

# Inter-Generational Effects of Basic Pension on Adult Children's Subjective Well-Being

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## Abstract

This study aimed to estimate the inter-generational effect of Basic Pension on adult children's overall life satisfaction using the propensity score matching (PSM) and generalized difference-in-differences (GDD) design with an event study framework and 2007~2019 Korean Welfare Panel Study data.

The findings of this study showed that although overall life satisfaction of the adult children was relatively improved following their parents' receipt of Basic Pension among those whose education level was university graduation or higher, the effect was not generally found in the sample. The absence of statistically significant improvement in overall life satisfaction among the adult children in the entire sample was presumably due to the low level of Basic Pension benefits and the absence of household income pooling and resource allocation to the adult children. Further investigation of the within-household distribution of Basic Pension income in Korea is needed to understand the true effect of the policy on households.

This study is the first to provide empirical evidence on the inter-generational effect of Basic Pension policies in Korea on adult children's well-being by benefit duration, using a quasi-experimental study design.

**Keywords:** Basic Pension, Inter-Generational Effect, Subjective Well-Being, Difference-in-Differences, Propensity Score Matching

## 알기 쉬운 요약

**이 연구는 왜 했을까?** 우리나라는 베이비부머와 같이 성인이 노인 부모를 부양하는 등 노인 부모와 성인 자녀가 경제적으로 연결되어 있거나 동거하는 사례가 많다. 이런 사회적 배경에 따라 이 연구는 최초로 개인 수준에서 부모의 기초연금 수급이 자녀의 주관적 웰빙에 미치는 영향을 추정하여 기초연금 정책의 영향을 종합적으로 평가하는 데 기여하고자 하였다.

**새롭게 밝혀진 내용은?** 이 연구는 노인 부모의 기초연금 수급은 성인 자녀 중 교육 수준이 대학교 이상인 자녀의 삶의 만족도를 개선하는 것으로 나타난 세대 간 효과를 최초로 밝혔다. 저자들은 이 결과를 한국에서 일부 성인 자녀가 겪는 부양부담과 관련이 있을 것으로 보았다.

**앞으로 무엇을 해야 하나?** 아직까지 우리나라에서 기초연금 등 사회보장제도 및 사회서비스의 영향을 개인의 주관적 웰빙과 신체·정신적 건강 측면에서 종합적으로 살펴보는 연구가 부족한 실정으로, 증가하는 노인 및 장애 인구를 고려할 때 보건학적 관점에서 노인과 장애인 대상 해당 제도의 영향과 그 경로를 종합적으로 파악할 필요가 있다.

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## I. Introduction

To improve social security system in Korea, the government introduced the Basic Old Age Pension (BOAP) in 2008, a tax-financed non-contributory pension for older adults aged 65 and over. The BOAP paid monthly benefits of approximately 80,000 won for a single beneficiary aged 65 and over and in the bottom 70% of the “recognized income” in 2009 (Lee & Wolf, 2014). In July 2014, BOAP was replaced with Basic Pension (BP) (Lee, Ku & Shon, 2019), which was fundamentally the same scheme except for doubled benefit level. Target population and eligibility rules remained same and existing BOAP beneficiaries continued to receive BP, with the maximum monthly benefit raised almost two-fold to approximately 200,000 won for single beneficiary. In both schemes, nearly all beneficiaries received the legally mandated maximum benefit. Recently, single beneficiary BP benefit was increased to 250,000 won in September 2018 and to 300,000 won in January 2021. The number of beneficiaries exceeded 5.2 million in 2018, nearing the policy target coverage of 70% of individuals aged 65 and over (Chung, Choi & Lee, 2018). Hereafter, BP refers to both the BOAP and the BP collectively in this study.

A cash transfer to older adults such as BP may produce unexpected outcomes given the older adults' household environment. For instance, shared housing often suggests sharing of household resources such as income, living standard, and psychological risk factors. If such resource and risk sharing exists, BP income of older adults may eventually benefit individuals living in the same house. In this case, BP policy can be an instrument that simultaneously affects both groups and may produce unexpected outcomes (Bertrand, Mullainathan & Miller, 2003, p.27; Case & Deaton, 1998, p.1330).

Although the incidence of cohabiting with adult children is declining in Korea, it is still relatively high. According to the statistics Korea, 27.6% of the individuals aged 65 and older lived with their children in 2017 (Lee & Lee,

2018, p.26) and the most frequently expressed reason behind this was the ‘inability to live independently’ (40.5%). Among the BP (BP) beneficiaries, 17.8% lived with either their children or grandchildren. Additionally, only 21.8% of the BP beneficiaries indicated that they no longer need financial assistance from children due to the BP receipt, suggesting interconnectedness of household finances and older adults' heavy reliance on their children in Korea (Ahn, Choi, Han & Lee, 2018, p.131). Indeed, middle to older adults in Korea are often known to experience double burden of supporting parents and their own children (Jung et al., 2010, p.64, 87).

Given these circumstances in Korea, BP policies are expected to affect not only the beneficiary but also the household members who live with the beneficiary. However, studies on BP have only investigated its effect on the beneficiary's own material well-being, including income, consumption, and poverty (Kang & Choi, 2010; Lee & Kwon, 2016; Lee & Tak, 2018; Park & Kim, 2015; Shin & Do, 2015), neglecting indirect but increasingly known consequences of non-contributory pension programs on subjective well-being of the beneficiary and the family members. Additionally, the means-tested nature of BP program in Korea, which implies that a beneficiary receives the benefit indefinitely since a sudden increase in income in old age is very rare, make it an ideal case to investigate the effect of non-contributory pension program over time.

Given the aforementioned significance as old age income, the non-contributory nature, meaning that it is tax-financed policy, and the strong possibility of inter-generational effect, there is a growing need to understand comprehensive effect of BP on different areas of individual well-being and to provide lessons for future policy reforms. In previous studies, the authors have so far discovered a positive effect of an increase in basic pension benefit on subjective well-being (Hwang & Lee, 2020) and a positive effect of continually receiving basic pension on objective measures of health (Hwang & Lee, 2022). In this study, for the first time in Korea, we investigate the inter-generational effects

of BP programs on subjective well-being of the adult children of BP beneficiary by benefit duration up to two years.

## II. Background

### 1. Theoretical considerations

There is no theoretical model that explains the relationship between non-contributory pension income and the household member's subjective well-being per se. Rather, we briefly discuss theoretical models of resource allocation within households and their implications on individual well-being. Although BP can affect household members in absence of resource allocation (i.e. through changes in psychological risks), models of resource allocation are still insightful in that they provide fundamental understanding of how non-contributory pension affects different households.

One prominent model of resource allocation within households is known as the common preference model that depicts households maximizing a single utility function (Bertrand, Mullainathan & Miller, 2003, p.29). In other words, utility of marginal expenditure spent by every person in a given household is the same. Therefore, who gets the marginal income (i.e. BP income) will affect neither household consumption level nor subjective well-being of each member associated with additional consumption. In such households, household resources are often managed altogether under the objective of the household as a single optimizing agent.

Another important models of household resource allocation reject the idea that households can be reduced to a single optimizing entity. These models assume each household member has distinct preference and allocation of resources within household is determined through bargaining process between the members. In this model, who gets the marginal income affects the utility of each

member. Additionally, bargaining power of each member affects the amount of resources that he or she receives (Bertrand, Mullainathan & Miller, 2003, p.29).

In the non-contributory pension literature, the notion of household income pooling is strongly associated with the resource allocation models. Household income pooling refers to the idea that household members pool their income and draw on the pooled income for common and individual expenditures. For instance, in income pooling households, BP beneficiaries may choose to contribute non-contributory pension income to the income pool. In other words, income pooling households follow the common preference model of resource allocation. In this case, non-contributory pension income may benefit and improve subjective well-being of all household members.

On the other hand, in the non-income pooling households, non-contributory pension beneficiaries spend non-contributory pension income based on their distinct preferences. In other words, non-income pooling households follow the resource allocation model that rejects the idea of the single optimizing agent. Thus, non-contributory pension income may or may not benefit and improve subjective well-being of other household members in non-income pooling households.

### 2. Literature Review

Although studies that investigated inter-generational effects of non-contributory pensions such as BP on adult children's subjective well-being were rare, many examined effects of non-contributory pension on aspects of adult children's life that were strongly associated with one's subjective well-being. Namely, inter-generational effects of non-contributory pension on the labor supply and self-rated health of adults (Bertrand, Mullainathan & Miller, 2003, p.33; Case, 2004, p.291), level of living (Case & Deaton, 1998, p.1348), and transfer or remittances from adult children (Jensen, 2004, p.103) were frequently investigated. Changes in the household resources such as nutrition due

to non-contributory pension income were also investigated using children's health as outcome (Duflo, 2003, p.1).

Study by Bertrand, Mullainathan & Miller (2003, p.33) investigated the effects of the non-contributory pension benefit to older adults on the labor supply of the working age adults living with older adults in extended families in South Africa using household survey data in 1993. Study sample was restricted to three-generation households to reduce heterogeneity in sample and to adults aged 50 and less to avoid anticipation effects of basic pension. By instrumenting (IV OLS regression) the pension income with the number of age-eligible older adults in the household, the authors concluded that the non-contributory pension income paid to older adults reduced the weekly labor supply of a working age adult roughly by 15%. In addition, pension income received by an older woman reduced the working hours of a prime age adult more than that received by an older man, suggesting a selective redistribution of the pension income among the household members caused such changes. These effects of non-contributory pension were robust even after controlling for effects of having older adults in the household and clustering standard errors on household level. Lastly, by interacting demographics with pension income, the authors suggested that adults with certain characteristics (i.e. lower education level, older, oldest adult in the household) were relatively more affected by pension income (i.e. reduced labor supply more than others).

Study by Case (2004, p.291) investigated the effect of non-contributory pension on health of household members that live with the non-contributory pensioner in South Africa using a survey data in 1999. In this study, status of household income pooling and the number of older household members were used to identify exogenous effect of non-contributory pension on household members. The authors suggested that non-contributory pension income (represented by the number of non-contributory pensioners) improved the self-rated health of all adult members in households that pooled income and the

pensioner did not enjoy any additional health benefit. However, self-rated health of only the pensioner was improved in households that did not pool non-contributory pension income and the effect was larger. The authors argued that mechanisms through which non-contributory pension income improved health of adult household members were changes in Activities of Daily Living (ADL), sanitation, nutrition, and psychological risk factors such as stress. Specifically, non-contributory pension income improved nutritional intake, living conditions, and reduced stress of household members and resulted in lower depression scores.

A non-contributory pension also changes the level of living of a household by boosting household spending on both durable and non-durable goods. A study by Case & Deaton (1998, p.1348) investigated the effect of non-contributory pension income on household consumption expenditures (food, clothing, housing, health, and so on) using a 1993 national survey data and an instrumental variable approach. The authors suggested that the non-contributory pension income boosted food expenditures and ownership of various durable goods. The authors concluded that in a household where the older adult and adult) children were arranged to cohabit, the non-contributory pension is a public policy instrument that simultaneously affect both groups.

Effects of non-contributory pension on household living condition were often contested due to 'crowding out' effect of non-contributory pension on private transfer income. However, if existing private transfer income is not completely replaced by non-contributory pension income (i.e. private transfer income decreases by exactly the amount of non-contributory pension income), which is not the case in most countries, we can argue that non-contributory pension still contributes to household living conditions. Such 'crowding out' effect of non-contributory pension on private transfer has been widely studied. For instance, a study by Jensen (2004, p.103) investigated whether non-contributory pension

income displaced the private transfer from their children living away from home in South Africa using survey data between 1989 and 1993 and differences-in-differences (DDD) framework. The authors suggested that for each South African rand, private transfers from adult children decreased by 0.25-0.3 rand. Therefore, non-contributory pension income only partially displaced private transfer and still benefitted the household. Crowding out effect of non-contributory pension has also been debated in Korea, but no study has reported a 100% displacement of private transfer income so far.

Changes in household resources and corresponding improvement in health of non-adult children after collecting the non-contributory pension income were investigated as well. A study by Duflo (2003, p.1) investigated the effect of non-contributory pension on anthropometric indicators of children under seven by sex of the non-contributory pension beneficiary in South Africa using a national survey data in 1993 and instrumental variable approach. Presence of non-contributory pension eligible men or women based on age eligibility was used as instruments. And the outcome measure was children's weight for height that was known to respond quickly to changes in nutrition. The author suggested that non-contributory pension received by women increased the weight for height of girls but did not significantly affect that of boys. The author concluded that non-contributory pension income had a large effect on household nutrition and the effect was significantly different by sex of the pension recipient and the children. The author pointed out that although non-contributory pension income improved nutritional status of household members, it can be spent differently depending on characteristics of the recipient and that targeting non-contributory pension to certain group can be preferable in achieving public policy objectives.

In Korea, receiving basic pension was associated with increased income and consumption expenditure and decline in relative poverty (Kang & Choi, 2010; Lee & Moon, 2014; Park & Kim, 2015). And a study reported that

despite these improvements, basic pension income did not crowd out the private transfers going to the beneficiary (Lee et al., 2019, p.514). Only few studies investigated the effect of basic pension on the beneficiary's health and subjective well-being in Korea. Specifically, increased basic pension benefit reduced depressive symptoms (Pak, 2020) and improved subjective well-being of the beneficiary (Hwang & Lee, 2020). Additionally, a recent study reported that receiving basic pension improved grip strength and cognitive ability, after 5 years and immediately, respectively (Hwang & Lee, 2022).

Basic pension was also associated with decreased burden of supporting parents. In Korea, older adults with elderly parents often experience both the financial strain of providing for parents and the physical care responsibilities. Using panel fixed effect regression model, a recent study suggested that basic pension decreased financial and time burden of the family member who care for the beneficiary. Specifically, the study suggested that private transfer income of the beneficiary decreased and amount of care given by non-family professional care providers increased, following the beneficiary's basic pension receipt (Song & Lee, 2020). Decrease in private transfer income of the basic pension beneficiary was also consistently observed in other recent studies (Kim & Chun, 2020; Seol & Lim, 2019). In Korea, middle-aged and older adults are known to experience 'double care burden' of supporting both their elderly parents and single children (Kim, 2019). For example, the babyboomers in Korea transferred 14.6% of their annual income to their parents as financial support in 2010 (Chung et al., 2010). And it is well-established that the care burden is closely associated with individual life satisfaction. In particular, a recent study suggested that individual life satisfaction decreased with higher subjective care burden for both parents and parents-in-law (Lee, 2014).

These evidence suggested that an important mechanism through which basic pension improves the adult children's well-being is by lifting financial and psychological strain of supporting elderly parents. In other words, BP benefit can

be a policy instrument that can increase well-being of both the beneficiary and the financial supporter of the family.

In summary, the theoretical and empirical evidence suggested that parent's basic pension benefit affect the children's subjective well-being by bringing changes in 1) its determinants - household income, health, nutrition, labor supply, and so on through within-household resource allocation and 2) the children's psychological and economic factors such as reduced financial burden and expenses of caring for family.

However, existing studies 1) mostly used household level variables, as proxies for individual level changes in well-being, to estimate changes in composition of household income or consumption and others, 2) was not able to directly observe changes in individual life satisfaction following parent's non-contributory pension receipt, 3) was not able to observe changes in individual well-being by time, and 4) mostly relied on non-quasi-experimental study designs due to data limitations.

Our study fill this gap by estimating the causal effect of parent's basic pension receipt in Korea on adult children's individual life satisfaction by benefit duration using a GDD model with event study framework, combined with PSM for sample selection, using over 10 years of population representative panel data.

### III. Methods

#### 1. Data

This study used the Korean Welfare Panel Study (KOWEPS) data from 2007 (2nd survey) to 2019 (14th survey). Since year of BP receipt is different for each parent, longer periods of data were preferred. Characteristics of the KOWEPS that are valuable to this research are oversampling of the low-income households and 13 consecutive surveys of the BP income on household level and individual subjective well-being. This unique feature allowed an

inter-generational study design. A balanced panel data set that consisted of 4 consecutive years of data was constructed for statistical analyses.

Since we must test for the common trend assumption, we set the first two periods ( $t=-2$ ,  $t=-1$ ) as pre-treatment periods in which parents of individuals in both treatment and control groups did not receive the BP. Third and fourth periods ( $t=0$  &  $t=1$ ) were set as post-treatment periods in which only parents of individuals in treatment group received the BP. In this case,  $t=0$  is the period in which parents of individuals in treatment group received the benefit for the first time. Therefore, data from  $t=-2$  and  $t=-1$  were used to test for any differences in the pre-treatment trends between treatment and control group and data from  $t=-1$ ,  $t=0$ , and  $t=1$  were used to estimate the inter-generational effects of parents receiving the BP on adult children's subjective well-being.

#### 2. Variables

The outcome variable of interest is the adult children's subjective well-being represented by the overall life satisfaction score. In the KOWEPS, overall life satisfaction was measured by a 5-point scale - from very unsatisfied (1) to very satisfied (5). In this study, we used overall life satisfaction in continuous scale. The independent variable of interest is the treatment indicator, which is equal to 1 if the parent(s) of the adult children had received the BP in the post treatment periods. In the KOWEPS, receipt of the BP is indicated by amount of the BP income of the household. Therefore, it is not possible to identify who received the BP. In this study, we eliminated households with older adults aged 65 and over other than the parent(s) and classified adult children in the household with positive BP income as treatment group.

We selected determinants of subjective well-being as matching variables and covariates. In previous studies, prevalent determinants of individual life satisfaction across different population groups included demographic

characteristics, income and labor force participation, and health status (Easterlin, 1995; Frey & Stutzer, 2000; Lee, 2016; Park, 2019). Additionally, number of parents aged 65 and over was selected as a proxy measure for basic pension benefit amount, since the benefit for couple beneficiary household is 1.6 times higher than the benefit for single beneficiary household. Specifically, demographics such as age, sex, marital status, educational attainments, and number of parents aged 65 and over in the household were included. As a measure of health, self-rated health, chronic diseases, and disability status were included. Lastly, labor and income variables such as labor force participation status, personal earnings, household income, and household assets were included. Specification of variables used in this study are summarized in <Table 1>.

### 3. Sample

Only the adult children whose older parent(s) and household BP income amount were identified in the data were included in the sample. Sample selection strategies were as follows. We set the age requirement for older parents as 65 and over and the requirement for adult children as 60 and younger. Age of the adult children was set as 60 and younger to eliminate possible anticipation effects of receiving the BP in the near future on one's life satisfaction. Since identifying the BP recipient was not feasible in the KOWEPS data, it was critical to select the households that consisted of only the older parents and the adult children. A variable that represents one's relationship with head of the household was used to select such

**Table 1.** Definition of variables used in the study

	Variable	Definition
Dependent variable	Overall life satisfaction	5-point scale overall life satisfaction based on last year's experiences (continuous)
Independent variable	Parent's BP receipt (treatment status)	0=no household BP income 1=household BP income greater than 0 (based on total amount of household BP income in the last year)
	Age	Age (continuous)
Matching variables and covariates	Sex	0=women, 1=men
	Education	0=no education, 1=elementary school, 2=middle school, 3=high school, 4=university, 5=graduate school or higher
	Marital status	0=no spouse, 1=with spouse
	Number of parents aged 65 and over	number of parents aged 65 and over (continuous)
	Labor participation status	0=currently working, 1=currently not working
	Personal earnings	Total personal earnings in the last year, in ten thousand KRW (continuous)
	Household income	Total household income in the last year, in ten thousand KRW (continuous)
	Household assets	Total household disposable assets (assets-debts) in the last year, in ten thousand KRW (continuous)
	Self-rated health	0=bad 1=good
	Chronic disease	0=none 1=1 or more
	Disability status	0=no disability 1=diagnosed with disability

Note: Labor participation, household assets, chronic diseases, disabilities were included in regression only. Household income and self-rated health were included in matching only.

households as follows.

We eliminated households in which older adults other than the parents (i.e. siblings of the parents) were present, households that consisted of only the parent and his/her spouse, households that did not include one or more older parents or adult children, and households that included parents of the older parents. In addition, adult children who branched out (i.e. adult children who moved out after marriage) were excluded from the sample to estimate the inter-generational effect of BP within the cohabiting households. Finally, individuals were classified as older parents or adult children based on age and relation to the head of the households. Parents-in-laws and children-in-laws were included as older parents.

We assigned individuals whose parents initially did not receive the BP for two years and received the BP in the following two years to treatment group. In 2007~2019 KOWEPS data, there were ten possible cases of treatment groups that satisfied the two pre-treatment periods and two post-treatment periods condition, as represented in <Table 2>. Additionally, we were able to identify individuals whose parents did not receive the BP for four consecutive years or more in the respective periods as control groups 1~10. Once individuals in control group who belong to these ten cases were identified, they were matched to the individuals

in treatment group using the Propensity Score Matching (PSM) method in the first pre-treatment period,  $t = -1$ . Since period of treatment was different for different individuals, individuals in control group were matched to the individuals in treatment group whose observation periods were identical. The number of treatment group and control group were 458 and 232, respectively.

Although adult children in the BP eligible (treatment group) and ineligible households (control group) may not be as systematically different as the BP beneficiary and non-beneficiary, we can still suspect a possibility of selection bias between the treatment and control groups. For example, individuals in the basic-pension eligible households were expected to be older than individuals in ineligible households because BP receipt was partially determined by parent's age. In addition, it is conceivable that there were unobservable differences in intrinsic characteristics between individuals in eligible and ineligible households that affected life satisfaction differently. Therefore, we implemented Propensity Score Matching (PSM) in combination with the Generalized Difference-in-Differences (GDD) model. The propensity score was estimated using the matching variables listed in <Table 1> based on 1:1 nearest neighbor matching with replacement.

Table 2. Treatment and control group assignment in the study

Cases	Data year												
	07	08	09	10	11	12	13	14	15	16	17	18	19
Case 1	t=-2	t=-1	t=0	t=1									
Case 2			t=0										
Case 3				t=0									
Case 4					t=0								
Case 5						t=0							
Case 6							t=0						
Case 7								t=0					
Case 8									t=0				
Case 9										t=0			
Case 10											t=0		



#### 4. Estimation strategies

In this study, we used a GDD model with the event study framework (Wing et al., 2018). The GDD model incorporated two groups (treatment and control groups) and four periods (two pre-treatment periods and two post-treatment periods) and different timing of treatment for each individual. The number of post-treatment periods were set to two to retain sufficient number of sample. In addition, the inter-generational effects of BP were allowed to vary over time by incorporating the event study framework (Wing et al., 2018). The estimating equation below represented the GDD model used in this study.

$$Y_{it} = \alpha_i + \sum_{k=-2}^1 \gamma_k Period_{k,it} + \sum_{k=-2}^1 \beta_k Treat_i \times Period_{k,it} + \delta X_{it} + \epsilon_{it} \quad (1)$$

In equation (1),  $Y_{it}$  represents the individual overall life satisfaction for individual  $i$  in period  $t$ . And  $\alpha_i$  represents the individual fixed effect.  $Treat_i$  takes a value of 1 if an individual is in treatment group and 0 if an individual is in control group.  $Period_{k,it}$  is a period dummy that takes a value of 1 if  $t=k$  and 0 otherwise. And one period prior to initial BP receipt ( $t = -1$ ) was set as a reference period.

$\beta_k$  is the GDD estimate that represents the inter-generational effects of BP on adult children's overall life satisfaction. It is an estimate of the difference in the  $Y_{it}$  between treatment and control groups in period  $t$  compared to the difference in  $Y_{it}$  between the two groups in the reference period ( $t = -1$ ).  $\beta_k$  can be also used to test for the common trend assumption. If  $\beta_k$  was not statistically significant for  $t < -1$ , it indicates that the pre-treatment trends of  $Y_{it}$  between treatment and control groups did not diverge and the GDD parameters from equation (1) were not biased (Jeon & Pohl, 2017, p.8; Wing et al., 2018, p.460).  $X_{it}$  represents the time-variant characteristics of the individual  $i$  in period  $t$ .  $\epsilon_{it}$  represents the error term. We used the functional form of Ordinary Least Square

(OLS) fixed effect panel model. The GDD estimates are to be interpreted as average treatment effects on the treated (ATT) since matching weights created in the PSM step were also incorporated. Standard errors were clustered on household level to allow for correlation in outcomes within households since multiple number of adult children from single household can be included in this study.

In addition, equation (1) was used to implement sub-group analyses based on age, sex, marital status, education, labor participation, number of elderly parents to examine group heterogeneities.

## IV. Results

### 1. Descriptive statistics and the propensity score matching results

<Table 3> presents the descriptive statistics and the results of PSM for matching variables. Before matching, there were notable differences in the distribution and mean of matching variables, especially for age, education, marital status, personal and household income, and self-rated health. Specifically, individuals in treatment group were more likely to be older and married and less likely to be university educated and have good health than those in control group.

In addition, there were notable differences in personal and household income between two groups. Although personal earnings of treatment group were only lower by 12% than that of control group, household income and household income in equivalence scale of treatment group were both roughly 1/3 lower than that of control group, indicating differences in household resources between two groups. Results of the chi-square tests and t-tests indicate that the distribution of these variables was indeed different for the two groups. Household asset of treatment group was smaller than 1/2 of the household asset of control group.

As represented by the standardized percentage bias, we

can observe that the balance or the differences in distributions of the matching variables were significantly improved following the PSM. After matching, the individual standardized percentage biases ranged from 0.7 to 17.4 and averaged at 7.5. More importantly, balances among the income variables that were closely associated with parents' eligibility for BP and adult children's life satisfaction were significantly improved. Following the PSM, the number of treatment group and control group were 387 and 109, respectively.<sup>1)</sup>

[Figure 1] represents the kernel density plots of propensity score for treatment and control groups before and after the PSM was implemented. In the right panel, we can see that the distribution of the propensity scores for treatment group and control group were nearly equated.

Additionally, mean values of variables that represent the mechanisms of change in subjective well-being of adult children following older parents' BP receipt (i.e. household consumption expenditure and self-rated health) are presented in <Table 4>. In <Table 4>, increases in

Table 3. Descriptive statistics and the result of propensity score matching

Variables (Mean±SD for continuous variables)	Before matching (%)		Chi2 test / t- test	After matching (%)		Standardized percentage bias
	Treatment group (n=458)	Control group (n=232)		Treatment group (n=387)	Control group (n=109)	
Age	41.5 ±7.6	36.9 ±7.2	p=0.000	41.7 ±7.7	40.2 ±9.2	N/A
Sex						
Male	60.0	58.6	p=0.719	60.0	57.7	4.7
Female	40.0	41.4		40.0	42.3	
Education						
University or higher	29.5	57.8	p=0.000	30.7	24.9	12.2
Lower than university	70.5	42.2		69.4	75.1	
Marital Status						
Married	47.8	23.3	p=0.000	49.1	57.7	17.4
Not married	52.2	76.6		50.9	42.3	
Number of older parents						
1	77.3	69.4	p=0.024	76.2	66.8	21.3
2	22.7	30.6		23.8	33.2	
Personal earnings <sup>3)</sup>	1,841.6 ±1,826.3	2,090.2 ±2,563.1	p=0.1428	1,808.5 ±1,736.3	1,789.3 ±2,553.9	0.7
Household income <sup>4)</sup>	4,212.7 ±2,679.3	6,317.7 ±4,546.8	p=0.000	4,306.7 ±2,823.1	4,367.8 ±2,776.8	1.9
Self-rated health						
Good	74.0	87.5	p=0.000	75.7	74.0	4.1
Bad	26.0	12.5		24.3	26.0	

Note: 1) Mean standardized percentage bias (before / after matching) : 21.4 / 7.5

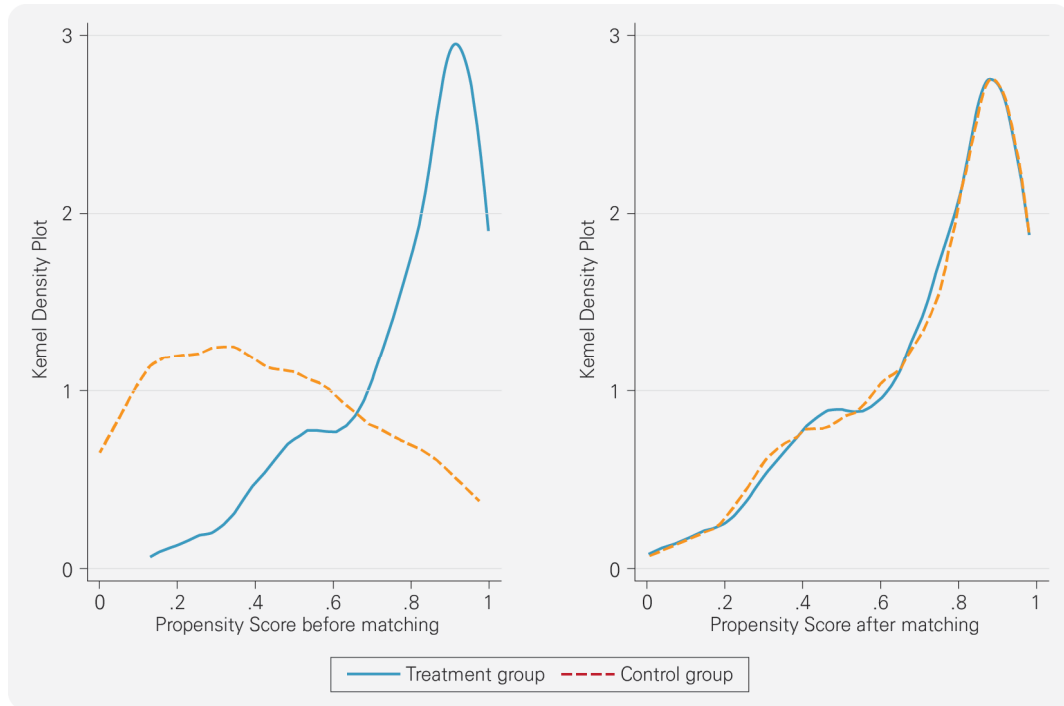
2) Median standardized percentage bias (before / after matching) : 20.1 / 4.7

3) In KOWEPS, only personal earnings were surveyed on individual level, whereas other types of income (i.e. asset income) were surveyed on household level. All incomes indicate incomes in the year prior to the survey, indicated in ten thousand Korean Won

4) Household gross income in ten thousand Korean Won

1) Since 1:1 matching with replacement was implemented and the matching weights were included in the regression analysis, the number of observation used in the regression analysis is equal to 774.

Figure 1. Kernel density plot of the propensity score before/after PSM



household consumption expenditures from  $t=-1$  (before older parents' BP receipt) to  $t=1$  (second year of older parents receiving the BP) were relatively larger for individuals in treatment group than individuals in control group for most consumption categories. For instance, total, food, and housing expenditures, which can simultaneously affect all household members, changed by 12.8%, 11.3%, 1.4% from  $t=-1$  to  $t=1$  in treatment group, whereas it

changed by 4.5%, 10.4%, -4.9% in control group. Since the average number of household members were almost identical in both groups, these numbers suggested that household resources that contribute to life satisfaction of all household members were relatively more invested in treatment group. In addition, self-rated health of individuals in treatment group increased between  $t=-1$  and  $t=1$  but decreased in control group over the same period.

Table 4. Mean values of variables that represent mechanisms of change in SWB by relevant time to treatment

	Treatment group			Control group		
	t=-1	t=0	t=1	t=-1	t=0	t=1
Overall life satisfaction	3.36	3.36	3.49	3.30	3.25	3.37
Self-rated health	2.09	2.14	2.10	2.14	1.87	2.05
Household consumption expenditure <sup>1)</sup>	Total	150.6	160.1	169.9	167.0	174.6
	Food	68.9	74.2	76.7	75.6	83.5
	Housing	20.8	22.3	21.1	26.1	24.8
	Healthcare	16.1	18.0	18.3	14.7	17.2
	Leisure	9.3	9.4	11.0	8.5	9.8
	Clothing	8.8	9.5	10.3	9.9	12.1

Note: 1) Monthly average expenditure in previous year of the survey, in ten thousand KRW

## 2. Generalized Difference-in-Differences with time-varying treatment effects

<Table 5> presents results of the GDD analyses using event study framework. Column (A) presents the baseline result in which estimates were adjusted for covariates including age, sex, education level, marital status, personal earnings, household assets, labor participation, number of older parents, chronic diseases, and disability and standard errors were clustered on household level. Additionally, we presented regression results controlling for parent’s public pension receipt and parent’s public pension benefit amount in columns (B) and (C), respectively. In <Table 5>,  $\beta_k$  for  $t=-2$  was not statistically significant in all regressions. Therefore, we can conclude that the pre-treatment trends of overall life satisfaction were not different between treatment and control groups and that the common trends assumption was satisfied. Regressions in <Table 5> included individual fixed effect and period dummies.

The baseline regression result in column (A) suggested that there was positive inter-generational effect of BP on adult children’s overall life satisfaction, which grew with time. The overall life satisfaction of treatment group declined compared to that of control group before parent(s) of treatment group started receiving BP (indicated by  $\beta_k$  for  $t=-2$ ; -0.048). However, overall life satisfaction of

treatment group increased compared to that of control group by 0.016 and 0.060 in  $t=0$  and  $t=1$ , respectively, although GDD estimates were not statistically significant. Additionally controlling for parent’s public pension receipt or public pension benefit amount did not significantly affect our result.

## 3. Sub-group analysis

<Table 6> presents results of GDD using event study framework for sub-groups categorized by age, sex, marital status, labor participation, education, and number of parents. Regression results suggested that GDD estimates were statistically significant only in the case of individuals whose education level was university or higher. Among the individuals whose education level was university or higher, overall life satisfaction of treatment group increased by 0.424 and 0.135 compared to that of control group in  $t=0$  and  $t=1$ , respectively, and  $\beta_k$  for  $t=0$  was statistically significant. An increase of 0.424 in overall life satisfaction corresponds to more than 10% increase given the average overall life satisfaction score of 3.41 in the study sample. Additionally, we presented results of sub-group analysis that additionally controlled for parent’s public pension receipt and public pension benefit amount, in <Table 7> and <Table 8>, respectively. In the additional regression

Table 5. Regression results for inter-generational effect of BP on adult children’s overall life satisfaction

	Propensity score matched Generalized Difference-in-Differences estimates		
	Coef. (SE)		
	(A)	(B)	(C)
$t=-2$	-0.048 (0.117)	-0.059 (0.109)	-0.043 (0.118)
$t=-1$	Reference period		
$t=0$	0.016 (0.109)	0.031 (0.109)	0.018 (0.109)
$t=1$	0.060 (0.132)	0.081 (0.134)	0.061 (0.133)
Control for parents' national pension receipt	N	Y (binary)	Y (amount)
N (Treatment/Control)	496 (387/109)		

Note: 1) All estimates are adjusted for age, sex, education level, marital status, personal earnings, household assets, labor participation, number of older parents, chronic diseases, and disability  
 2) All estimates are adjusted for individual and time fixed effects

results, only the life satisfaction of treatment group whose education level was higher or equal to university was improved, confirming the baseline result.

## V. Discussion

This study investigated the inter-generational effect of BP on adult children's subjective well-being in Korea, represented by the overall life satisfaction score, using the GDD models with time varying treatment effects combined with PSM method.

Findings of the PSM-GDD analysis suggested that overall life satisfaction of treatment group was significantly improved only among treatment group whose education level was university and higher immediately after parent's BP receipt, compared to that of control group. This increase in overall life satisfaction corresponded to more than 10% compared to the average in the study sample. The regression results were consistent even after parent's public pension receipt or benefit amount was controlled for. However, GDD estimates were not statistically significant in other sub-groups. Evidences of violation of the common trend assumption were not found in the PSM-GDD analysis, assuring credibility of PSM-GDD framework.

Absence of statistically significant improvement in overall life satisfaction of treatment group in the GDD analysis using the entire sample and most sub-samples is presumably due to following reasons. First, It is possible that BP income was simply not big enough to have meaningful inter-generational effect. For instance, if BP income was equally distributed within household, the maximum amount of BP income per household member ranged between 33,000 and 100,000 KRW in 2008~2019 period, which is less than 1/18 of personal earnings of adult children in this study. Second, it is possible that income was not pooled among the household. For instance, 2018 BP survey indicated that BP beneficiaries spent the benefit mainly on personal purposes (i.e. healthcare) and

household living expenses such as hydro and electricity (Ahn et al., 2018, p.61). Although these living expenses affect everyone in the household, it is difficult to believe that they would significantly change living standard of the household because the benefit amount was relatively small. Further investigation on the within-household distribution of BP income in Korea is needed to understand the true effect of the policy for the household. Lastly, It is also possible that among the sub-groups, the highly educated adult children, who are more likely to be able to provide for parents, experienced care burden of supporting elderly parents, which was partially relieved by parent's BP receipt. In fact, higher education level was associated with increased economic burden of adult children to support elderly parents in Korea (Kim & Park, 2016).

This study has the following limitations. First, it was not able to organize individual level data in which both parent's BP receipt and adult children's subjective well-being were observed. If this data limitation is resolved in the future, more accurate analysis of the inter-generational effect of BP considering personal characteristics of BP recipient will be feasible. Second, it was not feasible to include adult children who have moved out in the sample due to data limitations. Although we identified 283 adult children who have moved out, which is much smaller than 24,742 adult children who live with the beneficiary, from 2007~2019 KOWEPS data, no such individuals were included in the analytic set following data cleaning (i.e. selecting only the individuals who were continually surveyed for at least four years) and PSM due to small group size. Third, it is possible that there exist unobserved differences in the characteristic of treatment and control groups, which we cannot account for in PSM method since it is a 'selection on observable' method. However, we combined PSM method with difference-in-differences regression, which is a 'selection on unobservable' method that controls for characteristics that are time-constant, achieving 'double robustness' in estimating causal effect of basic pension on adult children's subjective well-being. In other words, unless the

Table 6. Regression results for sub-group analysis

Overall life satisfaction	Age		Sex		Marital status		Labor participation		Education		# of older parents	
	≥40	<40	Male	Female	Married	Not married	Participant	Non-participant	≥ University	< University	1	2
t = -2	0.096 (0.155)	-0.290 (0.141)*	-0.095 (0.160)	0.002 (0.153)	-0.166 (0.132)	-0.018 (0.189)	-0.029 (0.125)	-0.400 (0.203)	-0.003 (0.140)	-0.078 (0.142)	-0.062 (0.154)	0.065 (0.184)
t = -1	Reference period											
t = 0	-0.032 (0.110)	0.108 (0.187)	0.107 (0.122)	-0.110 (0.216)	-0.091 (0.157)	0.098 (0.124)	0.046 (0.121)	-0.073 (0.228)	0.424 (0.187)*	-0.156 (0.126)	0.076 (0.140)	-0.134 (0.143)
t = 1	0.199 (0.196)	-0.113 (0.180)	0.040 (0.140)	0.092 (0.224)	0.044 (0.213)	0.012 (0.164)	0.085 (0.139)	-0.166 (0.294)	0.135 (0.242)	0.014 (0.136)	0.087 (0.181)	0.052 (0.168)
N (Treatment /Control)	269 (229/40)	227 (158/69)	299 (232/67)	197 (155/42)	230 (190/40)	266 (197/69)	385 (301/84)	111 (86/25)	163 (119/44)	333 (268/65)	371 (295/76)	125 (92/33)

Note: 1) \* p<0.05

2) All estimates are adjusted for age, sex, education level, marital status, personal earnings, household assets, labor participation, number of older parents, chronic diseases, and disability

3) All estimates are adjusted for individual and time fixed effects

Table 7. Regression results for sub-group analysis, controlling for parent's public pension receipt

Overall life satisfaction	Age		Sex		Marital status		Labor participation		Education		# of older parents	
	≥40	<40	Male	Female	Married	Not married	Participant	Non-participant	≥ University	< University	1	2
t = -2	0.065 (0.128)	-0.291 (0.141)*	-0.146 (0.131)	-0.002 (0.152)	-0.166 (0.132)	-0.061 (0.153)	-0.041 (0.112)	-0.394 (0.203)	-0.003 (0.140)	-0.097 (0.130)	-0.077 (0.137)	0.062 (0.186)
t = -1	Reference period											
t = 0	-0.010 (0.112)	0.103 (0.188)	0.124 (0.123)	-0.128 (0.216)	-0.087 (0.158)	0.112 (0.123)	0.066 (0.121)	-0.066 (0.227)	0.421 (0.188)*	-0.140 (0.127)	0.085 (0.140)	-0.110 (0.144)
t = 1	0.253 (0.199)	-0.114 (0.180)	0.070 (0.139)	0.072 (0.227)	0.049 (0.216)	0.031 (0.160)	0.112 (0.141)	-0.161 (0.294)	0.134 (0.242)	0.047 (0.138)	0.100 (0.181)	0.085 (0.164)

Note: 1) \* p<0.05

2) All estimates are adjusted for covariates listed in Table 6 and parents' national or special pension receipt

3) All estimates are adjusted for individual and time fixed effects

4) The number of individuals in each sub-group is presented in Table 6

Table 8. Regression results for sub-group analysis, controlling for parent's public pension benefit amount

Overall life satisfaction	Age		Sex		Marital status		Labor participation		Education		# of older parents	
	≥40	<40	Male	Female	Married	Not married	Participant	Non-participant	≥ University	< University	1	2
t = -2	0.103 (0.154)	-0.294 (0.142)*	-0.094 (0.160)	0.015 (0.158)	-0.162 (0.132)	-0.013 (0.194)	-0.028 (0.125)	-0.414 (0.207)*	-0.004 (0.140)	-0.069 (0.145)	-0.055 (0.158)	0.064 (0.184)
t = -1	Reference period											
t = 0	-0.020 (0.111)	0.107 (0.187)	0.106 (0.122)	-0.106 (0.215)	-0.081 (0.160)	0.099 (0.124)	0.048 (0.121)	-0.074 (0.228)	0.416 (0.191)*	-0.154 (0.125)	0.077 (0.139)	-0.140 (0.146)
t = 1	0.213 (0.201)	-0.113 (0.180)	0.040 (0.140)	0.95 (0.225)	0.060 (0.222)	0.013 (0.164)	0.086 (0.140)	-0.167 (0.293)	0.133 (0.242)	0.016 (0.136)	0.088 (0.181)	0.050 (0.168)

Note: 1) \* p<0.05

2) All estimates are adjusted for covariates listed in Table 6 and parents' national or special pension benefit amount

3) All estimates are adjusted for individual and time fixed effects

4) The number of individuals in each sub-group is presented in Table 6

unobserved characteristics are time-varying, our estimates are still robust. In our study, we included a wide range of matching variables. Additionally, no previous study reported evidence on systematic differences between the characteristic, which is not observed in the surveys such as KOWEPS, of individuals from basic pension household and non-basic pension household. Fourth, although it is ideal to investigate individual-level changes in private transfers between the beneficiary and the adult children, as proxy for changes in care burden, to confirm the mechanism of change in individual life satisfaction, such was not feasible because private transfer within household was not surveyed in the KOWEPS. Further study on this issue is needed using individual-level data.

Our results have important implications for the design and efficacy of basic pension program in Korea – that it

can be a policy instrument that simultaneously improves the well-being of both the beneficiary and the adult children. In particular, it suggested that the basic pension improved well-being of the adult children who is expected to experience financial burden of supporting the family with elderly parents. A follow-up study to investigate mechanisms of the change in detail is needed.

황인옥은 서울대학교 보건대학원에서 보건학 석·박사학위를 받았으며, 동 대학원 보건학과에서 연구교수로 재직 중이다. 주요 연구 분야는 기초연금 및 기타 노후소득 보장제도, 노인 및 장애인 건강과 관련 제도, 건강재난 등이다.

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# 성인 자녀의 주관적 웰빙에 대한 기초연금의 세대 간 영향

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## 초 록

이 연구는 2007~2019년 한국복지패널 자료 및 성향점수매칭(PSM)과 사건 연구(event study) 디자인을 포함한 일반화이중차이모형(GDD)을 이용해 노인의 기초연금 수급이 성인 자녀의 전반적인 삶의 만족도에 미치는 세대 간(inter-generational) 영향을 추정하였다.

이중차이모형 분석 결과, 자녀의 교육 수준이 대학교 이상인 집단에서 부모의 기초연금 수급이 자녀의 삶의 만족도를 유의하게 개선했으나 그 외 다른 집단에서 유의한 영향이 나타나지 않았다. 전반적인 세대 간 영향이 나타나지 않은 점은 기초연금 급여가 연구 기간 내 1인당 약 10만~20만 원 내외로 비교적 적고, 가구 내 소득 공유(income pooling) 또는 자원 배분이 이루어지지 않은 것에 따른 결과로 추측할 수 있다. 가구 수준에서 기초연금의 영향을 명확하게 이해하기 위해 기초연금 소득의 가구 내 배분 등에 대한 추가 연구가 필요하다.

이 연구는 노인 부모와 거주하는 성인 자녀에 대한 우리나라의 기초연금 정책의 세대 간 영향을 성향점수매칭 및 이중차이모형 등 준실험설계모형을 이용해 최초로 밝힌 데 의의가 있다.

**주요 용어:** 기초연금, 세대 간 효과, 주관적 웰빙, 이중차이모형, 성향점수매칭

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