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ABSTRACT

The 'Mighty Girl' Effect: Does Parenting Daughters Alter Attitudes towards Gender Roles?*

Understanding the malleability of gender norms is crucial to address gender inequalities. We study the effect of parenting daughters on a gender role attitude relating to the traditional male breadwinner model: whether the husband should earn and the wife stay at home. We control for other covariates that capture alternative explanations for gender role perceptions. Our results suggest evidence of a positive effect of parenting daughters on acceptance of less traditional gender roles. The effect is only robust among fathers and driven by parenting school age rather than younger daughters, which is consistent with a social identity explanation. Results suggest that parenting daughters of school age (as opposed to parenting only sons) increases the probability to disagree with the statement that 'husband should earn and wife stay at home' by over 5 percentage points. We conclude that gender role attitudes can be shaped by events that occur later in life.

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1. Introduction

A growing body of research has established the importance of gender norms in explaining the persistence of the gender pay gap (Burda et al., 2007) and, more broadly, gender inequalities in the allocation of paid and domestic work. So far, research has shown that gender norms (as perceived by individuals) are closely related to a number of economic outcomes. That is, they help explain women's labor force participation (Fortin, 2005; Fernandez and Fogli, 2009), the division of domestic work as well as marriage formation and divorce (Bertrand et al. 2015, Kaufman 2000), and perceptions of marital quality (Amato and Booth, 1995).

Nonetheless, the literature has devoted limited attention to how gender norms are formed and how they evolve over time. This paper contributes to the empirical understanding of the evolution of gender role attitudes by analyzing one potential exogenous source of change: the effect of parenting daughters – as opposed to sons. Given that the gender of a child cannot be anticipated, we argue that parenting daughters can reasonably be regarded as a random event, and we find evidence of it. As a result, the effect of a child's gender qualifies as a quasi-natural experiment (Washington 2008)[1] to the study of several outcomes, including the formation of gender norms.

This paper examines whether parenting daughters changes parents' - both fathers' and mothers' - attitudes towards gender roles at home and in the market. We borrow the definition of gender norms from Pearse and Connel (2016), who define gender norms as collective definitions of socially approved conduct in relation to groups constituted in the gender order – mainly distinctions between men and women. Similarly, and consistently with Akerlof and Kranton's theoretical framework on social identity, we assume that an individual reveals his or her attitudes with regards to social categories – traditional/non-traditional man/woman – which are associated with prescribed behaviors (Akerlof and Kranton 2000:718). The social category *traditional man*, for example, prescribes that individuals identifying as such are the breadwinners of the household, and therefore, their economic activity ought to take place outside the household. Consistently, if an individual's actions (e.g., contributing significantly to household work at home) would conflict with the prescribed behavior of a traditional gender role, this would yield disutility. Conversely, the social category *traditional woman* is associated with home labor, and a woman's actions conflicting with that role conflict with her social identity, and produce disutility. However, the adoption of different gender roles is still largely to be understood, and this paper attempts to contribute to such endeavor.

We argue that parenting daughters, especially school age daughters, primes the non-traditional gender role category (e.g., women may choose to be career women, and men may choose to not to be sole breadwinners). To test this, we draw upon a nationally representative and long panel data survey, namely the British Household Panel Survey (BHPS) where we can test whether rearing daughters as opposed to sons changes

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[1] However, some authors such as Hamoudi and Nobles (2014) found that relationship conflict between husband and wife predicted the sex of subsequent children, and hence, separate analyses need to be done looking at the effect of the first child only, and the effect of the number of daughters.

perception of gender roles. Consistent with literature suggestive that gender roles begin to be perceived at school age, we examine the effect of rearing daughters of different age groups (Bian et al., 2017).

Our findings indicate that parenting daughters makes on average both fathers and mothers less likely to hold traditional gender role attitudes. However, we find that this effect is robust only among fathers with school age daughters and in contrast, the effect is not robust for mothers. Our estimates survive a number of alternative specifications and robustness checks.

Our interpretation of these results is that rearing daughters makes men more aware of some of the disadvantages women face in the labor market and in other aspects of their life. Specifically, our results are consistent with a social identity explanation where men incorporate part of their daughters' identity in forming their gender role perceptions, that is, their answers reflect not just the attitude of an average man, but a *girl's dad* attitude (which we refer to as *mighty daughter effect*). The significance of the findings lies in that attitudes can change even later in life, specifically, gender role attitudes after having daughters. Adopting different attitudes can either be an intrinsic attitude change, or an instrumental attitudinal change in order to strengthen the success chances of their offspring.

The structure of the paper is as follows. The next section provides the paper background, and section three describes the data and empirical strategy. Section four contains the main results, section 5 robustness checks, and a final section concludes.

2. Related literature

On the formation and evolution of norms and gender norms

Attitude formation is argued to develop during adolescence and early adulthood, and after that, norms remain fixed over time. Inglehart and Baker (2000) borrowing from Schuman and Scott (1989) refer to "imprinted collective memories" of different generations, and Krosnick and Alwin (1989) express a similar idea by referring to the "hypothesis of the impressionable years". They propose that individuals "are highly susceptible to attitude change during late adolescence and early adulthood and that susceptibility drops precipitously immediately thereafter and remains low". Alternatively, a different line of thought argues that attitudes are susceptible to changes over the life cycle, a hypothesis which has been coined as *the lifelong openness hypothesis* (Hogg and Vaughan, 2008).

Notwithstanding this, evidence is however still inconclusive and dependent on the specific attitudes examined. More specifically, the hypothesis of impressionable years has received some confirmation - see for a recent analysis Giuliano and Spilimbergo (2014). However, such results are at odds with Brim and Kagan (1980) who point to mixed evidence, suggesting that whereas some attitudes seem to stay fixed after early adulthood, others might well be very malleable and fast-adapting to changing circumstances. Hence, individuals adapt to new events in life by changing their attitudes

accordingly. Among those events, some are more likely than others to exert an influence on gender norms such as the rearing of daughters versus sons.

The economics literature that focuses on gender norms specifically provides some evidence that they appear to be formed in the early ages of an individual (Vella 1994), and that the intergenerational transmission mechanism plays an important role (Fernandez et al., 2004). This does not imply though that gender norms persist and remain unchanged over time. Indeed, Fernandez (2011) argues that there is nothing intrinsic with what she names 'culture' that makes it slow-changing and persistent. Therefore, while some authors insist on the persistence of norms in the long term (e.g. Alesina et al., 2013), others show that exogenous events can contribute to a fairly rapid change in gender norms (e.g. Goldin and Katz, 2002). However, the empirical evidence on events that can rapidly change gender role attitudes is limited.

One event that could explain changes in gender role attitudes later in life includes the reasonably random life course event of parenting a daughter – as opposed to a son. Robust evidence of such an event would be suggestive of how malleable attitudes can be, and whether events that occur later in life can change gender norms.

Evidence on the influence of the gender of the child on norms
Empirical evidence on the effect of the gender of the child on attitudes is inconclusive. A number of studies show that parenting daughters triggers attitudinal changes towards upholding liberal political attitudes. Washington (2008) and Iacus et al. (2011) find that members of Congress who have daughters are more likely to support liberal leaning policies. Glynn and Sen (2014) show that having daughters influences the rulings of judges working in the US Court of Appeal on women's issues and Oswald and Powdthavee (2010) show that having daughters makes people more likely to vote for left-wing parties.

At the same time, though, other studies are at odds with these findings. Conley and Rauscher (2013) find that a higher proportion of female children leads to more Republican identification and Lee and Conley (2016) obtain null effects of the sex of the child on party identification and political ideology. Fiese and Skillman (2000) find that girls are less likely to be told stories promoting autonomy or independence. Healy and Malhotra (2013) find that having sisters causes young men to be more likely to express conservative viewpoints with regards to gender roles and to identify more as Republicans.

There are few papers which focus specifically on gender role attitudes as a dependent variable. Warner and Steel (1999) find that parents are more likely to support public policies designed to address gender equality when they have a daughter instead of a son. This is partially in line with Warner's findings (1991), in which views of women in the US and Canada and men in Canada who have reared daughters are more egalitarian than those who have reared sons. These papers however suffer from small and unrepresentative samples. The only related study that uses a large sample (the National Longitudinal Study of Youth 1979 from the US) is that of Shafer and Malhotra (2011).

The present paper departs from previous studies on the effect of child gender on gender role attitudes in several ways. First, it focuses on the UK and uses a large dataset that follows individuals over a longer period. Second, the data covers very recent years (up to 2011), which is important given the changing patterns of gender inequalities in the past decades. Third, it does not only look at attitudes but also actual behavior concerning gender roles, specifically the involvement in housework.

3. Data and empirical strategy

3.1 Data

We use data from the British Household Panel Survey (BHPS) together with the BHPS sample of Understanding Society, in order to include more recent survey years. This is a nationally representative random sample of British households, interviewed each year. The data used comprises the years 1991 to 2011 (waves 1 to 21).

The sample of the main analysis will be restricted to individuals with at least one child living in the household in the respective survey wave. Thus, we compare the effect of having daughters as opposed to having sons, while excluding individuals without children. This restricted sample contains 53,782 observations (22,365 male and 31,417 female), for which the main outcome variable *earn* was recorded. For summary statistics and descriptions of all variables used in the empirical analysis, see table A.3.[2]

We focus on one main attitude reflective of gender norms designated as *earn*, which refers to a gender role attitude of the statement "husband should earn, wife stay at home". The answer scale is from 1 to 5, with 1 being *strongly agree*, and 5 *strongly disagree*. Thus, lower values indicate more traditional gender role attitudes or support for a traditional male breadwinner model, while higher values stand for more gender-equal attitudes or support for an adult worker model. This question was included in the survey in every other year, starting in wave 1. In addition, we conduct robustness checks with a second attitudinal variable, which we call *contribute*, referring to the statement "husband and wife should both contribute to household income". Again, the answer scale is from 1 to 5, but for this variable, higher values indicate higher agreement with the statement so that for both statements, higher values indicate more gender equal attitudes.

The key regressor of interest is what we refer to as *dummy daughter*, which is a binary variable taking a value of 1 if the individual has at least one daughter living in the household, and 0 otherwise. We specify alternative regressors in some of the robustness

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[2] One data limitation we face is that we do not observe births directly but only those children who live in the respondent's household. This might be problematic for two reasons: First, it is possible that the respondent has a child, which does not live in the same household, and we falsely do not consider the child in the analysis. And second, it is possible that we falsely record a child as the first and only child in the household if older children have already moved out of the household. Related to that, we do not have information on those children who have left home. However, this problem is not of highest relevance for what we are interested in. This is because it is reasonable to assume that children potentially affect parents' attitudes not merely because they are born, but instead through intense interaction, which is arguably most likely if they live in the same household.

checks, namely *dummy daughters only*, which is a binary variable taking a value of 1 if the individual has only daughters living in the household and no sons, as well as dummy variables for the number of daughters.

3.2 *Empirical strategy*

Our identification strategy relies on measuring the effect of a reasonably random variable, namely child gender. Specifically, we are interested in the identification of the effect of parenting daughters on parents' attitudes towards gender roles. In our main analysis, we conduct OLS regressions with *earn* as the outcome variable and a dummy for having at least a daughter as the key covariate (*dummy daughter*). Since the sample is restricted to individual-wave pairs with at least one child living in the household, the counterfactual to having at least one daughter is having no daughter but at least one son. Thus, we compare the association between having daughters and gender role attitudes, as opposed to having no daughters among those with at least one child. We run separate regressions for male and female subsamples, as we are mainly interested in the effect of daughters on men. All regressions include controls for the total number of children, age and age squared of the respondent, as well as wave and region dummy variables. We then introduce further control variables. We estimate the following OLS regression model:

$$y_i = \alpha + x_i'\beta + \varepsilon_i$$

where y_i is the outcome variable *earn*, x_i' a vector of control variables including wave and region fixed effects, and ε_i the error term. In a robustness check, we use individual fixed effects on a restricted sample of individuals, which is described in section 5.6.

3.3 *Threats to the identification*

The paper considers a number of potential threats to the identification. Absent sex-selective abortion, the gender of a firstborn child is random. However, one potential concern is reverse causality - if more liberal respondents were to express a preference for daughters and practice some form of sex selection, then our results would be biased. We therefore conduct a robustness check in which we examine the effect of existing attitudes on the probability of having a firstborn daughter.

A second concern is that there could be endogenous fertility patterns and strategic stopping rules depending on the gender mix of children that a parent already has. For example, depending on a parent's attitudes, the probability of having a second or third child could depend on the gender of existing children. Therefore, we examine the effect of the first child separately in a robustness check. While we cannot fully address the endogeneity of family size decisions, this is less relevant in our context as parents cannot fully control the gender mix of their children. Therefore, they cannot fully control all the different regressors we use, namely the probability of having at least one daughter, the probability of having daughters only, and the number of daughters.

To further account for omitted variable bias arising from variables that are correlated with both gender role attitudes and the gender mix of children or the size of family, we conduct individual fixed effects regressions. For these, we use a different data sample, which includes not only individuals who have children already, but instead we focus on

individuals who are childless when first interviewed and have at least one baby during subsequent interview years. We thus look at changes in attitudes within individuals, and include only those that become parents while excluding those that might have older children moving back into the household, for example, after completing college.

4. Main results
4.1 Preliminary evidence
We begin by examining how the gender role attitude *earn* differs by gender of the individual and the gender composition of offspring. Figure 1 shows the mean values of *earn* for individuals with at least one child in the household. The figure shows that, on average, men hold more traditional views concerning who should be the breadwinner. The figure also reveals that among both men and women, those who have daughters hold less traditional attitudes than those without daughters (i.e. only sons). However, to understand whether these results are explained by other covariates requires further analysis.

[Insert Figure 1 and Table 1 about here]

4.*2 Baseline results*
Table 1 shows OLS regressions for the outcome variable *earn*. The key regressor *dummy daughter* is a binary variable taking a value of 1 if the individual has at least one daughter, and 0 otherwise. The sample is restricted to individuals with at least one child in the household in the respective survey year. In all specifications, we control for age and square of age of the respondent, wave and region dummies, as well as dummies for the total number of children. Therefore, the coefficient identifies the effect of parenting daughters as opposed to having only sons on the *earn* attitude after holding family size constant. Panel a) looks at male respondents. Column 1 shows that having daughter(s) is associated with a higher probability of disagreeing more with the statement that "husband should earn, wife stay at home". That is, it is associated with less traditional gender role attitudes concerning who should be the breadwinner.

Column 2 adds a number of additional control variables, namely education, marital status, employment status, the log of household income, and religious affiliation, all capturing different and alternative explanations for gender role attitudes. In column 3, dummies for the age group of the youngest child are added in addition. The results show that the positive association between having daughters and more equitable gender role attitudes is robust to the inclusion of control variables.

In column 4, we interact the effect of having daughters with the age group of the youngest child.[3] This is because we are interested in whether the change in attitudes is driven by the birth of a daughter, or whether it happens at a later stage, when the daughter(s) are already older. It shows that the positive association between having daughter(s) and higher support for a gender-equal adult worker model happens when daughters are already older: The coefficients on the interaction effects for age groups

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[3] These are as follows: age group 1: youngest child is aged 0 to 2; age group 2: youngest child is aged 3 to 5; age group 3: youngest child is aged 6 to 15; age group 4: youngest child is aged 16 or older.

three (ages 6 to 15) and four (older than 15) of the youngest child are statistically significant, and linear combinations of the daughter dummy with age groups three and four (not shown), respectively, reveal that the association between having daughters and the outcome variable are statistically significant at the 1 percent level for both age groups three and four.

In column 5, we recode the outcome variable to a dummy taking the value of 1 if the respondent disagrees or strongly disagrees with the statement, and 0 otherwise. The coefficients exhibit the same sign as those for the ordinal outcome variable, and the linear combination of estimates (not shown) shows that, again, the effect of having a daughter is statistically significant at the 1 percent level. However, the size of the coefficients is only about half those in column 4, indicating that changes in attitudes are not mainly driven by individuals changing from agreeing to disagreeing, but they are rather more incremental. Fathers with the youngest child in age group 3 or 4 are more than five percentage points more likely to disagree with the traditional male breadwinner model attitude when they have at least a daughter, as opposed to only sons.[4]

Panel b) reports results for female respondents. Again, having daughters is associated with more equitable gender role attitudes, however, the size of the coefficients is less than half that of male respondents when looking at columns 1 to 3. None of the interaction effects in columns 4 and 5 are significant. However, linear combinations of estimates (not reported) reveal that for those with a youngest child of age 6 to 15, there is a positive effect of having daughters on disagreeing with the statement, which is statistically significant at the 5 percent level.

Taken together, the results suggest that, firstly, having daughters while controlling for family size increases the likelihood of disagreeing with the statement that husband should earn and wife stay at home. Second, the effect is larger for men than for women, which is in line with the social identity framework outlined in the introduction. Third, the effect seems to be that some parents change attitudes only from strongly agreeing to agreeing or neither agreeing nor disagreeing, or from disagreeing to strongly disagreeing. That is, the effect on the external margin is smaller, albeit still significant. Finally, the effect does not occur right after individuals become parents of daughters, but seems to be driven at a later stage, when the youngest children are in school age or older. Among those fathers with school age children, the effect is sizeable.

5. Robustness checks

5.1 Alternative mechanisms

We conduct a number of robustness checks for the results obtained in the last section. First, in Table 2, we use alternative key covariates. In column 1, we introduce a dummy taking a value of 1 if the individual has *only* daughters, and 0 if the individual has at least one son. Column 1 includes the full set of control variables (as in table 1 column 3) and reveals that there is a positive association between having daughters and more equitable gender role attitudes among men with this alternative covariate. The size of

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[4] Among fathers in this subsample with the youngest child in age group 3 or 4, the binary variable takes a value of 1 for 50.9 percent, i.e. 50.9 percent disagree or strongly disagree with the statement in *earn*.

the coefficient is 0.0722, just slightly smaller compared to the one in table 1. None of the interaction effects are significant, however, linear combination of estimates reveal that there is a significant association between having *daughters only* and the outcome variable at the 1 percent level for those with their youngest child in age group 4. For female respondents (columns 4 and 5), the overall effect of having *only* daughters is not statistically significant. However, linear combinations of estimates (column 5) show that there is a positive effect of having daughters for age group 4, statistically significant at the 10 percent level.

[Insert Table 2 about here]

5.2 Number of Daughters
In columns 3 and 6 of Table 2, we look at the effect of the number of daughters for the male and female subsamples, respectively. For the male subsample, there is a positive effect for the first and second daughter only; however, additional daughters do not impact attitudes. For females, there is an effect only for the dummy of having two daughters.

Taken together, the results from table 2 show that for male respondents, the results are robust to alternative specifications of the key covariate, and confirm that the effect of having daughters occurs at a stage when children are already older. Furthermore, it is the first and the second daughter that matter. For female respondents, the results are less robust to these alternative specifications of the regressor.

[Insert Table 3 about here]

5.3 Alternative Attitudes
In Table 3, we check whether the results are robust to another, similar outcome variable. The variable contained in the survey most similar to our main outcome variable is *contribute*, which is the statement "husband and wife should both contribute to household income", with an answer scale from 1 (strongly disagree) to 5 (strongly agree). So again, higher values indicate higher levels of support of a more gender-equal division of work. For male respondents, there is a positive association between having daughters and a more equitable gender role attitude, statistically significant at the 10 percent level. While the interaction effects in column 2 are not significant, linear combination of estimates (not shown) reveal that only for the age group 3 dummy (i.e. youngest child aged 6 to 15), there is positive and statistically significant effect of having daughters. In panel b) (columns 3 and 4) we look at female respondents, and none of the coefficients is statistically significant. In sum, the results for male respondents are robust to this alternative outcome variable, but not for females.
[Insert Table 4 about here]

5.4 Behavior related to gender role attitudes
Table 4 looks at reported hours per week spent on housework, as well as share of housework within the household. This is motivated by the question whether daughters not only change parents' attitudes, but also potentially their behaviour related to those attitudes. For male parents, we find that there is no overall effect of having daughters on the parent's time spent on housework. However, when we include interactions with the

age group of the youngest child, we find that for those with young children (age group 1), having daughters is negatively associated with time in housework, but the effect is not statistically significant. However, the sign of this association reverses for those with older children, and for age group 3, there is a positive and statistically significant effect of having daughters on both hours of housework as well as the share of housework within the couple.

The effect size is considerable: Having at least one daughter, with the youngest child age 6 to 15, is associated with an increase of 0.43 hours of weekly housework, for a mean of approximately 6 hours for male parents with the youngest child aged 6 to 15 (not shown). Panel b) of table 4 shows that among females, there is a stronger association between having daughters and time spent on housework. Overall, having daughters is associated with a decrease in hours on housework (column 1) among mothers and the negative effect is driven by those with older children.

In sum, for male parents with children of which the youngest is between 6 and 15 years old, having daughters as opposed to sons is associated with an increase in both time spent and share of housework within the household. For females with older children, having daughters as opposed to sons is associated with a decrease in both the hours as well as share of housework. Furthermore, while males with young children initially decrease their time spent on housework, females with young children increase theirs, and once children get older, this effect reverses for both males and females. This is in line with the results from the regressions on gender role attitudes: having school-age daughters, as opposed to sons, is associated with a higher involvement of fathers in housework, and thus a more gender-equal allocation of housework within the household.

[Insert Table 5 about here]

5.5 Alternative specifications
In Table 5, we check whether the results from the main Table 1 are robust to the alternative specification of an ordered logit model for the ordinal outcome variable and a logit model for the binarised outcome variable "earn". Columns 1 to 5 in both panels *a* and *b* mirror the OLS regressions from Table 1, while in column 6 we add marginal effects after the logit model of column 5.

The results are in line with those obtained from the OLS regressions, in particular that there is a positive association between having daughters as opposed to sons and more equitable attitudes towards gender roles, with the effect being stronger for males than females, and driven by older children. The marginal effects in column 6 allow making a precise statement about the size of the effect. Panel a) column 6 shows that among fathers with the youngest child between 6 and 15 years old, having a daughter as opposed to a son is associated with an increase in the probability to disagree or strongly disagree with the statement by approximately 5.3 percentage points. For fathers with the youngest child older than 15, the size of the effect is approximately 5.5 percentage points. These effects are sizeable, given that among male fathers, around 54 percent disagree or strongly disagree with the statement that husband should earn and wife stay at home. These effect sizes are in line with the baseline OLS results in Table 1. Again,

for females, the effects of having daughters are weaker and we find zero effects for the binarised variable *earn*.

[Insert Table 6 about here]

5.6 Fixed effects
In table 6, we look at a different sample and conduct fixed effects regressions. Specifically, we limit our sample to individuals who are (i) childless when first interviewed and (ii) have at least one baby aged 0 to 2 during subsequent interview years. With restriction (i), we exclude individuals who already have children when they were first interviewed and with (ii) we ensure that individuals who are recorded as childless in one year and then have an adult child move back into the household are also excluded from the analysis. Thus, we focus solely on those individuals who transition to parenthood during the interview years. We conduct individual fixed effects regressions because we are interested in whether child gender is associated with a change in attitudes within individuals transitioning into parenthood. Again, we split the sample into male and female subsamples. Now, we run separate regressions with two key covariates: a dummy variable capturing the effect of having at least one daughter, and a dummy for having at least one son. This is because, in these regressions in which we look at changes *within* individuals over time, the counterfactual to having at least one daughter is to have no children yet (as opposed to the main models in the paper, in which the counterfactual was to have sons).

In panel a) column 1 we find that having daughters, overall, does not have a significant effect on fathers' attitudes. When including the age group interactions though (columns 2 and 3), we again find that, for fathers of older children, having daughters is associated with more equitable gender role attitudes. Importantly, columns 5 and 6 reveal that having sons leads to the opposite: having sons, when children are already older, is associated with more traditional gender role attitudes among fathers.

In panel b) of table 6 we look at the female subsample. Again, overall, there is no effect of having daughters on mothers' attitudes. When including the age group interactions though, we find that for mothers with older children (youngest child age group 4), having daughters is associated with more equitable gender role attitudes. Having sons, however, has no effect on mothers' gender role attitudes (columns 4 to 6).

5.7 Further robustness checks

In order to account for the endogeneity of family size, specifically the fact that having further children may depend on the gender of the first child, we conduct regressions looking at the gender of the first child only. Specifically, we restrict the sample to respondents with one child only, and aged between 0 and 3 years old. We restrict the sample to infants only, so that it is likely that the sample includes both families who go on to have further children as well as those who will remain with one child only. The key regressor is a dummy variable taking a value of 1 if the first child is a girl, and 0 if it is a boy. Table A.1 column 1 shows that among males, having a firstborn baby daughter is associated with slightly higher support for more equitable gender roles, however, the effect is not statistically significant. For females, the effect of having a

firstborn daughter is negative, but very small, and not statistically significant. We do not find an effect of a firstborn infant daughter on parents' gender role attitudes. These results can be interpreted in a more causal way than the other regressions including all children because the gender of a firstborn child is arguably most random. While we cannot confirm the significant effects of school-age daughters on attitudes when we look at firstborn infants only, the results of table A.1 confirm those from previous tables: that having daughters is not associated with gender role attitudes when children are still very young.

In table A.2, we address the concern of reverse causality, namely that attitudes might predict the probability of having a firstborn daughter. We restrict the sample to individuals who have one child only and had no children in the previous wave. Then, we regress a dummy of having a daughter (as opposed to a son) on the gender role attitude the individual held in the previous wave. The results show that gender role attitudes are not predictive of the probability of having a daughter, as opposed to a son. There is thus no evidence of sex-selective abortion or other potential reasons for why pre-existing attitudes should be predictive of the gender of a first child.

6. Conclusion

Understanding the formation of gender role attitudes is key to tackling a major part the origin of gender related inequalities. Against the backdrop that attitudes start to form early in life, we show that gender role attitudes among men are modified by the parenting of daughters. Indeed, parenting daughters increases the likelihood of adopting less traditional gender norms. Specifically, we find that this effect is driven by fathers with children who are at least of school age. The findings are robust to a number of alternative specifications and robustness checks. For mothers, we find that the association between having daughters and gender role attitudes is not robust.

Our results are important and suggest a source of variation of gender role attitudes that has to do with parenting girls. This finding is consistent with an increasing literature on the social formation of preferences (Hoff and Stiglitz, 2015). Specifically, our results point towards a social identity explanation whereby men put themselves in their daughter's shoes in choosing the social norms their children should adhere to, and/or exhibit an increasing shared identity of non-traditional gender norms after parenting daughters. This does not necessarily imply that their actions actually are consistent with those gender norms, but that those non-traditional gender norms become the norms he would like their daughters to be constrained by in order not to be at a disadvantage in competing with men in the labour market (Gneezy *et al*, 2009). Our results confirm evidence of either a direct or instrumental attitudinal change in fathers' gender roles attitudes, deviating from the prescribed traditional role categories. From this reasoning it follows that mothers' identity should not be affected as much as that of the fathers: Women, having experienced firsthand the effect of gender stereotypes earlier, may have either accepted them or alternatively

shifted their identity earlier, rejecting traditional roles. In either case, parenting a daughter should not have as strong an effect on mothers as on fathers.

Our preferred explanation of the other relevant finding, i.e. that the effect is significant for fathers with school-age children - and not for fathers with pre-school children – results from an increasing awareness of the different gender roles as children grow older. In line with that, a recent study (Bian et al., 2017) finds that girls start associating 'brilliance' as a 'boys' trait at the age of 6, not earlier. Hence, if children's own perceptions are noticed by fathers, they are likely to gradually become aware of the gender roles affecting their daughters' actions after that age, prompting the change in their gender role attitudes.

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Figures and Tables

Figure 1: Mean value of outcome variable "earn", by gender or respondent
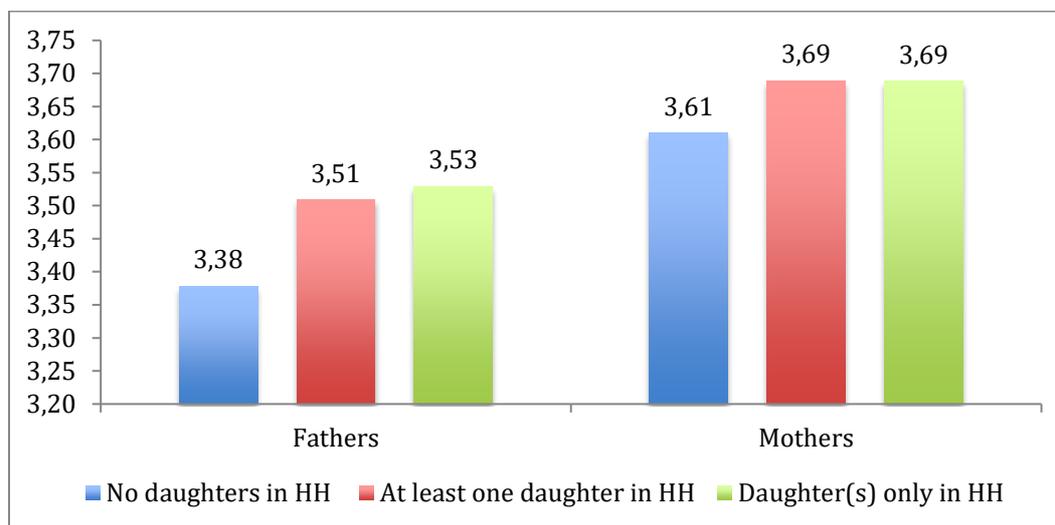
Source: BHPS and Understanding Society, different waves.

Table1: OLS for variable "earn"

	(1)	(2)	(3)	(4)	(5)
a) Male respondents					
Dependent var.			earn		earn binarised
Dummy daughter	0.111***	0.103***	0.0954***	0.00878	-0.000794
	(0.0247)	(0.0252)	(0.0251)	(0.0424)	(0.0202)
Daughter x age group 2				0.0622	0.0332
				(0.0480)	(0.0243)
Daughter x age group 3				0.108**	0.0545**
				(0.0492)	(0.0244)
Daughter x age group 4				0.115**	0.0564**
				(0.0559)	(0.0263)
Observations	22,226	18,773	18,773	18,773	18,773
R-squared	0.085	0.124	0.127	0.128	0.080

	(1)	(2)	(3)	(4)	(5)
b) Female respondents					
Dependent var.			earn		earn binarised
Dummy daughter	0.0495**	0.0412**	0.0376*	0.00734	-0.000821
	(0.0211)	(0.0210)	(0.0209)	(0.0385)	(0.0173)
Daughter x age group 2				-0.0503	-0.00650
				(0.0416)	(0.0200)
Daughter x age group 3				0.0612	0.0290
				(0.0437)	(0.0203)
Daughter x age group 4				0.0436	0.0166
				(0.0489)	(0.0224)
Observations	31,214	26,143	26,143	26,143	26,143
R-squared	0.080	0.151	0.153	0.153	0.113

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with at least one child in the household in the respective wave.

Control variables column 1 : 4 dummies no. of total children, age, age squared, wave and region dummies
Control variables column 2: 4 dummies no. of total children, age, age squared,2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies

Control variables columns 3 to 5: as column 2, plus 3 dummies for age group of youngest child
Daughter x age group are interactions of the daughter dummy with age group of youngest child: group 1 (omitted) age 0 to 2, group 2 age 3 to 5, group 3 age 6 to 15, group 4 age 16 or older.

Table 2: Testing for different regressors

	a) Male respondents				b) Female respondents		
	(1)	(2)	(3)		(4)	(5)	(6)
Dependent var.				earn			
Dummy daughters only	0.0722***	0.0117			0.0193	0.0174	
	(0.0268)	(0.0432)			(0.0218)	(0.0393)	
Daughters only x age group 2		0.0755				-0.0508	
		(0.0500)				(0.0433)	
Daughters only x age group 3		0.0512				-0.00948	
		(0.0519)				(0.0433)	
Daughters only x age group 4		0.0954				0.0404	
		(0.0584)				(0.0505)	
1 daughter			0.0907***				0.0334
			(0.0252)				(0.0210)
2 daughters			0.121***				0.0567*
			(0.0413)				(0.0338)
3 daughters			0.126				0.0817
			(0.0785)				(0.0698)
4 daughters			-0.0287				0.110
			(0.186)				(0.165)
Observations	18,773	18,773	18,773		26,143	26,143	26,143
R-squared	0.126	0.127	0.127		0.153	0.153	0.153

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with at least one child in the household in the respective wave.
Control variables: 4 dummies no. of total children, 3 dummies age group youngest child, age, age squared,2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies
The interactions of the daughters only dummy with age group of youngest child are as follows: group 1 (omitted) age 0 to 2, group 2 age 3 to 5, group 3 age 6 to 15, group 4 age 16 or older.

Table 3: "Husband and wife should both contribute to household income" as outcome variable

	a) Male respondents		b) Female respondents	
	(1)	(2)	(3)	(4)
Dependent var.	contribute		contribute	
Dummy daughter	0.0438*	-0.00604	0.0180	0.0298
	(0.0231)	(0.0413)	(0.0191)	(0.0352)
Daughter x age group 2		0.0537		-0.0101
		(0.0484)		(0.0406)
Daughter x age group 3		0.0620		-0.0282
		(0.0489)		(0.0410)
Daughter x age group 4		0.0586		0.000364
		(0.0526)		(0.0446)
Observations	18,777	18,777	26,144	26,144
R-squared	0.051	0.051	0.087	0.087

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with at least one child in the household in the respective wave.
Control variables: 4 dummies no. of total children, dummies age group youngest child, age, age squared, 2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies
The interactions with age group of youngest child are as follows: group 1 (omitted) age 0 to 2, group 2 age 3 to 5, group 3 age 6 to 15, group 4 age 16 or older.

Table 4: Time spent on housework

a) Male respondents

Dependent var.	(1)	(2)	(3)	(4)
	Hours on housework		Share housework in HH	
Dummy daughter	-0.0489	-0.181	0.00349	-0.0116
	(0.144)	(0.206)	(0.00542)	(0.00752)
Daughter x age group 2		0.162		0.00824
		(0.227)		(0.00755)
Daughter x age group 3		0.429*		0.0253***
		(0.261)		(0.00954)
Daughter x age group 4		-0.138		0.0144
		(0.321)		(0.0114)
Observations	34,888	34,888	31,959	31,959
R-squared	0.140	0.140	0.094	0.094

b) Female respondents

Dependent var.	(1)	(2)	(3)	(4)
	Hours on housework		Share housework in HH	
Dummy daughter	-0.444**	0.964**	-0.000134	0.0130*
	(0.218)	(0.385)	(0.00536)	(0.00745)
Daughter x age group 2		-0.393		-0.0149**
		(0.400)		(0.00745)
Daughter x age group 3		-1.407***		-0.0227**
		(0.443)		(0.00950)
Daughter x age group 4		-2.405***		-0.00794
		(0.509)		(0.0112)
Observations	48,604	48,604	32,275	32,275
R-squared	0.192	0.193	0.092	0.092

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with at least one child in the household in the respective wave.
Control variables: 4 dummies no. of total children, 3 dummies for age group of youngest child, age, age squared,2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies
Daughter x age group are interactions with age group of youngest child: group 1 (omitted) age 0 to 2, group 2 age 3 to 5, group 3 age 6 to 15, group 4 age 16 or older.

Table 5: Ordered logit and logit models

a) Male respondents

Dependent var.	(1) Ologit earn	(2) Ologit earn	(3) Ologit earn	(4) Ologit earn	(5) Logit earn binarised	(6) Marginal effects earn binarised
Dummy daughter	0.214***	0.205***	0.192***	0.0117	-0.00407	-0.000933
	(0.0461)	(0.0487)	(0.0486)	(0.0853)	(0.0880)	(0.0201)
Daughter x age group 2				0.135	0.143	0.0328
				(0.0965)	(0.105)	(0.0241)
Daughter x age group 3				0.232**	0.234**	0.0536**
				(0.0980)	(0.105)	(0.0241)
Daughter x age group 4				0.224**	0.239**	0.0547**
				(0.109)	(0.116)	(0.0265)
Observations	22,226	18,773	18,773	18,773	18,767	18,767

b) Female respondents

Dependent var.	(1) Ologit earn	(2) Ologit earn	(3) Ologit earn	(4) Ologit earn	(5) Logit earn binarised	(6) Marginal effects earn binarised
Dummy daughter	0.0972**	0.0867**	0.0799*	0.0246	-0.00913	-0.00190
	(0.0393)	(0.0410)	(0.0410)	(0.0788)	(0.0877)	(0.0183)
Daughter x age group 2				-0.108	-0.0307	-0.00639
				(0.0859)	(0.101)	(0.0210)
Daughter x age group 3				0.121	0.147	0.0306
				(0.0891)	(0.101)	(0.0210)
Daughter x age group 4				0.0731	0.0794	0.0166
				(0.0960)	(0.109)	(0.0228)
Observations	31,214	26,143	26,143	26,143	26,142	26,142

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with at least one child in the household in the respective wave.
Control variables: 4 dummies no. of total children, 3 dummies for age group of youngest child, age, age squared, 2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies
The interactions with age group of youngest child are as follows: group 1 (omitted) age 0 to 2, group 2 age 3 to 5, group 3 age 6 to 15, group 4 age 16 or older.

Table 6: Fixed effects regressions with restricted sample

a) Male respondents

Dependent var.	(1)	(2)	(3)		(4)	(5)	(6)
	earn		earn binarised		earn		earn binarised
Dummy daughter	-0.103	-0.121	-0.0755*	Dummy son	0.00604	0.0360	0.0232
	(0.0719)	(0.0768)	(0.0425)		(0.0782)	(0.0831)	(0.0415)
Daughter x age group 2		0.0528	0.0296	Son x age group2		-0.0562	-0.0392
		(0.0693)	(0.0389)			(0.0632)	(0.0380)
Daughter x age group 3		0.00570	0.0214	Son x age group3		-0.101	-0.0555
		(0.0946)	(0.0527)			(0.0934)	(0.0515)
Daughter x age group 4		0.794**	0.416*	Son x age group4		-0.947***	-0.467**
		(0.380)	(0.234)			(0.310)	(0.213)
Observations	3,639	3,639	3,639	Observations	3,639	3,639	3,639
R-squared	0.032	0.033	0.028	R-squared	0.030	0.033	0.027
Number of pid	1,077	1,077	1,077	Number of pid	1,077	1,077	1,077

b) Female respondents

Dependent var.	(1)	(2)	(3)		(4)	(5)	(6)
	earn		earn binarised		earn		earn binarised
Dummy daughter	0.0388	0.0177	-0.00937	Dummy son	-0.0461	-0.0361	-0.00833
	(0.0652)	(0.0696)	(0.0380)		(0.0759)	(0.0771)	(0.0399)
Daughter x age group 2		0.0254	0.0126	Son x age group2		0.0126	0.0153
		(0.0575)	(0.0306)			(0.0562)	(0.0324)
Daughter x age group 3		0.119	0.0509	Son x age group3		-0.120	-0.0423
		(0.0796)	(0.0425)			(0.0758)	(0.0402)
Daughter x age group 4		0.922**	0.417*	Son x age group4		-0.513	-0.325
		(0.387)	(0.235)			(0.389)	(0.214)
Observations	4,789	4,789	4,789	Observations	4,789	4,789	4,789
R-squared	0.032	0.036	0.025	R-squared	0.032	0.035	0.025
Number of pid	1,303	1,303	1,303	Number of pid	1,303	1,303	1,303

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes individuals who are childless when first interviewed and have at least one baby during subsequent interview years.
Control variables: 4 dummies no. of total children, 3 dummies age group youngest child, age, age squared,2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, wave and region dummies

The interactions with age group of youngest child are as follows: group 1 (omitted) age 0 to 2, group 2 age 3 to 5, group 3 age 6 to 15, group 4 age 16 or older.

Appendix

Table A1: First child

	a) Male respondents	b) Female respondents
	(1)	(1)
	OLS	OLS
Dependent var.	earn	earn
Dummy daughter	0.0342	-0.00249
	(0.0479)	(0.0436)
Observations	1,856	2,487
R-squared	0.099	0.111
Number of pid		

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with one child only aged 0 to 3.
Control variables: age, age squared, 2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies.

Table A2: Testing for reverse causality

	a) Male respondents		b) Female respondents	
	(1)	(2)	(3)	(4)
Dependent var.	Dummy first child=daughter			
Earn, previous wave	0.0131	0.0177	0.0117	0.00971
	(0.0175)	(0.0194)	(0.0157)	(0.0176)
Observations	971	849	1,142	979
R-squared	0.037	0.049	0.031	0.059

Robust standard errors in parentheses, clustered by individual.

*** p<0.01, ** p<0.05, * p<0.1

Sample includes respondents with one child in the household in the respective wave.

Control variables columns 1 and 3: age, age squared, wave and region dummies.
Control variables columns 2 and 4: age, age squared, 2 education dummies, 6 marital status dummies, 9 employment status dummies, ln household income, 3 religious affiliation dummies, wave and region dummies

Table A.3: Descriptive statistics

Variable	Description	Males		Females	
		Mean	Sd	Mean	Sd
Earn	"Husband should earn, wife stay at home"; 1=strongly agree, 2= agree, 3= neither, 4=disagree, 5=strongly disagree	3.463	1.021	3.66	1.032
Earn binarised	"Husband should earn, wife stay at home"; 0=strongly agree/agree/neither, 1=disagree/strongly disagree	0.539	0.498	0.621	0.485
Contribute	"Husband and wife should both contribute to household income"; 1=strongly disagree, 2=disagree, 3=neither, 4=agree, 5=strongly agree	3.411	0.92	3.494	0.929
Number of daughters	Total number of daughters in household	0.872	0.807	0.86	0.805
Dummy at least one daughter	At least one daughter in household=1	0.65	0.477	0.642	0.479
Dummy only daughters	Only daughters in household=1	0.28	0.449	0.293	0.455
Number of children	Total number of children in household, 4 or more=4	1.838	0.837	1.807	0.844
Youngest child: age group 1	Youngest child in household aged 0 to 2=1	0.159	0.365	0.143	0.35
Youngest child: age group 2	Youngest child in household aged 3 to 5=1	0.157	0.364	0.156	0.363
Youngest child: age group 3	Youngest child in household aged 6 to 15=1	0.394	0.489	0.4	0.49
Youngest child: age group 4	Youngest child in household aged older than 15=1	0.29	0.454	0.301	0.459
Age	Age of respondent	43.45	11.418	41.438	12.047
Age squared	Age of respondent squared	2018.235	1100.784	1862.245	1151.744
First degree	First degree, i.e. undergraduate degree = 1	0.103	0.304	0.083	0.276
Higher degree	Higher degree, i.e. postgraduate degree = 1	0.033	0.18	0.019	0.138
Married	Marital status, married = 1	0.833	0.373	0.664	0.472
Living as couple	Marital status, living as couple = 1	0.126	0.332	0.109	0.312
Widowed	Marital status, widowed = 1	0.014	0.117	0.046	0.209
Divorced	Marital status, divorced = 1	0.019	0.136	0.081	0.273
Separated	Marital status, separated = 1	0.006	0.076	0.034	0.18
Never married	Marital status, never married = 1	0.002	0.044	0.066	0.249
Other marital status	Marital status, other = 1	0	0.016	0	0.006
Self-employed	Employment status, self-employed = 1	0.154	0.361	0.046	0.209
In paid employmend	Employment status, in paid employment = 1	0.678	0.467	0.57	0.495
Unemployed	Employment status, unemployed = 1	0.051	0.221	0.027	0.161
Retired	Employment status, retired = 1	0.056	0.231	0.054	0.227
Family care	Employment status, family care = 1	0.001	0.038	0.059	0.236

Full-time student	Employment status, FT student = 1	0.009	0.092	0.188	0.391
Longterm sick or disabled	Employment status, longterm sick or disabled = 1	0.01	0.098	0.016	0.125
On maternity leave	Employment status, maternity leave = 1	0.037	0.188	0.034	0.182
On government training scheme	Employment status, government training scheme = 1	0.001	0.033	0.001	0.028
Other employment status	Employment status, other = 1	0.003	0.055	0.005	0.071
No religion	Religion: no religion = 1	0.488	0.5	0.374	0.484
Church of England	Religion: Church of England = 1	0.218	0.413	0.275	0.447
Roman Catholic	Religion: Roman Catholic = 1	0.101	0.301	0.136	0.343
Other religion	Religion: Other = 1	0.193	0.395	0.215	0.411
Ln household income	Log of household income	7.877	0.658	7.739	0.723
Share housework	Hours of housework respondent as share of total hours of housework of couple	0.24	0.204	0.76	0.204
Hours of housework	Hours of housework per week	6.041	6.456	18.974	12.055
Share working hours	Working hours respondent as share of total working hours of couple	0.68	0.261	0.311	0.256

Sample: all respondents with at least one child in household and for whom the main variable earn is not missing.