Estimating Labor Supply Elasticities in Korea : the Role of Limited Commitment between Spouses

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본 연구는 가구 내 소비 배분이 가구원의 가구 내 협상력에 따라 변동하는 것을 고려하여 노동공급 탄력성을 추정해야 과소추정(underestimation) 문제를 해결할 수 있다는 Bredemeier et al. (2023)의 방법론을 차용하여 한국의 노동공급 탄력성을 추정하고자 한다. 한국노동패널(2008-2022) 자료를 이용하여 가구 내 관찰되는 다양한 소비 종류를 통제하여 분석한 결과, 한국의 남성 노동공급 탄력성은 약 0.93으로 추정되었다. 이는 소비를 아예 통제하지 않거나 가구의 전체 소비만을 통제했을 때보다 평균적으로 0.2 높게 추정됨을 확인하였다. 반대로 여성의 경우 편의(bias)가 전반적으로 유의미하게 나타나지 않았다. 개인 특성을 기반으로 한 여러 부집단에 대한 분석에서도 유사하게 나왔다.

주요용어 : 노동공급 탄력성, 제한적 약속

Ⅰ. Introduction

Despite the importance of estimating labor supply elasticity being emphasized in both macroeconomics (see Chang and Kim (2006)) and microeconomics (see Pencavel (1986)), the issue in terms of the magnitude of the elasticity has been controversial. In particular, estimates can be biased depending on different household characteristics and preferences over time (see Keane and Rogerson (2015)): Bredemeier et al. (2019) showed that ignoring borrowing constraints yields upward-bias in the estimated labor supply elasticities. Bredemeier et al. (2023) further argued that it is important to consider different bargaining positions within a household by using the distribution of different types of consumption bundles as a proxy for bargaining power when estimating the elasticity because of the limited commitment between married couples.

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In this paper, I examine if the recent finding by Bredemeier et al. (2023) can be applied to the context of South Korea (hereinafter Korea).[1] In particular, this paper estimates the Frisch labor supply elasticity in Korea by considering the existence of limited commitment under married households. Adopting the idea of Bredemeier et al. (2023) in estimating Korea's labor supply elasticity seems crucial by the following reasons. Korea is a unique country in that despite striving economic development, gender inequality such as wage gap and difference in participation rate still prevails.[2] Recent increases in divorce rates in Korea[3] partially reflect an increase in the existence of limited commitment in Korean households. Therefore, bargaining positions within a household are more likely to be observed and excluding these bargaining powers from the estimation could lead to a bias.

To estimate the Frisch elasticity in Korea, I use the Korean Labor and Income Panel Study (KLIPS) data, a panel survey on Korean households. Using data from 2008 to 2022, I find that Frisch elasticity increases as not only consumption but different consumption bundle shares are additionally controlled in a two-way time and individual fixed effect regression that also takes into account different taste shifters; on average 0.2 more in magnitude for men, while the overall bias was not significant for women. Specifically, the elasticity is estimated to be around 0.93 for married employed men and 1.62 for married employed women, in which the change is consistent with Bredemeier et al. (2023). Despite the changes in the magnitude of the elasticity being smaller than what was presented in the US data when additional consumption bundle shares are controlled for, the overall higher estimated values of elasticities than previous literature on Korean labor supply elasticity implies that when controlling for consumption instead of household asset or debt, the downward bias in estimation can be mitigated. Additional subgroup analyses based on age group, education level, and type of employment status also show overall bias easing, with the older, higher educated, and non-permanent workers being slightly more elastic compared to the younger, lower education, and permanent workers, respectively.

Hence, this paper contributes to the literature in several dimensions. First, I provide an unbiased estimate of the Frisch elasticity in Korea in that limited commitment and different bargaining positions over time are considered, which to my knowledge is hardly done using

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1) Kim et al. (2022) is close to my paper in the sense that they also applied the methodology developed by Bredemeier et al. (2019) to the Korean data. However, they focused on the role of borrowing constraint while I am interested in the bias from ignoring the composition of consumption goods.

2) According to an OECD report, while gender wage gap in Korea has been declining slightly, Korean women are still paid a third less on average than men, which is the lowest among the OECD members. (Source: OECD report "Gender equality: Korea has come a long way, but there is more work to do")

3) Crude divorce rates (divorces per 1,000 people) have steadily increased from 1970, starting from 0.4 to recent rates peaking around 2.3. (Source: OECD 2020 report)

Korean data. In addition, this paper shows that different types of consumption bundles can also be a proxy for bargaining powers of spouses in the case of Korea, as consumption patterns may differ from the US. Moreover, additional estimations of elasticity based on individual characteristics such as age, education, and employment status are interpreted under various subgroup estimations.

This paper is organized as follows. Section 2 briefly introduces the model by Bredemeier et al. (2023) and the empirical methodology behind the analysis. Empirical results are presented in section 3. Finally, section 4 concludes.

II. Model and Methodology

1. A labor supply model with limited commitment[4)]

In this section, I briefly discuss the labor supply model in Bredemeier et al. (2023) that considers limited commitment and endogenous divorce in households. Individual agents face the following utility function at time t:

$$u_{gj,t}(c_{gj,t},h_{gj,t},m_{gj,t}) = \frac{c_{gj,t}^{1-\sigma_g}-1}{1-\sigma_g} - \alpha_{gj,t} \cdot \frac{h_{gj,t}^{1+1/\eta_g}}{1+1/\eta_g} - \Phi_g \cdot I_{h_{gj,t}>0} + \Psi_{j,t} \cdot m_{gj,t} \tag{1}$$

subject to

$$\sum_{g=m,f} P_{g,t}c_{gj,t} + a_{j,t+1} \leq \sum_{g=m,f} w_{gj,t}h_{gj,t} + (1+r)a_{j,t}, \tag{2}$$

$$a_{j,t+1} \geq \underline{a}_{\tau j,t}, \tag{3}$$

where $g \in \{m,f\}$ denotes the individual's gender (male (m), or female (f)), j denotes the household she lives in, $c_{gj,t}$ her total consumption, $h_{gj,t}$ her hours worked, and $m_{gj,t}$ her marital status. σ_g is the rate of risk aversion and η_g the Frisch elasticity of labor supply for each individual g. Preferences for work is determined by the utility weight $\alpha_{gj,t}$. Φ_g and $\Psi_{j,t}$ capture utility loss from labor participation and gain from being in a marriage, respectively. The total consumption of each individual can be further defined as an aggregate of K categories of

4) This section is mainly from Bredemeier et al. (2023).

consumption goods and services, $k = 1 \cdots K$, and we let spouses to have different preferences, in which consumption and price index can be further defined as:

$$c_{gj,t} = (\sum_{k=1}^{K} \gamma_{g.k} c_{gj,k,t}^{\frac{\nu-1}{\nu}})^{\frac{\nu}{\nu-1}} \tag{4}$$

and

$$P_{g,t} = (\sum_{k=1}^{K} \gamma_{g.k} p_{k,t}^{1-\nu})^{\frac{1}{1-\nu}} \tag{5}$$

where $\gamma_{g,k}$ is the individual's preference weight on consumption bundle k and ν the elasticity of substitution between bundles. Information on different preferences over different consumption bundles would let us know the distribution of consumption within a household.

Hence, the labor supply equation would be as follows:

$$\log h_{gj,t} = \eta_g \cdot \log w_{gj,t} - \eta_g \sigma_g \cdot \log c_{gj,t} - \eta_g \cdot \log P_{g,t} - \eta_g \cdot \log \alpha_{gj,t} \tag{6}$$

which can be easily estimated if data on individual consumption were to be available. However, most consumption data are observed in the household level, like below:

$$\tilde{c}_{j,t} = P_t c_{j,t} = \sum_{g=m,f} P_{g,t} c_{gj,t} = \sum_{g=m,f} \tilde{c}_{gj,t}. \tag{7}$$

Using household level consumption as a proxy of individual consumption when estimating labor supply elasticity may lead to an estimation bias when both consumptions are not perfectly correlated. Under the limited-commitment model, bargaining positions within households are closely linked to the earning levels of spouses, as increased wage levels improve outside options for a spouse thus leading to an improvement in it's bargaining position and Pareto weight. Simply using household level consumption data would thus create a downward-biased estimation of the Frisch elasticity.

Bredemeier et al. (2023) adds the information of household expenditures on different types of goods and services to the equation to eliminate this bias. Through a first-order Taylor approximation, they obtain the following:

$$\log(\tilde{c}_{gj,t}/\tilde{c}_{j,t}) = \Theta_{g,0} + \frac{\bar{c}_k/\bar{c}_g}{(\gamma_{g,k} - \gamma_{-g,k})} \log(\tilde{c}_{j,k,t}/\tilde{c}_{j,t}) + \Theta_{g,1} \log p_{k,t} + \Theta_{g,2} \log P_{g,t} + \Theta_{g,3} \log P_{-g,t} \tag{8}$$

where $\Theta_{g,0} = \bar{c}_k/\bar{c}_g \log(\bar{c}_k/\bar{c})/(\gamma_{-g.k} - \gamma_{g,k}) + \log(\bar{c}_g/\bar{c})$, $\Theta_{g,1} = \bar{c}_k/\bar{c}_g/(\gamma_{-g.k} - \gamma_{g,k})$,
$\Theta_{g,2} = (\nu-1)\gamma_{g,k}/(\gamma_{-g.k} - \gamma_{g,k})$, and $\Theta_{g,3} = (\nu-1)\gamma_{-g,k}\bar{c}_{-g}/\bar{c}_g/(\gamma_{-g.k} - \gamma_{g,k})$.

Equation (8) shows how different consumption bundles can be used as a proxy for individual consumption shares and thus unobservable bargaining positions. Substituting (8) into (6) gives the final labor supply equation that can be estimated empirically:

$$\log h_{gj,t} = \eta_g \cdot \log w_{gj,t} - \eta_g\sigma_g \cdot \log \tilde{c}_{j,t} - \frac{\eta_g\sigma_g}{(\gamma_g - \gamma_{-g})}\frac{\bar{c}_k}{\bar{c}_g}\log(\tilde{c}_{j,k,t}/\tilde{c}_{j,t}) \tag{9}$$
$$- \eta_g \cdot (1 - \sigma_g\Theta_2 + \sigma_g) \cdot log\, P_{g,t} - \eta_g\sigma_g\Theta_3 \log P_{-g,t}$$
$$+ \eta_g\sigma_g\Theta_1 \log p_{k,t} - \eta_g \cdot \log a_{gj,t} + \Theta_0$$

where all variables in the first line of equation (9) are observable and the remaining variables in the second and third lines either do not vary across households or over time, letting an unbiased Frisch elasticity estimation be available under a two-way fixed effect analysis.

2. Empirical Analysis

A. Methodology

In the empirical analysis, I mainly estimate equation (9), but with few adjustments. First, I estimate the log-difference instead of log-level, in other words I regress hours growth on expected wage growth, to strengthen the property of leaving the marginal utility of wealth constant (see Altonji (1986); and Bredemeier et al. (2019)). This modification also allows to compare estimation results to previous Korean literature as most papers using Korean data uses the log-difference format to estimate the labor supply elasticity of Korea.[5] Altogether, I estimate the following equation:

$$\Delta \log(h_{gj,t}) = \eta_g E_t \Delta \log(w_{gj,t}) + C_{j,t} + \delta_{gj,t} + \chi_t + \mu_{gj,t} + \epsilon_{gj,t} \tag{10}$$

5) Moon and Song (2016) and Kim et al. (2022) as examples.

where $\Delta \log x_t = \log x_{t+1} - \log x_t$ for any variable x_t, $C_{j,t}$ is a vector of consumption-related variables including $\log \tilde{c}_{j,t}$ and $\log(\tilde{c}_{j,k,t}/\tilde{c}_{j,t})$ for all $k = 1 \cdots K$, $\delta_{gj,t}$ is a set of observable taste shifters such as age and the number of children and χ_t and $\mu_{gj,t}$ are the time and individual fixed effects, respectively.

It is well known that simply using wage rates computed as earnings over hours worked for labor supply regression causes measurement error to bias estimates toward zero (see Altonji (1986); and Keane (2011)). Therefore, running an initial wage regression to predict the expected wage growth, $E_t \Delta \log(w_{gj,t})$, is necessary (Borjas (1980)). Alike in Bredemeier et al. (2023), I run a first-stage wage regression on the actual wage growth rate which includes a third-order polynomial in age and interactions with education[6], year dummies, and other variables including taste shifters such as the number of young and old children. Moreover, as suggested in Moon and Song (2016) and Domeij and Flodén (2006), I also account for 2 lags of the log wage rate to resolve additional endogeneity issues. In the sample, the wage regression has an R^2 of about 26%.[7]

B. Data

I use the KLIPS data from 2008 to 2022 for the empirical analysis.[8] The main survey is conducted annually on a sample of 5,000 urban households in Korea on various information including household characteristics, economic activities, income, expenditure, and more.[9] This survey especially allows to decompose household expenditures into different types of goods and services, which is key in estimating the Frisch elasticity while taking into account the relative bargaining positions and limited commitment within households. For the main analysis I consider married households where the head is aged 25 to 60 and is currently an employed worker[10]. The same standard is applied for the spouses when I estimate for women, which is discussed later in detail.

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6) Education is measured into five categories: Category 1 is consists of no schooling to middle school graduates; category 2 is high school graduates; category 3 is 2-year college graduates; category 4 is 4-year college graduates; category 5 is master's degree holders and up.

7) 1st stage regression results are reported in the Appendix.

8) Earlier data did not survey some sub-items of household consumptions, such as health insurance.

9) I referred to the official KLI website (https://www.kli.re.kr) for specific information on the KLIPS data.

10) I exclude self-employed workers due to unavailability on the labor part of business income and employed workers that reported more than 98 hours of weekly hours worked, based on Moon and Song (2016).

The working hours variable is constructed by adding average regular and overtime hours worked per week. Monthly post-tax labor earnings in Korean won is deflated using the Consumer Price Index (2020=100) data from the Korea Statistical Information Service. The hourly wage rate is thus calculated by dividing monthly earnings by monthly hours worked.

KLIPS provides monthly average data on 20 categories of consumption goods and services for a given household. Closely following the consumption item mapping of Bredemeier et al. (2023), I utilize the 10 consumption bundles shown in <Table 1>. Note that some categories such as specific housing utility expenses are directly unavailable in the dataset, so some adjustments were made to include them in the estimation. Under the housing maintenance expenses category are included electricity, water, heating, and rent expenditures. Bredemeier et al. (2023) excluded rent-equivalent variables as it also interacts with bargaining positions and commitment problems in a form of wealth, apart from different consumption preferences among spouses, which is the main channel this estimation focuses on. However, the KLIPS data on housing maintenance expenses also includes all the main housing utility expenses, which consists most of the non-food category of the consumption items. Hence, I modify the variable by manually excluding rent if the household is living under rent or other equivalent situations.[11] All categories are expressed as monthly consumption levels in Korean won.

<Table 1> Categorization of KLIPS consumption items.

Item	Category
Food and groceries	Food
Meals out	Food
Public education	Services
Private education	Services
Vehicle maintenance expenses	Services
Public transportation	Services
Health and medical costs	Services
Medical insurance	Services
Expenses for communication	Nonfood
Housing maintenance expenses	Nonfood

11) Due to measurement errors, I exclude samples reporting rent to be higher than total housing maintenance expenses. I also note that I did not use this method for households living in self-owned houses or under full-Jeonse.

In this empirical analysis, three approaches are implemented in using the consumption variables as a proxy for within household bargaining power. First, consumption items are aggregated into three categories: food, services, and non-food expenditures. I then apply the expenditure share of food and services accordingly as control variables. Second, principal components of the shares of all 10 items are considered. Lastly, all of the shares of 10 items are included. Note that in all three alternatives, the total household consumption calculated as the sum of all consumption bundles are included.

As in equation (10), this two-way fixed effect labor supply regression includes individual fixed effects that accounts for taste for work heterogeneity and other differences in unobserved individual characteristics. Including time fixed effects allows the regression to filter out price effects and other fluctuations caused by business cycles. A third-order polynomial in age and the number of young and old children in the household are added as time varying taste shifters.[12] <Table 2> shows the summary statistics of the main variables mentioned earlier.

<Table 2> Summary statistics

Variable	Observation	Mean	Standard Deviation	Min	Max
Monthly hours worked	30,968	197.2	41.7	4.3	421.4
Monthly labor income (10,000 won)	30,968	349.1	177.9	0	5500
Total consumption (10,000 won)	30,968	207.7	89.0	0	1075
Food consumption (10,000 won)	30,968	68.3	30.7	0	350
Service consumption (10,000 won)	30,968	101.4	65.3	0	776
Non-food consumption (10,000 won)	30,968	38.0	15.6	0	380

Notes: Data from KLIPS data.

III. Empirical Results

1. Main analysis

The main results regarding men can be find in <Table 3>. Column (1) refers to a simple regression where log hours growth are regressed on predicted log wage growth rates with individual and time fixed effects along with other control variables such as age

12) Children in the household are those who live in the household, with young children aged 6 and below and old children aged 7 to 17.

and number of children. This regression is unable to identify Frisch elasticity correctly as consumption, in other words wealth, is not held constant, hence the income effect is not taken into account. The second column shows that the wage sensitivity of hours worked increases substantially from 0.687 to 0.897 when total household consumption is considered, thus in line with Altonji (1986).

However, like mentioned earlier, coefficient of column (2) still may be biased downwards due to limited commitment among spouses in a household. The third column shows the estimate for the elasticity when adding share of food consumption as another control variable. The sensitivity increases to 0.921, which is approximately 0.02 larger than the case where only total household consumption is considered. Similarly, column (4) switches out share of food consumption to share of services consumption, which gives a similar level of elasticity (0.922) as in column (3). Note that the estimated coefficient on the food consumption share is negative, which implies that food may be goods preferred more by men than women, which is in line with what the limited commitment theory predicts (see Mazzocco (2007)).

Columns (5) and (6) control for the first and second and third principal components, respectively. This also results in a similar magnitude of estimates for the elasticity, around 0.930. Lastly, column (7) considers all 10 shares of consumption separately, in which leads to a similar size of sensitivity.

In sum, I find statistically significant estimates for each consumption bundles (food and services), which is in line with Bredemeier et al. (2023). However, the bias from omitted variables problem seems to be less serious than the US (column (2) to (3)). Although the changes in the elasticities are not as apparent and large to that of Bredemeier et al. (2023) using US Panel Study of Income Dynamics data[13], the jump from 0.687 to 0.897 in column (1) and (2) show that by controlling for consumption, the downward bias of the elasticity estimates is revealed. Also, the negative estimated coefficient for food share shows some evidence that food consumption provides somewhat more utility to men than women in Korea as well.

13) In Bredemeier et al. (20230, estimation results from the PSID data is only 0.23 when wealth is not controlled, 0.45 when only total household consumption is controlled for and range from 0.63 to 0.66 when adding different consumption shares into the regression.

<Table 3> Labor supply regressions for men

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log wage growth rate	0.687***	0.897***	0.921***	0.922***	0.930***	0.932***	0.932***
$\Delta \log \tilde{w}_{mj,t}$	(0.0302)	(0.0354)	(0.0359)	(0.0361)	(0.0362)	(0.0361)	(0.0362)
Log total consumption	-	-0.115***	-0.129***	-0.127***	-0.123***	-0.116***	-0.111***
$\log \tilde{c}_{j,t}$	-	(0.0103)	(0.0108)	(0.0111)	(0.0110)	(0.0112)	(0.0123)
Log food share	-	-	-0.031***	-	-	-	-
$\log (\tilde{c}_{j,t,F} / \tilde{c}_{j,t})$	-	-	(0.00757)	-	-	-	-
Log service share	-	-	-	0.0208**	-	-	-
$\log (\tilde{c}_{j,t,S} / \tilde{c}_{j,t})$	-	-	-	(0.00871)	-	-	-
1st principal component	-	-	-	-	-0.00232	-0.00295	-
	-	-	-	-	(0.00269)	(0.00270)	-
2nd pc	no	no	no	no	no	yes	no
3rd pc	no	no	no	no	no	yes	no
All consumption shares	no	no	no	no	no	no	yes
R-squared	0.044	0.053	0.055	0.054	0.055	0.056	0.057
Number of HH	3,151	3,151	3,151	3,151	3,151	3,151	3,151
Observation	15,857	15,857	15,857	15,857	15,857	15,857	15,857

Notes: Dependent variable is log hours worked growth $\Delta \log \tilde{h}_{mj,t}$. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). All regressions control for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.

<Table 4> shows results for married, employed women aged 25-60. In line with the literature, estimated Frisch labor supply elasticities for women are larger than that for men. Alike the previous regression results, the magnitude of Frisch elasticity estimates tend to increase as information on total household consumption and different consumption shares are considered: The estimate for elasticity when consumption is not considered at all is 1.658 (column (1)), while controlling for total consumption gives an estimation of 1.786 (column (2)) and this estimation is further increased up to 1.957 (column (5)) when the first principal component of all 10 consumption shares is additionally controlled for. However, it can be seen that the downward estimation bias is not as substantial for women than in men. This could be due to several constraints: Observations for working women are less than half of men and important factors that effect labor participation of women such as home production rate are excluded from the estimation. The estimated coefficient for food consumption share is also negative for women, which may imply that consumption preference between spouses are not as apparent in Korea as is in the US.

<Table 4> Labor supply regressions for women

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log wage growth rate	1.658***	1.786***	1.856***	1.833***	1.957***	1.954***	1.954***
$\Delta \log \tilde{w}_{fj,t}$	(0.108)	(0.115)	(0.117)	(0.118)	(0.119)	(0.119)	(0.119)
Log total consumption	-	-0.062***	-0.081***	-0.093***	-0.062***	-0.066***	-0.072***
$\log \tilde{c}_{j,t}$	-	(0.0186)	(0.0199)	(0.0209)	(0.0201)	(0.0205)	(0.0230)
Log food share	-	-	-0.043***	-	-	-	-
$\log (\tilde{c}_{j,t,F} / \tilde{c}_{j,t})$	-	-	(0.0159)	-	-	-	-
Log service share	-	-	-	0.0673***	-	-	-
$\log (\tilde{c}_{j,t,S} / \tilde{c}_{j,t})$	-	-	-	(0.0188)	-	-	-
1st principal component	-	-	-	-	0.00618	0.00662	-
	-	-	-	-	(0.00551)	(0.00554)	-
2nd pc	no	no	no	no	no	yes	no
3rd pc	no	no	no	no	no	yes	no
All consumption shares	no	no	no	no	no	no	yes
R-squared	0.046	0.048	0.049	0.047	0.052	0.052	0.054
Number of HH	1,632	1,632	1,632	1,632	1,632	1,632	1,632
Observation	6,894	6,894	6,894	6,894	6,894	6,894	6,894

Notes: Dependant variable is log hours worked growth $\Delta \log \tilde{h}_{fj,t}$. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). All regressions control for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.

2. Additional analysis

The estimated results in the main analysis show that although some bias correction is seem when using the distribution of different types of consumption bundles, it is not as clear nor significant in magnitude in Korea. Still, it is noteworthy that the additional control for household consumption eases the downward bias by around 0.21 for employed men.

Therefore, in the first part of this section, I run a simple regression where I control for household asset and debt levels instead of consumption in attempts to hold marginal utility of wealth constant and compare the estimated Frisch elasticities with those when consumption is held constant. In the latter part of this section, I conduct several robustness checks as in Bredemeier et al. (2023) by dividing employed men into various subgroups: (1) by age groups, (2) by education level, and (3) by permanent employment statu s.[14] As the predicted wage rate is based on the interaction between age and education,

14) Empirical analysis by subgroups for married employed male workers are only reported due to the

Bredemeier et al. (2023) estimates elasticities per subgroups of these determinants.

A. Labor supply regressions for men under controls for household asset and debt

<Table 5> compares the two regression results for when different control variables for marginal utility of wealth is applied. Columns (2) through (4) are equivalent to the results reported in <Table 3> columns (1) through (3). Column (1) refers to the estimated elasticity when log hours growth are regressed on predicted log wage growth rates with individual and time fixed effects and the same control variables as in the main analysis, with the addition of controlling household asset growth and debt differences instead of consumption. Compared to column (2) (0.687), the coefficient of column (1) (0.703) is estimated higher. However, comparing with the estimates when consumption variables are controlled for (columns (3) and (4)), it can be noted that the estimation is downward biased.

<Table 5> Labor supply regressions for men controlling for household asset and debt

	(1)	(2)	(3)	(4)
Log wage growth rate	0.703***	0.687***	0.897***	0.921***
$\Delta \log \tilde{w}_{mj,t}$	(0.0305)	(0.0302)	(0.0354)	(0.0359)
Log total consumption	-	-	-0.115***	-0.129***
$\log \tilde{c}_{j,t}$	-	-	(0.0103)	(0.0108)
Log food share	-	-	-	-0.031***
$\log (\tilde{c}_{j,t,F} / \tilde{c}_{j,t})$	-	-	-	(0.00757)
Log financial asset growth	-0.0008	-	-	-
$\Delta \log (\widetilde{asset}_{FIN,jt})$	(0.0006)	-	-	-
Log real estate asset growth	-0.0001	-	-	-
$\Delta \log (\widetilde{asset}_{EST,jt})$	(0.0006)	-	-	-
Log debt growth	0.0013***	-	-	-
$\Delta \log (\widetilde{debt}_{j,t})$	(0.0004)	-	-	-
R-squared	0.046	0.053	0.055	0.054
Number of HH	3,151	3,151	3,151	3,151
Observation	15,857	15,857	15,857	15,857

Notes: Dependant variable is log hours worked growth $\Delta \log \tilde{h}_{mj,t}$. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). All regressions control for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.

larger sample size, however similar results in terms of the direction of coefficient changes and signs are observed for married employed female workers as well.

Hence, it can be inferred that taking household consumption into the equation alleviates a certain amount of omitted variable bias that household asset and debt differences cannot capture.

B. Robustness checks

First, samples are divided into two groups based on age: age of young ranges from 25 to 39 and old ranges from 40 to 60. <Table 6> shows results for young and the old, in which similar patterns of increasing estimated elasticities when consumption is accounted for is observed: Estimates change from 0.736 (column (1)) to 0.934 (column (2)) and 0.699 (column (4)) to 0.939 (column (5)) for young and old, respectively. Adding food consumption share into the equation slightly increases the estimated coefficient, but only by around 0.03 for the older group. Comparing the estimates between the subgroups, no significant differences can be found[15], which is in contrast with the case for the US.[16]

<Table 6> Labor supply regressions for age subgroups of men

	(1)	(2)	(3)	(4)	(5)	(6)
	age					
	young (25-39)			old (40-60)		
Log wage growth rate $\Delta \log \tilde{w}_{mj,t}$	0.736***	0.934***	0.937***	0.699***	0.939***	0.974***
	(0.0656)	(0.0795)	(0.0802)	(0.0353)	(0.0417)	(0.0423)
Log total consumption $\log \tilde{c}_{j,t}$	-	-0.115***	-0.117***	-	-0.128***	-0.147***
	-	(0.0262)	(0.0273)	-	(0.0120)	(0.0127)
Log food share $\log (\tilde{c}_{j,t,F} / \tilde{c}_{j,t})$	-	-	-0.00453	-	-	-0.0399***
	-	-	(0.0190)	-	-	(0.00883)
R-squared	0.058	0.066	0.066	0.044	0.055	0.057
Number of HH	1,072	1,072	1,072	2,706	2,706	2,706
Observation	3,476	3,476	3,476	12,381	12,381	12,381

Notes: Dependant variable is log hours worked growth $\Delta \log \tilde{h}_{mj,t}$. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). All regressions control for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.

Secondly, samples are also divided into two groups based on their education level: low

15) A simple F-test reveals the null hypothesis that estimated coefficient in column (3) equals that in column (6) cannot be rejected (F=0.39, p=0.532).

16) Bredemeier et al. (2023) reports Frisch elasticity for young workers to be around 0.386 while 0.839 for older workers.

education level for those up to high school graduates and high for those college graduates and up. Results are shown in <Table 7>. The effect of taking consumption into account through the addition of food consumption share can also be found for the two educational subgroups: The Frisch elasticity of high school graduates or less increases from 0.702 (column (1)) to 0.944 (column (2)) when total household consumption is added and 0.979 (column (3)) when the food expenditure share is additionally controlled for. The estimated elasticity of college graduates or more also increases from 0.689 (column (4)) to 0.885 (column (5)) and up to 0.901 (column (6)) when food share is also considered. Comparing the two groups based on education level, estimated labor supply elasticity is not significantly different from one another.[17]

<Table 7> Labor supply regressions for education subgroups of men

	(1)	(2)	(3)	(4)	(5)	(6)
	education					
	low (-high school graduates)			high (college graduates-)		
Log wage growth rate	0.702***	0.944***	0.979***	0.689***	0.885***	0.901***
$\Delta \log \tilde{w}_{mj,t}$	(0.0514)	(0.0609)	(0.0617)	(0.0369)	(0.0431)	(0.0436)
Log total consumption	-	-0.128***	-0.148***	-	-0.109***	-0.118***
$\log \tilde{c}_{j,t}$	-	(0.0175)	(0.0185)	-	(0.0126)	(0.0132)
Log food share	-	-	-0.0465***	-	-	-0.0206**
$\log (\tilde{c}_{j,t,F} / \tilde{c}_{j,t})$	-	-	(0.0135)	-	-	(0.00891)
R-squared	0.041	0.051	0.053	0.050	0.060	0.060
Number of HH	1,251	1,251	1,251	1,902	1,902	1,902
Observation	6,219	6,219	6,219	9,638	9,638	9,638

Notes: Dependant variable is log hours worked growth $\Delta \log \tilde{h}_{mj,t}$. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). All regressions control for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.

Lastly, apart from Bredemeier et al. (2023), I additionally conducted a subgroup estimation based on whether individuals are permanently employed or not. Permanent employment is defined as employment of full-time workers directly hired by employers without a fixed-term contract and is generally known for having higher job security. Others including temporary workers under a fixed-term contract or dispatched and subcontracted workers are classified as non-permanent workers. The rise of temporary employment contracts has appeared worldwide since the 1990s and while many countries

17) A simple F-test reveals the null hypothesis that estimated coefficient in column (3) equals that in column (6) cannot be rejected (F=0.67, p=0.415).

do not face much conflict, the apparent differences and discrimination between permanent and temporary employments has been an on-going social conflict in South Korea (see Moon (2014)).

Hence, I subgroup individuals by permanent and non-permanent employment status to identify if differences in terms of labor supply elasticity also exists among the two groups. According to <Table 8>, both groups still hold the effect of increased estimated elasticities when total household consumption and food consumption share is accounted for the regression. Although estimated elasticity values slightly differ betewen the two groups, it is hard to say that they are significantly different.[18] In addition, due to a large difference in sample size between the two groups, inferring further interpretation is limited.

<Table 8> Labor supply regressions for employment status subgroups of men

	(1)	(2)	(3)	(4)	(5)	(6)
	employment status					
	permanent worker			non-permanent worker		
Log wage growth rate	0.674***	0.893***	0.920***	0.781***	0.982***	0.990***
$\Delta \log \tilde{w}_{mj,t}$	(0.0306)	(0.0358)	(0.0363)	(0.0939)	(0.112)	(0.113)
Log total consumption	-	-0.118***	-0.132***	-	-0.113***	-0.121***
$\log \tilde{c}_{j,t}$	-	(0.0103)	(0.0108)	-	(0.0348)	(0.0372)
Log food share	-	-	-0.0322***	-	-	-0.0180
$\log (\tilde{c}_{j,t,F} / \tilde{c}_{j,t})$	-	-	(0.00739)	-	-	(0.0281)
R-squared	0.052	0.063	0.065	0.039	0.044	0.044
Number of HH	2,659	2,659	2,659	675	675	675
Observation	13,192	13,192	13,192	2,631	2,631	2,631

Notes: Dependant variable is log hours worked growth $\Delta \log \tilde{h}_{mj,t}$. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). All regressions control for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.

Ⅳ. Conclusion

Controlling for marginal utility of wealth is key in the principle of estimating the Frisch labor supply elasticity. Previous literatures using Korean data attempted this through controlling for household level asset and debt, but this may still leave room for a

18) A simple F-test reveals the null hypothesis that estimated coefficient in column (3) equals that in column (6) cannot be rejected (F=1.27, p=0.259).

downward bias of the estimation based on literatures based on US data. Also, taking the existence of limited commitment or different bargaining positions between spouses into account seems reasonable when estimating for labor supply elasticity in Korea as noticeable differences in wage and economic participation rate between gender is observable. An improved estimation approach in which not only total household consumption is controlled but also different types of expenditure shares are additionally accounted for eliminated this bias in US data.

This analysis uses a Korean panel data from KLIPS and shows that despite different results in the magnitude of change in the estimated elasticities compared to previous literature based on US data, meaningful interpretation can be taken from the empirical results. First, a downward bias can be reduced through considering total household consumption instead of asset levels and debt when estimating labor supply sensitivity. Second, while it is true that further bias correction through controlling for additional consumption bundle shares is not clearly observed in Korean data, with estimations increasing to only about 0.02 on average, it can be inferred that bargaining power within Korean households do not vary enough as in the US; gender rules and positions within the household may be more fixed in the case of Korea.

Specifically, Frisch elasticity is found to be around 0.93 for men when accounting for total household consumption and various different expenditure bundle shares. Estimation bias is not significantly found in the case for women, for which labor supply elasticity is around 1.95 for women. Several estimations under various subgroups also displayed similar patterns, with employed men who are older, less educated, and non-permanent workers are relatively more elastic than younger, more educated, and permanent workers, respectively. Hence, further research on the labor supply of South Korea considering consumption and limited commitments under households is deemed needed.

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Appendix

<Table A. 1> Wage regression results

	Log wage rate log $w_{mj,t}$
Lagged log wage rate log $w_{mj,t-1}$	0.138***
	(0.0076)
2 lagged log wage rate log $w_{mj,t-2}$	0.0387***
	(0.0074))
Log total consumption log $\tilde{c}_{j,t}$	0.183***
	(0.0086)
Log food share log $(\tilde{c}_{j,t,F}/\tilde{c}_{j,t})$	0.0355***
	(0.0072)
R-squared	0.257
Number of HH	3,646
Observation	19,847

Notes: Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Regression controls for individual and time fixed effects, a cubic in age, and numbers of young (age 0-6) and old (age 7-17) children.