Intergenerational Co-Residence and Female Labour Supply

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December 15, 2016

Abstract

This paper examines the role of family structure, specifically the co-residence with parents-in-law, for female labour supply. We apply an instrumental variable approach to account for the endogeneity of co-residence. Specifically, we make use of a tradition in Central Asia, namely that the youngest son of a family with his wife is expected to live with his parents. Hence, we instrument co-residence with being married to the youngest son. We use data from Kyrgyzstan and show that co-residence does not seem to increase female labour supply. This is in contrast to the previous literature, which has found substantial positive effects.

Keywords: Marriage, Family Structure, Labor Supply, Co-residence, Kyrgyzstan
JEL codes: J12, J21

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1   Introduction

The family is the most fundamental institution in society. It plays a key role for economic decisions and, hence, for economic outcomes. For example, the family serves as a risk-pool against adverse shocks (Cox and Fafchamps, 2008; Barr *et al.*, 2012), redistributes income - often across generations (Shorrocks, 1979; Cox and Fafchamps, 2008), and influences entrepreneurial activity and productivity (Hadnes *et al.*, 2013; Grimm *et al.*, 2013). In this study, we investigate the role of the family in labour market outcomes. Our interest is in the labour supply of women as it lacks behind that of men in most countries around the globe. We analyse how the structure of the family, in particular the co-residence with parents or in-laws, drives female labour force participation and working hours. A clear understanding of this relationship is important for designing appropriate policies: For example, if intergenerational co-residence reduced the labour supply of women, the promotion of institutionalised elderly care may be a way to allow more women to enter the labour market.

While the importance of family structure for the labour supply of women is widely recognized, the emphasis is typically on the presence of children. Having children negatively affects female labour supply, with the effect being stronger for having young children (Angrist *et al.*, 1998; Jacobsen *et al.*, 1999). It is rarely acknowledged that co-residing with parents or in-laws can also influence the labour supply of women. Such an influence can work through at least four channels.

First, co-residing parents or in-laws might still participate in the labour force or receive pensions and thereby contribute to household income (Maurer-Fazio *et al.*, 2011). High non-labour income is likely to make a woman reduce her labour supply. Second, co-residing parents or in-laws might take care of a woman's children or take over housekeeping tasks. Being freed from such tasks, the value of non-market time (the reservation wage) is reduced for the woman, leading to an increase in labour supply (Compton and Pollak, 2014; García-Morán and Kuehn, 2017; Posadas and Vidal-Fernández, 2013; Shen *et al.*, 2016). Third, co-residing parents or in-laws might need to be taken care of. Given that the woman is typically the one in the household providing care to the elderly, this increases her reservation wage and thus reduces her labour supply (for a review on elderly care and female labour supply, see Lilly *et al.*, 2007). Fourth, co-residing parents or in-laws might be better able to impose their preferences on a woman's labour market behaviour than distant parents or in-laws.

Depending on the type of preferences, parents or in-laws can either induce an increase or a reduction in female labour supply.

A priori, the impact of co-residence with parents or in-laws on the labour supply of women is unclear and requires empirical investigation. However, an empirical analysis is not straightforward. Co-residence and labour supply decisions are likely to be made jointly (Sasaki, 2002). For example, young adults with low ambitions on the labour market or with traditional gender attitudes may be inclined to co-reside with their parents or in-laws. Additionally, parents or in-laws are likely to move in with their adult children when they need to be taken care of or when the adult children need them as caregivers for their own children, especially if formal care is not easily available or too costly. If there are several siblings, the co-residence decision could be the result of a bargaining process. The sibling with the lowest (highest) opportunity costs on the labour market may be the one who ends up co-residing with parents if elderly (child) care is required (Ettner, 1996; Ma and Wen, 2016). Due to this endogeneity of co-residence, simple comparisons of co-residing and non-co-residing women are subject to bias.

Early attempts to evaluate the relationship between family structure and female labour supply neglect the endogenous nature of the family structure and treat co-residence as exogenous (for example, Kolodinsky and Shirey, 2000 for the US). Later studies recognize that the decision to form an intergenerational household is endogenous and make use of instrumental variables. Sasaki (2002) and Oishi and Oshio (2006) find that co-residence with parents or in-laws encourages women to participate in the labour market in Japan. Other studies find positive effects also for the case of China (Maurer-Fazio *et al.*, 2011; Shen *et al.*, 2016).[1]

In this study, we focus on the case of Kyrgyzstan, a post-Soviet country with a population of 5.9 million located in Central Asia. Kyrgyzstan is a highly relevant case to analyze. Despite the political objective of the Soviet government to achieve gender equality, women remained the main providers of care for the household (Akiner, 1997; Paci *et al.*, 2002). The provision of institutionalised child care, for example, covered only 31 percent of children aged 3-6 years in 1990, one year before the dissolution of the Soviet Union (Giddings *et al.*,

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[1]Compton (2015) provides a related, but slightly different analysis. She evaluates the effect of proximity to parents on labour market outcomes of Canadian women. She finds that, when controlling for the endogeneity of distance to the parents, close proximity to parents increases the labour force participation of married women. Please note that this study is not fully comparable to the other studies, as it focuses on proximity to parents rather than co-residence with parents.

2007). The labour force participation rate of females (aged 15-64 years) always remained lower than that of males. It amounted to 65 percent in 1990, compared with 78 percent for males (International Labour Office (ILO), 2016). Since then, the distance between females and males has increased: while 53 percent of females participated in the labour force in 2015; 80 percent of males did so. The provision of institutionalised care for children and the elderly remains low, which potentially keeps women from participating in the labour market. The Ministry of Labour and Social Development reports a total of six care homes for elderly people, with 750 residents and an additional 10,000 people receiving care from these homes in their own houses.[2] Compared with around 500,000 pensioners in the country, these numbers are very low. The enrolment rate in formal child care for children aged 3-6 years was as low as 9 percent in 1998 (Giddings *et al.*, 2007) and increased to 22 percent in 2013/14 (UNICEF Transmonee Database). The care for children and, more importantly, the elderly is thus mostly organised within families.

Kyrgyzstan, like Tajikistan (Grogan, 2007), is patrilocal. Women tend to move in with their husband's family when getting married. In our data (to be introduced below), 98 percent of those couples who co-reside with the older generation live with the husband's parents and only 2 percent with the wife's parents. Hence, what we analyze in this paper is, in fact, the impact of living with in-laws. Couples are free to move out of the parents' house and form an own household and typically do so when the husband's younger brothers get married. It is a tradition among Central Asians that the youngest son (and his wife and children) co-resides with his parents and never moves out (Bauer *et al.*, 1997; Thieme, 2014; Rubinov, 2014). This tradition is of crucial importance for our analysis. We use being married to the youngest son as an instrument for a woman's co-residence with in-laws. We show that the wife of a youngest son is significantly and substantially more likely to co-reside with in-laws than the wife of an older son, everything else equal. We also show that being married to the youngest son is unrelated to pre-marriage characteristics, which could influence later labour supply, of the females and their husbands. This suggests that our instrument is highly relevant and plausibly exogenous.

We find that living with parents-in-law in one household does not significantly affect the labour force participation or working hours of married females. Several mechanisms seem to be at play. Women who co-reside with parents-in-law that substantially contribute to

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[2]http://www.mlsp.gov.kg/?q=ru/sotsuchrejdeniya

household income or that need to be taken care of are significantly less likely to participate in the labour force. In contrast, women whose parents-in-law take over several hours of housekeeping tasks per day are significantly more likely to participate in the labour force. On average, these mechanisms appear to cancel each other out.

The remainder of this paper is structured as follows. The data is described in Section 2, in particular the important outcome variables, the co-residence indicator, and our instrumental variable. Section 3 presents the regression results. We first specify a naive model, treating co-residence as exogenous, before discussing the two-stage least-squares approach. Estimation results include analyses for specific subgroups and an examination of effect channels from co-residence to female labour supply. Finally, Section 4 concludes.

2 Data

We use data from the Life in Kyrgyzstan (LiK) survey, which is a nationally representative panel conducted annually between 2010 and 2013 and again in 2016 (for detailed information, see Brueck *et al.*, 2014). In contrast to household panels, in which only one member of the household is interviewed, the LiK is an individual panel, in which all adult individuals living in the originally sampled households are interviewed and tracked over time. The first wave of the survey included 8,160 adult individuals living in 3,000 households.

The LiK provides a wide range of individual and household level information on socio-demographic characteristics, employment, and many other topics. In our empirical analysis, we use data from the 2011 wave of the LiK and complement it with information from a supplementary data collection in 2014. This data collection aimed at obtaining information on the birth order of the LiK respondents and their siblings. This information was not included in the LiK but was crucial for our analysis.

Our sample consists of married women in the age range 20-50 who have at least one living parent-in-law. This latter restriction of the sample is important because women without any living parent-in-law do not have the opportunity to co-reside. We restrict this condition to parents-in-law because married women rarely co-reside with their own parents, as illustrated below. In the 2011 LiK, we identified 2,043 women who were married and aged 20-50. Out of these, 1,582 women (and their husbands) were successfully re-interviewed in 2014 with the objective to gather information on birth order. Our final estimation sample is further reduced to 1,048 observations due to the following reasons: both parents of the

husband are deceased (478 observations), the birth order of the husband could not clearly be identified (1 observation), and there are missing values in the variables used in the later empirical analysis (55 observations).

2.1 Outcome Variables

We measure the labour market outcomes of women in two ways: first, the probability to engage in the labour market, i.e. labour force participation (extensive margin), and second, the number of weekly working hours (intensive margin). Women participate in the labour force if they actively engage in the labour market by working or if they are unemployed and seeking work. In contrast, women do not participate in the labour force if they do not work and do not seek work. In the LiK, engaging in the labour market is measured by (a) working for someone who is not a household member, (b) working for a farm or business owned or rented by self or another household member, (c) engaging in farming, fishing, gathering fruits or other products or (d) being absent from a job to which one will return.[3] Women are identified as unemployed if they do not fall under any of these four categories but report to look for work. For all working women, we observe the number of working hours. We use the total number of working hours in our analysis, which may be spent in up to two occupations.[4] Unemployed women and women who do not participate in the labour force are assumed to have zero working hours.

Table 1 illustrates that close to half of the sample participates in the labour force. Out of 1,048 women, 500 (48 percent) participate in the labour force and 548 (52 percent) do not. Among those participating, 483 are employed and 17 are unemployed. The average number of weekly working hours for employed women is 36 hours.

[INSERT TABLE 1 ABOUT HERE]

2.2 Co-residence and Youngest Son

Our main explanatory variable is co-residence. We define co-residence as a married woman - and her husband and children (if any) - living in one household with at least one parent. In principle, the parent can be a parent of the wife or the husband. Out of 1,048 women,

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[3]Employment possibilities (a), (b) and (d) are defined in accordance with the Integrated Sample Household Budget and Labour Survey of the National Statistics Committee of the Kyrgyz Republic.

[4]1.7 percent of the women in our estimation sample have two occupations, which corresponds to 3.7 percent of all those with positive working hours.

547 (52.2 percent) live in nuclear families and 501 (47.8 percent) co-reside with parents or parents-in-law (see Table 1). Among the co-residing women, 490 live with at least one of the husband's parents and 11 with at least one own parent. These numbers illustrate the patrilocality of Kyrgyzstani society, namely that married couples tend to co-reside with the husband's rather than the wife's family. For simplicity, we therefore refer to co-residence with parents-in-law in the remainder of this paper, even if a woman co-resides with an own parent.

As explained above, co-residence with parents-in-law is likely endogenous. We therefore use information about the birth order of a woman's husband and create an indicator variable for whether or not her husband is the youngest son in his family. This is our instrument. 35 percent of the women in our sample are married to a youngest son. Among the co-residing women, 50 percent are married to a youngest son; among the non-co-residing women, only 21 percent are married to a youngest son (see Table 1). These numbers point to the explanatory potential of being married to the youngest son for the co-residence with in-laws.

Table 1 shows that women who co-reside with parents-in-law tend to supply less labour to the market. 39 percent of co-residing women participate in the labour force, but 56 percent of non-co-residing women. Among those women who are employed, co-residing women work 35 hours per week and non-co-residing women 36 hours.

3   Empirical Approach and Results

Our objective is to estimate the relationship between co-residing with parents-in-law and female labour supply. In what follows, we conduct two separate empirical analyses: First, we start by (naively) assuming that the co-residence decision is exogenous (Section 3.1). Then, we relax this assumption and argue that the decision to co-reside with parents-in-law depends, among others, on unobserved factors. We use exogenous variation of the co-residence decision introduced by our instrument, which indicates whether or not a woman is married to a youngest son (Sections 3.2 and 3.3).

3.1   Naive Results - Estimation Strategy and Results

We begin by assuming that the co-residence decision is exogenous and, hence, that we control for all factors, which influence co-residence and the outcome variables. In order to

evaluate the effect of family structure on labour market outcomes, we estimate an ordinary least-squares (OLS) model for labour force participation and a Tobit model for working hours:

$$LFP_i = \alpha_1 + \alpha_2 Co\text{-}residence_i + \alpha_3 X_i + \epsilon_i \tag{1}$$

$$WH^*{}_i = \beta_1 + \beta_2 Co\text{-}residence_i + \beta_3 X_i + v_i \tag{2}$$

where i indexes individual women. LFP_i denotes labour force participation and $WH^*{}_i$ the linear index determining working hours WH_i ($WH_i = 0$ if $WH^*{}_i \leq 0$, $WH_i = WH^*{}_i$ if $WH^*{}_i > 0$). $Co\text{-}residence_i$ is a dummy variable that captures whether or not a woman lives with at least one parent-in-law in the same household. X_i is a vector of control variables, including the characteristics of the woman (age, educational level, ethnicity), the household (number of children below the age of five), the residence (community is located in the south of the country, community is urban or rural, availability of kindergarten) and the husband (educational level). We also control for the age of the husband, the number of brothers of the husband, and the age of the oldest living parent of the husband. We refer to these three variables as conditioning variables. They are important to include in the below IV estimation because they help to make sure that the exclusion restriction of the instrument holds (for details, see Section 3.2). Given that we include them in the IV, we also include them here for the sake of comparability. Descriptive statistics for the control variables are reported in Table A.1 in the Appendix.

The results of the naive approach are reported in Table 2 (Panel A) for labour force participation and in Table 3 (Panel A) for working hours. For each outcome, we estimate a series of models, successively increasing in control variables. Column (1) reports the unconditional effect of co-residence on female labour supply, while column (6) reports the effect of co-residence on female labour supply conditioning on our full set of of controls.

The first specification suggests that women who co-reside with parents-in-law are discouraged to participate in the labour force (Table 2). Our unconditional estimate implies that the probability of participating in the labour force is by 17 percentage points lower for co-residing than for non-co-residing women. However, with the inclusion of control variables, the estimated coefficient of co-residence falls in magnitude and loses its significance. In our full specification, the coefficient amounts to -0.053.[5] Given that the labour force par-

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[5]Estimating a logit instead of an ordinary least-squares model leads to a very similar marginal effect.

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ticipation in our sample is 48 percent, the estimated effect implies a decrease of 11 percent. However, this effect should be interpreted with caution, as it is imprecisely estimated.

[Insert Table 2 about here]

Second, women who co-reside with parents-in-law work, on average, fewer hours than women who do not co-reside (Table 3). The unconditional effect is sizable; co-residing women work 14 hours less. However, this effect is not robust to the inclusion of control variables: co-residence still appears to have a negative impact of around 3 working hours but we fail to obtain significant results.

[Insert Table 3 about here]

3.2 Instrumental Variable Estimation - Identifying Assumptions

As we explained in Section 1, co-residing with parents-in-law is unlikely to be random. Instead, co-residence depends on the career ambition of young women or the care needs of parents-in-law, to name but a few sources of endogeneity. Earlier studies on the effect of intergenerational co-residence on female labour market outcomes use a variety of instrumental variables to take this endogeneity into account (Sasaki, 2002; Oishi and Oshio, 2006; Maurer-Fazio *et al.*, 2011; Shen *et al.*, 2016). In the following, we review the instruments of these studies. All of them are plausible and relevant for explaining the co-residence decision. However, some of the instruments do not appear to fulfill the exclusion restriction, which raises doubts about their validity.

Sasaki (2002) uses sibling characteristics (number of siblings and birth order of husband and wife) and housing information (house owned or rented, detached house or apartment, house size) as instruments. We believe that housing reflects the wealth of a family, which may, in turn, influence a woman's decision to participate in the labour market. In addition to sibling characteristics and housing information, Oishi and Oshio (2006) enrich their set of instruments with information on, for example, the husband's age and educational attainment. To the extent that the husband's age is a proxy for work experience and the level of education a proxy for spousal income, it seems questionable to assume that these variables have an impact on female labour supply only through co-residence. The instruments in Maurer-Fazio *et al.* (2011)'s study are the percentage of households in the prefecture that have co-resident parents, husband's age, wife's age and provincial dummies.

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If there are labour market differences across provinces, living in a specific province is likely to have a direct effect on women's labour supply.

Shen *et al.* (2016) use the number of surviving brothers and sisters of a woman as well as her birth order as instruments for co-residing with the woman's parents. These instruments are much less of a concern than some of those in the previous studies. Similar to our strategy, the authors aim at exploiting implicit social norms about co-residence via sibling structures. In their specification, however, the number of siblings of the wife could still be an invalid instrument, e.g. if the household size during childhood related to current labor market outcomes through any unobserved channels. Furthermore, there may be selection effects on the marriage market. Men with a preference for having a nuclear family may choose spouses with several siblings because the likelihood of co-residing with the wife's parents is shown to be reduced with the number of her siblings. Finally, if there were differential divorce rates among co-residing and non-co-residing couples, women who co-reside with their parents may be more inclined to participate in the labour market in anticipation of a divorce.

In our instrumental variable approach we try to address the challenges mentioned above. First, we exploit a particular social norm based on birth order while at the same time *controlling* for sibling structures. Second, we explicitly test whether our instrument fulfills the exclusion restriction with respect to observable pre-marriage characteristics and marriage stability. Our strategy is based on a Central Asian tradition, according to which the youngest son of a family is supposed to stay with his parents and to ensure their well-being (Bauer *et al.*, 1997; Thieme, 2014; Rubinov, 2014). Any woman who is married to a youngest son is thus substantially more likely to co-reside with parents-in-law than a woman who is married to an older sibling. This could already be seen from our descriptive statistics in Table 1 and our first-stage estimation results (see below) provide further support. A dummy variable that indicates whether or not a woman's husband is the youngest son thus provides a plausible instrument for co-residence with parents-in-law.

In all of our estimations, we control for the age of the husband, the number of brothers of the husband, and the age of the oldest living parent of the husband - our so-called conditioning variables. These variables are included because they are, by construction, correlated with being the youngest son. Youngest sons are on average younger than older sons; the probability of being the youngest son decreases with the number of brothers; and condi-

tional on son's age, parents of youngest sons tend to be older than parents of older sons. Given these relationships, being married to the youngest son may influence female labour supply through other channels than through co-residence.[6] Controlling for the conditioning variables blocks all these channels, which may otherwise violate the exclusion restriction, and thus improves the credibility of our instrument compared to earlier approaches.

Several threats to the crucial exclusion restriction remain, though. First, we need to assure that there is no selection on the marriage market in the sense that women with certain characteristics get married to youngest sons. Here, one could think of anticipation effects: women who are willing to care for a parent-in-law and are less prone to participate in the labour force might be more likely to marry a youngest son, as this would result in co-residing with the in-laws. Second and related to the previous point, we need to rule out that youngest sons have a preference for partners with lower career ambitions. For example, youngest sons are likely aware of their responsibility for their parents and could look for a wife willing to share this responsibility with them. Third, we assume that being married to the youngest son has no effect on the marital stability. If, for example, the wives of youngest sons are more likely to divorce (possibly due to the responsibility for parents-in-law), they might be more active on the labour market in anticipation of the divorce.

With regard to the first two assumptions, we compare pre-marriage characteristics between (a) women married to youngest sons and women married to older sons and (b) men being youngest sons and men being older sons. Panel A of Table 4 reports the results for the women. We regress a number of pre-marriage characteristics on a dummy variable indicating whether a woman is married to a youngest son, controlling for our conditioning variables. The pre-marriage characteristics are potential proxy variables for labour market affinity (years of education, an indicator for having more than 11 years of education, employment status one and two years prior to the marriage), other socio-demographics (age at marriage, number of siblings), ethnicity, and type of marriage (love, arranged or captured marriage).

[Insert Table 4 about here]

We estimate a logit model in case the pre-marriage characteristic is binary and an

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[6]For example, younger sons who are of the same age as older sons tend to have older parents. Older parents, in turn, are likely to require more care, which potentially reduces female labour supply.

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OLS model if it is continuous. Column (1) presents the coefficient for being married to the youngest son, column (2) the standard error and column (3) the t-statistic/z-statistic. As can be seen from the last column, we do not find differences at the 5 percent significance level. Panel B of Table 4 compares pre-marriage characteristics for youngest sons and older sons. Hence, we conclude that couples involving a youngest son do not seem to self-select in terms of labor market characteristics at the time of marriage.[7]

Last, we want to rule out any effect of being married to a youngest son on marriage stability. More precisely, we would like to find out whether divorced women are significantly more likely to have been married to youngest sons compared with older sons. This assumption cannot be tested with our estimation sample, as the women in our sample are married. An alternative would be to exploit the fact that we have a list of all female siblings of every wife and husband in our estimation sample.[8] However, while we do know the marital status of all female siblings, we lack information on whether these women are or were married to youngest sons. Hence, we instead use information on all male siblings: we know their marital status and their birth order. We compare the likelihood of being divorced between male siblings being youngest sons and those not being youngest sons. We estimate a logit model and regress being divorced on being the youngest son of a family and the conditioning variables. Based on a sample of 5,679 male siblings, the marginal effect of being the youngest son is -0.002; the corresponding z-statistic is -0.75. We conclude that couples involving a youngest son do not differ with respect to marriage stability.[9]

3.3 Instrumental Variables Estimation - Strategy and Results

We estimate the effect of co-residence with parents-in-law on labour market outcomes of women using an instrumental variable approach. We first report the results for labour force participation and later turn to working hours.

In the first stage of the estimation (equation 3), the endogenous variable (co-residence) is treated as a linear function of the instrument (being married to the youngest son) and the remaining control variables (X_i). In the second stage (equation 4), we estimate a linear

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[7]In addition we use a non-parametric matching method in order to test for differences in pre-marriage characteristics. The results show a similar picture, we do not find significant differences (see Table A.3 in the Appendix A).

[8]The list of siblings of all wives and husbands was collected during the supplementary data collection in 2014, with the aim to identify the youngest son in every family.

[9]As before, we additionally use a non-parametric matching method to test for differences in marriage stability between youngest and non-youngest sons. In accordance with our parametric result, we do not find a significant difference.

probability model and replace co-residence by the predicted values of the first stage. The estimation equations of both stages are as follows:

$$Co\text{-}residence_i = \pi_1 + \pi_2 Youngest\ Son_i + \pi_3 X_i + \epsilon_i \tag{3}$$

$$LFP_i = \gamma_1 + \gamma_2 \hat{Co\text{-}residence}_i + \gamma_3 X_i + v_i \tag{4}$$

where π_2 is the first-stage effect of the instrument. In the second stage, using the fitted values for $Co\text{-}residence_i$ from the first stage ($\hat{Co\text{-}residence}_i$), γ_2 has the interpretation of the 'true' (i.e. unbiased) effect of co-residence on labour force participation. Estimation results can be found in Table 2 (Panel B).

With regard to the relevance of our instrument, the first stage results show that being married to the youngest son has a positive and highly significant effect on co-residence with parents-in-law. Women who married a youngest son are 22 percentage points more likely to live with in-laws compared with women who married an older son (Table 2, column (6)). We test for strength of the instrument and report the relevant F-statistic in the lower part of Table 2. As can be seen, the F-statistic is sufficiently large (Staiger and Stock, 1997), which leads us to conclude that we can rule out problems arising from weak instruments.

Instrumenting co-residence with being married to the youngest son yields an IV estimate of the effect on labour force participation of -0.196 in column (1) and -0.046 in column (6). As in Panel A, the effect is substantially reduced and loses in significance when control variables are included. Additionally, the magnitude of the effect is surprisingly close in Panel A and Panel B. We compare specification (6) of the OLS and IV regressions using a Hausman test and cannot reject that both models estimate the same coefficient. Hence, we cannot reject the null hypothesis that co-residence is exogenous (F-statistic is 0.0015, p-value is 0.9686).

We apply the same setting for estimating the effect of co-residence on working hours. Table 3, Panel B provides an overview of the key results. The IV estimate of the unconditional effect is -19.7 hours (column (1)) and of the full specification -7.7 hours (column (6)). In contrast to the OLS estimate in Panel A, the IV estimate in Panel B yields a negative effect of larger magnitude. However, this effect is not statistically significant as soon as control variables are included. We again perform a Hausman endogeneity test. It yields a chi2-statistic of 0.18 which is a strong indication that we cannot reject the hypothesis of co-residence being exogenous. Hence, the difference in the coefficients appears to be not

systematic.

3.4 Heterogeneity

We find that co-residence with parents-in-law does not significantly affect female labour supply. If anything, there appears to be a negative effect as indicated by the signs of the estimated coefficients. This is in contrast to the previous literature, which unequivocally finds a significant positive impact of intergenerational co-residence on the labour force participation of women (Sasaki, 2002; Oishi and Oshio, 2006; Maurer-Fazio *et al.*, 2011; Shen *et al.*, 2016). Possibly, co-residence influences different groups of women differently, resulting in a positive effect for some and a negative effect for others. Depending on the composition of the estimation sample, the average effect may then be positive, zero, or negative. In order to shed some light on potential heterogenous effects, we investigate the impact of co-residence on labour supply for a number of sub-groups: women living in urban versus women living in rural areas, women with small children versus women without small children, and women with relatively old parents-in-law versus women with relatively young parents-in-law.

We regress the respective labour market outcome on the co-residence indicator, a variable identifying the sub-group of women, an interaction term and the control variables. The interaction term introduces an additional endogenous variable in those models which take the endogeneity of co-residence into account. Here, the interaction between the youngest son indicator and the sub-group variable serves as additional instrument. The heterogeneity results for labour force participation are reported in Table 5 and for working hours in Table 6. To facilitate comparison, the first column always reproduces the results from column (6) in Tables 2 and 3.

[Insert Table 5 about here]

[Insert Table 6 about here]

Urban and rural areas: In Kyrgyzstan, urban and rural areas differ considerably in terms of labour market conditions and the types of jobs available. Urban women are likely to work in offices or factories, while rural women are likely to be engaged in (family-run) agriculture. In our sample, the female labour force participation rate is 49 percent in rural areas and 44 percent in urban areas. In contrast, employed urban women work on average

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43 hours per week; 9 hours more than employed women in rural areas. This is an indication that the labour market is more flexible in rural areas, allowing for a better compatibility of work and family duties. At the same time, urban areas are characterised by a higher provision with child and, to a much lesser extent, elderly care facilities. Around 98 percent of the urban households in our sample have a kindergarten in the community, whereas only 47 percent of the rural households do. We do not have information on elderly care facilities but on hospitals, which may also be decisive for elderly care. Hospitals are much more available in urban areas (87%) than in rural areas (55%). Given these very different conditions for urban and rural areas, it is impossible to predict the signs of the heterogenous effects. They are up for empirical investigation. In the naive setting (Panel A, Tables 5 and 6), co-residence does not have a significant impact on labour force participation and working hours in rural areas. In urban areas, in contrast, co-residence affects labour force participation (by 15 percentage points) and working hours (by 16 hours) negatively and significantly. In the instrumental variable estimation (Panel B, Tables 5 and 6), however, this negative effect disappears and neither rural women nor urban women are influenced by co-residing with parents-in-law.

Small children: Co-residing with parents-in-law is likely to affect women with small children (i.e. up to age 5) and women without small children differently. As mentioned in Section 1, only a small share of children below school age receive institutionalised child care. Thus, women with small children should particularly benefit from living in an intergenerational household if parents-in-law provide care for their grandchildren. Older children who go to school do not require the same intensity of child care; thus, women with older children may also benefit from living with in-laws but less so than women with small children. Our naive estimation results (Panel A, Tables 5 and 6) show that the effect of co-residence on female labour supply indeed depends on the number of small children in the household. Whereas women without small children are negatively affected by co-residence, the effect is still negative but much smaller for women with one small child, and it is positive for women with two or more small children. Living in an intergenerational household increases labour force participation of women with two small children by 4.8 percentage points and working time by 5.3 hours. However, these effects become smaller and insignificant once we control for the endogenous nature of co-residence (Panel B, Tables 5 and 6).

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Age of parents-in-law: Women are the main providers of care for elderly people in the household. Therefore, co-residence is likely to affect female labour supply negatively if co-residing parents-in-law require care. The likelihood of care needs increases with the age of the parents-in-law. We define a cutoff of 65 years and assume that elderly people above the age of 65 are likely to require attention.[10] We expect a strong negative impact of co-residence on labour supply for women with relatively old parents-in-law and a positive or weak negative impact for women with relatively young parents-in-law. We do not obtain any significant estimates, though (Tables 5 and 6).

In sum, we find no significant impact of co-residence on female labour supply for women in rural areas, for women with old parents-in-law as well as for women with young parents-in-law. Women in urban areas and women without small children appear to be negatively affected by co-residence; while women with two or more small children seem to benefit from living in an intergenerational household. These latter effects, however, lose their statistical significance in the IV estimation. In addition, the magnitude and signs of the coefficients differ considerably between the naive approach and the IV estimation for rural and urban areas; hence, we conclude that the negative effect for urban women is not robust. Only the findings for women with and without small children seem to be somewhat stable as the signs of the coefficients remain the same. Yet, the magnitude of the coefficient for the interaction term is much smaller in the IV estimation than in the naive approach. We expect that selection into co-residence is particularly strong for women with small children who want to engage in the labour market. Ignoring this selection then leads to a positive effect of co-residence on the labour supply of women with small children.

This may explain the positive effect found in the earlier studies: If their samples consisted of many women with small children and their instrumental variables did not take the endogeneity of co-residence sufficiently into account, they would conclude that living in an intergenerational household facilitated the labour force participation of women. The samples (25-50 years) of Oishi and Oshio (2006) and Maurer-Fazio *et al.* (2011) are comparable to our sample (20-50 years); while the sample of Sasaki (2002) is relatively young (24-34 years) and that of Shen *et al.* (2016) relatively old (35-65 years). Only Sasaki (2002)

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[10]For the generation of the parents-in-law, the life expectancy at birth was roughly 65 years.

provides descriptive information on the number of small children; there is about one small child per woman in their sample, whereas we measure less than one small child in our sample. Hence, while the given explanation for our deviating results may be true for a comparison with Sasaki (2002), it remains unclear whether it also serves for a comparison with the other studies.

3.5   Channels

Different from the literature, we do not find evidence that co-residing with parents-in-law facilitates the labour supply of women. Only women with several small children may benefit from living in an intergenerational household but even this result is ambiguous. All other women appear to be unaffected by co-residence, which is surprising. In Section 1, we elaborated on four different channels through which co-residence may have an influence on female labour supply. It is possible that several channels are at play that cancel each other out such that the total effect appears to be zero in our sample. In the following, we analyze the prevalence of these four channels: financial contribution of parents-in-law to the household (Channel 1); in-kind services such as housekeeping and childcare (Channel 2); care needs of parents-in-law (Channel 3) and preferences of parents-in-law (Channel 4).

For most of these channels, we rely on information provided by the parents-in-law. This means that we restrict our sample to those women who co-reside because we do not have information on parents-in-law if they are not within the same household. Thus, for the sub-sample of co-residing women, we regress the women's labour market outcome on a variable that captures the specific channel of interest and our remaining control variables.[11] Descriptive statistics of the channel variables can be found in Table A.2 in the Appendix. Estimation results for labour force participation can be found in Table 7 (OLS models) and for working hours in Table 8 (Tobit models).

[Insert Table 7 about here]

[Insert Table 8 about here]

Channel 1: We hypothesize that income by co-residing parents-in-law are likely to influence female labour market outcomes. Parents-in-law may contribute to total income

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[11]Our conditioning variables are neglected in this analysis, as we restrict the analysis to only co-residing households and do not use information on being married to the youngest son.

through income earned on the labour market or through pension income. We restrict attention to labour income from dependent employment, because we are interested in the pure income effect and want to rule out effects from family-owned businesses that may provide employment to women in the family. Among all intergenerational households, 86 (17%) benefit from labour income of the parents-in-law and 301 (63%) from pension income. In those households with labour income, the average earned per month is 7,990 Som, while the average monthly pension income is 4,450 Som. In line with our hypothesis we observe a significant negative effect of parent-in-law's labour income on labour force participation and working hours of the co-residing women. For parents-in-law with average labour income this translates into a 8.8 percentage points decrease in female labor force participation and a drop in weekly working time by 10.1 hours. In contrast, pension income does not exhibit a significant effect.

Channel 2: Co-residing parents-in-law may facilitate the engagement of women on the labour market if they provide in-kind services, i.e. housekeeping tasks and child care, to the household. We use information on the total time spent by co-residing parents-in-law for housekeeping or child care. 71 percent of households benefit from parents-in-law taking over housekeeping tasks (on average four hours per day) and 52 percent receive child care support (on average three hours per day). Our results provide a weak indication that releasing women from housekeeping tasks enhances their probability of engaging in the labour market. There is a marginally significant effect on female labor force participation, but has no effect on working hours. We also find no effect of receiving child care support on labour market outcomes.

Channel 3: If co-residing parents-in-law require care for themselves, the labour supply of women is likely to be reduced as women typically provide care for elderly people in the household. Around 18 percent of women who co-reside with parents-in-law report to provide elderly care. Among those, the average time spent per day is 1.2 hours. Time commitment by women appears to reduces their labour force participation by 6.6 percentage points (marginally significant) and working hours by 6.3 hours (insignificant) per hour spent on elderly care.

Channel 4: Co-residing parents-in-law may impose their preferences with regard to female labour market behaviour on a woman. We measure preferences in terms of attitudes towards the role of females in society expressed by the parents-in-law. Respondents reported their level of agreement on a four-point Likert scale ranging from *Strongly disagree* (1) to *Strongly agree* (4) on seven statements.[12] We conduct a factor analysis to extract one single latent factor from these statements. To facilitate interpretation, we use a standardized index ranging from lower traditional attitudes (lower index values) to stronger traditional attitudes (higher values). Our estimation results suggest that parents-in-law's gender attitudes have neither a significant effect on labour force participation nor on working hours.

Based on the findings in this sub-section, co-residing with parents-in-law could be related to female labour market outcomes through different channels. Labour income earned by parents-in-law as well as care needs reduce female labour supply; while support with housekeeping provided by parents-in-law facilitates female labour supply. On average, these effects may cancel each other out in our study, which might explain why we often find insignificant effects. Channels which promote the labour supply of women could dominate in other contexts, possibly explaining the positive effect found in the studies by Sasaki, 2002, Oishi and Oshio, 2006, Maurer-Fazio *et al.*, 2011 and Shen *et al.*, 2016.

4 Conclusion

In this paper, we investigate the role of the family in labour market outcomes of married females. We analyse how the co-residence with parents-in-law influences female labour force participation and working hours. We use data from Kyrgyzstan. We exploit the tradition among Central Asians that the youngest son is expected to live with his parents. This tradition helps us to take the endogeneity of intergenerational co-residence into account. We instrument co-residence with being married to the youngest son of a family. This instrument turns out to be highly relevant and plausibly exogenous.

Our findings suggest that living together with parents-in-law does not make labour market outcomes of married women better or worse. Controlling for socio-demographic and community characteristics, women are equally likely to participate in the labour market and work a similar number of hours, regardless of whether they live with in-laws or not.

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[12]A list of these statements can be found in Table A.9 in the Appendix.

This result is in contrast to the previous literature which has found a positive effect of co-residence on labour force participation for China and Japan. Our paper differs from the literature in several dimensions. First, we use data from a much poorer country. Second, our sample of women covers a different age range than some of the other studies (Sasaki (2002); Shen *et al.* (2016)). Third, our analysis exclusively focuses on co-residence with parents-in-law, while the other studies also or only examine co-residence with own parents. Fourth, we explicitly discuss the exogeneity of our instrument; the other studies merely assume that their instruments were exogenous. In principle, all of these differences may explain why our findings deviate. However, we believe that the main explanation lies in the channels through which co-residence affects female labour market outcomes. We find suggestive evidence that in Kyrgyzstan several channels are at play, which seem to cancel each other out and cause a zero effect on average. Our findings imply that the positive effect of co-residence on women's labour market outcomes found in the previous literature cannot be regarded as a stylized fact; the local context is important to consider.

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Tables and Figures

Table 1: Descriptives: Co-Residence, Youngest Son and Female Labour Supply

	(1)	(2)	(3)
	All (n=1,048)	Co-Residence	
		Yes (n=501)	No (n=547)
Labour Force Participation (share)	0.48	0.39	0.56
	(0.50)	(0.49)	(0.50)
Working Hours (mean)[a]	35.97	35.32	36.38
	(14.30)	(14.42)	(14.24)
Youngest Son (share)	0.35	0.50	0.21
	(0.48)	(0.50)	(0.41)

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.

Notes: Standard deviation in parentheses.

[a] The mean working hours are calculated based on the sample of employed women.

Table 2: Estimation Results: Labour Force Participation

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
A. OLS Estimation Results **(Co-Residence exogenous)**						
Co-Residence	-.168*** (0.03)	-.057 (0.036)	-.023 (0.037)	-.027 (0.036)	-.051 (0.037)	-.053 (0.037)
B. Two-stage Least-Squares Estimation Results **(Co-Residence endogenous)**						
First Stage						
Youngest Son	0.316*** (0.031)	0.204*** (0.032)	0.21*** (0.031)	0.212*** (0.031)	0.218*** (0.03)	0.216*** (0.03)
Second Stage						
Co-Residence	-.196* (0.101)	-.084 (0.185)	-.106 (0.175)	-.047 (0.171)	-.041 (0.166)	-.046 (0.167)
Observations	1,048	1,048	1,048	1,048	1,048	1,048
F-statistic	104.104	41.637	46.8648	47.6032	51.8899	50.8932
Conditioning Variables		✓	✓	✓	✓	✓
Wife Characteristics		✓	✓	✓	✓	✓
Household Characteristics			✓	✓	✓	✓
Residence Characteristics				✓	✓	✓
Husband Characteristics						✓

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Conditioning variables: Age of the husband, number of brothers of the husband, age of the oldest living parent of the husband. Their inclusion makes sure that the exclusion restriction of the instrument holds (see discussion in Section 3.2).

Wife characteristics: age, educational level, ethnicity.

Household characteristics: number of children below the age of five.

Residence characteristics: community is located in the south of the country, community is urban or rural, availability of kindergarten.

Husband characteristic: educational level.

The full estimation results can be found in the Appendix A in Table A.4 for the OLS estimation result and in Table A.5 and Table A.6 for the two-stage least-squares estimation results.

Table 3: Estimation Results: Working Hours

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
A. Tobit Estimation Results **(Co-Residence exogenous)**						
Co-Residence	-14.241***	-4.388	-1.264	-1.406	-2.779	-2.929
	(2.672)	(3.131)	(3.179)	(3.124)	(3.191)	(3.200)
B. IV Tobit Estimation Results **(Co-Residence endogenous)**						
First Stage[a]						
Youngest Son	0.316***	0.204***	0.21***	0.212***	0.218***	0.216***
	(0.031)	(0.032)	(0.031)	(0.031)	(0.03)	(0.03)
Second Stage						
Co-Residence	-19.731**	-12.161	-15.299	-8.388	-7.474	-7.714
	(8.874)	(16.120)	(15.519)	(14.998)	(14.594)	(14.747)
Observations	1,048	1,048	1,048	1,048	1,048	1,048
F-statistic	104.104	41.637	46.8648	47.6032	51.8899	50.8932
Conditioning Variables		✓	✓	✓	✓	✓
Wife Characteristics			✓	✓	✓	✓
Household Characteristics				✓	✓	✓
Residence Characteristics					✓	✓
Husband Characteristics						✓

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Conditioning variables: Age of the husband, number of brothers of the husband, age of the oldest living parent of the husband. Their inclusion makes sure that the exclusion restriction of the instrument holds (see discussion in Section 3.2).

Wife characteristics: age, educational level, ethnicity.

Household characteristics: number of children below the age of five.

Residence characteristics: community is located in the south of the country, community is urban or rural, availability of kindergarten.

Husband characteristic: educational level.

The full estimation results can be found in the Appendix A in Table A.7 for the Tobit estimation result and in Table A.8 for the IV Tobit estimation results.

[a] The first stage is identical to the first stage in Table 2.

Table 4: Parametric Difference of Pre-Marriage Characteristics

	(1) Coefficient/Marginal Effect	(2) S.E.	(3) Z-Stat/T-Stat
A. Wife			
Years of education^c	0.24	0.18	1.33
More than 11 years of education	0.05	0.04	1.28
Age Women^c	-0.04	0.24	-0.16
Age at Marriage^c	0.47	0.24	1.93
Total number of siblings^c	-0.07	0.16	-0.47
Kyrgyz	-0.01	0.04	-0.14
Uzbek	-0.03	0.03	-1.01
Russian	0.02	0.01	1.36
Love Marriage	0.03	0.04	0.92
Arranged Marriage	-0.02	0.03	-0.44
Captured Marriage	-0.02	0.02	-0.78
Worked t-1 if t=year of marriage	0.01	0.04	0.34
Worked t-2 if t=year of marriage	0.02	0.03	0.61
B. Husband			
Years of education^c	-0.03	0.18	-0.18
More than 11 years of education	-0.002	0.04	-0.07
Age at marriage^c	0.52	0.31	1.69
Total number of siblings^c	0.07	0.11	0.60
Kyrgyz	-0.01	0.04	-0.32
Uzbek	-0.04	0.03	-1.28
Russian	0.02	0.01	1.31

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes:
^{c} denotes continuous variable.
Panel A shows the effect of being married to the youngest son of a family on pre-marriage characteristics of the wife. Panel B shows the effect of being a youngest son of a family on pre-marriage characteristics of the husband. Results are based on Logit estimations for binary outcome variables and ordinary least-squares (OLS) estimations for continuous outcomes. Column (1) reports the Logit marginal effect or OLS coefficient of the variable *youngest son*, while further controlling for number of brothers of the husband, age of the husband and age of the oldest living parent of the husband. Column (2) reports the corresponding standard errors, column (3) the values of z-statistic (for Logit estimation results) or t-statistic (for OLS estimations). Critical values of t-distribution: $t_{\infty,0.95} = 1.645$, $t_{\infty,0.975} = 1.96$, $t_{\infty,0.995} = 2.576$. Non-parametric results can be found in the Appendix A in Table A.3.

Table 5: Heterogeneity Analysis: Labour Force Participation

	(1)	(2)	(3)	(4)
A. OLS Estimation Results				
Co-Residence	-.053	-.025	-.140***	-.077
	(0.037)	(0.04)	(0.05)	(0.048)
Co-Residence * Community in urban area		-.121*		
		(0.067)		
Co-Residence * Number of Children below age 5			0.094***	
			(0.036)	
Co-Residence * Age oldest elderly > 65				0.049
				(0.064)
B. Two-Stage Least-Squares Estimation Results				
Co-Residence	-.046	-.089	-.051	-.129
	(0.167)	(0.166)	(0.192)	(0.333)
Co-Residence * Community in urban area		0.249		
		(0.267)		
Co-Residence * Number of Children below age 5			0.005	
			(0.136)	
Co-Residence * Age oldest elderly > 65				0.105
				(0.277)
Observations	1,048	1,048	1,048	1,048
Conditioning Variables	✓	✓	✓	✓
Wife Characteristics	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓
Residence Characteristics	✓	✓	✓	✓
Husband Characteristics	✓	✓	✓	✓

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Column (1) provides main results from column (6), Panel A and B in Table 2. The remaining columns provide heterogeneity results with respect to the following variables: (2) Community in urban area, (3) Number of Children below age of 5, (4) Age oldest elderly > 65. For each column we conduct a separate estimation. For the OLS estimation results we additionally include the respective variable and its interaction with the co-residence variable. For the two-stage least-squares estimation results, as we in addition include the respective variable and its interaction with the co-residence variable into our model, we have a an additional first stage with the dependent variable being the interaction between co-residence and the respective heterogeneity variable and with the interaction of youngest son and respective heterogeneity variable as additional instrument.

Table 6: Heterogeneity Analysis: Working Hours

	(1)	(2)	(3)	(4)
A. Tobit Estimation Results				
Co-Residence	-2.929	0.723	-8.806**	-4.299
	(3.200)	(3.439)	(4.229)	(4.287)
Co-Residence * Community in urban area		-17.071***		
		(6.126)		
Co-Residence * Number of Children below age 5			7.049**	
			(3.310)	
Co-Residence * Age oldest elderly > 65				2.654
				(5.567)
B. IV Tobit Estimation Results				
Co-Residence	-7.714	-8.991	-9.053	-14.552
	(14.747)	(14.464)	(16.543)	(30.403)
Co-Residence * Community in urban area		8.457		
		(23.809)		
Co-Residence * Number of Children below age 5			2.257	
			(12.792)	
Co-Residence * Age oldest elderly > 65				8.321
				(25.346)
Observations	1,048	1,048	1,048	1,048
Conditioning Variables	✓	✓	✓	✓
Wife Characteristics	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓
Residence Characteristics	✓	✓	✓	✓
Husband Characteristics	✓	✓	✓	✓

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Column (1) provides main results from column (6), Panel A and B in Table 2. The remaining columns provide heterogeneity results with respect to the following variables: (2) Community in urban area, (3) Number of Children below age of 5, (4) Age oldest elderly > 65. For each column we conduct a separate estimation. For the Tobit estimation results we additionally include the respective variable and its interaction with the co-residence variable. For the IV Tobit estimation results, as we in addition include the respective variable and its interaction with the co-residence variable into our model, we have a an additional first stage with the dependent variable being the interaction between co-residence and the respective heterogeneity variable and with the interaction of youngest son and respective heterogeneity variable as additional instrument. variable.

Table 7: Channel Analysis: Labour Force Participation

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
Channel 1: Financial contribution to the Household						
Income Parents (in 1000 Som)	-0.011**					
	(0.005)					
Pension Income (in 1000 Som)		0.008				
		(0.007)				
Channel 2: In-kind Service (Housekeeping and Child Care)						
Housekeeping (in Hours)			0.013*			
			(0.007)			
Child Care (in Hours)				-0.002		
				(0.011)		
Channel 3: Care Needs of Parents						
Elderly Care (in Hours)					-0.066*	
					(0.038)	
Channel 4: Preferences of Parents						
Gender Attitudes (std.)						0.005
						(0.022)
Observations	501	501	501	501	501	472
Wife Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Residence Characteristics	✓	✓	✓	✓	✓	✓
Husband Characteristics	✓	✓	✓	✓	✓	✓

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The channel analysis is restricted to only co-residing couples. The possible channels are presented in the different columns:
(1) Income parents (in 1000 Som): Total income of all co-residing parents earned as employees.
(2) Pension Income (in 1000 Som): Pension Income (for elderly) of the household.
(3) Housekeeping (in Hours): Total time of all co-residing parents spent for housekeeping (e.g. cooking, washing, laundry, cleaning, shopping, repairs, other household tasks).
(4) Child Care (in Hours): Total time of all co-residing parents spent for child care.
(5) Elderly Care (in Hours): Time of wife spent for elderly care.
(5) Gender Attitudes (std.): Average gender attitudes of co-residing parents in the household. We define preferences as the parents attitude towards the role of females in the society. Gender attitudes are measured using seven self-reported items. Item responses are reported on a four-point Likert scale ranging from *Strongly disagree* (1) to *Strongly agree* (4).[13] We identify two liberal and five traditional items. We then use all items to conduct a factor analysis and to extract one single latent factor. To facilitate the interpretation, we use a standardized index ranging from lower traditional attitudes (lower index values) to stronger traditional attitudes (higher values)

Table 8: Channel Analysis: Working Hours

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
Channel 1: Contribution to Household Income						
Income Parents (in 1000 Som)	-1.269*					
	(0.728)					
Pension Income (in 1000 Som)		0.499				
		(0.761)				
Channel 2: In-kind Service (Housekeeping and Child Care)						
Housekeeping (in Hours)			0.928			
			(0.709)			
Child Care (in Hours)				0.035		
				(1.133)		
Channel 3: Care Needs of Parents						
Elderly Care (in Hours)					-6.303	
					(4.044)	
Channel 4: Preferences of Parents						
Gender Attitudes (std.)						1.322
						(2.168)
Observations	501	501	501	501	501	472
Wife Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Residence Characteristics	✓	✓	✓	✓	✓	✓
Husband Characteristics	✓	✓	✓	✓	✓	✓

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The channel analysis is restricted to only co-residing couples. The possible channels are presented in the different columns:

(1) Income parents (in 1000 Som): Total income of all co-residing parents earned as employees.

(2) Pension Income (in 1000 Som): Pension Income (for elderly) of the household.

(3) Housekeeping (in Hours): Total time of all co-residing parents spent for housekeeping (e.g. cooking, washing, laundry, cleaning, shopping, repairs, other household tasks).

(4) Child Care (in Hours): Total time of all co-residing parents spent for child care.

(5) Elderly Care (in Hours): Time of wife spent for elderly care.

(5) Gender Attitudes (std.): Average gender attitudes of co-residing parents in the household. We define preferences as the parents attitude towards the role of females in the society. Gender attitudes are measured using seven self-reported items. Item responses are reported on a four-point Likert scale ranging from *Strongly disagree* (1) to *Strongly agree* (4).[14] We identify two liberal and five traditional items. We then use all items to conduct a factor analysis and to extract one single latent factor. To facilitate the interpretation, we use a standardized index ranging from lower traditional attitudes (lower index values) to stronger traditional attitudes (higher values)

A Supplementary Tables and Figures

Table A.1: Summary Statistics of Explanatory Variables

	(1) mean	(2) sd	(3) min	(4) max
Age (husband)^c	36.46	(8.50)	19.00	61.00
Number of brothers (husband)^c	2.09	(1.40)	0.00	8.00
Age oldest living parent^c	65.85	(10.28)	42.00	98.00
Age^c	32.83	(8.49)	20.00	50.00
Low school education (ref.)	0.10	(0.30)	0.00	1.00
Medium school education	0.58	(0.49)	0.00	1.00
High school education	0.32	(0.47)	0.00	1.00
Kyrgyz	0.70	(0.46)	0.00	1.00
Uzbek	0.16	(0.37)	0.00	1.00
Russian	0.03	(0.18)	0.00	1.00
Other ethnicity^a	0.11	(0.31)	0.00	1.00
Number of children below age 5^c	0.84	(0.84)	0.00	4.00
Oblast in south	0.57	(0.50)	0.00	1.00
Community in urban area	0.27	(0.45)	0.00	1.00
Kindergarten in community	0.61	(0.49)	0.00	1.00
Low school education (husband, ref.)	0.09	(0.28)	0.00	1.00
Medium school education (husband)	0.58	(0.49)	0.00	1.00
High school education (husband)	0.29	(0.45)	0.00	1.00

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes:
^{a} Other ethnicity: Dungan, Uigur, Tajik, Kazakh, other ethnicities.
^{c} denotes continuous variable.

Table A.2: Summary Statistics of Variables used in Channel Analysis

	(1) n	(2) mean	(3) sd	(4) min	(5) max
Income parents (in 1000 Som)	86	7.99	(7.56)	1.40	60.00
Pension (in 1000 Som)	316	4.45	(2.44)	1.50	30.00
Housekeeping time (in Hours)	358	4.00	(3.04)	0.50	16.00
Child care time (in Hours)	263	3.00	(1.96)	0.50	12.00
Elderly Care time (in Hours)	90	1.22	(0.74)	0.50	4.00
Gender attitudes (std.)	490	-0.05	(0.98)	-2.86	1.52

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Summary statistics are restricted to only co-residing couples and to strictly positive values of the variables (with the exception of the variable gender attitudes).

Table A.3: Non-Parametric Difference of Pre-Marriage Characteristics

	(1) Treated	(2) Controls	(3) Difference	(4) S.E.	(5) T-Stat
A. Wife					
Years of education^c	11.00	10.97	0.03	0.49	0.06
More than 11 years of education	0.28	0.36	-0.08	0.11	-0.73
Age Women^c	30.28	29.90	0.38	1.42	0.27
Age at Marriage^c	21.35	20.84	0.51	0.82	0.62
Total number of siblings^c	3.36	3.88	-0.52	0.47	-1.11
Kyrgyz	0.64	0.69	-0.05	0.11	-0.45
Uzbek	0.15	0.18	-0.03	0.09	-0.33
Russian	0.05	0.03	0.03	0.04	0.75
Love Marriage	0.74	0.71	0.03	0.11	0.27
Arranged Marriage	0.24	0.21	0.03	0.10	0.30
Bride capture	0.03	0.08	-0.05	0.05	-1.00
Worked t-1 if t=year of marriage	0.23	0.26	-0.03	0.11	-0.27
Worked t-2 if t=year of marriage	0.10	0.23	-0.13	0.10	-1.30
B. Husband					
Years of education^c	10.92	10.78	0.14	0.45	.31
More than 11 years of education	0.31	0.28	0.03	0.11	0.27
Age at marriage^c	25.32	25.49	-0.16	1.10	-0.15
Total number of siblings^c	3.64	3.85	-0.21	0.40	-0.52
Kyrgyz	0.64	0.69	-0.05	0.11	-0.45
Uzbek	0.15	0.18	-0.03	0.09	-0.33
Russian	0.03	0.03	0.00	0.04	0.00

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.

Notes:

^{c} denotes continuous variable.

Panel A compares pre-marriage characteristics of women married to youngest sons (treated) and not married to youngest sons (control). Panel B compares pre-marriage characteristics of husbands being youngest sons (treated) to non-youngest sons (control). Comparisons are based on matching results, whereby the variable *youngest son* is used as treatment. The following information are used for balancing: number of brothers of the husband, age of the husband and age of the oldest living parent of the husband. Column (1) (column (2)) provides the average treatment effect of the treated (controls), column (3) their difference. Column (4) provides the standard error and column (5) the t-statistic. Critical values of t-distribution: $t_{\infty,0.95} = 1.645$, $t_{\infty,0.975} = 1.96$, $t_{\infty,0.995} = 2.576$.

Table A.4: OLS Estimation Results: Female Labour Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Co-Residence	-.168***	-.057	-.023	-.027	-.051	-.053
	(0.03)	(0.036)	(0.037)	(0.036)	(0.037)	(0.037)
Age Husband		0.012***	-.003	-.002	-.003	-.003
		(0.003)	(0.005)	(0.005)	(0.005)	(0.005)
No. of brothers (husband)		0.003	0.005	0.005	0.003	0.003
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Age oldest living parent (husband)		-.0002	-.0007	-.0008	-.0001	0.00002
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age Women			0.047***	0.058***	0.055***	0.055***
			(0.016)	(0.016)	(0.016)	(0.016)
Age Women^2			-.0004**	-.0007***	-.0007***	-.0007***
			(0.0002)	(0.0002)	(0.0002)	(0.0002)
Medium school education			0.177***	0.147***	0.136**	0.152***
			(0.054)	(0.054)	(0.054)	(0.056)
Higher school education			0.275***	0.251***	0.267***	0.281***
			(0.058)	(0.058)	(0.058)	(0.061)
Kyrgyz			0.068	0.099	0.031	0.031
			(0.084)	(0.083)	(0.085)	(0.085)
Uzbek			0.106	0.12	0.05	0.047
			(0.091)	(0.09)	(0.094)	(0.095)
Other ethnicities			-.059	-.040	-.099	-.102
			(0.093)	(0.092)	(0.093)	(0.093)
Number of children below age 5				-.102***	-.101***	-.101***
				(0.02)	(0.02)	(0.02)
Oblast in south					0.043	0.042
					(0.033)	(0.033)
Community in urban area					-.142***	-.144***
					(0.038)	(0.039)
Kindergarten in community					0.051	0.052
					(0.034)	(0.034)
Medium school education (husband)						-.049
						(0.048)
Higher school education (husband)						-.040
						(0.054)
Const.	0.558***	0.07	-.643**	-.671**	-.578**	-.551**
	(0.021)	(0.109)	(0.279)	(0.275)	(0.275)	(0.277)
Observations	1,048	1,048	1,048	1,048	1,048	1,048

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Two-stage Least-Squares Estimation Results: Co-Residence (First Stage)

	(1)	(2)	(3)	(4)	(5)	(6)
Youngest Son	0.316***	0.204***	0.21***	0.212***	0.218***	0.216***
	(0.031)	(0.032)	(0.031)	(0.031)	(0.03)	(0.03)
Age Husband		-.033***	-.014***	-.013***	-.013***	-.013***
		(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
No. of brothers (husband)		-.006	-.006	-.006	-.006	-.008
		(0.011)	(0.01)	(0.01)	(0.01)	(0.01)
Age oldest living parent (husband)		0.004**	0.004**	0.004**	0.004**	0.005**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age Women			-.104***	-.102***	-.100***	-.101***
			(0.013)	(0.013)	(0.013)	(0.013)
Age Women^2			0.001***	0.001***	0.001***	0.001***
			(0.0002)	(0.0002)	(0.0002)	(0.0002)
Medium school education			0.073	0.068	0.051	0.072
			(0.045)	(0.045)	(0.045)	(0.046)
Higher school education			0.086*	0.081*	0.094*	0.127**
			(0.048)	(0.048)	(0.048)	(0.05)
Kyrgyz			0.081	0.087	-.012	-.019
			(0.07)	(0.07)	(0.071)	(0.071)
Uzbek			0.143*	0.145*	0.01	-.006
			(0.075)	(0.075)	(0.079)	(0.079)
Other ethnicities			0.134*	0.137*	0.071	0.059
			(0.078)	(0.078)	(0.077)	(0.077)
Number of children below age 5				-.017	-.015	-.016
				(0.017)	(0.017)	(0.017)
Oblast in south					0.12***	0.117***
					(0.028)	(0.028)
Community in urban area					-.116***	-.111***
					(0.032)	(0.032)
Kindergarten in community					0.047*	0.05*
					(0.028)	(0.028)
Medium school education (husband)						-.059
						(0.04)
Higher school education (husband)						-.099**
						(0.045)
Const.	0.368***	1.358***	2.477***	2.471***	2.460***	2.501***
	(0.018)	(0.082)	(0.219)	(0.219)	(0.216)	(0.217)
Observations	1,048	1,048	1,048	1,048	1,048	1,048

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Two-stage Least-Squares Estimation Results: Labour Force Participation (Second Stage)

	(1)	(2)	(3)	(4)	(5)	(6)
Co-Residence	-.196*	-.084	-.106	-.047	-.041	-.046
	(0.101)	(0.185)	(0.175)	(0.171)	(0.166)	(0.167)
Age Husband		0.011	-.005	-.003	-.003	-.003
		(0.008)	(0.006)	(0.006)	(0.006)	(0.006)
No. of brothers (husband)		0.002	0.002	0.005	0.004	0.003
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Age oldest living parent (husband)		0.00002	0.0001	-.0006	-.0002	-.00005
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age Women			0.039	0.056**	0.056**	0.056**
			(0.024)	(0.023)	(0.023)	(0.023)
Age Women^2			-.0003	-.0007**	-.0007**	-.0007**
			(0.0003)	(0.0003)	(0.0003)	(0.0003)
Medium school education			0.183***	0.149***	0.135**	0.152***
			(0.056)	(0.055)	(0.054)	(0.057)
Higher school education			0.283***	0.253***	0.266***	0.28***
			(0.06)	(0.059)	(0.06)	(0.065)
Kyrgyz			0.071	0.1	0.031	0.031
			(0.084)	(0.083)	(0.085)	(0.085)
Uzbek			0.114	0.122	0.05	0.047
			(0.092)	(0.09)	(0.094)	(0.094)
Other ethnicities			-.051	-.038	-.100	-.102
			(0.094)	(0.093)	(0.092)	(0.092)
Number of children below age 5				-.102***	-.101***	-.101***
				(0.02)	(0.02)	(0.02)
Oblast in south					0.042	0.041
					(0.037)	(0.037)
Community in urban area					-.140***	-.143***
					(0.043)	(0.043)
Kindergarten in community					0.051	0.052
					(0.035)	(0.035)
Medium school education (husband)						-.049
						(0.049)
Higher school education (husband)						-.039
						(0.057)
Const.	0.571***	0.106	-.437	-.620	-.602	-.567
	(0.051)	(0.267)	(0.508)	(0.497)	(0.484)	(0.494)
Observations	1,048	1,048	1,048	1,048	1,048	1,048

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: Tobit: Working Hours

	(1)	(2)	(3)	(4)	(5)	(6)
Co-Residence	-14.241***	-4.388	-1.264	-1.406	-2.779	-2.929
	(2.672)	(3.131)	(3.179)	(3.124)	(3.191)	(3.200)
Age Husband		1.118***	-.014	0.071	0.037	0.047
		(0.258)	(0.467)	(0.459)	(0.461)	(0.461)
No. of brothers (husband)		0.29	0.443	0.581	0.499	0.477
		(0.964)	(0.97)	(0.955)	(0.957)	(0.959)
Age oldest living parent (husband)		-.082	-.114	-.123	-.092	-.087
		(0.195)	(0.194)	(0.19)	(0.191)	(0.191)
Age Women			5.102***	6.124***	6.034***	6.023***
			(1.439)	(1.423)	(1.427)	(1.429)
Age Women^2			-.056***	-.079***	-.078***	-.078***
			(0.019)	(0.02)	(0.02)	(0.02)
Medium school education			14.432***	11.989**	11.304**	12.838**
			(5.202)	(5.158)	(5.182)	(5.425)
Higher school education			22.755***	20.782***	21.297***	22.363***
			(5.512)	(5.452)	(5.521)	(5.788)
Kyrgyz			1.859	5.248	1.907	2.104
			(7.318)	(7.213)	(7.430)	(7.445)
Uzbek			7.431	8.944	5.058	5.103
			(7.893)	(7.760)	(8.216)	(8.263)
Other ethnicities			-9.901	-8.046	-10.816	-10.778
			(8.297)	(8.158)	(8.279)	(8.299)
Number of children below age 5				-10.968***	-10.896***	-10.912***
				(1.838)	(1.841)	(1.840)
Oblast in south					2.923	2.771
					(2.920)	(2.922)
Community in urban area					-6.102*	-6.473*
					(3.386)	(3.422)
Kindergarten in community					3.502	3.438
					(2.956)	(2.962)
Medium school education (husband)						-4.376
						(4.293)
Higher school education (husband)						-2.513
						(4.779)
Const.	6.661***	-34.123***	-113.060***	-114.218***	-111.287***	-109.262***
	(1.871)	(9.708)	(25.309)	(24.763)	(24.951)	(25.086)
Observations	1,048	1,048	1,048	1,048	1,048	1,048

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: IV Tobit: Working Hours

	(1)	(2)	(3)	(4)	(5)	(6)
Co-Residence	-19.731**	-12.161	-15.299	-8.388	-7.474	-7.714
	(8.874)	(16.120)	(15.519)	(14.998)	(14.594)	(14.747)
Age Husband		0.816	-.279	-.060	-.049	-.039
		(0.666)	(0.552)	(0.536)	(0.531)	(0.529)
No. of brothers (husband)		0.003	-.067	0.329	0.322	0.288
		(1.130)	(1.124)	(1.095)	(1.098)	(1.116)
Age oldest living parent (husband)		-.009	0.023	-.055	-.045	-.038
		(0.245)	(0.246)	(0.238)	(0.238)	(0.242)
Age Women			3.660*	5.412***	5.562***	5.535***
			(2.127)	(2.064)	(2.020)	(2.048)
Age Women^2			-.039	-.071***	-.073***	-.073***
			(0.027)	(0.026)	(0.025)	(0.026)
Medium school education			15.635***	12.569**	11.618**	13.270**
			(5.407)	(5.312)	(5.274)	(5.585)
Higher school education			24.170***	21.472***	21.818***	23.064***
			(5.771)	(5.656)	(5.751)	(6.168)
Kyrgyz			2.332	5.502	1.628	1.787
			(7.402)	(7.249)	(7.484)	(7.512)
Uzbek			8.744	9.607	4.904	4.861
			(8.092)	(7.902)	(8.237)	(8.303)
Other ethnicities			-8.631	-7.401	-10.688	-10.707
			(8.479)	(8.287)	(8.295)	(8.309)
Number of children below age 5				-11.028***	-10.924***	-10.947***
				(1.847)	(1.844)	(1.845)
Oblast in south					3.442	3.283
					(3.321)	(3.307)
Community in urban area					-6.649*	-7.006*
					(3.775)	(3.784)
Kindergarten in community					3.735	3.694
					(3.043)	(3.064)
Medium school education (husband)						-4.683
						(4.396)
Higher school education (husband)						-3.032
						(5.033)
Const.	9.289**	-23.599	-78.264*	-96.917**	-99.685**	-97.226**
	(4.442)	(23.480)	(45.350)	(43.940)	(43.103)	(44.019)
Observations	1,048	1,048	1,048	1,048	1,048	1,048

Source: Life in Kyrgyzstan (LIK) Survey, wave 2011, own calculations.
Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: Gender Attitude Items

Gender Attitude Items (Scale 1-4)	Liberal/ Traditional
I1: Important decisions should be made by the husband rather than the wife	T
I2: A man's job is to earn money; a woman's job is to look after the home and family	T
I3: A women is really fulfilled only when she becomes a mother	T
I4: A working women can establish just as warm and secure of relationship with her children as a mother who does not work	L
I5: A husband's career should be more important to the wife than her own	T
I6: A university education is more important for a boy than for a girl	T
I7: Both the husband and the wife should contribute to the household income	L

Source: Life in Kyrgyzstan Individual Questionnaire 2011

Notes: Items marked with T/L refer to items which are categorized as traditional (T) or liberal (l) items, meaning the respondent has a rather traditional/liberal attitude towards the role of females in the society.