

Living Arrangements and Labor Supply of Married Women: An Instrumental Variable Approach

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〈요약〉

This paper examines the effect of coresidence with one's parents or parent-in-laws on the labor supply of married women. Previous studies have consistently found that coresidence with parents is positively associated with the labor supply of married women. However, there is an increasing recognition that coresidence should be treated as endogenous because the choice of family structure and labor supply of married women are jointly determined. Using the Korean Labor and Income Panel Study (KLIPS) 2004, we construct the husband's birth order among siblings as a new instrumental variable (IV) for coresidence with parents. Our IV estimation results cast doubt on the argument that coresidence with parents has a significant positive effect on the labor supply of married women.

JEL Classification: J12, J22

Keywords: Birth Order, Coresidence, Female Labor Supply

1. Introduction

While there has been growing interests among economists in family decisions regarding intergenerational living arrangements, the issue of its effect on the labor supply of married women has been a neglected topic. Coresidence with one's own parents or in-laws has a

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significant effect on the labor supply of married women. Coresidence allows married women to reduce the burden of household work through the assistance of their parents or in-laws and thereby frees up time for market work. However, it may also reduce the labor supply of married women if married women spend time in taking care of their parents or in-laws. Furthermore, families probably prefer privacy of living independently, other things being equal. A priori, the effect of coresidence on the labor supply of married women is ambiguous. This study addresses this issue empirically.

Existing studies have focused on estimation of the relationship between parental care and employment decisions of the adult daughter. Initial analyses were generally based on models of labor market participation and parental care which treated each decision as exogenous (Stone and Short, 1990; Boaz and Muller 1992; White-Means, 1992). More recent research has recognized the joint nature of these decisions and used instrumental variables to address the endogeneity problem (Wolf and Soldo, 1994; Ettner, 1996; Pezzin and Schone, 1999; Sasaki, 2002). Since coresidence is an option that married women may choose married women's labor supply and coresidence with parents can be determined simultaneously. The results from these studies provide mixed evidence of labor supply in response to competing demands for married women's time.

This study examines the impact of coresidence with parents on the labor supply of married women, using the Korean Labor and Income Panel Study (KLIPS) 2004. To control for endogeneity problem, we use the husband's birth order as the instrumental variable (IV) for living arrangement. Intergenerational household structure is largely affected by cultural preferences. In East Asian countries such as Korea where traditional Confucian values and practices still persist, the cultural preference for living arrangements is that the eldest son or the son of lower birth order coreside with his parents. This cultural prescription along with son preference in intergenerational living arrangements makes us to use the husband's birth order as an instrument for coresidence with parents.

The main finding of this study is that a positive association between coresidence with parents and labor force participation of married women in OLS disappears when we control for endogeneity of coresidence decision. The instrumental variable estimation results suggest that a positive impact of coresidence with parents can be explained by a selection process, in which married women oriented for market work are more likely to decide to coreside with parents.

This paper is organized as follows. Section 2 discusses the empirical framework to control

for the potential endogeneity of intergenerational family structure. Section 3 describes the data used in this study. We suggest an instrument for the living arrangements and analyze its validity. Section 4 presents the estimation results. Section 5 concludes.

II. Empirical Framework

As noted before, the goal of this paper is to estimate the effect of coresidence with husband's parents on the labor supply of married women. To do so, we estimate the following labor supply equation

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i \quad (1)$$

where Y_i is a variable indicating labor supply of married women, X_i is a dummy equal to one if married woman i lives with her husband's parents, and ε_i is the error term. The coefficient of interest is β_1 . If coresidence with parents increases labor supply of married women, $\beta_1 > 0$.

In estimating equation (1), we face a problem. Coresidence with husband's parent would arguably be endogenous to the labor supply of married women. Unobservable attributes of married women that affect cohabitation might be associated with their unmeasured propensity to participate in the labor market. This implies that the error term () in the labor supply and coresidence with parents (X_i) are correlated. The OLS estimate of β_1 would be biased.

For example, married women who want to work in the market are more likely to reside with their parents if coresiding parents can provide services for home production such as childcare. In this case, one might find a positive relationship, even in the absence of a causal effect of labor supply on coresidence. Alternatively, the opposite may be true. If married women who have strong tastes for non-market work are also more inclined to coreside with their parents, one might find a negative correlation between labor supply and coresidence. In both of these cases, one would find a spurious relationship between labor supply and coresidence. The direction of the bias cannot be determined *a priori*. OLS estimates are upward or downward biased depending on whether ε_i is positively or

negatively correlated with X_i .

To address the endogeneity problem of living arrangements, we use an instrumental variable approach. An ideal instrument should be correlated with living arrangements but uncorrelated with all other factors that determine labor supply. We suggest our instrument and describe its property as a valid instrument in the next section. With such an instrument, we use a two stage least squares (2SLS) approach.

The first stage the coresidence equation uses ordinary least squares to predict the coresidence probability. The coresidence equation is expressed as

$$X_i = \gamma_0 + \gamma_1 Z_i + \nu_i \quad (2)$$

where Z_i denotes an instrument for living arrangements and ν_i is the error term. Using the predicted probability of coresidence, we estimate the labor supply equation in the second stage. The labor supply equation is expressed as

$$Y_i = \beta_0 + \beta_1 \widehat{X}_i + \varepsilon_i \quad (3)$$

where \widehat{X}_i is the predicted probability of coresidence from the first-stage regression. The labor supply equation may include a vector of other exogenous demographic and economic variables.

III. Data and Instrument

1. Data

This study uses data from the 2004 wave of Korea Labor and Income Panel Study (KLIPS). The KLIPS is a longitudinal survey of a representative sample of Korean households residing in urban areas. It has been conducted by the Korea Labor Institute since 1998. The KLIPS 2004 has information on 4,592 households and 11,543 individual household members. In addition to a wide array of socioeconomic and demographic variables, the KLIPS also provides detailed information on family structure, intergenerational relationships and labor market activities of each household member.

The sample consists of married women aged 25 to 55. Thus, respondents who are

divorced, separated, or widowed are excluded from the sample. For women aged 25-55, the average proportion of women with college education is about 27% shown in <Table 1>. In 2004, however, 78.9% of Korean female high school graduates go to college (including two-year college graduates) and the mean age at female first marriage is 27.5 years. Thus, we set age 25 as a lower bound to account for these facts. A sample restricted to female of younger ages tends to omit female who may postpone their marriage until their education is completed. Our choice of age 55 as an upper bound corresponds to labor market detachment of Korean female workers. The proportion of female workers aged 56 or above is only 16% of all female workers in 2004. Furthermore, including married women older than age 55 does not increase the sample size. A substantial portion of them do not have at least one living parent-in-laws.

To identify types of living arrangements, we need information on the family relations within a household. Like the CPS data in the United States, the KLIPS data are constructed in such a way that multiple families, related or unrelated, are intermingled in a household unit. Thus, exact matching of the husband and the wife as well as married children and parents are required to construct a sample. We first use household and spousal identification information to find all possible matches of the husband and the wife. Then, using information on family relationship, we identify whether a married son lives with his parents.

This study focuses on the relationship between labor supply of married women and coresidence with their husbands' parents. We dropped married women who live together with their own parents. Most coresiding married women live with their husbands' parents in our sample. Among the 2,217 matches of the husband and the wife, only 20 women coreside with their own parents (0.90% in the total sample and 8.20% in the coresidence sample).

After imposing restrictions and omitting married women who do not have relevant information, we obtained 2,197 sample observations. Using the sample of a wider span of ages does not significantly increase the sample size and does not affect the main results of this paper. Also, including in the sample the married women who live with their own parents does not change the main results of this paper.

<Table 1> presents some descriptive statistics of the sample by the labor market status of married women. Married women who participate in the labor market are 51.1 percent of the sample, while 48.9 percent do not work. Married women who live with their husbands' parents are 10.2 percent of the sample. The remaining 89.2 percent live independently.

Married women who participate in the labor market are more likely to coreside with their

husbands' parents than their non-working counterparts. Working married women show a higher rate of coresidence than non-working married women. The proportion of married women coresiding with their husbands' parents is 12.4 percent in the subsample of working married women, whereas the proportion of married women coresiding with their husbands' parents is 7.9 percent in the subsample of non-working married women.

〈Table 1〉 also shows some differences in economic and socioeconomic characteristics between families in which women are full-time housewives and those in which women participate in the labor market. First, housewives are on average younger than women who participate in the labor market, and they are more likely to have more children, especially children aged between zero and six years. This corresponds to the well-known pattern of female labor supply across age. Female labor force participation rate tends to drop among married women around birth-giving ages, and goes up among women in their late 30s and mid-40s when the burden of childbirth and childcare lessens. Second, married women who participate in the labor market tend to have lower educational attainment and slightly less total annual household income. They are more likely to have self-employed husbands and own their home.

〈Table 1〉 Descriptive Statistics: Married Women Aged 25-55

Variable	Total	Working	Non-working
Age	40,204 (7.768)	41,549 (7.301)	38,798 (7.994)
Education			
Middle school or lower	0.256 (0.437)	0.319 (0.466)	0.191 (0.393)
High school	0.476 (0.500)	0.446 (0.497)	0.507 (0.500)
College or higher	0.268 (0.443)	0.235 (0.424)	0.303 (0.460)
Log of annual household income (excluding wife's earnings)	7.710 (0.822)	7.589 (0.866)	7.836 (0.752)
Home ownership (=1 if owns home; =0 otherwise)	0.634 (0.482)	0.647 (0.478)	0.620 (0.486)
Self-employed husband (=1 if self-employed; =0 otherwise)	0.200 (0.400)	0.249 (0.433)	0.149 (0.356)
Number of children			
Total number of children	1.153 (0.947)	1.023 (0.941)	1.290 (0.934)
Number of children: age 6 or below	0.408 (0.672)	0.232 (0.520)	0.592 (0.759)
Coresidence with parents (=1 if coresiding; =0 otherwise)	0.102 (0.303)	0.124 (0.329)	0.079 (0.270)
Sample size	2197	1123	1074

Note: Numbers in parentheses are standard deviations of variables.

2. Husband's Birth Order as an Instrument for Living Arrangements

Differences in family structures in the United States and East Asia have been studied

extensively by many scholars. According to these studies, there are considerable differences in terms of family ties and living arrangements. The social norm in Western Europe and the United States has always been for the child to leave home for marriage. The traditional East Asian family has been described as a unit with strong patriarchal authority and patrilineal descent, in which one of the sons marries and continues to live with the parents while the other sons and daughters marry and go out of the family unit.

Family relationships involve many and sometimes contradictory elements, but two findings stand out from research on coresidence in the United States. First, coresidence is child centered. Early gerontological studies emphasized help by adult children to parents, but several newer studies found that the usual direction of assistance is from parents to children. A parallel conclusion can be drawn from research on coresidence. Many studies find that parents' needs do not predict coresidence as well as do corresponding measures of children's need. Another central aspect of the American pattern is its gender neutrality. Family theorists usually argue that daughters are assigned the key role in intergenerational support. But much recent studies find mixed effects of child's gender on coresidence.

In East Asian countries, the traditional pattern of coresidence is parent centered. This implies that parental needs and preferences were more important than child needs, fulfilling the deeply ingrained cultural mandate of deference to parents (Milagros et al., 1995). It is also highly gendered, with a strong preference for living with sons rather than daughters. Research in East Asia shows a strong preference for living with sons (See Arnold and Zhaoxiang (1986) for China and Park and Cho (1995) for Korea). Coresidence depends partly on the number of children, but the number of sons rather than the number of daughters is most important. Coresidence with a daughter is more likely in the absence of a son. In addition to preferences with respect to the gender of the coresiding child, there could also be cultural prescriptions with respect to the position of the son within the sibship. Traditionally, coresidence with a son of a higher birth order was less likely and importance was placed on the eldest son.

The shift away from a traditional family in East Asian countries would involve a movement toward a child-centered and gender-neutral pattern. Recent studies of levels and trends in coresidence in various East Asian countries suggest both a close bond between generations and a clear trend away from patterns in this region. New familial relationships emerge as traditional values and expectations give way to changing circumstances. Even if coresidence has been rapidly declining, however, people's choices about when and with

whom to reside could still be greatly influenced by traditional norms.

The mixture of traditional and emerging values in the pattern of intergenerational coresidence is well documented in our data. Only 10.2% of the married children in our sample reside with parents. This clearly shows a shift away from the traditional coresidence pattern. A family in which married child lives with their parents is not the representative family in Korea.

However, traditional norms still has a strong effect on the pattern of coresidence. As we mentioned, most of married couples reside with the husband's parents. Of the 246 samples living with parents, 226 couples live with the husband's parents and 20 couples live with the wife's parents. This indicates that there exists a strong cultural preference for living with sons rather than daughters.

Another surviving traditional norm in coresidence pattern is the importance placed on birth order. <Table 2> shows the relationship between the husband's birth order and the probability of coresidence. Higher the husband's birth order, the lower the probability of coresidence. The probability of coresidence is 15.49 percent among the eldest sons. It's interesting to note that the negative relationship between coresidence and birth order is also observed for the sample of the second birth or below.

<Table 2> Husband's Birth Order and Probability of Coresidence with Parents

Husband's birth order	Total		Non-Coresidence	Coresidence	Probability of Coresidence (B/A, %)
	Frequency (A)	Relative Frequency (%)	Frequency	Frequency (B)	
1	639	29.09	540	99	15.49
2	473	21.53	419	54	11.42
3	374	17.02	339	35	9.36
4	289	13.15	275	14	4.84
5	215	9.79	199	16	7.44
6	105	4.78	102	3	2.86
7	72	3.28	69	3	4.17
8 or below	30	1.37	30	0	0.00
Sample size	2197		1973	224	

Notes: Since frequency of birth order with 8 or below is very small, frequency in the last row of birth order (8 or below) is the sum of frequency for birth order from 8 to 12. Frequency in each birth order below 8 is less than or equal to 5.

It declines to 11.42 percent and 4.84 percent in the husband of the second birth order and the husband of the fourth birth order, respectively. The sample of the eldest sons accounts for about 29% while the sample of the second to fourth birth order for about 52%. In total, we have a monotonically decreasing pattern for about 80 % of the sample.

In fact, the variation in the probability of coresidence associated with birth order is not confined to the small fraction of sample.

[Figure 1] shows that there is a strong negative relationship between the husband's birth order and the probability of coresidence. It indicates that the husband's order of birth is correlated with the coresidence with parents, so called instrument relevance. Thus, findings in <Table 2> and [Figure 1] confirm that husband's birth order is a relevant instrument. Statistical test on the instrument relevance condition shown in the next section also confirms the conclusion based on <Table 2>.



[Figure 1] Husband's Birth Order and Probability of Coresidence

In addition, an instrument should be exogenous in labor supply equation. However, the exogeneity of a single instrument cannot be statistically tested. Following Angrist and Evans (1998), we check whether husband's birth order are randomly assigned for characteristics that can affect the labor supply of married women. In fact these characteristics are included as omitted variables in error terms of univariate labor supply regression equation. The second column of <Table 3> shows the correlation between the husband's birth order and the characteristics that determines the labor supply of married women. The husband's birth order is found to be significantly correlated with the married woman's educational attainment and the number of children aged 6 or below at the 5% level.

A husband of a higher birth order is more likely to marry a high school graduate and is

less likely to marry a woman with a college or higher degree. It also shows that the husband of a higher birth order have less young children aged 6 or below. It may be that older son tends to get married and have children earlier than his younger brothers. Although not reported here, the dummy variable indicating whether the husband is the eldest son shows statistically significant correlations with the married woman's educational attainment and the number of children aged 6 or below.

<Table 3> Correlations between the Husband's Birth Order and Characteristics of Married Women

Variable	Husband's birth order (including the eldest sons)	Husband's birth order (excluding the eldest sons)
Age	0.005 (0.831)	0.009 (0.710)
Education		
Middle school or lower	-0.011 (0.621)	-0.009 (0.725)
High school	0.050** (0.020)	0.028 (0.269)
College or higher	-0.046** (0.033)	-0.023 (0.360)
Log of annual household income (excluding wife's earnings)	0.027 (0.204)	-0.011 (0.678)
Home ownership (=1 if owns home; =0 otherwise)	-0.021 (0.315)	-0.032 (0.204)
Self-employed husband (=1 if self-employed; =0 otherwise)	0.031 (0.150)	0.007 (0.797)
Number of children		
Total number of children	0.031 (0.150)	0.030 (0.242)
Number of children: age 6 or below	-0.042** (0.048)	-0.038 (0.131)
Sample size	2197	1558

Notes: p-values are reported in parentheses.

** Significant at the 5 percent level

The statistically significant correlations of the husband's birth order with the determinants of married women's labor supply imply that the factors that affect a woman's decision to marry a son of a higher birth order, especially the eldest son, can also have an effect on her decision to supply labor.

A woman who married an eldest son, who tends to adhere to traditional values, is more likely to share the same value with her husband. To the extent that this value manifests itself through coresidence, it is possible that the unobservable propensity to coreside may be correlated with the propensity to participate in the labor market. This suggests another possible instrument for coresidence, the wife's birth order. The average of wife's birth order is 2.95 (std. 0.38) is not statistically different from husband's birth order. Interestingly, women with higher birth order are more likely to coreside with husband's parents, which

is statistically significant at the 5 percent level with and without controlling for husband's birth order. Note that wife's birth order is not correlated with husband's birth order. This implies that wife's birth order can be an instrument for coresidence with husband's parents. However, since we estimate wife's labor supply, the wife's birth order may be more likely correlated with her characteristics that may affect her labor supply than husband's order. In fact, wife's birth order is correlated with her age and education. Thus we also do not use wife's birth order as an instrument.

We exclude the eldest sons from the sample and reconstruct the husband's birth order. The third column of <Table 3> shows the correlation between the husband's birth order and the characteristics that determine the labor supply of married women. Surprisingly, there is no correlation between the husband's birth order and determinants of married women's labor supply in the sample excluding the eldest sons.

To be a valid IV, the IV has a correlation with coresidence with parents and is independent from the determinants of married women's labor supply. The husband's birth order has high correlation with coresidence with parents and it has no correlation with the determinants of married women's labor supply. Therefore, we use the husband's birth order among siblings as an instrument for living arrangements. In the next section we will perform formal tests on the relevance and exogeneity of the husband's birth order IV.

IV. Results

1 Main Results

<Table 4> presents estimates of the effect of coresidence on the labor force participation of married women. Columns (1) and (2) report the estimation results from the sample including the eldest sons while columns (3) and (4) report those from the sample excluding the eldest sons.

The OLS estimates of the coresidence dummy variable in columns (1) and (3) are 0.122 and 0.144, respectively. Both estimates are statistically significant at the 1% level. These estimates imply that the labor force participation rate of married women living with the husband's parent is 12.2% or 14.4% higher than non-coresiding married women, depending on the sample used.

OLS findings are also consistent with those of Sung and Chah (2001) that estimate the effect of coresidence on the labor supply of married women using KLIPS 1999.

(Table 4) Effect of Coresidence with Parents on the Labor Force Participation of Married Women: OLS versus 2SLS Estimation Results

	Husband's birth order (including the eldest sons)		Husband's birth order (excluding the eldest sons)	
	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Dependent variable: Labor force participation of married women				
Coresidence with parents	0.122*** (0.034)	-0.012 (0.268)	0.144 *** (0.045)	-0.738 (0.498)
Dependent variable in the first stage regression: Coresidence with parents				
Husband's birth order		-0.022*** (0.004)		-0.017*** (0.004)
Weak instrument test First stage F-statistic		50.370*** [0.000]		21.210*** [0.000]
Specification test H0: OLS vs. H1: 2SLS		0.260 [0.613]		3.820* [0.051]
Sample size	2197	2197	1558	1558

Notes: Numbers in parentheses are robust standard errors. Numbers in brackets are p-values for F-statistics in the weak IV and specification tests. Coefficient estimates for intercepts are omitted.

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

The results from the 2SLS estimation are reported in columns (2) and (4). We use the husband's birth order as an instrumental variable for coresidence to control for the endogeneity of coresidence. Before considering the 2SLS estimates, it is necessary to investigate the validity of instruments. First, we check the instrument relevance condition. Instruments that explain too little of the variation in the coresidence variable are called weak instruments. If instruments are weak, the normal distribution is a poor approximation to the sampling distribution of the 2SLS estimator, even if the sample size is large. We perform an instrument relevance test for husband's birth order. In the first-stage coresidence regression the coefficient estimates of the husband's birth order are -0.022 and -0.017 in columns (2) and (4), which implies that the husband's birth order is negatively correlated with coresidence (also shown in (Table 2)). The higher the husband's birth order, there is a significantly higher likelihood for married women to live with the husband's parents. F-statistics for the instruments in the first-stage regressions are 50.37 and 21.21, respectively, which are greater than the approximate cut-off of 10 for weak instruments suggested by Stock and Yogo (2005). The husband's birth order is not a weak IV in both samples.

We also perform specification test for the null hypothesis that OLS estimator is consistent and efficient. Since we allow heteroskedasticity-consistent standard errors, we use the auxiliary regression method instead of the Hausman test. If the coresidence variable is endogenous, two estimators of OLS and 2SLS seem to be significantly different. In contrast, the 2SLS estimator is less efficient than OLS when the explanatory variables are exogenous. Under the null hypothesis, the OLS estimator is consistent and efficient while the 2SLS estimator is consistent estimator under the alternative hypothesis. While, the F-statistic [p-value] in the sample including the eldest sons is 0.260[0.613] in column (2), it is 3.820[0.051] in the sample excluding the eldest sons. We cannot reject the null hypothesis when we use the husband birth order excluding the eldest sons. The results suggest that the instrument of the husband birth order without excluding the eldest sons is not exogenous if the coresidence variable is endogenous. (Unobservable) Characteristics of women married with the eldest son are different from other married women, which also affect their labor supply.

The 2SLS estimates of the effect of coresidence on the labor force participation of married women are -0.012 and -0.783, neither of which are statistically different from zero. Coresidence with husband's parent does not have any effect on the labor force participation of married women. Insignificance of the 2SLS estimators indicates that there is an endogeneity problem associated with intergenerational living arrangements. Unobservable attributes of married women that affect cohabitation are positively correlated with their unmeasured propensity to participate in the labor market. The OLS estimates are upward biased. This suggests a possibility that married women who are more likely to participate in the labor market tend to coreside with the husband's parents. The main results in (Table 4) are maintained when we include additional variables in the regression model.

(Table 5) presents the multiple regression results. The estimates of the additional explanatory variables are very similar in magnitude and significance level. As expected, the labor force participation rate of married women increases with age at a decreasing rate. The impact of education on the labor force participation does not show monotone increasing pattern. Labor force participation rates of high school graduates are lower than other groups. The estimates of other variables have the expected signs and statistically significant. Higher household income, having more children, and having younger children have negative effects on the labor supply of married women. On the other hand, having a self-employed husband are positively associated with the labor force participation of married

women. When the husband is self-employed, a married woman may be likely to supply her labor as a form of assistance to his business. These results are consistent the findings from previous studies on female labor supply.

(Table 5) Effect of Coresidence with Parents on the Labor Force Participation of Married Women: OLS versus 2SLS Multivariate Estimation Results

	Husband's birth order (including the eldest son)		Husband's order of birth (excluding the eldest son)	
	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Age	0.065*** (0,016)	0.065*** (0,016)	0.077*** (0,019)	0.080*** (0,021)
Age squared	-0.001*** (0,000)	-0.001*** (0,000)	-0.001*** (0,000)	-0.001*** (0,000)
Education				
High school	-0.050* (0,028)	-0.050* (0,028)	-0.049 (0,034)	-0.063* (0,037)
College or higher	0.002 (0,034)	0.003 (0,035)	-0.010 (0,041)	-0.026 (0,045)
Log of annual household income (excluding wife's earnings)	-0.081*** (0,013)	-0.080*** (0,014)	-0.086*** (0,017)	-0.093*** (0,018)
Home ownership (=1 if owns home; =0 otherwise)	-0.014 (0,022)	-0.019 (0,033)	-0.023 (0,027)	0.026 (0,046)
Self-employed husband (=1 if self-employed; =0 otherwise)	0.108*** (0,025)	0.107*** (0,026)	0.104*** (0,030)	0.117*** (0,033)
Number of children				
Total number of children	-0.033** (0,015)	-0.033** (0,016)	-0.045** (0,018)	-0.035* (0,020)
Number of children: age 6 or below	-0.159*** (0,020)	-0.160*** (0,021)	-0.156*** (0,024)	-0.144*** (0,028)
Coresidence with parents (=1 if coresiding; =0 otherwise)	0.104*** (0,034)	0.154 (0,251)	0.151*** (0,044)	-0.472 (0,458)
Adjusted R-squared	0.112	0.044	0.116	0.028
Sample size	2197	2197	1558	1558

Notes: Numbers in parentheses are robust standard errors.

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

The estimated effect of coresidence on labor force participation, when coresidence is taken as exogenous, is consistent with the results in (Table 4). Coresidence with parents has a significantly positive impact in columns (1) and (3). This effect becomes zero when coresidence is taken as endogenous. The 2SLS estimators in columns (2) and (4) of (Table 5) are not statistically significant. Thus, coresidence with the husband's parents does not have effect on the labor force participation of married women, even when controlling for other explanatory variables that may affect the labor supply of married women.

Previous studies consistently found that parental health status is an important determinant of coresidence. The only relevant variable in our data is a subjective health indicator provided by respondent, with categories "very poor," "poor," "fair," "good," and "excellent." Most of the respondents record their health status as "fair." When we include this as an additional explanatory variable, the estimate is not statistically significant.

2. Robustness Checks

To check the robustness of our estimates, we modify our empirical model and estimate the effect of coresidence on the labor supply of married women using several additional specifications. The results are reported in <Table 6> and <Table 7>. They show that our main results remain virtually unchanged.

<Table 6> presents the IV Probit estimation results. Since our measure of labor supply is a dummy variable indicating whether married women participated in the labor market, it is possible to use the Probit estimation. The Probit estimates of coresidence with parents are positive and statistically significant at the 1% level. However, as expected, the IV Probit estimates are not statistically different from zero. One exception is the IV Probit estimate from the baseline specification in the sample excluding the eldest sons. The point estimate is -1,589, which is marginally significant at the 10% level. However, even in this case, the bias of the OLS estimates resulting from endogeneity of living arrangement points to the same direction.

Another measure of labor supply commonly used is working hours. Since a substantial portion of married women work as part-time workers, the dummy for labor force participation may not represent properly the intensity of labor market activity of married women. <Table 7> presents the IV Tobit estimation results, in which we use weekly working hours of married women as dependent variable. The results from Tobit estimation mimic our main results. While the Tobit estimates of coresidence with parents are positive and statistically significant, all of the IV Tobit estimates are statistically insignificant.

〈Table 6〉 Probit Estimation Results: Labor Force Participation as Dependent Variable

	Husband's birth order (including the eldest son)				Husband's order of birth (excluding the eldest son)			
	(1) Probit	(2) IV Probit	(3) Probit	(4) IV Probit	(5) Probit	(6) IV Probit	(7) Probit	(8) IV Probit
Age			0.177*** (0.047)	0.176*** (0.047)			0.212*** (0.057)	0.200*** (0.058)
Age squared			-0.002** (0.001)	-0.002** (0.001)			-0.003*** (0.001)	-0.003*** (0.001)
Education								
High school			-0.132* (0.078)	-0.131* (0.078)			-0.133 (0.093)	-0.157* (0.089)
College or higher			0.021 (0.094)	0.025 (0.096)			-0.013 (0.112)	-0.052 (0.110)
Log of annual household income (excluding wife's earnings)			-0.228*** (0.038)	-0.225*** (0.041)			-0.239*** (0.047)	-0.233*** (0.049)
Home ownership (=1 if owns home; =0 otherwise)			-0.035 (0.062)	-0.048 (0.090)			-0.061 (0.074)	0.074 (0.110)
Self-employed husband (=1 if self-employed; =0 otherwise)			0.292*** (0.071)	0.289*** (0.073)			0.284*** (0.083)	0.290*** (0.081)
Number of children								
Total number of children			-0.088** (0.042)	-0.090** (0.043)			-0.127** (0.049)	-0.088 (0.057)
Number of children: age 6 or below			-0.445*** (0.061)	-0.447*** (0.061)			-0.443*** (0.071)	-0.367*** (0.100)
Coresidence with parents (=1 if coresiding; =0 otherwise)	0.310*** (0.090)	-0.027 (0.672)	0.291*** (0.094)	0.423 (0.693)	0.368*** (0.119)	-1.589* (0.861)	0.427*** (0.126)	-1.236 (1.026)
Log-likelihood	-1516.265	-1988.183	-1391.992	-1828.629	-1075.088	-1245.555	-983.5774	-1135.406
Sample size	2197	2197	2197	2197	1558	1558	1558	1558

Notes: Numbers in parentheses are standard errors. Coefficient estimates for intercepts are omitted.

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

(Table 7) Tobit Estimation Results: Weekly Working Hours as Dependent Variable

	Husband's birth order (including the eldest son)				Husband's order of birth (excluding the eldest son)			
	(1) Tobit	(2) IV Tobit	(3) Tobit	(4) IV Tobit	(5) Tobit	(6) IV Tobit	(7) Tobit	(8) IV Tobit
Age			6.095*** (1,844)	6.039*** (1,857)			7.744*** (2,260)	8.096*** (2,403)
Age squared			-0.076*** (0,022)	-0.075*** (0,023)			-0.097*** (0,028)	-0.101*** (0,029)
Education								
High school			-6.402** (3,004)	-6.356** (3,012)			-5.651 (3,597)	-7.161* (3,990)
College or higher			-3.029 (3,644)	-2.821 (3,727)			-3.694 (4,417)	-5.300 (4,838)
Log of annual household income (excluding wife's earnings)			-8.709*** (1,375)	-8.563*** (1,476)			-9.340*** (1,782)	-10.062*** (1,972)
Home ownership (=1 if owns home; =0 otherwise)			-2.342 (2,432)	-3.049 (3,549)			-3.691 (2,924)	1.599 (5,097)
Self-employed husband (=1 if self-employed; =0 otherwise)			13.259*** (2,706)	13.094*** (2,774)			13.909*** (3,195)	15.289*** (3,557)
Number of children								
Total number of children			-3.332** (1,627)	-3.438** (1,675)			-4.991*** (1,937)	-3.913* (2,212)
Number of children: age 6 or below			-19.460*** (2,483)	-19.560** * (2,511)			-20.012*** (2,933)	-18.758*** (3,222)
Coresidence with parents (=1 if coresiding; =0 otherwise)	15.414*** (3,754)	3.830 (29,155)	13.382*** (3,554)	20,755 (27,161)	17,459*** (5,011)	-76,581 (55,993)	18,169*** (4,714)	-48,667 (51,403)
Log-likelihood	-1516,265	-1988,183	-1391,992	-1828,62 9	-1075,088	-1245,555	-983,5774	-1135,406
Sample size	2197	2197	2197	2197	1558	1558	1558	1558

Notes: Numbers in parentheses are standard errors. Coefficient estimates for intercepts are omitted.

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

Taken together, results in (Table 6) and (Table 7) indicate that coresidence with the husband's parents is unlikely to have a positive effect on labor supply of married women.

V. Conclusion

This paper has explored the hypothesis that married women who reside with the husband's parents are more likely to participate in the labor market, taking account of the joint determination of family structure and labor supply. In order to correct for the potential

endogeneity of coresidence, we construct a new instrumental variable (IV) for coresidence with parents and estimate the coresidence effect on the labor force participation and labor supply of married women.

An interesting finding in this study is that married women are more likely to reside with the husband's parents if their husband is the son of lower birth order. This suggests that traditional values and practices still persist in modern Korea, in particular the cultural preference for living arrangements that the eldest son and the son of lower birth order are more likely to coreside with his parents. This cultural prescription along with son preference in intergenerational living arrangements makes us to use the husband's birth order as an instrument for coresidence with parents.

This study shows that the positive effect of coresidence on labor force participation found in previous studies in which coresidence was treated as exogenous disappears after correcting for the endogeneity of coresidence. This result casts doubt on the argument that coresidence with parents has a significant positive effect on labor supply of married women. It also suggests that married woman who tends to participate in the labor market are likely to reside with her husband's parents who could provide household goods and services.

Cultural origin matters in the pattern of intergenerational living arrangements. This explains why most existing studies have focus on the labor supply of daughters who reside with and provide assistance to their elderly parents. It remains to be verified whether the results from Korean married women has general applicability to other countries with different cultural preferences for cohabitation with parents.

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