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Estimating the Income Elasticity of Marginal Utility: A Study Using South Korean Household Survey Data*

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In this study, we estimate the elasticity of the marginal utility of income using nationally representative household survey data from South Korea, following the direct measurement approach of Layard et al. (2008). Our findings suggest that the income elasticity of marginal utility for the broader population is 1.49 and remains stable over time. Moreover, we explore potential heterogeneity in the income elasticity of marginal utility among individuals. Statistically significant differences in this elasticity are observed across subgroups defined by various demographic and socioeconomic characteristics, including age, marital status, employment status, health status, educational attainment, and net asset positions.

JEL Classification: I31, D6, H21
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I. Introduction

The income elasticity of marginal utility, which measures how quickly the marginal utility of income declines as income increases, is a key parameter in normative public economics. For instance, in evaluating a Utilitarian social welfare function—the sum of individuals' utilities derived from income—the change in social welfare is calculated as the aggregate of weighted changes in individual income, with each weight determined by the marginal utility of that specific income. Crucially, the magnitude of these weights is inversely related to the income elasticity of marginal utility.[1] As such, a comprehensive understanding of this curvature parameter is essential in various areas of public economics, including optimal taxation, cost-benefit analysis, and the analysis of user fee policies and social insurance—see Mirrlees (1971), Feldstein (1972), Diamond (1998), Dahan and Strawczynski (2000), Auerbach and Hines (2002), among others.

Despite its importance, there is no consensus on the precise estimate of the income elasticity of marginal utility. Most estimates have been obtained based on analyses of economic behaviors such as risk aversion (Cohen and Einav, 2007; Gertner, 1993; Metrick, 1995), intertemporal resource allocation (Attanasio and Browning, 1995; Blundell et al., 1994; Patterson and Pesaran, 1992), and labor supply (Chetty, 2006). However, these approaches yield a wide range of estimates, as they rely on indirect methods and involve assumptions that may not be directly related to the marginal utility of income.[2]

A more fundamental issue concerns the cardinality and interpersonal comparability of utility. For the marginal utility of income to serve as a weight across different individuals or income groups, utility must be cardinal, and interpersonal comparisons of utility must be possible. This requires that the measurement of utility be based not on ex-ante inferences from economic behaviors, but on direct measures of ex-post or experienced utility from income.

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[1] Assuming a Utilitarian social welfare function, denoted as $SW=\sum_{i=1}^{n}u_i(y_i)$, along with a utility function for individual income exhibiting constant relative risk aversion, given by $u_i(y_i)=\frac{y_i^{1-\rho}-1}{1-\rho}$ for all i, the differential change in social welfare can be expressed as $dSW=\sum_{i=1}^{n}u_i'(y_i)dy_i$. Here, each weight attributed to an individual's income change corresponds to the marginal utility of income, represented as $y_i^{-\rho}$. Consequently, the income elasticity of marginal utility, denoted ρ, plays an important role in determining these weights.

[2] Cohen and Einav (2007) employ insurance purchasing behavior to present estimates for the risk aversion parameter that exceed 10, with a specific estimate of 14.84. Similarly, estimations of the utility function based on intertemporal resource allocation yield a wide range of estimates, from as low as 0.211 (Attanasio and Browning, 1995) to as high as 5 (Patterson and Pesaran, 1992). Chetty (2006) argues that "the standard expected utility model cannot generate high levels of risk aversion without contradicting established facts about labor supply," and suggests that the upper bound for this parameter is around 2.

In this paper, we estimate the income elasticity of marginal utility for South Korea using the empirical framework of Layard et al. (2008). This framework employes subjective well-being measures, obtained from nationally representative household surveys, as proxies for individuals' experienced utility levels. The approach models an individual's experienced utility as a function of income and a set of control variables, assuming a constant relative risk aversion (CRRA) utility function for income. Additionally, it posits a common linear relationship between an individual's subjective well-being measure and their experienced utility, incorporating a random additive term to account for errors that are independent of the circumstances affecting true utility. This direct measurement approach provides a robust framework for estimating the income elasticity of marginal utility, represented by the CRRA parameter, using subjective well-being measures.

To estimate the income elasticity of marginal utility for South Korea, we employ data from the Korea Welfare Panel Study (KOWEPS), a nationally representative household survey. The KOWEPS provides comprehensive data on individuals' subjective well-being, income, and various demographic and socioeconomic characteristics. Our estimation results show that the income elasticity of marginal utility ranges from 1.49 to 1.57, depending on the regression model specifications. Notably, in our benchmark model specification, which includes all considered control variables, the income elasticity of marginal utility is estimated at 1.49. This estimate is regarded as the income elasticity of marginal utility for the broader population. Moreover, our analysis finds that the income elasticity of marginal utility remains stable over time.

While the income elasticity of marginal utility, estimated from a sample representative of the entire population, reflects the average effect, heterogeneous preferences among individuals are likely, as underscored by studies such as Barsky et al. (1997).[3] Accordingly, the rate at which the marginal utility of income diminishes as income increases may vary among individuals, with such variations carrying important welfare implications for policy evaluations. To investigate potential heterogeneity in the income elasticity of marginal utility among individuals, we conduct a subgroup analysis, segmenting our KOWEPS sample based on various demographic and socioeconomic characteristics, such as age, employment status, and educational attainment.

Our subgroup analysis reveals statistically significant heterogeneity in the income elasticity of marginal utility across the specified subgroups. For instance, when

[3] In their seminal work, Barsky et al. (1997) assessed individual preference parameters—namely risk aversion, the subjective rate of time preference, and intertemporal substitution—using survey responses to hypothetical scenarios designed to align with an economic theorist's conceptualization of these parameters. They identified significant heterogeneity in these measured preferences, particularly noting variations in risk aversion, as reflected by respondents' willingness to gamble on lifetime income, across subgroups distinguished by age, sex, educational attainment, and employment status.

dividing the entire sample into younger (aged 25 to 39) and older (aged 40 to 54) working-age subgroups, the income elasticities of marginal utility for these two groups are estimated at 1.87 and 1.31, respectively. Importantly, a Wald test on the equality of these estimates confirms that they are statistically different. Furthermore, subgroups such as non-wage-and-salary workers, individuals with poorer health, those with lower educational attainment, the non-married, and individuals with negative net assets generally display lower income elasticities of marginal utility compared to their respective counterparts. These findings have significant implications for social welfare policy analyses. By understanding differences in the income elasticity of marginal utility among subgroups—defined by, for example, age, health status, and employment status—policymakers can more accurately assign social welfare weights. Integrating these specific values into policy development allows for targeted approaches that effectively address risks associated with aging, health challenges, and employment status. This targeted approach not only meets the distinct needs of each subgroup but also enhances overall social welfare, which aggregates the economic well-being of groups with diverse elasticities of the marginal utility of income.

Our study contributes to the literature that estimates the elasticity of the marginal utility of income or consumption (e.g., Blundell et al., 1994; Evans, 2005; Cohen and Einav, 2007; Layard et al., 2008; Hartley and Lanot, 2013). To the best of our knowledge, this is the first to estimate the income elasticity of marginal utility within the context of South Korea, using the direct measurement approach proposed by Layard et al. (2008). Given the limited availability of reference values for estimates of the income elasticity of marginal utility specific to South Korea, our findings are instrumental for research in the field of public economics that requires such country-specific estimates.

Our study is also closely related to a broader literature on the relationship between income and subjective well-being (e.g., Clark et al., 2005; Clark et al., 2008; Boyce et al., 2011; Frijters and Beatton, 2012; Perez-Truglia, 2020). For instance, Clark et al. (2005) employ latent class techniques to model a heterogeneous relationship between income and self-reported well-being. Using representative household survey data from twelve European countries, they show that the marginal effect of income on well-being varies across four distinct classes of individuals identified by characteristics such as age, gender, marital status, and education. Boyce and Wood (2011) draw upon measures of self-reported well-being and personality traits from the German Socio-Economic Panel to show that an individual's marginal utility of income is heavily dependent on their personality.

The remainder of this paper is organized as follows. Section 2 provides a detailed description of the survey sample, while Section 3 outlines the empirical strategy employed to estimate the income elasticity of marginal utility. In Section 4, we present and discuss our estimation results. Finally, Section 5 offers concluding

remarks.

II. Data and Analysis Sample

2.1. KOWEPS Data Set

In our empirical study, we use data from the Korea Welfare Panel Study (KOWEPS), a nationally representative longitudinal household survey in South Korea.[4] Conducted annually since 2006, the KOWEPS is designed and managed by the Korea Institute for Health and Social Affairs and the Social Welfare Research Center of Seoul National University. The survey includes more than 15,000 respondents each year.

In the KOWEPS, an individual's subjective well-being, defined as their perceived level of life satisfaction, is measured on a scale of 1 to 5 through a self-reported questionnaire and has been collected since the first wave of the survey.[5] This self-reported life satisfaction variable is used as our measure of an individual's subjective well-being. The KOWEPS also provides data on survey respondents' yearly household disposable income.[6] We first convert this income into real terms using the consumer price index, and then normalize real household disposable income by dividing it by the square root of household size. In our analysis, this normalized income variable is used as a measure of an individual's income.

In addition, our analysis incorporates individuals' demographic and socioeconomic char-acteristics as control variables, including sex, age, marital status, educational attainment, employment status, average working hours per week, health status, housing size, and household net assets.[7]

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[4] The Korea Welfare Panel Study (KOWEPS) is comparable to the Panel Study of Income Dynamics (PSID) in the United States, the British Household Panel Survey (BHPS) in the United Kingdom, the German Socio-Economic Panel (GSOEP) in Germany, and the Survey of Labour and Income Dynamics (SLID) in Canada.

[5] The detailed survey question about the subjective well-being measure is: "Taken all together, how satisfied are you with your life as a whole? Answer on a scale of 1 to 5, where 1 means very dissatisfied and 5 means very satisfied."

[6] Household disposable income is defined by subtracting non-consumption expenditures from ordinary income. Ordinary income includes wage and salary income, gross self-employment income, realized property income, and both private and public transfer income. Non-consumption expenditures include taxes (such as income tax and property tax) and social security contributions (such as public pensions and social insurance).

[7] Among the control variables considered, household net assets are defined by subtracting total liabilities from total assets. Total assets include real estate other than the residence (e.g., land), non-residential property in possession (e.g., lease deposit given), financial assets (e.g., savings), owned non-commercial vehicles, agricultural machinery (e.g., tractors), agricultural products and livestock (e.g., cattle), and other assets (e.g., membership in sports clubs). Total liabilities consist of loans from financial institutions, mortgage loans, general bonds, credit card debt, lease deposits received,

2.2. Analysis Sample

In our analysis, we use the KOWEPS data set spanning from its 3rd wave in 2007 to the 18th wave in 2022 (i.e., the most recent available wave). The starting point of the sample period is dictated by the availability of data on hours worked. We obtain our analysis sample as follows. First, we limit our sample to working-age adults aged 25 to 54 to prevent potentially misleading results regarding the relationship between income and subjective well-being over the long term. This group exhibits a stronger correlation between annual income and permanent income, resulting in a more homogeneous population for our analysis. Second, following Layard et al. (2008), we exclude the top and bottom 5% of the distribution of fitted residuals from a linear regression model of the logarithm of our income measure on a set of standard regressors.[8] This exclusion is done to account for potential measurement errors or temporary deviations from typical income levels among these observations.[9]

Table 1 presents descriptive statistics of our analysis sample. In addition, Figure 1 shows the histograms of the life satisfaction and income variables. We first examine the life satisfaction variable, that is, the frequencies of respondents' answers to the life satisfaction question on a scale of 1 to 5. As shown in Table 1, approximately 61% of respondents in the sample answered with a life satisfaction level of 4, which is fairly high, almost 30% answered with a neutral level of 3, and about 6% answered with a fairly low level of 2. The remaining respondents answered with either a very low or very high level of life satisfaction. These frequencies indicate that the distribution of respondents' answers to the life satisfaction question is skewed left, as illustrated in the left panel of Figure 1.

Next, we look at the descriptive statistics for the income variable, along with that for the household size. As shown in Table 1, the average annual household income across respondents is approximately 57,800,000 Korean wons, which is equivalent to roughly 44,000 US dollars. The average household size is about 3.5. The average value of normalized household income, which is used as our measure of an individual's income, is nearly 31,400,000 Korean wons. Furthermore, as depicted in

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outstanding payments, and other liabilities. For our empirical analysis, household net assets are converted into real terms using the consumer price index.

[8] The regressors used in this regression are: a constant term, a male dummy variable, age terms in a quadratic polynomial, a dummy variable for married status, dummy variables for educational attainment, a dummy variable for employment, interaction terms of employment with hours worked in a cubic polynomial, and wave and region dummy variables.

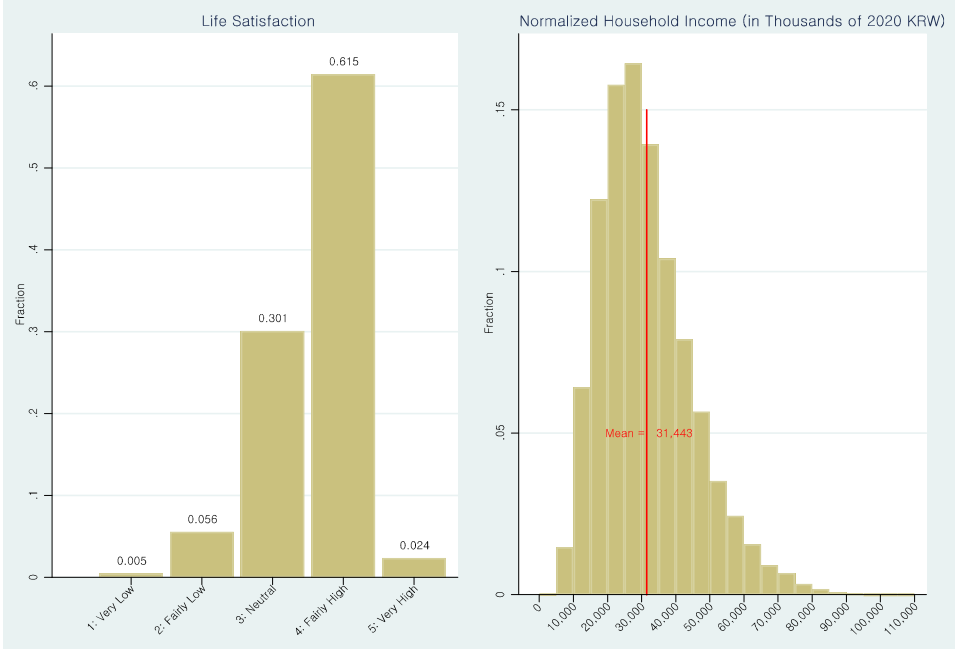
[9] The sample period initially includes approximately 11,500 households (or 195,000 observations). Limiting the sample to working-age adults aged 25 to 54 excludes nearly 4,800 households (or 111,300 observations), leaving around 6,700 households (or 84,000 observations). Further exclusion of the top and bottom 5% of the distribution of the fitted residuals removes an additional 187 households (or 8,613 observations), resulting in a final analysis sample of 6,516 households (or 75,044 observations).

the right panel of Figure 1, the distribution of normalized household income is skewed to the right.

[Table 1] Descriptive Statistics of the Analysis Sample

Variable	Percent	Mean	SD
Life Satisfaction (on a Scale of 1 to 5)			
Very Low	0.48		
Fairly Low	5.56		
Neutral	30.11		
Fairly High	61.48		
Very High	2.37		
Income (in Thousands of 2020 KRW)			
Household Income		57,806	27,093
Household Size		3.47	1.16
Normalized Household Income		31,443	13,526
Sex			
Male	48.81		
Female	51.19		
Age		40.51	8.21
Aged 25 to 39	44.69	32.73	4.32
Aged 40 to 54	55.31	46.79	4.30
Marital Status			
Married	71.28		
Others (Never Married, Separated, etc.)	28.72		
Education Attainment			
Less than High School	10.40		
High School	42.78		
College and Above	46.82		
Employment Status			
Worker (Wage and Salary, Self-employed)	77.02		
Others (Unemployed, Out-of-Labor-Force)	22.98		
Average Working Hours per Week (AWH)		46.60	13.80
AWH: Wage and Salary Worker		45.01	12.12
AWH: Self-employed Worker		53.84	18.03
Health Status			
Bad	5.87		
Neutral	12.90		
Good	81.23		
Housing Size (in Square Meters)		83.48	30.17
Household Net Assets (in Thousands of 2020 KRW)		104,201	280,834
Net Assets ≤ 0	28.23		
Net Assets > 0	71.77		
Sample Period		2007-2022	
Number of Observations		75,044	

[Figure 1] Histograms of Life Satisfaction and Income Variables



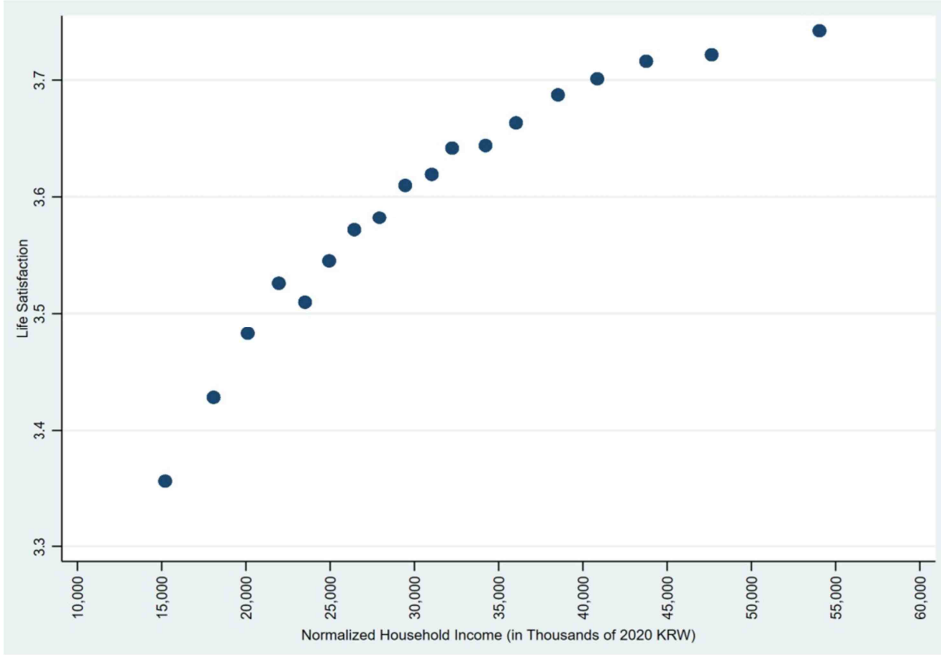
Note: This figure displays two histograms using our analysis sample. The left panel shows the histogram of respondents' answers, scaled from 1 to 5, to the subjective well-being (i.e., life satisfaction) question. The right panel shows the histogram of our measure of respondents' income.

Lastly, we turn to the descriptive statistics for the control variables, which are also shown in Table 1. The distribution of male and female respondents is almost equal. With the average age of all working-age adults close to 41 years, the average ages of the younger working-age group (25 to 39) and the older working-age group (40 to 54) are about 33 years and 47 years, respectively. Nearly 71% of respondents in the sample are married, while the remaining respondents fall into other marital categories such as never married and separated. About 90% of respondents have attained education beyond high school, and nearly 77% report being wage and salary or self-employed workers. The average weekly working hours for all worker respondents is about 47 hours: wage and salary workers average around 45 hours, while self-employed workers typically report 54 hours. Around 94% of respondents report their health status as either neutral or good, and the typical housing size is 83 square meters. Additionally, the mean and standard deviation of household net assets across respondents are approximately 104,000,000 and 281,000,000 Korean wons, respectively. Almost 28% of respondents report their household net asset position as being negative, while the remaining 72% report it as being positive.

III. Empirical Strategy

In Figure 2, we illustrate the cross-sectional relationship between the income and life satisfaction variables using our analysis sample. For this visualization, the means of the income and life satisfaction variables across various deciles of the income distribution are computed, and then these average values are plotted. In this study, we analyze the curvature of this relationship, as depicted in the figure, by estimating the elasticity of marginal utility of income in an empirical regression model.

[Figure 2] The Cross-sectional Relationship between Income and Life Satisfaction



Note: This figure illustrates the cross-sectional relationship between income and life satisfaction using our analysis sample. Average income and life satisfaction are computed for each income decile, and these averages are then plotted.

Our empirical strategy follows Layard et al. (2008), which is now described. For the empirical analysis conducted, the experienced utility level of an individual at time t, u_{it}, is modeled as follows:

$$u_{it} = \alpha_t \frac{y_{it}^{1-\rho} - 1}{1-\rho} + \beta' x_{it} + \gamma' D_{it} + \epsilon_{it}, \tag{1}$$

where y_{it} is an individual's income at time t, x_{it} is a set of control variables,

D_{it} is wave and region dummy variables, and ϵ_{it} is an error term.[10] The model assumes a functional form of constant relative risk aversion utility for individual income, in which the curvature parameter, ρ, represents the elasticity of marginal utility of income that is assumed to be identical across all individuals. While assuming that the coefficient on an income term, α_t, is the same for all individuals at time t, the model allows for it to vary at different points in time.

We estimate the model specified in Equation (1) for an individual's experienced utility level using the direct measurement approach proposed by Layard et al. (2008). This approach assumes that an individual's experienced utility level, u_i, which is cardinal, is a function of observable variables such as income and work and is comparable across individuals. Individuals apply their own idiosyncratic and strictly increasing function, f_i, to their experienced utility level to answer a subjective well-being (SWB) question, resulting in a reported SWB measure, swb_i, that is given by $swb_i = f_i(u_i)$.

However, due to the idiosyncratic nature of individuals' application of the strictly increasing function to their experienced utility level, the resulting SWB measure is an ordinal, non-comparable measure of true utility. To address this issue, a further assumption is made that the function, f_i, is common to all individuals up to a random additive term denoted by v_i, which represents an error term that is independent of the circumstances affecting true utility. As a result, the reported SWB for an individual is given by $swb_i = f(u_i) + v_i$. Furthermore, the assumption of a common linear transformation function (that is, $f(u_i) = u_i$) leads to a straightforward additive relationship between an individual's experienced utility and their reported SWB:

$$swb_i = u_i + v_i \tag{2}$$

Finally, the model for an individual's experienced utility level, as specified in Equation (1), is combined with the assumed linear relationship between reported SWB and experienced utility, as expressed in Equation (2). The resulting equation is as follows:

$$swb_{it} = \alpha_t \frac{y_{it}^{1-\rho} - 1}{1-\rho} + \beta' x_{it} + \gamma' D_{it} + \varepsilon_{it}, \tag{3}$$

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[10] In our analysis, we consider the 17 administrative divisions of South Korea, which consist of eight metropolitan cities and nine provinces. To further refine our analysis, we use the KOWEPS data set, which divides these administrative divisions into seven regions. Each region comprises a metropolitan city and adjacent provinces. Specifically, the regions are classified as (1) Seoul, (2) Incheon/Gyeonggi, (3) Busan/Ulsan/Gyeongnam, (4) Daegu/Gyeongbuk, (5) Daejeon/Sejong/Chungnam, (6) Gangwon/Chungbuk, and (7) Gwangju/Jeonnam/Jeonbuk/Jeju. We generate region-specific dummy variables based on this classification.

where $\varepsilon_{it} = \epsilon_{it} + \upsilon_{it}$. The income elasticity of marginal utility, denoted by ρ, is then estimated using standard maximum likelihood estimation on Equation (3).[11]

IV. Results

4.1. Main Results

In this subsection, we present the main results on the income elasticity of marginal utility, obtained by estimating Equation (3) using our KOWEPS sample. Table 2 reports the estimation results for four different model specifications of Equation (3).[12] In accordance with Layard et al. (2008), Models (1) and (2) control for sex, age, marital status, educational attainment, employment, and hours worked. To further account for other important sources of variation in individual life satisfaction, Models (3) and (4) include additional control variables such as health status, household housing size, and household net assets. Models (2) and (4) include regional dummy variables to control for region fixed effects, whereas Models (1) and (3) do not. All model specifications include wave dummy variables to control for year fixed effects.

We begin by examining the estimation results for the income elasticity of marginal utility (ρ). As shown in Table 2, the estimated income elasticity of marginal utility is statistically significant at the 1% level across all four model specifications, with a stable value ranging from 1.490 to 1.571. Additionally, the 95% confidence intervals for the income elasticity estimates from the four model specifications overlap.[13] These results suggest that the inclusion of regional dummy variables or additional control variables does not significantly alter the estimation result for the income elasticity of marginal utility.

The estimation results for the coefficients on the control variables are generally consistent with the existing literature. Specifically, the estimated coefficient on the male dummy variable is consistently negative across all model specifications,

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[11] Whether to treat subjective well-being measures as either cardinal or ordinal represents an important issue in the literature. However, the cardinal approach is prevalent in many empirical studies. Some of these studies even suggest that the choice between cardinal and ordinal models yields negligible differences in estimation outcomes. For further details, see Ferrer-i-Carbonell and Frijters (2004), Clark et al. (2008), Boyce and Wood (2011), Frijters and Beatton (2012), and Perez-Truglia (2020), among others. In line with this, our extended analysis in Section 4.3 also provide results from ordered logit estimation of Equation (3).

[12] Due to space limitations in Table 2, we do not report the estimation results for the time-varying coefficient on income (α_t) and the coefficients on the wave and region dummy variables (γ). These results are available upon request.

[13] The 95% confidence intervals for the income elasticity estimates from Models (1), (2), (3), and (4) are [1.497, 1.645], [1.482, 1.628], [1.419, 1.610], and [1.398, 1.582], respectively.

[Table 2] Estimation Results for Income Elasticity of Marginal Utility

Outcome:	Model Specification			
	Model (1)	Model (2)	Model (3)	Model (4)
Income Elasticity of Marginal Utility (ρ)	1.571***	1.555***	1.514***	1.490***
	(0.038)	(0.037)	(0.049)	(0.047)
Male	–0.006	–0.008*	–0.017***	–0.018***
	(0.005)	(0.005)	(0.005)	(0.005)
Age	–0.003	–0.003	–0.007***	–0.007**
	(0.003)	(0.003)	(0.003)	(0.003)
Age2	–0.000	–0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.177***	0.164***	0.168***	0.158***
	(0.006)	(0.006)	(0.006)	(0.006)
Edu. Attaintment (Baseline: Less than High School)				
High School	0.062***	0.069***	0.042***	0.047***
	(0.009)	(0.009)	(0.009)	(0.009)
College and Above	0.144***	0.152***	0.111***	0.119***
	(0.010)	(0.010)	(0.010)	(0.010)
Employment	0.014	0.016	–0.002	–0.001
	(0.025)	(0.025)	(0.025)	(0.025)
Employment × (Hours of Work)	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Employment × (Hours of Work)^2	–0.000***	–0.000***	-0.000***	–0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Employment × (Hours of Work)^3	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Health Status (Baseline: Neutral)				
Bad			–0.128***	–0.128***
			(0.013)	(0.013)
Good			0.217***	0.214***
			(0.007)	(0.007)
Log(Housing Size)			0.176***	0.154***
			(0.007)	(0.007)
Net Assets			0.008***	0.007***
			(0.001)	(0.001)
Year Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	No	Yes	No	Yes
Observations	75,044	75,044	75,044	75,044

Note: Robust standard errors are in parentheses. ***, **, and * indicate p-values less than 0.01, 0.05, and 0.10, respectively. To save space, the estimates of the time-varying coefficient on income (i.e., α_t in Equation (3)) and the coefficients on wave and region dummy variables are not reported in the table.

although it is not statistically significant in Model (1). This indicates that men report lower levels of life satisfaction compared to women. The estimated coefficient on the married dummy variable is consistently positive and statistically significant,

suggesting that married individuals report higher levels of life satisfaction compared to non-married individuals (such as those who have never been married or are separated). In Models (3) and (4), which include additional control variables, the age variable has a negative and statistically significant coefficient in its linear term but a statistically insignificant coefficient in its quadratic term. This implies that while age has an adverse linear effect on life satisfaction, there is no significant non-linear relationship.

Across all model specifications, the estimated coefficients on the dummy variables for educational attainment suggest a positive effect on life satisfaction for both the high school and college-and-above education groups, compared to the baseline group with less than a high school education. Moreover, the estimated coefficient for the college-and-above education group is significantly greater than that for the high school education group, indicating that higher levels of education are associated with higher levels of life satisfaction.

To control for the effects of employment and hours worked on life satisfaction, we first incorporate a dummy variable for employment into all model specifications. This dummy variable, representing wage and salary workers as well as self-employed workers, uses individuals who are unemployed or out of the labor force as the reference group. The employment dummy variable is then interacted with a cubic polynomial in hours worked. The estimated coefficient on the employment dummy variable is not statistically significant across all model specifications, indicating that employment itself does not have an impact on life satisfaction. However, the estimated coefficients on the three interaction terms, all of which are statistically significant, provide additional insights. The estimated positive cubic coefficient in the interaction term with hours worked suggests that the adverse effect of employment on life satisfaction is strongest for individuals who work very few or very many hours. The estimated negative quadratic coefficient implies a minimum point of the adverse effect at some intermediate level of hours worked. Additionally, the estimated positive linear coefficient suggests that the adverse effect increases as hours worked deviate from this minimum point in either direction.

In Models (3) and (4), health status, the housing size of a household, and household net assets are included as additional control variables. The estimation results indicate that the estimated coefficients on the dummy variables for health status are statistically significant and intuitive, with a negative coefficient for individuals with bad health status compared to the baseline group with neutral health status, and a positive coefficient for individuals with good health status. This implies that better health is linked to higher life satisfaction. The coefficients on both housing size and household net assets are estimated to be significantly positive, suggesting that a larger housing size or a higher level of net assets is associated with a higher level of life satisfaction for individuals.

In summary, the estimation results do not change significantly across different

model specifications of Equation (3). In Model (4), which includes both additional control variables and region dummy variables and is considered our benchmark model, the income elasticity of marginal utility is estimated at 1.490, with a 95% confidence interval of 1.398 to 1.582. This estimate can be interpreted as the income elasticity of marginal utility for the entire population of South Korea. Moreover, it aligns with the income elasticity estimates reported by Layard et al. (2008), although it is slightly higher. Using representative household survey data from the US and European countries, Layard et al. estimated the income elasticity to range from 1.19 to 1.34, suggesting a uniform income elasticity of marginal utility across countries.[14]

4.2. Subgroup Analysis

Building on previous empirical studies, such as Barsky et al. (1997) and Clark et al. (2005), which highlight heterogeneous preferences among individuals, we now expand our analysis to investigate potential heterogeneity in the income elasticity of marginal utility across various population subgroups. We conduct this subgroup analysis by categorizing the sample according to individuals' demographic and socioeconomic characteristics and subsequently estimating the income elasticity of marginal utility for each subgroup from our benchmark model specification of Equation (3), that is, Model (4).

A key consideration in our subgroup analysis is the endogenous choice issue, which can yield selection bias. For instance, marital status is an endogenous choice characteristic, meaning that the same individuals can transition from one subgroup (e.g., non-married) to another (e.g., married) during the sample period. To address this issue, we divide the sample into subgroups based on individuals' status in the first survey year they appear in the sample, which are referred to as baseline characteristics.[15] For example, if an individual's first survey year in the sample is 2010 and their marital status is recorded as non-married that year, then we classify that individual's marital status as non-married for all subsequent survey years. Thus, all observations for this individual throughout the sample period are assigned to the non-married subgroup. This procedure applies equally to all other endogenous choice characteristics, including employment status, health status, education attainment level, and net assets level.

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[14] It is worth noting that while estimates of the income elasticity of marginal utility from Layard et al.'s direct measurement approach show considerable consistency, results from alternative approaches—particularly those based on risk behavior or expected utility—yield a broader range of estimates. For examples, see Metrick (1995), Cohen and Einav (2005), Hartley and Lanot (2013), and O'Donoghue and Somerville (2018), among others.

[15] It is worth noting that conducting subgroup analyses based on baseline characteristics, even when some may not be entirely exogenous, is a common practice in applied economics research, as in studies such as Figlio et al. (2014) and Autor et al. (2020).

[Table 3] Subgroup Analysis Results

Subgroup	Panel A: Estimation Results			Panel B: Wald Test Results		
	Percent in a Subgroup	Estimate of ρ	95% Conf. Interval	Null Hypothesis	χ^2	p-Value
Sex						
Male	48.81	1.337 (0.069)	[1.203, 1.472]	$\rho^{\text{Male}} = \rho^{\text{Female}}$	2.1	0.149
Female	51.19	1.476 (0.066)	[1.346, 1.605]			
Age						
Aged 25 to 39 (Younger)	44.69	1.872 (0.083)	[1.710, 2.035]	$\rho^{\text{Younger}} = \rho^{\text{Older}}$	29.9***	0.000
Aged 40 to 54 (Older)	55.31	1.305 (0.058)	[1.191, 1.419]			
Marital Status						
Married	33.36	1.620 (0.062)	[1.498, 1.743]			
Others (Never Married, Separated, etc.)	66.64	1.345 (0.077)	[1.194, 1.497]	$\rho^{\text{Married}} = \rho^{\text{Others}}$	7.7***	0.006
Education Attainment						
Less than High School (Edu1)	10.54	1.338 (0.154)	[1.036, 1.640]	$\rho^{\text{Edu1}} = \rho^{\text{Edu2}}$	0.1	0.799
High School (Edu2)	45.43	1.382 (0.084)	[1.218, 1.546]	$\rho^{\text{Edu1}} = \rho^{\text{Edu3}}$	12.9***	0.000
College and Above (Edu3)	44.03	1.981 (0.084)	[1.816, 2.146]	$\rho^{\text{Edu2}} = \rho^{\text{Edu3}}$	22.1***	0.000
Employment Status						
Wage and Salary Worker (Emp1)	60.15	1.648 (0.063)	[1.525, 1.772]	$\rho^{\text{Emp1}} = \rho^{\text{Emp2}}$	8.1***	0.005
Self-employed Worker (Emp2)	11.83	1.022 (0.211)	[0.608, 1.436]	$\rho^{\text{Emp1}} = \rho^{\text{Emp3}}$	15.6***	0.000
Unemployed, Out-of-Labor-Force (Emp3)	28.02	1.231 (0.089)	[1.056, 1.406]	$\rho^{\text{Emp2}} = \rho^{\text{Emp3}}$	0.9	0.357
Health Status						
Bad	5.96	0.965 (0.133)	[0.704, 1.227]	$\rho^{\text{Bad}} = \rho^{\text{Neutral}}$	6.1**	0.014
Neutral	12.56	1.342 (0.113)	[1.120, 1.563]	$\rho^{\text{Bad}} = \rho^{\text{Good}}$	27.4***	0.000
Good	81.48	1.638 (0.059)	[1.522, 1.755]	$\rho^{\text{Neutral}} = \rho^{\text{Good}}$	5.7**	0.017
Net Assets						
Negative Net Assets	27.43	1.013 (0.087)	[0.842, 1.185]	$\rho^{\text{Negative}} = \rho^{\text{Positive}}$	32.8***	0.000
Positive Net Assets	72.57	1.611 (0.057)	[1.499, 1.723]			
The Entire Sample (Observations)	75,044	1.490 (0.047)	[1.398, 1.582]			

Note: This table presents the estimates of the income elasticity of marginal utility (ρ), obtained from the Model (4) Specification of Equation (3), for different subgroups. Specifically, Panel B of the table provides the results from Wald tests on statistical differences in the estimates of the income elasticity of marginal utility across different subgroups, reporting χ^2 statistics and their p-values. ***, **, and * indicate p-values less than 0.01, 0.05, and 0.10, respectively.

The results from our subgroup analysis are presented in Table 3. For different subgroups, each defined by a specific demographic or socioeconomic characteristic of individuals, the table provides the proportions of subgroups within the sample, the estimates of the income elasticity of marginal utility for each subgroup, their standard errors, and 95% confidence intervals. It also reports the results from Wald tests on statistical differences in the estimates of the income elasticity of marginal

utility across different subgroups.

As shown in Table 3, the estimates of the income elasticity of marginal utility are greater than one for all subgroups, except for the subgroup with bad health status. Importantly, the differences in the income elasticity estimates across subgroups defined by each of all characteristics considered, except for sex, are statistically significant. More specifically, when divided into male and female subgroups, each of which constitutes roughly half of the sample, the income elasticity of marginal utility is estimated at 1.337 for the male subgroup and 1.476 for the female subgroup. Furthermore, the Wald test result for these two subgroups indicates no statistical significance in the difference between their income elasticity estimates.

On the other hand, segmenting the sample into two working-age subgroups reveals a noticeable difference between their income elasticities of marginal utility, which is statistically significant. The income elasticity of marginal utility is estimated at 1.872 for the younger working-age subgroup (aged 25 to 39), while it is estimated at 1.305 for the older working-age subgroup (aged 40 to 54). This indicates that as income increases, the marginal utility of income exhibits a substantially steeper decline among young working-age adults compared to older working-age adults.

Our subgroup analysis further shows heterogeneity in the income elasticity of marginal utility across subgroups defined by marital status, educational attainment level, employment status, health status, and net assets level. Specifically, for marital status, the married subgroup exhibits a higher estimated income elasticity of marginal utility (1.620) compared to the non-married subgroup (1.345), which includes individuals who have never married, are separated, or fall under other non-married categories. The Wald test result for these two subgroups indicates the statistical significance of this difference. Furthermore, when examining three subgroups based on educational attainment level (less than high school, high school, and college and above), the subgroup with college and above education exhibits a statistically significant and higher income elasticity of marginal utility (1.981) compared to the other two subgroups (1.338 for less than high school and 1.382 for high school), which do not show a statistically significant difference in their income elasticity estimates.

Regarding employment status, we divide the sample into three subgroups: wage and salary workers, self-employed workers, and non-workers, which include those who are unemployed or out of the labor force. The income elasticity of marginal utility is estimated at 1.648 for the wage and salary worker group, 1.022 for the self-employed worker group, and 1.231 for the non-worker group. The Wald test results for these three groups show that while the income elasticity estimate for the wage and salary worker group is statistically different from that of either the self-employed worker group or the non-worker group, there is no statistically significant difference between the self-employed worker group and the non-worker group.

These results indicate that the wage and salary worker group exhibits a significantly higher income elasticity of marginal utility compared to the self-employed worker group and the non-worker group, whose income elasticities are not distinct. This finding is consistent with that of Barsky et al. (1997), which shows that self-employed or not-working individuals tend to be more risk-tolerant than employees.

With respect to health status, we segment the sample into three subgroups: those in bad, neutral, and good health. Estimation and Wald test results reveal statistically significant differences in the income elasticity of marginal utility across these subgroups. Of particular note is the finding that as health status improves from bad to neutral to good, the income elasticity of marginal utility consistently increases: 0.965 for the subgroup with bad health status, 1.342 for the subgroup with neutral health status, and 1.638 for the subgroup with good health status. This suggests that illness reduces the rate at which the marginal utility of income diminishes as income rises. This finding aligns closely with the literature on the effects of health status on individual preferences, as seen in works like Finkelstein et al. (2011) and Decker and Schmitz (2016).

Lastly, when the sample is divided into subgroups based on net asset positions, the income elasticity of marginal utility is estimated at 1.013 for those with negative net asset positions and 1.611 for those with positive net asset positions. The difference between these two estimates is statistically significant, indicating that individuals with positive net asset positions display a higher income elasticity of marginal utility.

In summary, our subgroup analysis reveals systematic differences in the income elasticity of marginal utility across various population subgroups. While these findings on heterogeneous income elasticities align with studies like Barsky et al. (1997) and Clark et al. (2005), which highlight heterogeneous preferences among individuals, they diverge from the results of Layard et al. (2008), who find no significant variations in the income elasticity of marginal utility among subgroups in US and European samples.

The variations in the income elasticity of marginal utility observed in the Korean sample carry notable implications for social policies and taxation in Korea, particularly due to the inverse relationship between the income elasticity and the social welfare weight derived from it. Our findings suggest that the income elasticity of marginal utility is significantly lower for groups more vulnerable to income risks, such as those with lower educational attainment, the self-employed, the unemployed, older working-age adults, those with severe illnesses, and those in precarious net asset positions. This underscores the need for redistributive social welfare policies, such as subsidies for groups with inadequate consumption power, including those with lower lifetime income due to limited educational attainment or smaller net asset holdings, as well as unemployment insurance and public health insurance. Furthermore, these findings provide a foundation for optimizing the

benefit structure of such policies and can inform the development of an optimal tax structure, such as applying differentiated income tax rates to wage and salary workers versus the self-employed, or offering favorable tax treatment to middle-aged workers who face significant non-discretionary expenses like educational investments for their children.

4.3. Extended Analysis of Income Elasticity of Marginal Utility

In this subsection, we further investigate the income elasticity of marginal utility in two ways. First, we estimate the income elasticity of marginal utility by using an alternative estimation approach that treats the subjective well-being measure as ordinal. Second, we examine the temporal stability of the income elasticity of marginal utility.

In our approach to estimating Equation (3), we have treated the subjective well-being measure as cardinal. This aligns with the prevalent practice in many previous empirical studies, which have shown that whether one adopts a cardinal or ordinal model does not materially impact the estimation results—refer to Footnote 11 for references. Nonetheless, the choice between cardinal and ordinal models remains an issue worthy of further exploration. To delve deeper into this issue, we re-estimate Equation (3) using ordered logit estimation.

[Table 4] Ordered Logit Estimation Results for Income Elasticity of Marginal Utility

Model Specification	Standard Estimation		Ordered Logit Estimation	
	Estimate of ρ	95% Conf. Interval	Estimate of ρ	95% Conf. Interval
Model (1)	1.571 (0.038)	[1.497, 1.645]	1.450 (0.068)	[1.317, 1.583]
Model (2)	1.555 (0.037)	[1.482, 1.628]	1.439 (0.063)	[1.316, 1.562]
Model (3)	1.514 (0.049)	[1.419, 1.610]	1.342 (0.082)	[1.182, 1.503]
Model (4)	1.490 (0.047)	[1.398, 1.582]	1.327 (0.075)	[1.179, 1.475]

Note: This table presents the results from the ordered logit estimation of Equation (3), including the estimates of the income elasticity of marginal utility, denoted by ρ, with their standard errors in parentheses and 95% confidence intervals. For comparison, the standard estimation results, as shown in Table 2, are also provided.

Table 4 presents the results from the ordered logit estimation of Equation (3), including estimates of the income elasticity of marginal utility (ρ), along with their standard errors and 95% confidence intervals. These estimates are based on the four model specifications of Equation (3) considered. For comparison purposes, we also provide the results from the standard estimation, as shown in Table 2. The ordered logit estimates are somewhat lower than the standard estimates by about 0.12 to 0.17, with standard errors that are approximately 60% to 80% higher. Overall, the ordered logit estimates closely align with the standard estimates, as the

confidence intervals for both ordered logit and standard estimates overlap. These findings suggest that our estimation results for the income elasticity of marginal utility remain robust, irrespective of whether the subjective well-being measure is treated as ordinal.

We now examine the temporal stability of the income elasticity of marginal utility by modeling it as time-varying. To this end, we estimate a variant of Equation (3) where the income elasticity of marginal utility is allowed to vary at different points in time, while the coefficient on income is assumed to be constant. Table 5 reports the estimates of time-varying income elasticities (ρ_t) for different years of the

[Table 5] Estimation Results for Time-Varying Income Elasticity of Marginal Utility

Time-Varying Income Elasticity (ρ_t)	Estimate of ρ_t	95% Conf. Interval	Wald Test on $H_0 : \rho_t = \rho_{bm}$	
			χ^2	p-Value
ρ_{2007}	1.454 (0.053)	[1.350, 1.557]	5.1**	0.025
ρ_{2008}	1.429 (0.053)	[1.326, 1.532]	18.6***	0.000
ρ_{2009}	1.486 (0.053)	[1.383, 1.590]	0.0	0.850
ρ_{2010}	1.479 (0.051)	[1.378, 1.580]	0.3	0.560
ρ_{2011}	1.475 (0.052)	[1.374, 1.576]	0.9	0.354
ρ_{2012}	1.507 (0.052)	[1.405, 1.608]	0.8	0.386
ρ_{2013}	1.470 (0.051)	[1.369, 1.570]	1.5	0.217
ρ_{2014}	1.477 (0.051)	[1.377, 1.576]	0.6	0.439
ρ_{2015}	1.526 (0.052)	[1.424, 1.629]	2.5	0.115
ρ_{2016}	1.539 (0.055)	[1.431, 1.646]	4.1**	0.044
ρ_{2017}	1.514 (0.052)	[1.413, 1.616]	1.0	0.313
ρ_{2018}	1.547 (0.052)	[1.445, 1.650]	4.6**	0.033
ρ_{2019}	1.526 (0.053)	[1.423, 1.629]	1.8	0.179
ρ_{2020}	1.529 (0.054)	[1.423, 1.635]	1.7	0.194
ρ_{2021}	1.566 (0.054)	[1.460, 1.672]	5.8**	0.016
ρ_{2022}	1.544 (0.052)	[1.442, 1.646]	3.5*	0.061
ρ_{bm}	1.490 (0.047)	[1.398, 1.582]		

Note: The estimates of the income elasticities for different years of the sample period, reported in this table, are obtained by estimating the Model (4) Specification of a variant of Equation (3), where the income elasticity of marginal utility (ρ_t) is allowed to vary at different points in time, while the coefficient on income (α) is assumed to be constant. For comparison purposes, the estimate of the benchmark time-invariant income elasticity (ρ_{bm}), obtained from the Model (4) Specification of Equation (3), is also presented. The columns under Wald Test present the results from Wald tests on the equality of each of the time-varying income elasticity estimates (ρ_t) for all sample years and the benchmark time-invariant income elasticity estimate (ρ_{bm}). ***, **, and * indicate p-values less than 0.01, 0.05, and 0.10, respectively.

sample period, obtained by estimating the Model (4) specification of this variant of Equation (3), along with their standard errors and 95% confidence intervals. Additionally, the table presents the results of Wald tests on statistical differences between each of the time-varying income elasticity estimates for all sample years and the benchmark time-invariant income elasticity estimate, obtained from Model (4) of Equation (3).

As shown in Table 5, the time-varying income elasticity estimates for all sample years range from a low of 1.429 in 2008 to a high of 1.566 in 2021. These estimates are all close to the benchmark time-invariant income elasticity of 1.490, with the 95% confidence intervals for the time-varying income elasticity estimates overlapping with the 95% confidence interval for the benchmark time-invariant income elasticity estimate. Furthermore, the Wald test results indicate that among the 16 time-varying income elasticity estimates, only six are statistically different from the benchmark time-invariant income elasticity estimate. Thus, our analysis of the time-varying income elasticity of marginal utility suggests that the income elasticity of marginal utility remains stable across different years of the sample period.

V. Conclusion

In this study, we aimed to estimate the income elasticity of marginal utility for South Korea within the empirical framework of Layard et al. (2008), which uses individuals' perceived level of subjective well-being as a direct measure of their experienced utility. Drawing on data from a nationally representative household survey in South Korea, we estimated the income elasticity of marginal utility to be 1.49, which is considered representative of the broader population. Furthermore, our analysis shows that the income elasticity of marginal utility remains stable over time.

Previous empirical studies have highlighted the presence of heterogeneous preferences among individuals. Building on this, we explored potential variations in the income elasticity of marginal utility across different subgroups. Our analysis reveals statistically significant differences in the income elasticity of marginal utility across various subgroups defined by specific demographic and socioeconomic characteristics. Notably, older working-age adults, those in poor health, individuals with less than a college-level education, non-wage-and-salary workers, and those with negative net asset positions all exhibit substantially lower income elasticities of marginal utility compared to their respective counterparts.

These variations have significant implications for public policies, particularly those involving the redistribution of resources across demographic and socioeconomic groups. By identifying differences in the income elasticity of marginal utility across these groups, policymakers can more accurately assign social

welfare weights. Consequently, explicitly considering heterogeneity in the income elasticity of marginal utility among various population groups enhances the targeting efficiency of public policies, such as public aid for socially disadvantaged groups, unemployment insurance, public health insurance, and taxation. This approach not only contributes to the formulation of an optimal structure for social policies but also improves overall social welfare.

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한계효용의 소득탄력성 추정: 한국의 가구 설문조사 자료를 이용한 연구*

남 덕 우** · 이 정 환*** · 전 영 준****

초 록

본 연구는 가구 설문조사 자료인 한국복지패널을 이용하여 한계효용의 소득탄력성을 추정하였다. 설문 응답자들이 보고한 생활실태 만족도 수준을 응답자들의 효용 수준으로 사용하는 Layard et al. (2008)의 직접 측정 방법을 이용하여 한계효용의 소득탄력성을 추정한 결과, 전체 표본 집단을 대상으로 추정한 한계효용의 소득탄력성은 1.49로 나타났으며 이 추정치는 시간의 경과에도 안정적임을 확인하였다. 또한 본 연구는 인구집단별 한계효용의 소득탄력성의 이질성을 분석하였으며, 나이, 혼인 상태, 고용 상태 및 고용상의 지위, 건강 상태, 교육 수준, 순자산 수준 등 다양한 인구통계 및 사회경제적 특성에 기반한 인구집단 간 한계효용의 소득탄력성이 유의하게 차이가 있음을 확인하였다.

핵심 주제어: 소득의 한계효용, 주관적 생활실태 만족도, 한국복지패널

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