A Substitute for Mother : Firstborn Daughters in Korea

By

SHIN, Songyi

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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: Firstborn Daughters in Korea

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Thesis

ABSTRACT

I examine the causal relationship between the firstborn child's sex and the mother's time spent on home and work responsibilities. Using the Korean Longitudinal Survey of Women and Families (KLoWF), the empirical strategy in this paper exploits the randomness of the firstborn child's sex in a fixed-effect model. I demonstrate that the firstborn daughter (1) lightens the working mother's domestic responsibilities and (2) offsets the negative impact of additional childbirth on the mother's working hours. Both findings are consistent with the hypothesis that the firstborn daughter substitutes for the mother in carrying out domestic tasks.

Keywords: child gender effect, firstborn, daughter, gender socialization, domestic responsibilities, married women's labor, double burden, fixed-effect model, Korea

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I. Introduction

Housework is an inseparable burden in a woman's life. The gender imbalance in family and home responsibilities not only exists between partners but also persists through generations. According to the 2019 Korean Time Use Survey, women with a male breadwinner spend five and half hours per day on domestic tasks while wives in dual-earner couples spend three hours on average. In contrast, men in either type of the households shoulder the same workload, 50 minutes. Unlike the husbands', daughters' workloads are responsive to mothers' employment status. Underage girls older than ten participate in more intra-house tasks when the adult woman is in the workforce. This cross-sectional evidence provides a clue that the female minor may substitute the adult female's place.

Does the daughter alleviate the domestic burden of the employed mother? If so, can this effect lead to an improvement in labor market outcomes? To verify the causality, I take advantage of the random variation of the first child's sex, exploring two decisive life events in one's life: employment and childbirth. The findings at each event will consistently support that the first daughter acts as a substitute for the married woman in performing domestic responsibilities.

The child gender effect has been captured in terms of various parental behaviors including marital status (Dahl & Moretti, 2008), father's involvement (Lundberg et al., 2007), men and women's working hours (Lundberg & Rose, 2002; Lundberg, 2005; Ichino et al., 2014), and parental investment (Barcellos et al., 2014; Song, 2018). Extensive literature, on the other hand, has analyzed the asymmetric distribution of domestic workload between partners (Becker, 1965; Lundberg & Pollak, 1996; Bianchi et al., 2000; 2012). The theoretical frameworks on mothers' labor supply also emphasize the existence of a secondary caregiver, such as husbands and daycare

(Heckman, 1974; Graham and Green, 1984; Blau & Robins, 1988; Connelly, 1992). However, relatively little scholarly attention has been paid to the relationship between a child's gender and a married woman's domestic burden.

Researchers have suggested plausible mechanisms of the child gender effect, such as the son preference, the child production function, and the long-term childcare cost (Dahl & Moretti, 2008; Lundberg, 2005). In South Korea, Choi and Hwang (2015; 2020) have substantiated parental sex preference through cross-sectional analyses on additional fertility decisions, private education expenditure, mother's employment status, and child's housework time. Kang (2011) also found evidence of son preference based on the negative impact of large family size on the education expenditure for daughters. Under those hypotheses, the children's role remains as a care receiver rather than a caregiver or housework provider.

This study adds the 'gender socialization' concept to the prior works as another conceivable hypothesis of the underlying mechanism. According to social psychologists, girls and boys adopt distinct gender norms in their childhood from the family and society (Stockard, 1999; Leaper & Friedman, 2007). The divergent norm induces daughters to be demure (Adler et al., 1992) and devote themselves to housework (Larson and Verma, 1999; Crouter et al., 2001). The vast majority of empirical studies also support that children's time usage in domestic responsibilities differs depending on the sex (Blair, 1992; Manke et al., 1994; Evertsson, 2006; Webbink et al., 2011; Álvarez & Miles-Touya, 2012; Hu, 2015). Through this channel, a daughter would be given the possibility to perform as a secondary unpaid supplier in the household production function, affecting the mother's workload at home.

Whether the daughter acts as a substitute for the mother in carrying out domestic responsibilities is a meaningful question in terms of public policy concerning labor, women, and

child's development. Family and home duties have been a primary constraint to the empowerment of working women (Blau & Khan, 2013). Conversely, a woman's employment status negatively affects her ability to carry out family responsibilities, which in turn affects the children's welfare (Baum II, 2003; Bernal, 2008; Ruhm, 2004). The child gender effect sheds light on this interplay. In particular, South Korea is a country where women's labor participation has drastically surged; however, gender-egalitarian awareness has not yet kept pace with the growth in women's labor participation[1]. The daughter-son difference in South Korea provides worthwhile insight into what should be considered in the inclusive development strategy for women.

The rest of this paper comprises five more parts. Sections II and III illustrate the data and empirical strategy used in the study. Sections IV and V discuss the analyses of the child gender effect on the mother's double burden. Finally, Section VI summarizes the findings and states the limitations of the study.

II. Data

This study exploited datasets from the Korean Longitudinal Survey of Women and Families (KLoWF). In 2007, the Korean Women's Development Institute extracted 9,068 households from all over the country to collect a representative sample[2]. The survey targeted all women between the ages of 19 and 65. The institute conducted the second survey in the following year, and since the third one, it has tracked down the respondents every two years. In the sixth wave of 2016, it enlarged the sample with additional female members from 2,049 new households in order to

[1] In 2020, Korea ranked 108th out of 153 countries in Gender Gap Index (World Economic Forum; 2020).
[2] The sampling process followed the Stratified as well as Systematic Sampling. Census in 2005 was used as the frame. The selection process considered the following characteristics of districts; its urbanization degree, the ratio of workers by industry, the ratio of households by housing type, the number of household members, the age of householder, the sex of householder, and the number of households by district and province. (Korean Women's Development Institute, 2020)

maintain a representative sample[3]. As of 2020, the survey has been conducted seven times, targeting a total of 15,525 individuals. The attrition rate has remained under 30% in all the waves.

KLoWF has several advantages. Firstly, it maintains a relatively larger sample of females than other similar-sized datasets targeting both men and women. Secondly, KLoWF provides the data about time spent on the house- and care-work. The household chores include cooking, washing dishes, doing laundry, grocery shopping, and cleaning. Care-work means childcare for preschool children under six. Lastly, KLoWF serves as an additional retrospective data on births beyond the survey period. The delivery record includes all the childbearing experiences in one's life until the last survey year. It allows capturing children's age and sex precisely along with the birth order.

In this paper, I merged the seven waves of the panel data with the delivery record to estimate the first daughter's effect on the mother's double burden. While the former provides mothers' time use information, the latter records her children's sex and birth year. Among 14,343 participants in the survey, 10,854 gave birth to at least one child. Women with an adult eldest child were excluded. The full sample of this study consists of the 5,367 mothers whose first child was born in or after 1991 when there was no evidence of sex-selective abortion for firstborns in Korea (Choi & Hwang, 2015; 2020). Table 1 displays the descriptive statistics of the complete set of respondents.

[3] Due to a panel survey's characteristics (e.g., attrition, refusal to respond), managing a representative sample over time required an additional sampling. The additional sampling process used the Census in 2015 as its frame.

Table 1. DESCRIPTIVE STATISTICS FOR MARRIED WOMEN WITH CHILDREN

	Full		First Daughter		First Son	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.
Sample Size	5367		2581		2786	
Num of Survey Participation	5.81	1.88	5.82	1.89	5.80	1.88
Key Var.						
Time on Domestic Tasks (min/day)	285.28	235.50	290.31	238.55	280.55	232.52
Working Hour (Unemployed=0)	17.23	22.51	17.08	22.43	17.37	22.58
Working Hour (no unemployed)	40.68	15.57	40.64	15.48	40.71	15.65
Prob. Employed (%)	70.54		70.62		70.48	
Demographic Var.						
Age	38.13	5.41	38.00	5.34	38.25	5.48
Education (%)						
Below Elementary School	0.15		0.08		0.22	
Elementary School	0.60		0.70		0.50	
Middle School	2.72		2.52		2.91	
High School	47.50		47.52		47.49	
University Or Higher	49.78		49.96		49.61	
Region (Province, %)						
Seoul	14.96		14.80		15.11	
Busan	7.29		7.56		7.04	
Daegu	6.37		5.97		6.75	
Incheon	7.38		8.25		6.57	
Gwangju	5.12		4.92		5.31	
Daejeon	5.50		5.11		5.85	
Ulsan	4.64		4.61		4.67	
Gyeonggi	17.83		17.98		17.70	
Gangwon	4.32		3.95		4.67	
Chungcheong	9.93		10.07		9.80	
Jeolla	8.44		8.87		8.04	
Gyeongsang	12.58		12.24		12.89	
Jeju	3.60		3.41		3.77	
Sejong	0.26		0.31		0.22	
Child						
Num of Children	1.89	0.67	1.94	0.70	1.85	0.63
Num of Preschooler	1.40	0.56	1.41	0.57	1.39	0.55
Private Education Cost (10,000 ₩)	53.87	46.09	53.94	45.83	53.81	46.34
Age of Firstborn	10.55	4.88	10.45	4.90	10.64	4.87
Daycare Using (hour per day)	2.51	4.17	2.64	4.28	2.39	4.06
Husband						
Prob. Married (%)	98.90		99.02		98.79	
Prob. Employed (%)	93.36		92.96		93.74	
Time on Domestic Tasks (min/day)	25.25	56.02	25.84	55.52	24.70	56.49
Age	40.80	5.66	40.67	5.62	40.92	5.70
Education (%)						
Below Elementary School	0.06		0.04		0.07	
Elementary School	0.56		0.53		0.60	
Middle School	2.45		2.15		2.73	
High School	36.55		36.57		36.53	
University Or Higher	61.31		61.61		61.04	
Household						
Yearly Household Income (10,000 ₩)	4457.7	2498.7	4485.1	2430.8	4432.0	2560.7
Prob. Having A Helper (%)	50.46		50.52		50.41	

Note: 'Full sample' contains all married women in the sample with at least one child as well as the firstborn in or after 1991. The second and third columns consist of the mothers whose firstborn child is a girl, and a boy, respectively.

III. Empirical Strategy

As in preceding literature (Lundberg, 2005; Dahl & Moretti, 2008; Choi & Hwang, 2015), this study capitalizes on the exogeneity of the firstborn's sex only[4]. To guarantee its randomness awarded by nature, I limited the sample to mothers who had their first childbirth in or after 1991, following Choi & Hwang (2015; 2020). Thus, the primary independent variable is a dummy for the firstborn's sex, equal to one if the child is a female. Given that the child gender effect on parental behavior is nonmonotonic along with the birth order (Lundberg & Rose, 2002), the result of the following estimation should be read as the first daughter effect rather than the general effect of daughters.

The fixed-effect model below measures the effect of the firstborn girl on employed mother's intra-household work time:

$$Housetask_{it} = \alpha_0 + \alpha_1 Firstgirl_i \cdot Employ_{it} + \alpha_2 Employ_{it} + X'_{it} + \mu_i + T_t + \varepsilon_{it} \quad \dots (1)$$

where the subscript *i* refers to each female subject, and *t*, survey wave. The dependent variable, $Housetask_{it}$ is the average minutes each individual spends on the house- and care-work on a weekday. Observations with more than 1,440 minutes were dropped. $Firstgirl_i$ is a dummy equal to one if the eldest child is a girl. $Employ_{it}$ is also a dummy for employment status. It is equal to one if the subject i has a job in a wave *t*, otherwise zero. A continuous variable, $Workhour_{it}$, which indicates the average working hours per week (zero if unemployed), was also used in the

[4] In contrast to the firstborn's sex, the randomness of the later-born children's sex is controversial. It often correlates with the sex of the previous children. (Dahl & Moretti, 2008; Choi & Hwang, 2020)

place of $Employ_{it}$. X'_{it} indicates a vector of time-variant control variables. μ_i and T_t capture individual and time fixed effects, respectively.

The coefficient α_2 measures the impact of being employed on the domestic chores. Then, the estimates for α_1 capture whether the first daughter furthers or offsets that impact. If the sign is statistically significantly negative, it implies that married women with the firstborn daughter cut down the unpaid working time more than the mothers with the firstborn son when they work outside (or when they increase the working hour, in case of using $Workhour_{it}$).

To assess the first daughter effect on the mother's workforce related to the domestic responsibilities, I adjusted an existent strategy that Lundberg and Rose (2000) previously invented to measure the childrearing effect. The regression equation below examines whether the firstborn's sex matters after an additional birth-giving:

$$Employ_{it} = \beta_0 + \beta_1 \, Firstgirl_i \times Newborn_{it} + \beta_2 \, Newborn_{it} + X'_{it} + \mu_i + T_t + \varepsilon_{it} \quad \dots (2)$$

where *i* and *t* mark an individual and survey wave, respectively. $Newborn_{it}$ is a dummy splitting the period fore-and-aft the additional birth-giving (the birth of firstborn's younger sibling). It has a value of one for the survey waves after the birth, and a value of zero otherwise. Other terms indicate the same concept as in Equation (1). To overcome the endogeneity between extra fertility and first child's sex[5], the sample was limited to those who gave second or later birth during the survey period and were observed at least one time before as well as after the birth-giving. The

[5] On average, girls have more siblings than boys (i.e., son-biased fertility stopping rule). In this sample also, the firstborn girls have statistically significantly more siblings. In the simple regression of the number of children on the firstborn's sex (girl=1), the coefficient is 0.1 with t-statistics, 5.75.

respondents who gave two or more births during the given period were also excluded to rule out the consecutive fertility impact.

While the coefficient β_2 measures the effect of the additional fertility, β_1 reports the heterogeneity of that effect across the first child's sex. As married women cut down their labor supply due to the second (or later) birth-giving, the first daughter may alleviate or exacerbate that negative impact. In a case where the estimate for β_1 is statistically significantly positive, it suggests that the first daughter alleviates the labor participation reduction owing to the increasing family responsibility after the arrival of her younger sibling.

IV. Result

Table 2 presents the estimation results of Equation (1). Columns differ across the inclusion of control variables and adult children. Columns (1), (2) and (3) contain the observations only when the first child is minor. Column (4) does not restrict the age so that it incorporates the effect of the adult firstborn daughter living together. The top half of the table illustrates the outcomes using a dummy regressor, $Employ_{it}$. The bottom half reports the estimates with the continuous variable, $Workhour_{it}$. The full set of control variables comprises information of individual, children, husband, and household.

The result demonstrates that the firstborn girl eases the intra-house task of a working mother more than the firstborn boy. In Column (3), the first daughter effect –during underage years– is statistically significant at the 5 percent level. When a mother goes to work, her time spent on housework correspondingly decreases by about 75 minutes per day. At the same time, if she has a girl as the eldest child, she reduces the time by about additional 20 minutes more per day. In

Column (4), the effect persists as well with the continuous term, $Workhour_{it}$., at the 10 percent significance level. If a mother extends her working time by one hour per week – that is, about 8.6 minutes per day, the intra-household task is cut down by 1.7 minutes per day. Meanwhile, relative to a mother with the first son, a mother with the first daughter cuts down the time by about additional 0.4 minutes.

Table 2. MOTHER'S TIME USAGE IN DOMESTIC RESPONSIBILITIES

	(1) Underage	(2) Underage	(3) Underage	(4) +Adult
First Daughter × Employed	-19.84**	-19.55**	-20.35**	-19.82**
	(9.58)	(9.45)	(9.75)	(9.58)
Employed	-80.44***	-74.47***	-75.68***	-74.45***
	(6.63)	(6.52)	(6.81)	(6.66)
Num of Individuals	5362	5362	5101	5123
Num of Obs	20141	20128	19006	19337
First Daughter × Working hour	-0.35*	-0.36*	-0.38*	-0.38*
	(0.21)	(0.20)	(0.21)	(0.21)
Working hour	-1.72***	-1.61***	-1.67***	-1.63***
	(0.14)	(0.14)	(0.14)	(0.14)
Num of Individuals	5358	5358	5097	5119
Num of Obs	20087	20074	18955	19286
Control for Demo.	Y	Y	Y	Y
Control for Child	N	Y	Y	Y
Control for Household	N	N	Y	Y

Note. Standard error in the parentheses is clustered at the individual level. *, **, and *** indicate the 10%, 5%, and 1% significance level. The sample contain only the mother whose firstborn is minor, except Column (5) where co-residing adult firstborn is also included. Individual, region, and time fixed effect are controlled in all regressions. The demographic control variables consist of age, age squared, and dummies for education level. The child information control variables comprise the number of children, private education expenditure, firstborn's age, age squared. The household information control variables include dummies for marital status, age of husband, age squared, dummies for husband's education level, a dummy for husband's employment status, a dummy for existence of intra- or extra- family helper, and log of yearly household income.

Table 3 reports the estimated coefficient in Equation (2). Five hundred eighty-five additional births were observed during the survey. Among those, 454 were second-born, 117 were third-born, and 19 were fourth- or later-born. Columns (1) and (3) ignore the birth order and include all 585

childbirths. Referring to the heterogeneity in childrearing impact across the birth order (Lundberg & Rose, 2002), Columns (2) and (4) restrict the sample to the mothers who had their second childbirth. The left half of the table shows the extensive margin, using $Employ_{it}$ as the dependent variable. The right half displays the intensive margin, running the regression on the $Workhour_{it}$ and including only working mothers in the sample. As in Lundberg and Rose (2000), the control variables consist of age, education, region, and year.

Table 3. MOTHER'S LABOR PARTICIPATION AFTER ADDITIONAL FERTILITY

	Extensive Margin		Intensive Margin	
	(1) All	(2) Secondborn	(3) All	(4) Secondborn
First Daughter × After New Born	-0.01	0.01	3.92**	4.41**
	(0.03)	(0.04)	(1.96)	(2.22)
After New Born	-0.12***	-0.13***	-3.57**	-5.00**
	(0.03)	(0.03)	(1.75)	(2.07)
Num of Ids.	585	454	346	259
Num of Obs.	2934	2183	1010	740
Full Control	Y	Y	Y	Y

Note. Standard error in the parentheses is clustered at the individual level. *, **, and *** indicate the 10%, 5%, and 1% significance level. The sample contain only the mother whose firstborn is minor. Individual, region, and time fixed effect are controlled in all regressions. Full control variable set consists of the mother's and firstborn's age, age squared, and dummies for education level.

In Columns (1) and (2) for the extensive margin, the boy-girl difference is not detected. Although the additional birth-giving statistically significantly lowers mothers' probability to work outside, the first daughter neither strengthens nor weakens that impact. At the intensive margin for working mothers, however, the first daughter effect appears. While the newly born baby decreases working hour by 4 hours per week, the firstborn girl increases the mother's working hours enough to offset the sibling's birth impact. The coefficients are statistically significantly positive at the 5 percent level. The result is robust with or without the control variable.

The findings in Tables 2 and 3 are both consistent with the 'gender socialization' hypothesis. Under the hypothesis, one can state that the first daughter encourages mothers' working hours after the sibling's arrival by alleviating the intra-house caregiving burden. Since each equation exploits distinct variation—working status and additional fertility, the two outcomes cannot be directly related or entirely prove the mechanism. What can be affirmed is that the first daughter effect is valid in two specific circumstances, and the two results consistently support the gendered behavior of the first daughter.

V. Discussion

i) Subsample Analysis: Age of the Firstborn

A subsample analysis by the firstborn's age gives indicative evidence toward the hypotheses on the underlying mechanism. The left half of Table 4 depicts the estimation outcome of Equation (1) across the subsamples. Columns (1), (2) and (3) limit the first child to be 0-6, 7-14, and 15-18 years old, respectively. Other than the sample restriction, are all equal.

One intriguing point here is that the first daughter effect mostly stems from the age between 7 and 14. The maternal effort is more required in early childhood than in other periods. If either the differential care demand (child production function hypothesis) or the discriminatory time investment (son preference hypothesis) leads to the boy-girl difference, the difference is more likely to occur during children’s preschool years. Most of the literature on those two hypotheses also finds their evidence from early childhood under seven (Choi & Hwang, 2015; Lundberg, 2005). On the other hand, Webbink et al. (2011) and Crouter et al. (2001) found that the age span from 7 to 14 is a period when girls' participation in the housework is significant. The fact that the

first daughter effect emerges after preschool age supports gender socialization as the best fit hypothesis for the finding in Equation (1).

Table 4. SUBSAMPLE ANALYSES
: MOTHER'S TIME USAGE IN DOMESTIC RESPONSIBILITIES

	Firstborn's age			Having Preschooler	
	(1)	(2)	(3)	(4)	(5)
	0-6	7-14	15-18	With Preschooler	Without Preschooler
First Daughter	7.36	-39.57***	-7.11	-50.72**	-13.04
× Employed	(32.96)	(13.51)	(16.13)	(23.91)	(8.58)
Employed	-140.42***	-61.06***	-47.95***	-86.44***	-41.87***
	(24.80)	(9.04)	(8.44)	(17.89)	(5.60)
Num of Individuals	2031	3612	2682	2432	2998
Num of Obs	4398	9718	4890	6148	8364
First Daughter	0.08	-0.85***	-0.08	-1.06*	-0.16
× Working hour	(0.83)	(0.30)	(0.30)	(0.56)	(0.18)
Working hour	-3.40***	-1.35***	-0.90***	-2.05***	-0.98***
	(0.61)	(0.20)	(0.18)	(0.41)	(0.12)
Num of Individuals	2027	3605	2682	2429	2997
Num of Obs	4386	9690	4879	6134	8342
Num of Children	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2
Full Control	Y	Y	Y	Y	Y

Note. Standard error in the parentheses is clustered at the individual level. *, **, and *** indicate the 10%, 5%, and 1% significance level. In Column from (1) to (3), the sample is limited to the observations during the firstborn's age 0-6, 7-14, and 15-18, respectively. In Column (4) and (5), the observations are split into two groups; mothers having at least one preschooler younger than the firstborn in the household, or not. The sample contains only the mother whose firstborn is minor. In Column (4) and (5), it is also limited to the mothers with two or more children. Individual, region, and time fixed effect are controlled in all regression. The demographic control variables consist of age, age squared, and dummies for education level. The child information control variables comprise the number of children, private education expenditure, firstborn's age, age squared. The household information control variables include dummies for marital status, age of husband, age squared, dummies for husband's education level, a dummy for husband's employment status, a dummy for existence of intra- or extra- family helper, and log of yearly household income.

ii) Subsample Analysis: Household with or without a Preschooler

Another subsample analysis utilizing the youngest child's age allows identifying in which part of the household production the first daughter effect arises—house chores or caregiving. Due to

the data limitations[6], the time usage variable does not differentiate between the two domestic burdens. Instead, the subsample analysis splits the respondents into two groups –mothers who have a preschooler younger than their firstborn and those who do not. KLoWF defines care-work as the time spent on children under six only. Thus, the domestic responsibilities of women without preschoolers only include house chores while the other group incorporates both house chores and caregiving. Since the observation in this analysis is limited to the mothers with at least two children, the presence of preschoolers in the household depends on the age of the firstborn's youngest sibling instead of the firstborn's age.

According to the right half of Table 4, most of the first daughter effect appears in caregiving activity rather than house chores. The female respondents in Columns (4) have at least one preschooler other than the first child in the household whereas the respondents in Columns (5) do not. The former group exhibits statistical significance in the same way as the full sample in Table 2. On the other hand, the latter group, whose children are all over six, does not show any daughter-son difference. The first daughter effect only occurs in the household where the married women rear at least one preschool child younger than the firstborn. Conversely, the effect does not arise in the household where there is no need to care for a preschooler.

iii) Robustness Check: Using a Different Dependent Variable

For robustness check, the dependent variable in Equation (1) is swapped with several possible time-variant omitted variables while keeping the right-hand side. This trial examines the existence of a third party who possibly takes on the domestic task instead of the first daughter. In other words, it tests whether working mothers reduce their task by passing it onto someone other

[6] Since the survey started to differentiate the two activities since the 4th wave, the regression on the two dependent variables – house chores and childcare– cuts down the number of available survey waves in half.

than the eldest girl. If the third party's time usage reacts considerably to the firstborn's sex as well as the mother's employment status, it implies an omitted variable bias in Equation (1). However, if none of the possible candidates is affected by the interaction term, it supports the causal inference's robustness. That is, the first underage child rather than any other adults leads to the daughter-son difference on the mother's domestic responsibilities.

Table 5. INTRA- OR EXTRA-FAMILY PROVIDER OTHER THAN MOTHER

	(1) Husband	(2) Parents	(3) Helper	(4) Daycare	(5) Mother
First Daughter	-0.769	-0.002	0.000	0.008	-20.410**
× Employed	(2.440)	(0.005)	(0.003)	(0.187)	(9.619)
Employed	9.913***	0.003	-0.001	0.538***	-77.836***
	(1.775)	(0.004)	(0.002)	(0.134)	(6.775)
Num of Ids.	5096	5101	5101	5101	5096
Num of Obs	18971	19006	19006	19006	18971
First Daughter	-0.0310	0.000	-0.000	-0.001	-0.377*
× Working hour	(0.0571)	(0.000)	(0.000)	(0.004)	(0.210)
Working hour	0.233***	-0.000	0.000	0.012***	-1.725***
	(0.0368)	(0.000)	(0.000)	(0.003)	(0.144)
Num of Ids.	5093	5097	5097	5097	5093
Num of Obs.	18921	18955	18955	18955	18921
Full Control	Y	Y	Y	Y	Y

Note. Standard error in the parentheses is clustered at the individual level. *, **, and *** indicate the 10%, 5%, and 1% significance level. The sample contain only the mother whose firstborn is minor. Individual, region, and time fixed effect are controlled in all regressions. The demographic control variables consist of age, age squared, and dummies for education level. The child information control variables comprise the number of children, private education expenditure, firstborn's age, age squared. The household information control variables include dummies for marital status, age of husband, age squared, dummies for husband's education level, a dummy for husband's employment status, a dummy for existence of intra- or extra-family helper, and log of yearly household income. Additional to the full control variable set, the regression in Column (5) includes four more control variables; the husband's average time spending on domestic tasks per weekday, a dummy for getting help in housework from parents or in-law, a dummy for hiring a helper or babysitter, and the average hour of using daycare per weekday

Based on the prior literature, there are four conceivable third parties who can substitute for the mother in performing housework: the husband (Lundberg, 2005), parents or parents-in-law (Sasaki, 2002; Maurer-Fazio et al., 2011), an extra-family helper or babysitter (Ribar, 1992), and

a daycare center (Connelly, 1992). Table 5 exhibits the regression result of Equation (1) with four new regressands. In each column from (1) to (4), The dependent variable is replaced with the husband's average time spending on domestic tasks per weekday, a dummy for getting help in housework from parents or in-law, a dummy for hiring a helper or babysitter, and the average hour of using daycare per weekday, respectively. None of the estimates in those columns is statistically significantly different from zero. Neither the intra- nor the extra-family adult shares particularly more burden just because the working mother's firstborn is a girl. The one who absorbs the reduced burden is the first daughter. Column (5) shows that the original regression result of Equation (1) is robust even after including all four above as control variable.

VI. Conclusion

This paper aimed to identify the first daughter effect on married working women's intra-house tasks and her labor supply after additional birth-giving. As a source of causal inference, the fixed-effect model and the randomness of the firstborn's sex were capitalized. In the estimation result, the firstborn daughter contributes to the mother’s domestic responsibility reduction when the mother goes to work –about 20 minutes more per day than the firstborn son. Also, a mother can alleviate the negative impact of the additional fertility on the working hours if her eldest child is a girl. Both findings are consistently justified by the gendered behavior of the first daughter.

In addition, the subsample analyses and robustness checks provide more evidence in favor of the hypothesis. The subsample analyses reveal that most of the first daughter effect emerges when the child is between the ages of 7 and 14 and when a preschooler is present in the household. Altering the dependent variable suggests that the first daughter effect does not result from any

other intra- or extra-family adult's behavior. Those supplementary analyses are all consistent with girls' housework provision.

This study intended to elucidate the nexus between the women's housework, childrearing, and labor participation. It extends the discussion of the preceding literature. Abundant literature has demonstrated that girls behave differently from boys in the household. At the same time, numerous papers have shown that mother's working hour allocation depends on the child's sex. My findings affirm the prior findings and serve as a causal bridge between them.

The empirical strategy and interpretation of this research have limitations. For example, it did not directly measure the time usage of the firstborn. To clearly prove the hypothesis, there is a need for a more explicit estimation of the relationship between parents' and children's time usage. Also, it did not investigate the heterogeneity across the birth order. The child gender effect revealed in this paper may not be present in later-ordered children. Subsequent research could address those limitations and identify more precisely the underlying mechanism.

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