**Optimal Income and Happiness of the Elderly:**

**Does Money Improve Happiness, Up to What Point?[[1]](#footnote-1)**

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**Abstract**

The most central idea in economics is that money makes people happy assuming utility will be increasing in income. This study constructs its empirical tests using elderly household data and estimates the size of the effect of income on happiness. To make persuasive progress on these tests, measures of happiness are needed. Individual survey responses to questions about happiness are used in the current study. In previous studies, such responses have been applied mostly by psychologists, but a little by economists because of dealing with subjective data. However, recently the border between economics and psychology has attempted to understand the effect of income on happiness emphasizing and using the subjective data. A polynomial regression model was applied to identify the relationship between income and happiness and to find out what is the optimal level of income for happiness? This study found that the coefficient of income square was significant and negative, indicating that there was a nonlinear relationship between income and happiness, and the saturation point is existing. It means that those with higher incomes are happier than those with lower ones. But at a certain point, the level of happiness is not increasing anymore and declining. Based on the polynomial model result, optimal income was calculated by differentiating the function and found that up to $3,065 (350 ten thousand won) a month, the level of happiness for elderly is increasing but after that point, the additional happiness gains from having one more unit of income is less. In other words, no matter how much more than $3,065 they have, they don't feel any greater degree of happiness. Rising income, it turns out, produces greater happiness until they get to around $3,065. After that, there are diminishing returns, with more income leading to little or ultimately no gain in real happiness. Although money does buy happiness up to a certain point, it does not always guarantee it. Generally, the economic requirements for happiness depend on income as well as the health condition and other external factors.

**Keywords:** *Optimal income, Happiness threshold, Saturation point, Income adequacy, Elderly*

**Introduction**

The impact of population aging on society is becoming an increasingly important area of concern to economists and policymakers. The elderly population is increasing not only in absolute numbers but as a share of the total population in Korea. From 1990 to 2015, the index of aging with reference person age 65 and over increased 20.0 to 94.8 persons, about five times the rate of increase in the population as a whole. By 2020, there are expected to be over 7 million such households, over 16 percent of the total population (Statistics Korea, 2016).

The income distribution in Korea is changing, and some of the changes have favored the elderly, who have, as a result, experienced a higher rate of increase in real income, adjusted for family size, than other age groups. Thus, on average, the elderly today, are at least as well off as other age groups and will continue to be so during the next several decades. Although the elderly households have average experienced economic gains, substantial numbers have inadequate resources. Chung and Cho (2016) identified two groups of elderly that should be objects of concern: the many near-poor whose incomes are just high enough to disqualify them for social programs and the elderly in poverty. It is obvious that the happiness of these elderly is much lower than the elderly with moderate or affluent income.

The most central idea in economics is that money makes people happy assuming utility will be increasing in income. Happiness is an outcome of daily life based on income and consumption. It is the state of health, comfort, or quality of life that results from among other things, the income and consumption of goods and services. Elderly households have numerous needs and desires, many of which require income to be happy. Some of the needs are essential for maintaining life, some are based on culturally determined prescriptions of how to live, and some are rooted in individual tastes and preferences. All yield happiness to the individual when they are satisfied.

Given this close association between income and happiness, it is reasonable to assume that measure of income is a good indicator of happiness, and it is generally accepted as such. Although the actual relationship between income and happiness is not easy, perhaps very difficult, to measure directly with any degree of accuracy, several theories have evolved concerning the nature of that relationship. The simplest theory is that more is better, and hence the more that is owned, the higher is the level of happiness. This theory is a useful simplification although it has many well-known exceptions.

Another theory is that happiness, and hence well-being, is a function of the magnitude of the gap between one's actual level of income and one's standard such as income adequacy (Magrabi et. al., 1991). The further below the standard one is the lower one's level of happiness. An example is the gap between actual income and recommended standards for wellbeing. The higher the level is, the higher is the happiness. Gaps may also be interpreted in terms of other comparisons, such as a standard based on scientific evidence regarding what is essential for happiness. An alternative to using scientifically based standards is the use of level of income as a standard for assessing happiness. If elderly household's level of income is below that of the reference group, its level of happiness is regarded as being correspondingly low; if the household is at the same level as the reference group, regardless of how low that level may be in absolute terms, then the household is deemed to be at a satisfactory level of happiness.

Still another theory is that happiness is a function of the gap between current income and previous levels experienced. If the level of income is rising, then the elderly perceives itself as having a high level of happiness, although its absolute level may be low. If its level of income is declining, the elderly perceives themselves to be at a low level of happiness, although its income level may still be high in absolute terms. This theory indicates that the happiness response to income changes. Then, the question is how does happiness respond to changes in income? Does the response depend on the nature of the income? These questions are crucial to understand happiness.

This study constructs empirical tests using elderly household data and estimates the effect of income change on happiness, taking the following research question into account. Does money improve happiness, up to what point? To make persuasive progress on these tests, measures of happiness are needed. Individual survey responses to questions about happiness are used in the study. In previous studies, such responses have been applied mostly by psychologists, but a little by economists because of dealing with subjective data. However, recently the border between economics and psychology has attempted to understand the effect of income on happiness emphasizing and using the subjective data (Gardner & Oswald, 2001; 2006).

**Methods**

**Empirical Model**

More than one study has tried to determine the monetary price of happiness. Some look at wealth and others look at income (Clark, Frijters, & Shields, 2008; Diener & Biswas-Diener, 2002; Headey, Muffels, & Wooden, 2008; Kahneman & Deaton, 2010; Tella, De New, & MacCulloch, 2010). This study constructs a test on income and reported happiness of the randomly chosen elders. The purpose is to identify the causation effect between income and happiness. To do so, this study run a series of regression specifications that are based on the following general form:

Happiness=β0 + β1\*(income) + β2\*(income**2**) + βi\*(xi) + ei (1)

Happiness=β0 + β1\*(income) + β2\*(income**2**) + β3\*(PI) + βi\*(xi) + ei (2)

Happiness=β0 + β1\*log(income) + ei (3)

The regression equation estimated an empirical version of equation 1. Happiness is assumed a function of real income and the perception of income such as income adequacy (PI), and xi is a set of demographic and personal characteristics: marital status (a set of dummy depending on whether the respondent has spouse or not), gender, age, and educational background (5 points scale from no education to college graduate).

**Data**

A questionnaire based on previous studies was designed to identify the status of the economic well-being of the elderly households (age 65 or older). Data were collected based on interview method. A 7-item scale, ranging from (1) very unhappy to (7) very happy, designed to measure happiness. Each respondent was asked to choose one of the 7 options that finish a given sentence fragment. Income was total monthly income after tax. Perceived income adequacy was rating on a 5-point scale derived from the following question, “Thinking of your household's total monthly income, would you say that your household is able to make ends meet?” The answer scale was composed of five categories ranging from with great difficulty to easily.

The quality of life was measured too and it was a 12-item instrument that measured five conceptual domains of quality of life: physical well-being, relationships with family and other people, social and community activities, personal development and fulfillment, and leisure. These 12-items were rating on a 5-point scale anchored with the words ‘delighted’ and ‘terrible’. The reliability of the 12-item scale was 0.886. In order to check the accuracy of the collected data, cases of extreme values and inconsistencies were investigated. Elderly people who did not respond to some questions were also omitted from the sample. After all the adjustment were made, the study sample consisted of 367 elderly households.

**Sample Characteristics**

The sample characteristics are summarized in Table 1. Of the 376 elderlies, 54.3 percent of reference persons were female and 41.5 percent of reference persons were unmarried, which included divorced, separated, and widowed. Considering educational level, 94.1 percent of the elderly have less than a college degree and they were mostly elementary school graduate (33.2%). Monthly mean income of the elderly was 1.65 million won ($1,475) and mean age was 69.7 years old.

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| Table 1. Sample Characteristics | | |
| Variable | Categories | % (N) |
| Gender | Male | 45.7 (127) |
| Female | 54.3 (204) |
| Marital status | Married | 58.5 (220) |
| Unmarried | 41.5 (156) |
| Education | No school | 26.6 (100) |
| Elementary school | 33.2 (125) |
| Junior high school | 20.5 (77) |
| High school | 13.8 (52) |
| College | 5.9 (22) |
| Age | Mean (SD) | 69.7 (7.04) |
| Monthly income | Mean (SD) | 165.3 (99.3) |
| Total |  | 100.0 (376) |

**Results**

**Determinants of Happiness: Polynomial Regression Model**

The polynomial regression model was applied to identify whether the relationship between income and happiness is nonlinear or curvilinear. Analysis of the results is shown in Table 2. Gender and education were significantly related to happiness but age and marital status were not significant in the sample as a whole. Income, as well as income square, were significantly related to happiness. The coefficient of income square was significant and negative indicating that there was a nonlinear relationship between income and happiness and the saturation point is existing. It means that those with higher incomes are happier than those with lower ones. But at a certain point, the level of happiness is not increasing anymore and gradually declining. Comparing the strength of the effect of income and income square to the happiness, the standardized beta coefficient of income square (β=-0.506) was higher than income (β=0.387).

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| Table 2. Polynomial Regression Results: Happiness | | | | |
| Model | Unstandardized | | Standardized | t |
| B | S.E, | Beta |
| (Constant) | 2.266 | 0.733 |  | 3.092\*\* |
| Gender | 0.370 | 0.124 | 0.157 | 2.998\*\* |
| Age | 0.002 | 0.009 | 0.009 | 0.182 |
| Marital status | 0.157 | 0.135 | 0.066 | 1.161 |
| Education | 0.279 | 0.059 | 0.279 | 4.757\*\* |
| Income | 0.007 | 0.002 | 0.387 | 2.030\* |
| Income**2** | -0.00001 | 0.000 | -0.564 | -2.940\*\* |
| F | 12.761\*\* | | | |
| R2 | 0.275 | | | |
| \*p<0.05 \*\*p<0.01 | | | | |

To examine income and income squared effects on happiness as well as on the quality of life, this study also used a polynomial model including the quality of life as a dependent variable. The results are presented in Table 3. Gender and age were significantly related to the quality of life. Education was positively related to the quality of life, but marital status was not significant. Considering income effect, income was significantly and positively related to the quality of life but income square was not significant indicating that there was a linear relationship between income and life quality and the saturation point is not existing. It means that those with higher incomes have a higher quality of life than those with lower and the quality of life level is increasing continuously.

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| Table 3. Polynomial Regression Results: Quality of Life | | | | |
| Model | Unstandardized | | Standardized | t |
| B | S.E, | Beta |
| (Constant) | 0.645 | 0.306 |  | 2.106\* |
| Gender | 0.158 | 0.052 | 0.148 | 3.075\*\* |
| Age | 0.015 | 0.004 | 0.197 | 4.109\*\* |
| Marital status | -0.005 | 0.056 | -0.004 | -0.086 |
| Education | 0.180 | 0.024 | 0.397 | 7.376\*\* |
| Income | 0.003 | 0.001 | 0.574 | 3.316\*\* |
| Income**2** | -0.00003 | 0.000 | -0.318 | -1.816 |
| F | 25.178\*\* | | | |
| R2 | 0.290 | | | |
| \*p<0.05 \*\*p<0.01 | | | | |

**Optimal Income for Happiness**

Then, what is the optimal income for happiness? Based on the polynomial model result (Table 2), this study calculated the optimal income for happiness by differentiating the function.

*Happiness* = (0.007\*income) - (0.00001\*income2)

⇒ differentiating⇒ 0.007- (2\*0.00001)\*income

Optimal income per month = 0.007/0.00002 = 3.5 million won (￦3,500,000; $3,120)

This study found that up to 3.5 million Korean won ($3,065) per month, the level of happiness is increasing but after that point, the additional happiness an elderly gain from having one more unit of income is less. In other words, no matter how much more than $3,065 they have, they don't feel any greater degree of happiness. Rising income, it turns out, produces greater happiness until they get to around $3,065. After that, there are diminishing returns, with more income leading to little or eventually no gain in real happiness.

Assume that if we have zero income and then gain 100 a month. This income will improve living standards of the elderly significantly. With that money, the elderly could be able to pay for the basic necessity of life such as food, clothing, shelter and heating, and health care need. Without the income, the life of an elderly would be tough. However, if the elderly can gain 200 a month, they would be happy to gain an extra 100 to spend on goods and services and they can afford most things they need. An extra 100 can increase in happiness but proportionately smaller increase. They may prefer to have food away from home more often, but it may not significantly affect the happiness.

If they have 350 a month, they would hardly notice an extra money a month. They may not even have the time or physical strength to spend it. Therefore, the marginal happiness of an extra income is very limited. Therefore, as income increases, additional happiness to individual declines. Although happiness itself is not easily defined, money is an indicator of happiness up to a certain point but it does not always guarantee it. Generally, the economic requirements for happiness depend on human relationship, health, and other external factors.

**Happiness Threshold with Income Change**

The concept of threshold, that is, the entrance, the level, or point at which people start to experience something, or at which something starts to happen, is easily understood. In this study, happiness thresholds, that is individuals or families are happy if their income rise above a certain amount, are calculated based on the regression coefficients (Table 4). Considering the 7-item scale of happiness, the mean level is 4.43 with 1.50 million won per monthly. In 2017, the median income of single person households in Korea is 1.65 million won. With the median income, the happiness level of the elderly is 4.49 that is a little above the mean level (m=4.43).

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| Table 4. Happiness Threshold with Income Change | |
| Model | Threshold |
| a+(b1\*100) | 4.23 |
| a+(b1\*110) | 4.27 |
| a+(b1\*120) | 4.31 |
| a+(b1\*130) | 4.35 |
| a+(b1\*140) | 4.39 |
| a+(b1\*150) | 4.43 |
| a+(b1\*165) | 4.49 |
| Median income of 2017 = ￦1,650,000 ($1,475)  Happiness: minimum vs. maximum 2~7, mean=4.43, SD=1.18 | |

**Happiness with Log Income Change**

In a regression model, logarithmically transforming variable is a common way to handle situations where a non-linear relationship exists between the independent and dependent variables. Using the logarithm of income variable makes the effective relationship non-linear while still preserving the linear model. Analyzing linear-log model of percentage changes in income, we can use the following result: The expected change in happiness associated with a percentage increase in income can be calculated by *e*b\*log(1.1). Table 5 shows the impact of a percentage change in income on happiness based on the liner-log regression coefficient. A 10% increase in income raise happiness by 5.6% and if income increase by 50% then happiness could be raised by 23.92%. Considering the variation of happiness by income change, there is a diminishing marginal happiness of income suggesting that as income increases, the elderly gain correspondingly smaller increase in happiness.

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| Table 5. Happiness with Log Income Change | | |
| Model | Level | Variation |
| *e*.590\*log(1.1) | 0.05623301 | - |
| *e*.590\*log(1.2) | 0.10756972 | 0.051337 |
| *e*.590\*log(1.3) | 0.15479492 | 0.047225 |
| *e*.590\*log(1.4) | 0.19851862 | 0.043724 |
| *e*.590\*log(1.5) | 0.23922441 | 0.040706 |

**Determinants of Happiness: Real Income and Perceived Income Adequacy**

Perception of income such as perceived income adequacy is an integral part of one's economic well-being at any age and is an important indicator for understanding the economic status of the elderly ([Litwin](https://www.ncbi.nlm.nih.gov/pubmed/?term=Litwin%20H%5BAuthor%5D&cauthor=true&cauthor_uid=19386829) & Sapir, 2009). This is because incomes tend to decline in late life due to retirement and health-related expenses tend to rise ([Stoller & Stoller, 2003](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2682171/" \l "bib39)). Perception of income is the income an elderly requires to live at the level of desires and is representing self-rated economic status as well as happiness. In a previous study ([Litwin](https://www.ncbi.nlm.nih.gov/pubmed/?term=Litwin%20H%5BAuthor%5D&cauthor=true&cauthor_uid=19386829) & Sapir, 2009), the validity of perceived income adequacy as a reliable measure of economic status in late life was confirmed.

Table 6 presents results showing that the two strongest predictors of happiness were the real income as well as perceived income adequacy. However, the table also shows that the strength of association with happiness was different. The coefficient of income was positive but income square was negative indicating nonlinear relationship exist. Perceived income adequacy was significantly and positively related to happiness. It means that those with a higher perception of income adequacy are happier than those with lower. Considering the strength of the effect of the income and perceived income adequacy to the happiness, the standardized beta coefficient of perceived income adequacy (β=0.327) was higher than income itself (β=-0.104). It indicates that income itself is necessary for happiness and perceived income is more important to be happy for the elderly.

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| Table 6. Determinants of Happiness with Perceived Income Adequacy | | | | |
| Model | Unstandardized | | Standardized | t |
| B | S.E. | Beta |
| (Constant) | 3.790 | 0.634 |  | 5.975\*\* |
| Gender | 0.158 | 0.109 | 0.067 | 1.448 |
| Age | -0.027 | 0.008 | -0.162 | -3.373\*\* |
| Marital status | 0.225 | 0.118 | 0.094 | 1.989\* |
| Education | 0.100 | 0.054 | 0.100 | 1.956\* |
| Income | 0.001 | 0.001 | 0.096 | 1.957\* |
| Income**2** | -0.00002 | 0.000 | -0.104 | -1.961\* |
| Income adequacy | 0.353 | 0.064 | 0.327 | 5.503\*\* |
| F value | 30.618\*\* | | | |
| R2 | 0.376 | | | |
| \*p<0.05 \*\*p<0.01 | | | | |

**Conclusion**

This analysis sought to better understand the nature of the causation between income and happiness and to present the results showing the economics view is correct. That is, income does buy greater happiness and rise in happiness is given by the increase in income. Then, the question is how much do the elderly need to be happy? This study found that up to 3.5 million Korean won a month, the level of happiness is increasing but after the point, the additional happiness gaining from one more unit of income is gradually diminishing.

Lower income may not cause sadness itself but could make people feel more restricted as well as ground down by the problems they have. Having money clearly allows more comfort and opportunity in daily life. According to the findings of this study, that effect is optimal at 3.5 million won for the elderly. However, this study does not find why 3.5 million is the benchmark, but it seems a plausible amount for the elderly doing things that make them feel happy with a spouse and friends. This study also found that it's not just absolute income that is linked with happiness, but perceived income adequacy, that is the income the elderly requires to live at the level they desire, has strong association too.

In conclusion, the present study focusing on the elderly found that the relationship between income and happiness is nonlinear and the saturation point is existing. One limitation of the present study is that it has used cross-sectional data and longitudinal data are needed to trace the effects of changes in income on happiness. Further study is necessary to find why certain amount (in this study 3.5 million) is the benchmark and to compare the difference among age groups and regions. Because how much people need to get to the happiness threshold usually depends on how old they are and where they live. If one lives in a metropolitan city where the cost of living is relatively high, one needs more money to get to the happiness threshold while in a rural area, by comparison, the threshold may be a lot lower.

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