcomes: the probability of partners living together, the probability of having a second or third child, and the timing of these decisions.

Contrary to what we might expect judging by the strong traditional gender norms observed in value surveys (Figures 1A-C), we do not find consistent evidence across the region of a significant preference in favour of boys. We do, however, confirm boy preferences as expressed in the family structure in Russia and find consistent support for boy preferences in Romania. In the data on families with one child we find that Romanian families with first born girls were slightly more likely to live without a father (by 1.1 percent) in early 2000s, while Russian families with two or three children were more likely to live without a father both in the 2000s and 2010s data (respectively by 1.1 percent and 1.7 percent). The results for Romania also showed a statistically significant negative association between the first-born boy and the probability of having a second child, and a lower probability of having a third child in families with two first-born sons compared to two first-born daughters. The latter result holds both for the 2000s and 2010s for Romania and Russia. As we showed using Romanian data disaggregated by ethnicity, the estimated boy preferences in the 2000s are driven primarily by the preferences of the Romanian majority. Having said that, in Roma families with one child in the 2000s, mothers of a girl were nearly 18 percent more likely to live without the father compared to mothers of a boy. However, such strong expressions of boy preferences were no longer identified in the 2010s.

In Belarus, Poland and Ukraine, when looking at the fertility history among families with one or two children we find evidence for girl preferences. While the gender of the first child in these countries seems to have no effect on partnership stability, parents were more likely to have a

second child if their first born was a boy. We find also that these girl preferences grew over time – in the 2000s families with a first-born boy were 2.1 percent more likely to have a second child compared to those with a first-born girl. In the 2010s the estimates are 5.8 percent in Belarus and 3.1 percent in Poland. Such expressions of girl preference could also be confirmed for Russia where the probability of having a second child among families with a first-born boy was 2.3 percent and 5.2 percent higher in the 2000s and 2010s respectively.

Consistent and significant differences were observed when comparing the impact of same-sex and mixed-sex offspring on progression to the third child in families with two or three children. This suggests a clear preference among parents who decided to have more than one child for having at least one boy and one girl. For Hungary, Poland and Romania such preferences can also be identified in the pre-transition data from the 1980s and 1990s. The pre-transition patterns show no evidence of gender preferences as expressed in family stability among families with one child in any of these countries. Moreover, looking at the probability of having a second child, contrary to the findings from later years, we find no evidence of girl preferences in Poland in the 1980s and 1990s data. Girl preferences identified in Poland, Belarus, Russia and Ukraine in the post-transition data call for further investigation, in particular since the magnitude of the estimated effects grew substantially in the first three countries between the 2000s and 2010s. As life expectancy in the regions grows, and governments seem unwilling to establish strong foundations for institutional support in old-age, the results may reflect expectations of parents concerning provision of care within the family. A preference for a daughter could then be interpreted as a form of care insurance under the assumption that daughters would be more likely to provide such care. If so, then such girl preferences could hardly be interpreted as a sign of discrimination against boys.

# Appendix

### Sex ratio at birth between 1950-2017 in selected countries

<Figure A1 about here>

### Results based on earlier data from the IPUMS repository for CEE countries – Hungary, Poland and Romania

<Table A1 about here>

<Table A2 about here>

<Table A3 about here>

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# Tables

**Table 1. IPUMS samples and sample sizes for analysis**

| Country | Year | Sample size | Children (aged 5-17) | Mothers (aged 18-40) | Average no of children per mother | Mother's education – university completed (%) | Living in rural area (%) |
|---|---|---|---|---|---|---|---|
| Belarus | 1999 | 990 706 | 95 468 | 61 528 | 1.55 | 20.42 | 22.07 |
| | 2009 | 940 594 | 53 351 | 40 492 | 1.32 | 26.71 | 21.31 |
| Hungary | 2001 | 510 502 | 29 026 | 17 823 | 1.63 | 14.30 | - |
| | 2011 | 496 762 | 19 181 | 12 401 | 1.55 | 18.72 | - |
| Poland | 2002 | 3 824 056 | 229 313 | 134 043 | 1.71 | 13.20 | 36.17 |
| | 2011 | 4 051 255 | 188 843 | 120 085 | 1.57 | 21.40 | - |
| Romania | 2002 | 2 137 967 | 134 511 | 89 958 | 1.50 | 5.97 | 38.96 |
| | 2011 | 1 991 924 | 88 483 | 62 058 | 1.43 | 16.37 | 47.79 |
| Russia | 2002 | 7 080 849 | 480 680 | 348 766 | 1.38 | 22.10 | 24.19 |
| | 2010 | 7 047 151 | 329 713 | 257 792 | 1.28 | 33.23 | 23.51 |
| Ukraine | 2001 | 4 889 288 | 389 325 | 276 161 | 1.41 | 19.83 | - |
| Total | - | 33 961 054 | 2 086 924 | 1 421 107 | - | - | - |

*Source:* IPUMS-International, version 6.5.

*Notes:* Sizes of the census samples: 10% in Belarus, Poland, Romania and Ukraine; 5% in Hungary and Russia.

**Table 2 Reproductive and family patterns over time (in %)**

| | | Belarus | | Hungary | | Poland | | Romania | | Russia | | Ukraine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1999 | 2009 | 2001 | 2011 | 2002 | 2011 | 2002 | 2011 | 2002 | 2010 | 2001 |
| Families by no of children | 1 | 48.8 | 69.9 | 44.5 | 53.4 | 40.9 | 50.2 | 56.0 | 61.2 | 65.2 | 74.1 | 62.1 |
| | 2 | 47.3 | 28.4 | 48.2 | 38.6 | 47.1 | 42.3 | 38.4 | 35.1 | 31.8 | 23.9 | 34.9 |
| | 3 | 4.0 | 1.7 | 7.3 | 8.1 | 12.0 | 7.5 | 5.6 | 3.8 | 3.1 | 2.0 | 3.0 |
| Mothers: | | | | | | | | | | | | |
| - never married | | 1.5 | 4.5 | 5.2 | 18.0 | 3.6 | 6.0 | 4.1 | 1.8 | 3.8 | 6.0 | 1.7 |
| - divorced | | 14.6 | 17.7 | 17.8 | 21.0 | 8.2 | 9.0 | 8.3 | 5.1 | 17.4 | 19.0 | 16.6 |
| Families living without father | | 21.7 | 31.6 | 19.2 | 26.2 | 17.8 | 25.7 | 12.1 | 11.1 | 31.6 | 37.0 | 28.0 |
| First born girl in all families | | 49.0 | 48.8 | 49.0 | 48.8 | 48.8 | 48.7 | 48.5 | 48.5 | 48.9 | 48.8 | 48.6 |
| First born girl in 1-child families | | 49.5 | 49.4 | 49.4 | 49.0 | 49.3 | 49.5 | 47.7 | 48.2 | 49.2 | 49.2 | 48.9 |
| Second born girl in 2-child families | | 49.1 | 48.4 | 48.3 | 48.5 | 48.8 | 48.6 | 48.7 | 48.2 | 48.3 | 49.1 | 49.0 |
| Third born girl in 3-child families | | 47.5 | 49.2 | 48.6 | 47.6 | 49.2 | 48.6 | 47.9 | 48.1 | 48.4 | 48.0 | 47.8 |
| Gender of the first two children in 3-child families* | BG | 23.3 | 26.0 | 20.8 | 23.2 | 23.4 | 23.7 | 23.0 | 22.8 | 22.2 | 22.9 | 22.3 |
| | BB | 28.9 | 25.7 | 29.6 | 27.9 | 27.6 | 28.4 | 26.4 | 27.3 | 28.5 | 28.0 | 29.7 |
| | GB | 20.4 | 23.3 | 22.6 | 23.4 | 23.5 | 23.5 | 22.1 | 22.4 | 21.8 | 21.3 | 21.3 |
| | GG | 27.5 | 25.0 | 27.0 | 25.7 | 25.6 | 24.3 | 28.5 | 27.5 | 27.5 | 27.8 | 26.7 |

*Source:* own calculations based on IPUMS-International, version 6.5.

*Notes:* Samples of families selected on the basis of certain criteria described in main text.

*Gender composition: BG – boy-girl, BB – boy-boy, GB – girl-boy, GG – girl-girl.

**Table 3. Effects of the first child's gender on the presence of a father in a family (boy versus girl)**

| | Families with one child | | Families with 2 or 3 children | |
|---|---|---|---|---|
| | **2000s** | **2010s** | **2000s** | **2010s** |
| Belarus | -0.001 | 0.002 | 0.000 | -0.005 |
| | (0.005) | (0.006) | (0.004) | (0.007) |
| | [-0.1] | [0.4] | [0.0] | [-0.6] |
| Hungary | 0.010 | -0.027* | 0.011 | 0.004 |
| | (0.010) | (0.011) | (0.006) | (0.010) |
| | [1.4] | [-3.9] | [1.2] | [0.5] |
| Poland | 0.002 | 0.001 | 0.004 | 0.002 |
| | (0.004) | (0.004) | (0.002) | (0.003) |
| | [0.2] | [0.2] | [0.5] | [0.3] |
| Romania | 0.010*** | 0.002 | 0.007* | 0.005 |
| | (0.003) | (0.004) | (0.003) | (0.003) |
| | [1.1] | [0.2] | [0.7] | [0.5] |
| Russia | 0.001 | -0.001 | 0.009*** | 0.013*** |
| | (0.002) | (0.002) | (0.002) | (0.003) |
| | [0.1] | [-0.2] | [1.1] | [1.7] |
| Ukraine | 0.002 | | 0.000 | |
| | (0.002) | | (0.002) | |
| | [0.3] | | [0.0] | |

*Source:* see Table 2.

*Notes:* * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in brackets, percent effect in square brackets. Data time points: 2000s – 1999 in Belarus, 2001 in Hungary and Ukraine, 2002 in Poland, Romania and Russia; 2010s – 2009 in Belarus, 2010 in Russia, 2011 in Hungary, Poland and Romania.

**Table 4. Effects of the gender of first child(ren) on the probability of having more children**

| | Second child in families with 1 or 2 children | | Third child in families with 2 or 3 children | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000s | 2010s | 2000s | | | | 2010s | | | |
| | | | Model 1 | Model 2 (ref: mix) | | | Model 1 | Model 2 (ref: mix) | | |
| | Boy versus girl | | Same sex vs. mix | Two boys | Two girls | Sign. (7-6) | Same sex vs. mix | Two boys | Two girls | Sign. (11-10) |
| | (1) | (2) | (3) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Belarus | 0.010* | 0.016*** | 0.020*** | 0.018*** | 0.022*** | | 0.004 | 0.001 | 0.009 | |
| | (0.004) | (0.005) | (0.003) | (0.004) | (0.004) | | (0.004) | (0.005) | (0.005) | |
| | [2.1] | [5.8] | [30.3] | [27.5] | [33.2] | | [8.2] | [1.3] | [16.3] | |
| Hungary | 0.009 | 0.004 | 0.036*** | 0.033*** | 0.039*** | | 0.024* | 0.021 | 0.027* | |
| | (0.008) | (0.009) | (0.007) | (0.008) | (0.009) | | (0.010) | (0.012) | (0.013) | |
| | [1.7] | [1.0] | [31.0] | [28.7] | [33.6] | | [15.0] | [13.2] | [17.0] | |
| Poland | 0.011*** | 0.014*** | 0.030*** | 0.026*** | 0.034*** | | 0.022*** | 0.023*** | 0.021*** | |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) | | (0.003) | (0.004) | (0.004) | |
| | [2.1] | [3.1] | [15.8] | [13.7] | [18.1] | | [15.7] | [16.6] | [14.7] | |
| Romania | -0.017*** | -0.006 | 0.029*** | 0.020*** | 0.039*** | *** | 0.022*** | 0.016*** | 0.029*** | * |
| | (0.003) | (0.004) | (0.003) | (0.004) | (0.004) | | (0.004) | (0.005) | (0.005) | |
| | [-4.1] | [-1.7] | [25.7] | [17.5] | [34.4] | | [26.1] | [19.2] | [33.9] | |
| Russia | 0.007*** | 0.012*** | 0.024*** | 0.020*** | 0.029*** | *** | 0.022*** | 0.017*** | 0.028*** | ** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | | (0.002) | (0.003) | (0.003) | |
| | [2.3] | [5.2] | [31.3] | [25.7] | [37.7] | | [32.8] | [25.2] | [41.6] | |
| Ukraine | 0.007*** | | 0.022*** | 0.021*** | 0.022*** | | | | | |
| | (0.002) | | (0.002) | (0.002) | (0.002) | | | | | |
| | [2.1] | | [31.5] | [30.9] | [32.1] | | | | | |

*Source and notes:* see Table 3.

**Table 5. Effects of the first child's gender (boy) on spacing between first two children in 2-child families (in years)**

| | 2000s<br>(1) | 2010s<br>(2) |
|---|---|---|
| Belarus | 0.027<br>(0.022) | 0.013<br>(0.044) |
| Hungary | -0.029<br>(0.038) | 0.095<br>(0.058) |
| Poland | -0.016<br>(0.015) | 0.008<br>(0.018) |
| Romania | 0.056**<br>(0.019) | 0.116***<br>(0.029) |
| Russia | 0.026*<br>(0.012) | 0.006<br>(0.020) |
| Ukraine | 0.030*<br>(0.013) | |

*Source:* see Table 2.

*Notes:* * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in brackets. Data time points: 2000s – 1999 in Belarus, 2001 in Hungary and Ukraine, 2002 in Poland, Romania and Russia; 2010s – 2009 in Belarus, 2010 in Russia, 2011 in Hungary, Poland and Romania.

**Table 6 Effects of the first child's gender on the presence of a father in a family (boy versus girl): Romania by mother's ethnicity and education**

| | Families with one child | | Families with 2 or 3 children | |
|---|---|---|---|---|
| | **2000s** | **2010s** | **2000s** | **2010s** |
| **Ethnicity:** | | | | |
| Romanian | 0.009**<br>0.003<br>[1.1] | 0.002<br>0.003<br>[0.2] | 0.008**<br>0.003<br>[0.9] | 0.005<br>0.003<br>[0.5] |
| Hungarian | 0.008<br>0.014<br>[0.9] | -0.014<br>0.013<br>[-1.6] | -0.003<br>0.010<br>[-0.3] | 0.003<br>0.010<br>[0.3] |
| Roma | 0.116**<br>0.041<br>[17.8] | 0.015<br>0.027<br>[1.8] | 0.000<br>0.027<br>[0.0] | 0.012<br>0.021<br>[1.4] |
| **Education:** | | | | |
| Completed primary or less | 0.009<br>0.007<br>[1.1] | 0.001<br>0.007<br>[0.1] | 0.006<br>0.005<br>[0.7] | 0.004<br>0.005<br>[0.4] |
| Completed secondary | 0.009*<br>0.004<br>[1.0] | -0.001<br>0.005<br>[-0.1] | 0.008*<br>0.003<br>[0.9] | 0.005<br>0.004<br>[0.5] |
| Completed university | 0.020<br>0.012<br>[2.4] | 0.009<br>0.008<br>[1.1] | -0.010<br>0.015<br>[-1.1] | 0.011<br>0.010<br>[1.2] |

*Source and notes:* see Table 3.

**Table 7 Effects of the gender of first child(ren) on the probability of having more children: Romania by mother's ethnicity and education**

| | Second child in families with 1 or 2 children | | Third child in families with 2 or 3 children | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000s | 2010s | 2000s | | | | 2010s | | | |
| | | | Model 1 | Model 2 (ref: mix) | | | Model 1 | Model 2 (ref: mix) | | |
| | Boy versus girl | | Same sex vs. mix | Two boys | Two girls | Sign. (7-6) | Same sex vs. mix | Two boys | Two girls | Sign. (11-10) |
| | (1) | (2) | (3) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| **Ethnicity:** | | | | | | | | | | |
| Romanian | -0.018*** | -0.006 | 0.029*** | 0.020*** | 0.039*** | *** | 0.022*** | 0.015** | 0.031*** | ** |
| | (0.004) | (0.004) | (0.003) | (0.004) | (0.004) | | (0.004) | (0.005) | (0.005) | |
| | [-4.4] | [-1.5] | [26.7] | [18.2] | [35.7] | | [27.3] | [17.9] | [37.6] | |
| Hungarian | -0.026 | -0.029 | 0.038** | 0.027 | 0.049** | | 0.022 | 0.028 | 0.015 | |
| | (0.014) | (0.016) | (0.012) | (0.015) | (0.016) | | (0.013) | (0.016) | (0.015) | |
| | [-5.7] | [-6.5] | [41.2] | [29.7] | [52.5] | | [33.7] | [43.5] | [23.2] | |
| Roma | 0.041 | -0.028 | 0.004 | -0.035 | 0.058 | | 0.064* | 0.048 | 0.086 | |
| | (0.033) | (0.028) | (0.037) | (0.042) | (0.049) | | (0.032) | (0.038) | (0.043) | |
| | [9.1] | [-6.1] | [1.3] | [-10.8] | [17.8] | | [25.7] | [19.1] | [34.5] | |
| **Education:** | | | | | | | | | | |
| Completed primary or less | -0.011 | -0.009 | 0.044*** | 0.029*** | 0.060*** | ** | 0.040*** | 0.028** | 0.053*** | * |
| | (0.007) | (0.008) | (0.007) | (0.008) | (0.009) | | (0.007) | (0.009) | (0.010) | |
| | [-2.1] | [-1.9] | [24.8] | [16.6] | [34.1] | | [29.2] | [20.6] | [39.1] | |
| Completed secondary | -0.021*** | -0.009 | 0.022*** | 0.014** | 0.031*** | ** | 0.014** | 0.010 | 0.018** | |
| | (0.004) | (0.005) | (0.004) | (0.004) | (0.005) | | (0.004) | (0.005) | (0.006) | |
| | [-5.2] | [-2.5] | [27.5] | [17.1] | [38.2] | | [23.9] | [16.7] | [31.7] | |
| Completed university | -0.031** | 0.003 | -0.013 | -0.012 | -0.013 | | 0.007 | 0.009 | 0.003 | |
| | (0.012) | (0.008) | (0.009) | (0.011) | (0.011) | | (0.007) | (0.009) | (0.009) | |
| | [-11.4] | [1.3] | [-33.3] | [-31.4] | [-35.3] | | [21.4] | [30.4] | [11.0] | |

*Source and notes:* see Table 3.

**Table 8 Effects of the first child's gender (boy) on spacing between first two children in 2-child families (in years): Romania by mother's ethnicity and education**

| | 2000s (1) | 2010s (2) |
|---|---|---|
| **Ethnicity:** | | |
| Romanian | 0.054** | 0.122*** |
| | (0.020) | (0.031) |
| Hungarian | 0.143 | 0.071 |
| | (0.078) | (0.103) |
| Roma | -0.066 | 0.125 |
| | (0.165) | (0.178) |
| **Education:** | | |
| Completed primary or less | 0.057 | 0.109* |
| | (0.032) | (0.047) |
| Completed secondary | 0.065** | 0.125** |
| | (0.024) | (0.041) |
| Completed university | 0.006 | 0.118 |
| | (0.100) | (0.085) |

*Source and notes:* see Table 5.

**Table A1. Effects of the first child's gender on the presence of a father (boy versus girl): 1970-1992**

| | Families with one child | | | Families with 2 or 3 children | | |
|---|---|---|---|---|---|---|
| | **1970s** | **1980s** | **1990s** | **1970s** | **1980s** | **1990s** |
| Hungary | 0.011 | 0.009 | 0.010 | 0.016** | 0.005 | 0.003 |
| | (0.006) | (0.008) | (0.009) | (0.005) | (0.005) | (0.006) |
| | [1.3] | [1.2] | [1.3] | [1.8] | [0.5] | [0.4] |
| Poland | | -0.006 | 0.007 | | -0.001 | 0.000 |
| | | (0.004) | (0.004) | | (0.002) | (0.002) |
| | | [-0.7] | [1.0] | | [-0.1] | [0.0] |
| Romania | | 0.004 | 0.005 | | 0.000 | 0.006** |
| | | (0.004) | (0.004) | | (0.002) | (0.002) |
| | | [0.5] | [0.6] | | [0.0] | [0.6] |

*Source:* own calculations based on IPUMS-International, version 6.5.

*Notes:* * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in brackets, percent effect in square brackets. Data time points: 1970s – 1970 in Hungary; 1980s – 1980 in Hungary, 1978 in Poland, 1977 in Romania; 1990s – 1990 in Hungary, 1988 in Poland, 1992 in Romania.

**Table A2. Effects of the gender of first child(ren) on the probability of having more children: 1970-1992**

| | Second child in families with 1 or 2 children | | | Third child in families with 2 or 3 children | | | |
|---|---|---|---|---|---|---|---|
| | 1970s | 1980s | 1990s | 1970s | | | |
| | Boy versus girl | | | Model 1 | Model 2 (ref: mix) | | |
| | | | | Same sex vs. mix | Two boys | Two girls | Sign. (6-5) |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Hungary | 0.015* | -0.013 | -0.013 | 0.019** | 0.012 | 0.026** | |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.009) | (0.009) | |
| | [3.8] | [-2.6] | [-2.2] | [13.3] | [8.3] | [18.7] | |
| Poland | | 0.006 | 0.004 | | | | |
| | | (0.003) | (0.003) | | | | |
| | | [1.1] | [0.7] | | | | |
| Romania | | -0.007 | -0.003 | | | | |
| | | (0.004) | (0.004) | | | | |
| | | [-1.5] | [-0.5] | | | | |

*Source and notes*: see Table A1.

**Table A2. Effects of the gender of first child(ren) on the probability of having more children: 1970-1992 (cont.)**

| | Third child in families with 2 or 3 children | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1980s | | | | 1990s | | | |
| | Model 1 | Model 2 (ref: mix) | | | Model 1 | Model 2 (ref: mix) | | |
| | Same sex vs. mix | Two boys | Two girls | Sign. (10-9) | Same sex vs. mix | Two boys | Two girls | Sign. (13-14) |
| | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
| Hungary | 0.028*** | 0.031*** | 0.025*** | | 0.024*** | 0.025*** | 0.022*** | |
| | (0.006) | (0.007) | (0.007) | | (0.005) | (0.006) | (0.006) | |
| | [37.9] | [41.3] | [34.1] | | [27.3] | [29.0] | [25.4] | |
| Poland | 0.033*** | 0.033*** | 0.032*** | | 0.034*** | 0.037*** | 0.032*** | |
| | (0.003) | (0.004) | (0.004) | | (0.002) | (0.003) | (0.003) | |
| | [19.3] | [19.7] | [18.8] | | [20.6] | [22.1] | [18.8] | |
| Romania | 0.035*** | 0.017*** | 0.055*** | *** | 0.033*** | 0.021*** | 0.046*** | *** |
| | (0.004) | (0.005) | (0.005) | | (0.003) | (0.004) | (0.004) | |
| | [19.7] | [9.4] | [30.9] | | [23.1] | [14.9] | [32.3] | |

*Source and notes*: see Table A1.

**Table A3 Effects of the first child's gender (boy) on spacing between first two children in 2-child families (in years): 1970-1992**

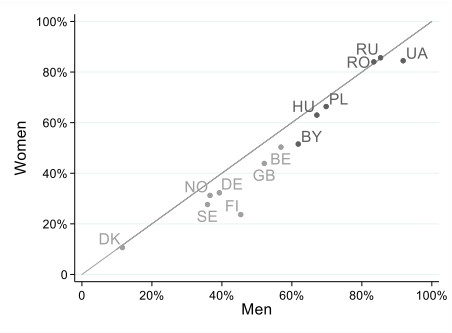
| | 1970s | 1980s | 1990s |
|---|---|---|---|
| Hungary | 0.011<br>(0.042) | 0.062<br>(0.041) | 0.041<br>(0.031) |
| Poland | | 0.009<br>(0.017) | 0.007<br>(0.014) |
| Romania | | 0.053*<br>(0.026) | 0.075***<br>(0.019) |

*Source and notes*: see Table A1.

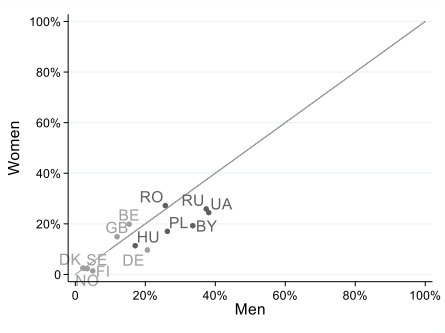
# Figures

**Figure 1 Female and male views on gender roles in the society in 2008, selected countries (percentage of those agreeing with each statement)**

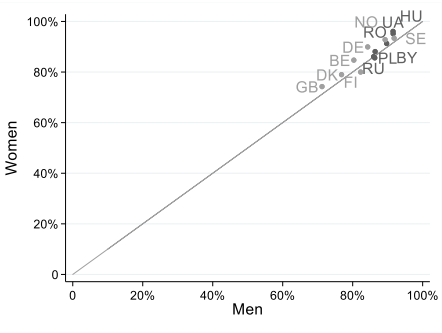
A) A job is alright but what most women really want is a home and children




B) When jobs are scarce, men should have more right to a job than women

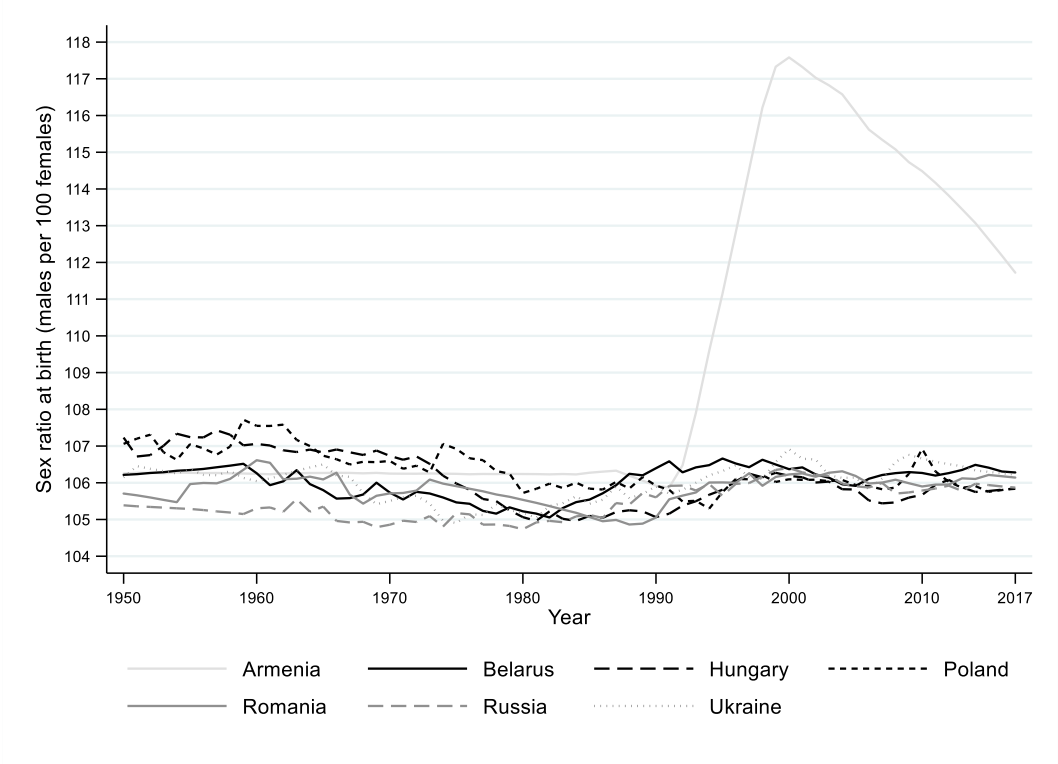



C) Both the husband and wife should contribute to household income




Source: *European Values Study 2008: Integrated Dataset (EVS 2008)*.

**Figure A1 Sex ratio at birth between 1950-2017 in selected countries**




*Source:* own compilation based on data from (Chao et al., 2019).