Three essays on poverty in South Korea

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: ……

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Abstract

This thesis explores poverty in South Korea. Elderly poverty has been regarded as one of the most urgent issues in Korea, so the first chapter analyses the trends and determinants of elderly poverty, while the second chapter decomposes the anti-poverty efficacy and efficiency of the Korean public transfer programmes. The third chapter identifies the effect of COVID-19 on poverty and household livelihood which is a contemporary and urgent issue. In addition, this thesis adopts relatively new research designs in each chapter to identify more relevant findings and implications.

Chapter 1. The trends and determinants of elderly poverty in South Korea: using both relative and absolute poverty thresholds

Background: Although social expenditure for the elderly has sharply increased since the mid-2000s, the relative poverty rate of people aged 65 over in Korea was 43.8% in 2017. This rate has remained at the highest level of the OECD member countries.

Data: This chapter analyses the Korean Labour and Income Panel Study (KLIPS) from 2003 to 2017. The KLIPS allows to capture longitudinal changes in elderly poverty because it has the longest panel data on labour activities and household income in Korea.

Methodology*: (i) Trends of elderly poverty*: This chapter adopts four poverty lines to identify the multi-dimensions of elderly poverty: one relative poverty line (a poverty index) and three absolute poverty lines (deep poverty indices). *(ii) Determinants of elderly poverty*: It conducts panel logistic regression with the above poverty lines as the

criteria of binary dependent variables. In addition, it adopts the Lasso (least absolute shrinkage and selection operator) to select more relevant independent variables.

Findings*:* (i) *Trends*: The absolute poverty rate 1 dropped from 35.9% in 2003 to 9.8% in 2017, however the relative poverty rate reduced slightly from 48.5% to 43.9%. (ii) *Determinants*: Firstly, householder employment, household size, the number of pensioners, family support, and net assets are significant on relative and absolute poverty. Secondly, some of the absolute poverty elderly were able to overcome their poverty in recent years thanks to the Basic Old-Age Pension implementation in 2008. Lastly, the healthy elderly tend to participate in the labour market more actively and have more earned income, so they can overcome relative poverty.

Implications: (i) Public transfer programmes have had positive effects on absolute elderly poverty, but they are still insufficient on relative poverty. Therefore, work activities and family support are still important income sources for the elderly. (ii) To reduce relative elderly poverty effectively, it is necessary to improve not only public transfer programmes, but also work incentive schemes for the healthy elderly.

Chapter 2. The efficacy and efficiency of public transfer programmes on elderly poverty in South Korea

Background: This chapter decomposes and compares the anti-poverty efficacy and efficiency of major public transfer programmes in Korea. It can find implications for policy makers who usually need to design better policy measures with finite resources.

Data: It uses the Korea Welfare Panel Study (KOWEPS) from 2006 to 2018 because the KOWEPS has a variety of information on the Korean public transfer programmes.

***Methodology**:* (i) *Efficacy*: This chapter measures the efficacy through the Shapley decomposition because the traditional decomposition approach has additivity and path dependence problems. (ii) *Efficiency*: It establishes four efficiency criteria focusing on coverage and benefit. (iii) It employs one relative poverty threshold and one absolute poverty threshold. (iv) It analyses the following four representative programmes in the Korean welfare system: public pension; the Basic Pension; the National Basic Livelihood Security (NBLS); and the Earned Income Tax Credit (EITC).

***Findings**:* (i) *Efficacy*: Public pension has the largest anti-poverty efficacy of the four programmes. The Basic Pension ranks second and its efficacy rose in 2008 and 2014 when it was expanded. However, the NBLS and the EITC have small efficacy. (ii) *Efficiency*: Public pension covered only 40% of the elderly in 2018 because it was introduced much later than in other countries. Whereas the Basic Pension has had too generous coverage since 2008, so more than half of recipients were not in absolute poverty in 2018. The NBLS is a main public assistance programme, but it supports only a quarter of the absolute poverty elderly. The EITC is more efficient for relative poverty.

Implications: (i) By the maturing of public pension, its coverage will reach nearly 90% of the elderly by 2060, so it needs to be a centrepiece of the benefits system for the elderly. (ii) The Basic Pension has to be restructured to assist the deep poor elderly. (iii) The NBLS should provide more support to the absolute poverty elderly. (iv) The EITC needs to increase benefit to incentivise work activities of the elderly.

Chapter 3. The effects of COVID-19 and response measures on poverty, income and consumption in South Korea

Background: Among several response measures, the Emergency Disaster Relief Funds triggered important debates because this is the first-ever universal benefit in Korea.

Data: This chapter analyses the Korea Household Income and Expenditure Survey (KHIES). The KHIES allows to separate (i) the effect of the pandemic as changes in non-social benefits income (disposable income – the social benefits) and (ii) the effects of response measures as changes in the social benefits (including the above relief).

Methodology: (i) *Poverty*: This chapter sets both a relative and an absolute poverty thresholds. (ii) *Income and consumption expenditure*: It adopts changes-in-changes (CC) instead of difference-in-differences (DD) because the parallel trends assumption of DD cannot be investigated due to the recent KHIES redesign. It conducts CC at five income and expenditure percentiles (5%, 25%, 50%, 75%, and 95%) and on the vulnerable (female, young, and elderly households) to identify disproportionate effects.

Findings*:* (i) *Poverty*: The pandemic delivered immediate impacts, so the poverty rate increased in the first quarter 2020. However, the poverty rate decreased in the second quarter due to the relief. (ii) *Income*: COVID-19 has had more critical effects on the poor and the vulnerable; while the relief was a universal benefit, and its benefit was proportionate to household size not income. Consequently, income increase effects were insignificant on high-income percentiles. In addition, the poor and the vulnerable faced an income reduction in the third quarter as the relief was a one-off payment. (iii) *Consumption*: Household consumption expenditure recovered in the second quarter.

Implications: (i) The government measures need to be concentrated on the poor and the vulnerable in response to the disproportionate effects. (ii) The measures are required to be immediate and sustainable, so improving the current system can be a feasible option.

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Chapter 1.

The trends and determinants of elderly poverty in South Korea: using both relative and absolute poverty thresholds

1.1. Introduction

The relative poverty rate among those who aged 65 over in South Korea (hereafter Korea) was 43.8% in 2017, which it was the highest of the Organisation for Economic Co-operation and Development (OECD) member countries (OECD, 2020). Furthermore, Korea faces a rapidly ageing population related to the retirement of the 'Baby Boomers' who were born after the Korean War (1950-1953) and are currently joining the elderly. Therefore, elderly poverty in Korea has been regarded as one of the most urgent issues (Ministry of Health and Welfare in Korea [MOHW], 2018). In addition, 79% of Korean respondents reported that an ageing population presents a serious problem, as it came the second out of 21 countries (Pew Research Centre, 2014).

Socio-economic changes have had fundamental effects on elderly poverty in Korea and the elderly have been the most vulnerable generation to poverty risk. Firstly, living arrangements have shifted rapidly due to industrialisation and urbanisation (Jones & Urasawa, 2014; Ku & Kim, 2020; Lee, 2018; Park & Kim, 2016). The number of single elderly households sharply increased from 115 thousand in 1985 to 1.4 million in 2018 (Statistics Korea [KOSTAT], 2020). In addition, the elderly living alone are more likely to be in poverty than the elderly living with other household members (Ku & Kim, 2020; Park & Kim, 2016; Yun & Kwon, 2014).

Secondly, a social attitude to financial support for their older parents has changed notably. Family support for older parents has always been considered as an important duty of adult children's filial piety in traditional Confucian culture. However, more recently this original value has significantly declined (Jung, Pirog & Lee, 2016; Koh & Yang, 2021; Sung & Dunkle, 2009). For example, in 1998, 90% of Korean respondents answered that family members (e.g., adult children) should support their older parents. However, this figure dropped to 27% in 2018 (KOSTAT, 2020).

Lastly, economic growth was valued more highly than improving welfare in the past, so the social security system in Korea has not developed sufficiently (Choi & Hong, 2018; Choi, Chung & Joo, 2018; OECD, 2018; Yeo, 2019). As a result, the Korean economy has grown remarkably, but it also caused several social problems including elderly poverty. Therefore, the Korean government set up the social welfare system and has increased public transfer expenditure since the 2000s (Ramesh, 2003).

In terms of the social security system in Korea (Table 1.1), firstly, the National Pension was introduced in 1988 as a centrepiece in this welfare system and it had spread to every business and workplace by 2006. The National Pension is a contribution-based

social insurance programme and a funded pension (National Pension Service in Korea [NPS], 2020). It has a narrower coverage and a smaller amount of benefit than in other developed countries (Jones & Urasawa, 2014; OECD, 2018).

Table 1.1. The social security system in Korea

	National Pension	Basic Pension	NBLS
Concept	Social insurance	Means-tested benefit	Means-tested benefit
Introduction	1988 (expanded by 2006)	2014 (the Basic Old-Age Pension from 2008)	2000 (reformed in 2015)
Financial source	Contribution-based (9%) and funded pension	Tax-financed (non-contributory)	Tax-financed (non-contributory)
Eligibility	Age: 62 and over Contribution period: 10 years and over	Age: 65 and over Income: bottom 70%	Income: below 30-50% of median income
Recipients	5.6 million	5.6 million	2.1 million 65+: 0.8 million
Benefits (£, monthly)	£269 (average)	£167-200 for the single elderly	Up to £351 for a single household (the Livelihood benefit)
Budget (£, billion)	17.7	11.3	10.7

Note: (1) 1 GBP = 1,500 Korean Won (KRW), (2) The age eligibility of the National Pension is 62 years and over in 2020. It will increase to 65 years old by 2033, (3) The income threshold of the NBLS: the Livelihood Benefit set at 30% of median income, the Medical Benefit at 40%, the Housing Benefit at 45%, the Education Benefit at 50%, (4) Data: 2020; Source: Author's summary, KOSTAT (2020), Ministry of Education in Korea (2019, 2020), Ministry of Land, Infrastructure and Transport in Korea (2019, 2020), MOHW (2019, 2020, 2021), and NPS (2020, 2021)

Secondly, the Basic Old-Age Pension was introduced in 2008, as a supplementary measure of the National Pension. Its name is a pension, but it is a tax-based income support programme through means-testing. It was expanded to the Basic Pension in 2014 and the Basic Pension provided £167-200 per month (hereafter 1 GBP = 1,500 Korean Won [KRW]) to the bottom 70% of the elderly by income in 2020 (MOHW, 2020). Lastly, the National Basic Livelihood Security (NBLS) was introduced

in 2000 after the Asian Financial Crisis 1997-1998 as a major public assistance programme for general residents based on means-testing (Lee & Phillips, 2011; MOHW, 2020). The NBLS was reformed in 2015 to reduce a blind spot within the welfare system and it covers the Livelihood Benefit, the Medical Benefit, the Housing Benefit, and the Education Benefit. Consequently, the Korean social expenditure for the elderly increased from 8.1 billion pounds in 2005 to 32.5 billion pounds in 2017 (OECD, 2020).

Despite the expansion of social expenditure, the relative poverty rate of the elderly decreased by only 0.5%p from 42.8% in 2006 to 42.3% in 2017 (A1.1 in appendices and KOSTAT, 2020). After the reform of the NBLS, the statutory poverty threshold was revised from 'absolute poverty' based on the Minimum Cost of Living (MCL) to 'relative poverty' set at 30-50% of median income (MOHW, 2015). Therefore, most researchers in Korea have focused on relative poverty and have concluded that the relative elderly poverty rate is still high (Chae & Heshmati, 2017; Cho & Yeo, 2017; Hwang, 2016; Jeon, 2019; Ku & Kim, 2020; Lee, Ku & Shon, 2019). Some also insist that public transfer is still insufficient compared to other OECD member countries, and the Korean government should provide more financial support to the poor elderly (OECD, 2018; Yeo, 2019).

This chapter will use both relative and absolute poverty thresholds to capture the trends and determinants of elderly poverty. This is because the two poverty can have different characteristics and allow us to compare poverty and deep poverty (Atkinson, Cantillon, Marlier & Nolan, 2002; Decerf & Ferrando, 2020; Marchand & Smeeding, 2016; Ravallion, 2012). Some researchers have defined multiple poverty lines to ascertain different poverty trends (Ku, 2004; Meyer & Sullivan, 2013; Notten & Neubourg, 2011; Park & Kim, 2016). In this chapter, the relative elderly poverty rate

decreased slightly, whilst the absolute poverty rate dropped rapidly.

This chapter is structured as follows. Section 1.2 reviews literature on the determinants of elderly poverty and multi-poverty thresholds. Section 1.3 introduces the Korean Labour and Income Panel Study (KLIPS); and sets poverty lines and methodology. Section 1.4 calculates poverty rates; compares the characteristics between the poor and non-poor elderly; and demonstrates the determinants of elderly poverty. Lastly, section 1.5 summarises this research, and discusses implications and limitations.

1.2. Literature review

From the mid-2000s, several researchers have paid considerable attention to elderly poverty in Korea (Choi, 2007; Hong & Kim, 2012; Lee, 2009; Seok, 2009). The first reason is the revision of the Korea Household Income and Expenditure Survey (KHIES), which presents the official statistics of the Korean government, in 2003 and 2006 when the elderly poverty rate increased by 5.9%p and 8.3%p, respectively (Korea Institute for Health and Social Affairs [KIHASA], 2018). Secondly, the proportion of the elderly amongst the total population in Korea sharply increased from 5.9% in 1995 to 10.2% in 2008 (KOSTAT, 2020). Lastly, the Korean government introduced the Basic Old-Age Pension to alleviate elderly poverty in 2008 (MOHW, 2020). These reasons have led to some researchers highlighting this issue.

1.2.1. Determinants of elderly poverty

Most literature has commonly focused on demographic and economic characteristics, and public transfer. Choi (2007) investigates the characteristics of householders (e.g.,

age and education) and households (e.g., assets and region) using panel logistic regression. This research analyses the KLIPS from 1998 to 2004 and establishes the relative poverty line at 40% of median equivalised disposable income. It defines the elderly as aged 55 and over and includes only the elderly living alone or with a spouse. It also shows age, educational attainment, and marital status of householders; and assets and region of households as being significant on elderly poverty.

Cho and Yeo (2017) also examine the determinants of elderly poverty in Korea. They conduct panel logistic regression using the Korea Welfare Panel Study from 2006 to 2015. However, they adopt different age and poverty thresholds from Choi (2007). They define the elderly as aged 65 years and over and set the relative poverty threshold at 60% of median equivalised disposable income. This study conducts the Hausman test and applies the fixed effects model. On the one hand, it finds that householder employment, logged monthly subjective minimum living cost, and logged property price all have significant effects on elderly poverty. On the other hand, their research shows that place of residence of households and educational attainment of householders are insignificant on the determination of elderly poverty.

Further determinants of elderly poverty include changes in public transfer income as well as living arrangements. In recent times, Ku and Kim (2020) find such determinants and their contributions to considerable change in the elderly poverty rate between 1996 and 2014. They analyse the Korea National Survey of Family Income and Expenditure 1996 and the KHIES 2014 using decomposition analysis. As such, they define the age of an elderly person as being 60 years and over, and the relative poverty line as being 50% of median equivalised disposable income. They conclude that the elderly poverty rate increased from 28.7% in 1996 to 40.8% in 2014. To be specific,

changes in public transfer and tax together dedicated to a reduction in poverty risk of the elderly. While shifts in living arrangements and ageing of householders have had negative effects on elderly poverty.

In response to the social expenditure expansion, some researchers have inspected the effect of increased public transfer income on well-being of the elderly. Lee, Ku and Shon (2019) analyse the potential crowding out effect of the Basic Pension on financial support from their adult children. They examine the KHIES 2013 and 2014 using difference-in-differences (DD). They define the elderly as aged 65 and over which is equal to the eligible age of the Korean Basic Pension. They set recipients of the Basic Pension as a treatment group and non-recipients as a control group. Since the Basic Pension was introduced in July of 2014, they compare the average monthly income in April-June to in July-December. They conclude that the Basic Pension increased household income of the Korean elderly and did not have a significant crowding-out effect on private transfer income.

However, Koh and Yang (2021) oppose to the conclusion of the above Lee et al. (2019) and insist that the Basic Old-Age Pension (former the Basic Pension) in Korea, which was introduced in 2008, displaced private transfer completely. They analyse the KHIES from 2006 to 2013 using DD. They compare age group 65-84 as being recipients of the Basic Old-Age Pension to aged 45-64 as being non-recipients. The former age group was set as a treatment group and the latter was set as a control group. They conclude that the Basic Old-Age Pension entirely reduced financial support from their adult children, so it has limited effects on household income of the Korean elderly.

Literature above commonly proved that demographic and economic characteristics, and public transfer are significant factors on the poverty status of the

Korean elderly. In addition, most literature analysed a longitudinal dataset to capture dynamic changes in elderly poverty and relevant socio-economic transitions, since the Korean society has faced considerable shifts related to elderly poverty, such as: the accelerated ageing population; the social attitude changes to support older parents; and the expansion of social expenditure. Meanwhile, the above literature adopted a variety of the age criteria of the elderly and poverty thresholds, therefore this chapter will review these issues in section 1.3.

1.2.2. Multiple poverty thresholds

As aforementioned, this chapter uses multiple poverty thresholds. This section reviews some prior papers which have adopted several poverty thresholds and illustrated different poverty trends. Ku (2004) utilises multi-poverty lines, such as: (i) the relative poverty threshold: set at 40% of median equivalised disposable income in each year, and (ii) the absolute poverty threshold: anchored at the first official MCL surveyed in 1999 and annually adjusted by the Consumer Price Index (CPI). This study analyses the Korea National Survey of Family Income and Expenditure in 1991, 1996, and 2000, and sets the age of the elderly at 60 years and over. It describes that the absolute poverty rate of the elderly decreased from 47.9% in 1991 to 33.5% in 2000, nevertheless the relative elderly poverty rate increased from 27.0% to 38.8% during the same period.

More recently, Park and Kim (2016) also employ both relative and absolute poverty thresholds, however they adopt different definitions to Ku (2004), such as: (i) the relative poverty threshold: set at 50% of median equivalised disposable income, and (ii) the absolute poverty threshold: equivalent to the official MCL in each year. They define the elderly as aged 65 years and older and analyse the KLIPS in 1998, 2008, and

2011. They describe that the absolute elderly poverty rate decreased from 50.0% in 1998 to 32.8% in 2011, while the relative poverty rate of the Korean elderly increased from 41.2% to 46.4% in the same year.

In the USA, an alternative absolute poverty threshold was introduced to measure the poverty reduction effects of government measures. The USA government had initiated significant welfare programmes through the 'War on poverty (1964)'; however, from the late-1980s, some criticised that this endeavour could not alleviate poverty problem despite massive fiscal expenditure (Lemann, 1988). In order to identify the poverty mitigation effect, Meyer and Sullivan (2013) use an alternative poverty threshold to reflect tax and noncash benefits. In contrast, the official poverty threshold in the USA does not consider the effects of the Earned Income Tax Credit (EITC), food stamps, and other in-kind transfers. They find that the official poverty rate in the USA slightly decreased from 19.5% in 1963 to 15.1% in 2010, while their alternative poverty rate dropped from 31.6% to 8.2% in the same period. Therefore, they stress that poverty has been considerably reduced by tax credits and in-kind benefits.

Another approach compares the poverty rates amongst the USA and the EU member states with both relative and absolute poverty lines. Notten and Neubourg (2011) apply not only the relative poverty threshold in the EU to the USA but also the absolute poverty threshold in the USA to the EU member nations to compare the poverty trends in each country. The EU uses the relative poverty line set at 60% of national median income; whereas the USA adopts the absolute poverty line based on minimum cost of living. In addition, they employ disposable income to consider tax and public transfer. They show that the absolute poverty rate in the UK decreased from 24.3% in 1993 to 13.7% in 2000, however the relative poverty rate slightly declined from 19.6%

to 17.1% in the same period. Most countries display that the absolute poverty rate decreased more than the relative poverty rate.

This paragraph defines some issues. Firstly, this chapter will establish multiple poverty thresholds to explore the multi-dimensions of elderly poverty in Korea. The above studies also commonly set multiple poverty thresholds. For example, both Ku (2004), and Park and Kim (2016), which focused on Korean elderly poverty, used the relative and absolute poverty thresholds. In addition, the Korean government changed the statutory poverty threshold from the absolute poverty threshold to the relative poverty threshold after the NBLS reform in 2015 (KIHASA, 2017). In other words, Korea had the multiple official poverty thresholds during the research period of this chapter (2003-2017). Secondly, since literature adopted disposable income to consider the effects of public transfer and tax rather than gross income, this chapter also will use disposable income. Lastly, this chapter will analyse more recent data to capture the effects of recently expanded public transfer programmes on elderly poverty (e.g., the Basic Pension implementation in 2014 and the NBLS reform in 2015).

1.3. Data and methodology

1.3.1. Data: The Korean Labour and Income Panel Study (KLIPS)

The KLIPS is a longitudinal survey of households and individuals in Korea. It launched in 1998 immediately after the Asian Financial Crisis and has been carried out annually by the Korea Labour Institute (KLI). It has the longest series of panel data in Korea and contains a variety of information on the labour market and income activities of households and individuals. As the employment rate of the Korean elderly was the

second highest of the OECD members in 2018 (OECD, 2020), it can be a suitable dataset for this chapter. In addition, it is a large-scale panel study with its sample of nearly 7,000 households (KLI, 2020a). Therefore, it has been widely used for research on poverty, income and labour activities to track the long-term changes in Korea.

This paragraph compares the KLIPS to other available datasets in Korea. Firstly, the Economically Active Population Survey is the official statistics in Korea, but it does not include income, expenditure, and assets data (KOSTAT, 2019c), so it cannot analyse poverty issues. Secondly, the Korean Longitudinal Study of Aging and the Korea Retirement and Income Study are biannual panel datasets, and they contain income, expenditure, and assets information. However, they cover only middle/old-aged population who aged 45/50 and over, respectively (Korea Employment Information Service, 2020; National Pension Research Institute in Korea, 2019), so they cannot calculate a poverty threshold of the whole population in Korea (Lee, 2018). Lastly, the National Survey of Tax and Benefit started in 2008 much later than the KLIPS in 1998. It focuses on tax information (Korea Institute of Public Finance, 2020), and it does not have sufficient data on labour and economic activities.

This chapter uses data from the 7th wave to the 21st wave surveyed from 2004 to 2018 (KLI, 2020a, 2020b), so it can examine the effect of recently implemented public transfer for the elderly (e.g., the Basic Old-Age Pension in 2008, the Basic Pension in 2014, and the NBLS reform in 2015) and the period of economic downturn (e.g., the Global Financial Crisis in 2008-2009). Moreover, it converts gross income to disposable income as discussed in section 1.3.2. To calculate disposable income, it needs to consider the non-consumption expenditure and the other subsidies of the KLIPS. These items were surveyed from the 7th wave and the 6th wave, respectively. Therefore, this

chapter uses data from the 7th wave. Since the KLIPS contains income data of a previous year, this chapter describes year of income data (e.g., the 7th wave data: 2003).

1.3.2. Elderly households and household income

Elderly households: The age criteria of the elderly in literature and statistics are 65, 60, 55 or 66 (e.g., (i) Age of 65: Cho & Yeo, 2017; Lee et al., 2019; Park & Kim, 2016; (ii) 60: Chae & Heshmati, 2017; Ku, 2004; (iii) 55: Choi, 2007; (iv) 66: OECD, 2020). The Basic Pension and the official statistics of the Korean government define the age threshold of the elderly as 65 (Basic Pension Act 2020, Article 3; KOSTAT, 2019b; MOHW, 2020). Therefore, more researchers have tended to apply this official age threshold of 65 in recent times. Moreover, Kwan and Walsh (2018) conducted the meta-analysis on elderly poverty research in several countries and they found that 32 out of 56 papers had defined age as 65 and over. Therefore, this chapter also defines the elderly as aged 65 and over.

In addition, an elderly household in this chapter is one whose head is elderly. This is because the elderly in a household with a non-elderly head can share income of their householder, so they have a much lower poverty rate than the average of the whole elderly group (Lim, 2016; Park & Kim, 2016). Therefore, most prior studies have defined an elderly household as one which has an elderly head to identify elderly poverty more exactly (Cho & Yeo, 2017; Jeon, 2019; Ku, 2004; Lee, 2018; Seok & Kim, 2012; Sung & Kim, 2018).

Disposable income: This chapter uses disposable income by deducting non-consumption expenditure and irregular income from gross income. Since disposable income reflects tax and public transfer, it can measure the effect of redistribution policy

on poverty more clearly (Atkinson et al., 2002; Meyer & Sullivan, 2013; OECD, 2013; UN, 2011). In addition, disposable income excludes irregular income (e.g., windfall gains) to consider sustainable financial resources for consumption. In this regard, the OECD and the United Nations (UN) recommend disposable income rather than gross income to calculate household income statistics (OECD, 2013; UN, 2011).

Income components: This chapter specifies household income into five components, such as: earned income, real estate income, financial income, public transfer income, and private transfer income (Table 1.2). In terms of transfer income, some separate it to public transfer and private transfer (KOSTAT, 2019b), but others do not classify it (OECD, 2013; UN, 2011). This chapter divides it into public transfer and private transfer to distinguish their trends and effects on poverty alleviation. Public transfer income is sharply increased by the social expenditure expansion, but private transfer income is slightly raised due to the cultural changes to support older parents (Table 1.7). Furthermore, this chapter splits public transfer to social insurance and means-tested benefits, because a contribution-based social insurance programme and a mean-tested benefit can have different effects on elderly poverty (Hwang, 2016).

Equivalence scale: The KLIPS collects income data at a household unit. However, household income data need to be equivalised to consider economies of scale in consumption by an equivalence scale (Atkinson et al., 2002; Haughton & Khandker, 2009; Marchand & Smeeding, 2016). As each household has a different size, it can have a different level of economy of scale in its consumption by sharing goods and services among household members. Therefore, the OECD and the UN suggest the OECD old scale, the OECD modified scale, and the square root scale to consider an economy of scale (OECD, 2013; UN, 2011).

Table 1.2. Income classification

Income components	Description
Earned income	wages and salaries, profit from self-employment
Financial income	interest on deposit, stock dividend, interest on private loans or credits
Real estate income	rent and land lease fee
Public transfer income	(1) Social insurance: National Pension benefit and occupational pension benefit (2) Means-tested benefits: Basic Pension benefit, NBLS benefit, and other subsidies from the government
Private transfer income	financial support from other households (e.g., children and relatives) and non-governmental organisations

Source: KLIPS user's guide (KLI, 2020a) and KLIPS codebook (KLI, 2020b)

Among these three scales, the square root scale is widely used for taking statistics and comparing poverty rates. The Korean government also uses the square root scale to calculate the official poverty rate (KOSTAT, 2019b) and most Korean literature has adopted the square root scale (Chae & Heshmati, 2017; Choi, 2007; Choi & Yeo, 2017; Lee et al., 2019). Therefore, this chapter also mainly uses the square root scale (e.g., household disposable income is divided by two, if a household size is four). The OECD modified scale is used to equivalise the MCLs because the Korean official MCL was also equivalised by this modified scale (MOHW, 2017).

1.3.3. Poverty thresholds and price indices

Absolute poverty and relative poverty: A poverty threshold is rooted in its theoretical background on poverty (Table 1.3). On the one hand, an absolute poverty threshold is to support 'basic needs' and is mainly calculated to the cost of purchase a bundle of

essential goods. On the other hand, a relative poverty threshold is maintaining a 'normal living standard' in a community and represents a given percentile in the income distribution in a country (Haughton & Khandker, 2009; Notten & Neubourg, 2011). Therefore, an absolute poverty line generally tends to be lower than a relative poverty line. An absolute poverty line typically aims to maintain the same real value in different times and places therefore it is adjusted by a price index to reflect inflation; whereas a relative poverty line is automatically adjusted by fluctuations in income (Atkinson et al., 2002; Marchand & Smeeding, 2016).

Table 1.3. Absolute poverty and relative poverty

	Absolute poverty	Relative poverty
Concept	basic needs	normal living standard
Measurement	the cost of purchase a bundle of essential goods	a given percentile in income distribution (e.g., 50% or 60% of median income)
Adjustment	adjusted by a price index to reflect inflation	automatically adjusted by changes in income
Example	USA, World Bank	EU, OECD, Korea

Source: Author's summary, Atkinson et al. (2002), Haughton and Khandker (2009), and Notten and Neubourg (2011)

An absolute poverty threshold is more suitable for least developed countries where basic needs (e.g., famine, clean water, and safe shelter) are still important issue (Decerf & Ferrando, 2020; Lakner, Mahler, Negre & Prydz, 2020; Ravallion, 2012). While a developed country tends to employ a relative poverty threshold. This is because it already supports basic material needs for residents, so absolute poverty is generally no longer an urgent issue. It puts its policy priority on social inclusion, social participation, and relative satisfaction on well-being, therefore relative poverty is regarded as a more

relevant poverty indicator (Chen & Ravallion, 2012; Deaton, 2006; Plotnick, 2012). Korea also changed its official poverty threshold from the absolute poverty threshold to the relative poverty threshold in 2015. This is because the absolute poverty scale did not fully express well-being for residents (Nam & Park, 2020; KIHASA, 2017; Yeo, Kim, Kim, Yang & Choi, 2005).

This chapter takes the above two poverty thresholds to analyse the multi-dimensions of elderly poverty in Korea. The first reason is that relative and absolute poverty can have different trends in Korea as described in section 1.2.2 (Ku, 2004; Park & Kim, 2016). In addition, absolute poverty decreased more than relative poverty globally (Decerf & Ferrando, 2020; Notten & Neubourg, 2011; Ravallion, 2012). Secondly, the relative elderly poverty rate in Korea is extremely higher than in other developed countries. This suggests that supporting basic needs can be still an important issue for the Korean elderly. Lastly, since the Korean official poverty threshold was changed in 2015, both relative and absolute poverty thresholds were the official indicators during the research period of this chapter 2003-2017. Therefore, it is worth tracking both elderly poverty rates to explore policy responses and their implications.

Poverty thresholds: This chapter applies three absolute poverty thresholds and one relative poverty threshold (Table 1.4). Firstly, the absolute poverty thresholds are anchored at the first official MCL surveyed in 1999 (KIHASA, 1999) and adjusted by three price indices. Secondly, the relative poverty threshold is set at 50% of median equivalised disposable income in each year. The Korean government and the OECD also establish the same relative poverty line for taking official statistics (KOSTAT, 2019b; OECD, 2020).

Price indices: This chapter places three price indices for inflation adjustment to the absolute poverty thresholds (Table 1.4). The first index is the Korean official CPI, and it is similar to the USA where the absolute poverty threshold is anchored at the initial poverty threshold developed by M. Orshansky in 1963 and adjusted by the CPI-U annually (Fisher, 1997; Fox, 2020). The second approach is adjusting by price changes in all 372 items included as the basic necessities of the poor in MCL 1999 while maintaining the same items and weights. Lastly, the third index is the 'CPI for living necessaries' that was designed to focus on essential necessities for all Koreans as an alternative indicator of the CPI. These three indices have different weights, for example: the ratio of food was 28.5% in the CPI 2017 (MCL1), 40.7% in the MCL 1999 (MCL2), and 37.7% in the CPI for living necessaries 2017 (MCL3) (KIHASA, 1999; KOSTAT, 2019a).

Table 1.4. Multiple poverty thresholds

Poverty lines	Description
Absolute poverty line 1	anchored at the initial MCL in 1999 and adjusted by the CPI (the USA style)
Absolute poverty line 2	anchored at the MCL 1999 and adjusted by price changes in 372 items (the MCL 1999 has 372 items and maintaining the same items and weights)
Absolute poverty line 3	anchored at the MCL 1999 and adjusted by the CPI for living necessaries (an alternative price indicator of the CPI)
Relative poverty line	set at 50% of median equivalised disposable income in each year (equal to the official statistics in Korea and the OECD)

1.3.4. Dependent and independent variables

Dependent variables: This chapter focuses on the poverty status of the Korean elderly and sets four poverty thresholds. Therefore, it defines four binary dependent variables.

If a household has smaller equivalised disposable income than the absolute or relative poverty threshold, this household has value of 1 and 0 otherwise, as can be seen in equation (1.1).

$$y_{it} = \begin{cases} 1 & if\ y_{it}^{*} < Poverty\ Line \\ 0 & if\ y_{it}^{*} \geq Poverty\ Line \end{cases} \tag{1.1}$$

Note: $i = 1,2, \dots, n\ and\ t = 1,2, \dots, T$, y_{it} is a binary variable and y_{it}^{*} is equivalised disposable income

Independent variables: A large literature has selected independent variables with theoretical backgrounds, but this chapter conducts the Lasso (least absolute shrinkage and selection operator) to select better explanatory variables and to avoid the overfitting problem. The Lasso is a regularised regression model by minimising the residual sum of squares subject to a L_1-norm penalty function (Belloni, Chernozhukov, Hansen & Kozbur, 2016; Lee & Hong, 2018; Tibshirani, 1996). This condition can be expressed as equation (1.2). The Lasso adds the penalty term of $\lambda \sum_{j=1}^{p} |\beta_j|$, the λ is a penalty parameter and $\sum_{j=1}^{p} |\beta_j|$ is the sum of the absolute value of potential coefficients.

$$\beta^{LASSO} = argmin \left\{ \sum_{i=1}^{n} (y_i - x_i' \beta)^2 + \lambda \sum_{j=1}^{p} |\beta_j| \right\} \tag{1.2}$$

Note: $i = 1,2, \dots, n$, λ is a penalty parameter, p is the number of potential variables

This chapter reviewed prior studies and selects 19 potential variables which include nine householder variables and ten household variables (A1.2 in appendices); and then it conducts lasso logit command with plugin option in Stata (Stata Press, 2019). As a result of the Lasso, it designates ten independent variables (Table 1.5). In addition, it conducts unpaired t-test on means difference according to the poverty status of the elderly, and all ten independent variables are statistically significant at the 1% level

(A1.3 in appendices).

In terms of householder, firstly, *hage* is the age of householders. Secondly, *hgen* is the gender of householders, and coded as 0 for a male and 1 for a female. Thirdly, *hwork* is the employment status of householders, and coded as 0 if a householder is employed and 1 if a householder is unemployed (including economically inactive status). Fourthly, *hedu* is the education years of householders. Lastly, *hheal* is the self-reported physical health condition of householders, and coded as 0 when a respondent answered healthy and 1 otherwise.

Table 1.5. Independent variables

Category	Name	Description
Householder	*hage*	age, years
	hgen	dummy, gender, 0=male, 1=female
	hwork	dummy, employment status, 0=employed, 1=unemployed (including economically inactive status)
	hedu	education years
	hheal	dummy, self-reported health condition, 0=healthy, 1=unhealthy
Household	*region*	dummy, place of residence, 0=urban areas (Seoul and other metropolitan regions), 1=rural areas (province regions)
	size	the number of household member(s)
	pens	the number of pensioner(s)
	childs	dummy, 0=no financial support from their adult children, 1=receiving financial support from their adult children
	assets	net assets = assets - debt (log)

In regard to household variables, firstly, *region* is the place of residence, and a binary variable coded as 0 for a household living in urban areas (Seoul and other

metropolitan cities) and 1 for rural areas. Secondly, *size* is the number of household members. Thirdly, *pens* is the number of public pensioners in each household. Fourthly, *childs* is binary, and 0 means an elderly household does not receive financial support from adult children and 1 otherwise. Since financial support from adult children accounts for 96% of private transfer income of an elderly household (Koh & Yang, 2021), the variable of childs can cover overall private transfer income. Lastly, the variable of *assets* is the logged amount of net assets. The KLIPS has surveyed property price as categories (e.g., 100 to less than 200 million KRW) if a respondent did not know the exact price of real estate (KLI, 2020a). This chapter used the mean price of each range to convert to continuous price (Choi & Kim, 2015; Kim & Song, 2010).

1.3.5. Pooled OLS and panel logistic regression

This chapter conducts pooled OLS and panel logistic regression as equation (1.3) and (1.4), respectively. Panel data have distinct advantages compared to cross-sectional data. They allow us to control individual heterogeneity and study complex issues of dynamic relations. In equation (1.4), Λ is the logistic cumulative distribution function. Panel logistic regression assumes that an error term ε_{it}^{l} follows the logistic distribution instead of the normal distribution (Baltagi, 2011; Cameron & Trivedi, 2010; Wooldridge, 2012).

$$\textit{Pooled OLS (linear model): } y_{it} = x_{it}'\beta + \varepsilon_{it} \tag{1.3}$$

$$\textit{Panel logistic regression (non-linear model): } y_{it} = \Lambda\,(x_{it}'\beta^{l}) + \varepsilon_{it}^{l} \tag{1.4}$$

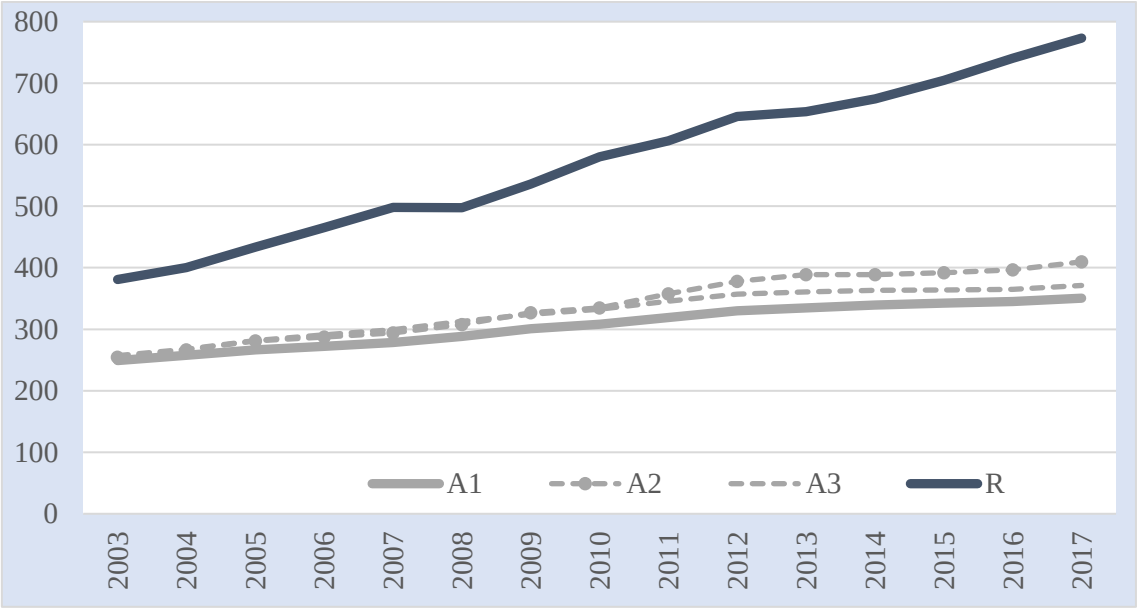
Note: $i = 1,2,\dots,n$ *and* $t = 1,2,\dots.,T,$ Λ *is the logistic cumulative distribution function*

1.4. Findings

1.4.1. Poverty thresholds and poverty rates

Poverty thresholds: The relative poverty threshold increased from £380.9 in 2003 to £773.3 in 2017 per month; whereas the absolute poverty thresholds rose from £249.1 (MCL1) - £257.1 (MCL3) to £350.5 (MCL1) - £409.6 (MCL2) in the same period (Figure 1.1 and A1.1 in appendices). The relative poverty threshold set at 50% of median equivalised disposable income more than doubled for 14 years since economic growth in Korea leads to improving its household income. However, the Korean CPI as an adjustment index of the absolute poverty threshold increased by 40% (KOSTAT, 2020). Among these three MCL indicators, the MCL2 shows the highest growth since the MCL2 has a more weight on food than the other MCLs, and food price doubled between 2003 and 2017. Whereas the MCL1 illustrates the lowest rise as its weight on food is smaller than the MCL2 and the MCL3.

Figure 1.1. Trends of the poverty thresholds (GBP)

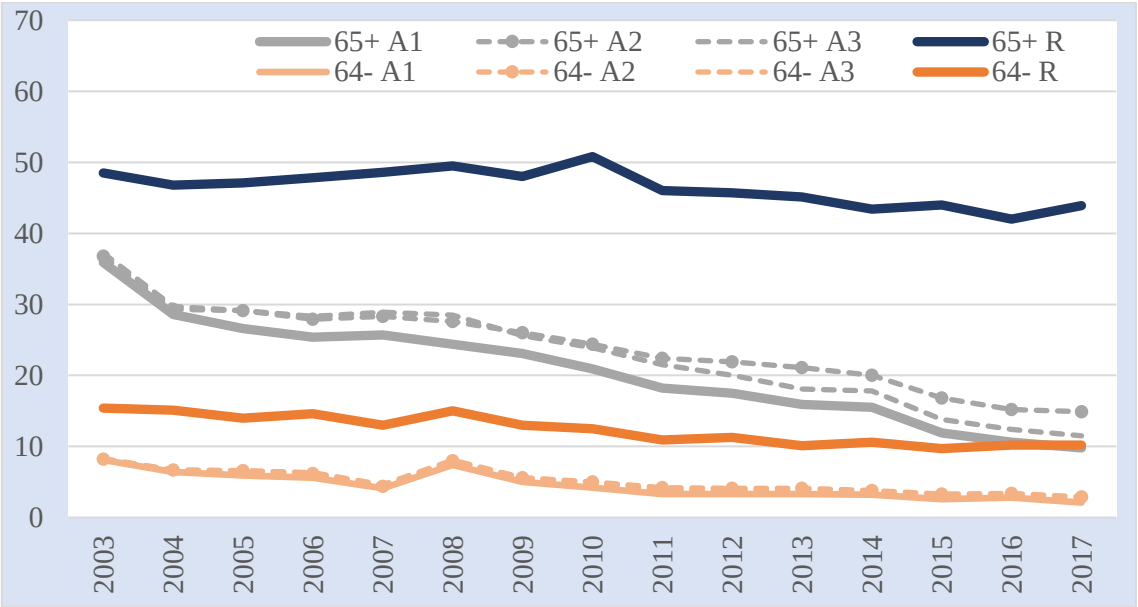


Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds, (2) A1: the absolute poverty threshold 1 (MCL1), A2: the absolute poverty threshold 2 (MCL2), A3: the absolute poverty threshold 3 (MCL3), R: the relative poverty threshold; Source: Author calculation (KLIPS 7th wave – 21st wave microdata) and price changes (KOSTAT, 2020)

The absolute poverty thresholds, which are lower than the relative poverty threshold, can allow us to analyse elderly poverty more correctly because elderly households tend to have smaller income and expenditure than non-elderly households (Table 1.6). Some researchers conclude that a poverty threshold for elderly households needs to be set at 50-65% of non-elderly households (Jeon, 2003; Kim & Lee, 2019; Seok, 2017). In addition, the USA government also assigned a lower poverty threshold of the elderly than that of the working age (Census Bureau in the USA, 2018).

Poverty rates: The poverty rates also display different trends. The absolute elderly poverty rates dropped from 35.9% (MCL1) - 37.2% (MCL3) in 2003 to 9.8% (MCL1) - 14.9% (MCL2) in 2017 (Figure 1.2 and A1.1 in appendices). However, the relative elderly poverty rate reduced slightly from 48.5% to 43.9% in the same year. This demonstrates that the relative elderly poverty rate is stagnant at a high level. In addition, the absolute elderly poverty rate is also still high compared to the non-elderly.

Figure 1.2. Trends of the poverty rates (%)



Note: (1) 65+: age 65 and over, 64-: age below 65, (2) A1: the absolute poverty rate 1 (MCL1), A2: the absolute poverty rate 2 (MCL2), A3: the absolute poverty rate 3 (MCL3), R: the relative poverty rate; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

As described in section 1.2.2, Ku (2004) and Park and Kim (2016) conclude that their relative elderly poverty rates increased despite reductions in the absolute elderly poverty rates. However, both relative and absolute poverty rates decreased in this chapter, which analysed more recent data. This implies that the recently introduced public transfer programmes in Korea can have more positive effects on elderly poverty.

In addition, the relative poverty rate of the non-elderly decreased from 15.4% in 2003 to 10.2% in 2017 and their absolute poverty rates remarkably dropped from 8.1% (MCL1) - 8.3% (MCL3) to 2.1% (MCL1) - 2.9% (MCL2) in the same period. It means that the poverty issue of the non-elderly is likely to be alleviated significantly in Korea. However, it also presents that the poverty gap between the non-elderly and the elderly in Korea is far higher than in any other OECD members (OECD, 2020).

1.4.2. Characteristics of elderly households

Householder: Older, female, unemployed, and unhealthy householders tend to be below the poverty lines. Among them ageing of householders could have effects on the gender and health of householders. Firstly, female's life expectancy of 86.3 years is longer than male of 80.5 years in 2021 (KOSTAT, 2021). Therefore, the ratio of female householders among the elderly is considerably higher than the non-elderly, and it can lead to the feminisation of poverty. Secondly, only half of elderly householders reported their physical health was in good condition, and this figure is much lower than non-elderly householders.

Meanwhile, the employment rate (1 – *hwork*; an employed householder is coded as 0) of the whole elderly group is 33%. This figure was the second highest of the OECD members in 2018 (OECD, 2020). This is because public pension income is

insufficient, so the Korean elderly need to participate in the labour market (Kang, 2015; Kim, Baek & Lee, 2018). Among the three groups, the employment rate of the absolute poverty elderly group is only 15% and it is the lowest of the three groups. In general, the employment rate of the non-poor elderly is higher than that of the poor elderly, and it can be a main factor determining the poverty status of the Korean elderly (Jeon, 2019).

Household: Poor households tend to live in rural areas rather than urban areas and have small household size fewer than two persons. In addition, the three elderly groups have only 0.2-0.4 pensioner fewer than one person. The coverage rate of the National Pension was only 46.4% of the Korean elderly in 2020 (KOSTAT, 2020; NPS, 2021) and it also distributes smaller benefits than in other developed countries, because the Korean National Pension has a short operation history (Yeo, 2019). In contrast, nearly 70% of elderly households receive financial support from their adult children.

Income, expenditure, and assets: Elderly households have smaller income and expenditure than non-elderly households (Jeon, 2003; Kim & Lee, 2019; Seok, 2017). Household income reduced to approximately 67% after retirement, and this figure was the lowest of the OECD members (OECD, 2020). However, household expenditure also decreased significantly, such that elderly households could maintain a surplus in their household balance. This contrasts to poor non-elderly households are in deficit.

In terms of earned income, firstly, earned income accounts for half of disposable income of the whole elderly group and this figure was the second highest of the OECD members in 2016 (OECD, 2020). Secondly, the two poor elderly groups have much smaller earned income than the whole elderly group. This implies that earned income is still important income source, but its distinct gap could have an influence on the poverty risk of the elderly (Ko, Woo, Ku & Lee, 2019; Park & Kim, 2016; Seok, 2009).

Table 1.6. Characteristics of elderly households

	Householder age	65+ (65 and over)			64- (below 65)		
	Poverty status	All	Relative poverty	Absolute poverty1	All	Relative poverty	Absolute poverty1
House-holder	hage (age, years)	73.17	75.31	75.63	46.25	46.51	43.12
	hgen (0=male)	0.33	0.48	0.58	0.15	0.29	0.30
	hwork (0=employed)	0.67	0.78	0.85	0.13	0.35	0.42
	hedu (education years)	7.95	5.96	5.25	12.98	11.48	11.89
	hheal (0=healthy)	0.38	0.51	0.56	0.05	0.17	0.17
Household	region (0=urban areas)	0.56	0.58	0.60	0.52	0.50	0.50
	size (persons)	2.06	1.67	1.53	3.10	2.48	2.13
	pens (number of pensioners)	0.43	0.30	0.20	0.06	0.08	0.05
	childs (0=no transfer from their children)	0.71	0.73	0.64	0.12	0.17	0.13
Income (£, month)	Gross Income	1,778.3	714.3	440.4	2,656.1	647.1	327.4
	Disposable income	1,234.4	442.2	237.4	2,427.9	502.4	169.8
	Equivalised disposable income	822.5	345.6	198.9	1,395.3	319.2	115.5
	(a) Earned income	641.7	111.0	33.7	2,261.5	389.0	100.1
	(b) Financial income	26.0	9.3	5.5	16.1	3.5	3.3
	(c) Real estate income	104.7	19.0	7.9	48.1	5.4	2.7
	(d) Public transfer	301.1	152.0	105.0	49.6	60.4	36.0
	(d)-1 Social insurance	236.7	63.9	26.3	34.9	23.3	9.8
	(d)-2 Means-tested benefits	64.3	88.0	78.7	14.6	37.2	26.3
	(e) Private transfer	168.5	153.4	87.1	70.0	49.5	31.7
Expenditure (£, month)	Gross expenditure	832.4	454.1	341.8	1,596.7	739.2	567.6
	Non-consumption expenditure	7.5	2.6	1.9	17.4	5.5	4.0
Balance (£, month)		946.0	260.2	98.5	1,059.4	-92.1	-240.3
Assets (£, thousand)	(a) Real estate	157.2	82.5	65.0	142.7	60.3	62.8
	(b) Savings	17.5	7.5	6.3	17.4	5.2	6.0
	Debt	15.0	5.3	4.1	30.4	15.3	14.3
	Net assets	159.7	84.8	67.2	129.7	50.2	54.4
Observations		18,281	9,731	4,081	58,576	8,089	3,313

Note: (1) 1 GBP = 1,500 KRW, (2) Weighted average, (3) Equivalence scale: square root of household size, (4) Data: between 2003 and 2017, (5) Disposable income = (a) Earned income + (b) Financial income + (c) Real estate income + (d) Public transfer + (e) Private transfer – Non-consumption expenditure, (6) (d) Public transfer = (d)-1 Social insurance + (d)-2 Means-tested benefits, (7) Balance = Gross income – Gross expenditure; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Social insurance income displays significant differences according to poverty status of elderly households. The National Pension is a contribution-based pension programme, and its benefit is related to lifetime wage and contribution years (NPS, 2020), so the poor elderly tend to receive smaller benefits. This means that the National Pension could retain poverty gaps after retirement (Choi, 2018; Hwang, 2016). In contrast, poor elderly households receive more means-tested benefits (e.g., the Basic Pension and the NBLS) from the Korean government. Therefore, means-tested benefits can mitigate poverty and income inequality among the elderly (Lee & Phillips, 2011; Lee et al., 2019; Lim, 2016).

In addition, the elderly tend to have more net assets than the non-elderly, because they had accumulated their lifetime income to support consumption after retirement. Among the three elderly groups, the absolute poverty group has the smallest assets. Meanwhile, the Koreans have a strong preference for real estate assets over financial assets in comparison to other developed economies (Financial Services Commission in Korea, 2019), therefore the ratio of real estate to the total assets is nearly 90%.

1.4.3. Changes of elderly households

Householder: Householder age, female householders, householder educational attainment, and unhealthy householders commonly increased between 2003 and 2017 in the three elderly groups. However, the employment rate shows different trends. To be specific, the employment rate (1 – *hwork*) of the whole elderly group and the relative poverty elderly group increased by 8%p and 1%p, respectively; whereas this rate of the absolute poverty elderly group decreased by 3%p from 14% to 11% in the same year.

Table 1.7. Changes of elderly households

Poverty status	All (65+)			Relative poverty (65+)			Absolute poverty 1 (MCL1, 65+)		
Year	2003	2017	Diff.	2003	2017	Diff.	2003	2017	Diff.
hage (age, years)	71.11	74.79	3.68	72.44	77.87	5.43	73.18	78.27	5.08
hgen (0=male)	0.45	0.27	-0.18	0.62	0.39	-0.22	0.65	0.48	-0.17
hwork (0=employed)	0.74	0.66	-0.08	0.83	0.81	-0.01	0.86	0.89	0.03
hedu (education years)	6.89	8.88	1.99	4.89	6.89	2.01	4.63	6.15	1.53
hheal (0=healthy)	0.35	0.39	0.04	0.47	0.54	0.07	0.49	0.58	0.08
region (0=urban areas)	0.51	0.57	0.06	0.56	0.59	0.03	0.58	0.63	0.05
size (persons)	2.09	2.06	-0.03	1.69	1.70	0.01	1.58	1.51	-0.07
pens (pensioners)	0.19	0.57	0.38	0.13	0.44	0.31	0.12	0.33	0.21
childs (0=no family support)	0.46	0.73	0.28	0.58	0.78	0.20	0.58	0.60	0.02
Gross Income	1,047.1	2,356.5	1,309.4	385.9	1,037.1	651.2	323.3	599.9	276.6
Disposable Income	716.6	1,643.5	926.9	227.5	611.3	383.8	171.5	294.0	122.6
Equivalised disposable income	460.1	1,102.7	642.5	176.8	472.2	295.4	139.0	245.6	106.6
(a) Earned income	397.0	886.8	489.7	78.5	132.5	54.0	42.8	24.7	-18.1
(b) Financial income	29.1	21.6	-7.5	9.3	9.8	0.5	5.1	2.2	-3.0
(c) Real estate income	59.5	123.0	63.5	7.7	25.0	17.3	7.2	4.1	-3.0
(d) Public transfer	145.3	446.7	301.4	46.0	263.6	217.6	40.9	175.7	134.8
(d)-1 Social insurance	123.7	347.3	223.6	12.9	121.2	108.3	7.8	54.9	47.1
(d)-2 Means-tested benefits	21.6	99.3	77.8	33.0	142.4	109.3	33.1	120.8	87.7
(e) Private transfer	90.8	174.8	84.0	88.8	183.4	94.7	77.9	89.7	11.9
Gross expenditure	552.1	1,040.4	488.2	316.3	596.8	280.5	276.8	463.4	186.5
Non-consumption expenditure	5.1	9.3	4.2	2.6	2.9	0.3	2.3	2.4	0.0
Balance	494.9	1,316.1	821.2	69.6	440.4	370.8	46.5	136.5	90.0
Real estate assets	83.8	205.7	121.8	45.8	113.2	67.4	40.9	85.3	44.3
Savings	9.9	26.5	16.6	3.8	12.5	8.7	3.4	10.3	6.9
Debt	8.0	19.0	10.9	4.2	5.8	1.6	3.8	2.2	-1.6
Net assets	85.7	213.2	127.5	45.5	119.9	74.4	40.5	93.4	52.9
Observations	563	1,806	-	331	885	-	254	208	-

Note: (1) 1 GBP = 1,500 KRW, (2) Weighted average, (3) Equivalence scale: square root of household size, (4) Disposable income = (a) Earned income + (b) Financial income + (c) Real estate income + (d) Public transfer + (e) Private transfer – Non-consumption expenditure, (5) (d) Public transfer = (d)-1 Social insurance + (d)-2 Means-tested benefits, (6) Balance = Gross income – Gross expenditure, (7) Income, expenditure, and balance: pounds per month, assets (Real estate assets, Savings, Debt, and Net assets): thousand pounds; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Household: Firstly, the ratio of households living in rural areas increased in the three groups. Secondly, the number of household members in the absolute poverty elderly group decreased sharply 1.58 in 2003 to 1.51 in 2017. Thirdly, the number of public pensioners nearly tripled from 2003 to 2017 in the three groups by the maturing of public pension. Lastly, the ratio of family support receipt increased in the three groups.

Income, expenditure, and assets: Gross income and disposable income increased from 2003 to 2017 in the three groups. In particular, social insurance and means-tested benefits increased rapidly due to the expansion of public transfer. However, earned income displays a different trend only in the absolute poverty elderly group. Their earned income decreased from £42.8 in 2003 to £24.7 in 2017 per month; whereas earned income increased in the other two elderly groups. The declines in the employment rate and health condition of householders, and household size can contribute to the reduction in earned income of the absolute poverty elderly group.

1.4.4. Panel logistic regression

POLS, FE and RE: This chapter conducts panel logistic regression and pooled OLS. The estimates of pooled OLS and random effects model can be biased and inconsistent if an unobservable error term is correlated with independent variables. However, fixed effects model can allow this endogeneity (Cameron & Trivedi, 2010; Hill, Griffiths & Lim, 2018; Wooldridge, 2012). Therefore, prior papers, which analysed panel data to identify elderly poverty, tended to adopt the fixed effects model (Chae & Heshmati, 2017; Cho & Yeo, 2017; Kim & Kim, 2019; Lee, 2018). As a result of the Hausman test, this chapter also adopts the fixed effects model (A1.4 in appendices).

In terms of the results of the fixed effects model, firstly, the independent variables of householder age, householder employment, household size, the number of pensioners, and financial support from adult children are all significant at the 1% level in the relative and absolute poverty models. Secondly, the education years of householders and the residing region of households are not significant in these models. Thirdly, the self-reported physical health status of householders is only significant in the relative poverty analysis, but it is insignificant in the absolute poverty models. Lastly, the variable of net assets is significant in the both models, but it has smaller p-value in the relative poverty analysis.

1.4.4.1. Householder (1): age (hage)

In the relative poverty analysis, householder age has a positive coefficient, and it is significant at the 1% level. It means that older householders are more likely to be in relative poverty. This result is consistent with a generally accepted consensus, because the older elderly are more likely to be unhealthy, so they are difficult to have a job. Several pieces of research also have concluded that the older elderly in Korea are more vulnerable to relative poverty (Choi, 2007; Lee, 2018; Seok & Kim, 2012).

However, in the absolute poverty models, the coefficients of householder age are negative (Table 1.8), and this represents that the younger elderly can be more vulnerable to absolute poverty than the older elderly. This can imply that some absolute poverty households could overcome their absolute poverty in later years. However, they have remained in relative poverty as this coefficient is positive in the relative poverty model. For example, the Basic Old-Age Pension, which was implemented in 2008, reduced the absolute elderly poverty rate by 4.6%p between 2007 and 2009, but the relative elderly poverty rate was decreased by only 0.9%p (Kim, 2013).

Table 1.8. Panel logistic regression (FE)

Dependent variables		1 = a household below the relative (or the absolute) poverty line 0 = a household over the relative (or the absolute) poverty line			
		Relative	Absolute poverty		
		poverty	MCL1	MCL2	MCL3
House-holder	*hage* (years)	0.07*** [0.01] (0.06, 0.09)	-0.08*** [0.01] (-0.10, -0.07)	-0.04*** [0.01] (-0.05, -0.02)	-0.08*** [0.01] (-0.09, -0.07)
	hgen (dummy, 0=male)	(omitted)	(omitted)	(omitted)	(omitted)
	hwork (dummy, 0=employed)	0.94*** [0.09] (0.77, 1.12)	0.82*** [0.09] (0.64, 1.00)	0.87*** [0.09] (0.70, 1.04)	0.85*** [0.09] (0.68, 1.03)
	hedu (education years, lifetime)	0.43 [0.30] (-0.15, 1.02)	0.10 [0.21] (-0.31, 0.52)	0.20 [0.21] (-0.22, 0.61)	0.25 [0.21] (-0.17, 0.66)
	hheal (dummy, 0=healthy)	0.15** [0.07] (0.02, 0.28)	0.07 [0.06] (-0.06, 0.20)	0.10 [0.06] (-0.02, 0.22)	0.02 [0.06] (-0.10, 0.15)
Household	*region* (dummy, 0=urban areas)	-0.04 [0.19] (-0.42, 0.33)	0.13 [0.22] (-0.31, 0.56)	0.13 [0.21] (-0.29, 0.54)	0.15 [0.22] (-0.27, 0.57)
	size (household size, persons)	-0.66*** [0.06] (-0.77, -0.56)	-0.37*** [0.06] (-0.48, -0.26)	-0.41*** [0.06] (-0.52, -0.30)	-0.39*** [0.06] (-0.50, -0.28)
	pens (the number of pensioners)	-0.31*** [0.08] (-0.48, -0.14)	-0.37*** [0.06] (-0.52, -0.17)	-0.35*** [0.08] (-0.51, -0.19)	-0.39*** [0.06] (-0.56, -0.23)
	childs (dummy, 0=no transfer from their children)	-0.31*** [0.08] (-0.45, -0.18)	-0.69*** [0.07] (-0.83, -0.54)	-0.55*** [0.07] (-0.69, -0.41)	-0.58*** [0.07] (-0.72, -0.44)
	assets (net assets, log)	-2.89*** [0.76] (-4.38, -1.41)	-2.34** [0.95] (-4.20, -0.47)	-1.63* [0.90] (-3.40, 0.13)	-1.77* [0.91] (-3.56, 0.03)
Observations		10,386	9,778	10,398	10,148

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) Since householder gender is constant, *hgen* is omitted in FE; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Additional panel logistic regression (1): by two birth year cohort groups

In this regard, this chapter conducts the heterogenous analysis by two birth year cohort groups, such as: (i) the older elderly group: householders born in 1943 or earlier, and (ii) the younger elderly group: householders born after 1943 (A1.5 in appendices). The older group could receive the Basic Old-Age Pension since 2008, so some of them being below the poverty line before 2008 could overcome absolute poverty thanks to the Basic Old-Age Pension. Since the KLIPS does not collect the Basic Old-Age Pension benefit data separately (KLI, 2020a), this chapter performs the above analysis to identify the anti-poverty effect of the Basic Old-Age Pension on elderly poverty.

As a result of this analysis, the older group has significant negative coefficients on householder age in the absolute poverty models, whereas the younger group has insignificant coefficients. This implies that the older elderly could overcome their absolute poverty thanks to the Basic Old-Age Pension implementation in 2008. However, the older elderly has a positive coefficient on householder age in the relative poverty analysis. This can indicate that the Basic Old-Age Pension could have limited effects on the older elderly to overcome their relative poverty.

1.4.4.2. Householder (2): gender (hgen)

In general, female householders are more likely to be in poverty because females tend to have a weak position in the labour market (Choi & Ryu, 2003; Marchand & Smeeding, 2016; Seok & Kim, 2012; Yeo, 2019). In pooled OLS, householder gender is statistically significant in the absolute poverty models, and female householders show a higher poverty risk than male householders (A1.4 in appendices). However, it is omitted in the fixed effects model since householder gender is constant and has no within

variation in the research years.

Additional panel logistic regression (2): by two gender groups

To explore relations between gender and elderly poverty, this chapter conducts the second heterogenous analysis by gender groups, such as: (i) the male householder group, and (ii) the female householder group (A1.6 in appendices). Firstly, household employment is significant at the 1% level on both males and females, but the male householders have much higher coefficients than the female householders. It indicates that employment is commonly an important factor for elderly households, but the male elderly can overcome poverty more effectively if they are employed. This is because male workers tend to have more wage than female workers in Korea (MOEL, 2021). Secondly, family support is also significant at the 1% level on both males and females in the absolute poverty models, but the female householders have larger coefficients than the male householders. It can imply that the female group is more dependent on family support from their adult children to overcome the deep poverty.

1.4.4.3. Householder (3): employment status (hwork)

The employment of householders is also significant in all relative and absolute poverty models at the 1% level. The Korean elderly tend to retire from their main job in mid-50s; find another job as a bridge job; and then exit in early-70s from the labour market (Kim, 2019). Since the Korea's public pension has not sufficiently developed, the Korean elderly need to have a job to make ends meet even though this job has generally inferior job quality (Jeon & Cho, 2017). Therefore, the employment rate of the elderly was 31.3% in 2018 and earned income presented 52.5% of household income in 2016. These figures were the second highest of the OECD member countries (OECD, 2020). In

addition, if an elderly householder has a job, this elderly household can reduce poverty risk by 14% (Ko et al., 2019).

1.4.4.4. Householder (4): education years (hedu)

The variable of education years is not omitted in the fixed effects model since only seven householders completed more educational attainment after 65 years old. This variable is not significant in both relative and absolute poverty models. However, in pooled OLS, this variable has negative coefficients, this means that less-educated householders are more likely to be in poverty (A1.4 in appendices).

1.4.4.5. Householder (5): self-reported physical health condition (hheal)

The physical health condition of householders could have relations with working activities and earned income. In this chapter, it is significant only in the relative poverty analysis at the 5% level, while it is not significant in the absolute poverty models. Physically healthy householders tend to participate in the labour market more actively, work longer time, and have more wage than unhealthy householders, so they could overcome their relative poverty more effectively.

To be specific, firstly, the employment rate of healthy elderly householders was 48.1%, this figure was nearly 4 times higher than unhealthy elderly householders of 12.2% in 2017. Secondly, healthy elderly householders worked 19.7 hours per week, whereas unhealthy elderly householders worked only 4.2 hours per week in 2017. Lastly, an elderly household whose householder is healthy had £740.7 of equivalised earned income per month, but an elderly household with an unhealthy householder had only £268.7 of equivalised monthly earned income in 2017.

On the one hand, the relative poverty threshold was £773.3 per month in 2017

(Figure 1.1 and A1.1 in appendices), so healthy householders could overcome relative poverty with earned income and other income sources, but this could be difficult for unhealthy householders. On the other hand, the absolute poverty thresholds were £350.5 (MCL1) - £409.6 (MCL2) in 2017 (Figure 1.1 and A1.1 in appendices), so elderly households could overcome absolute poverty with the above earned income and public transfer income (e.g., the Basic Pension: £133 per month in 2017) regardless of health condition of householders.

1.4.4.6. Household (1): place of residence (region)

Before the mid-2000s, the variable of region was statistically significant on the determination of elderly poverty status. To be specific, the elderly in rural areas were more vulnerable to poverty (Choi & Ryu, 2003; Choi, 2007). However, in recent times, others concluded that the region was insignificant on poverty status (Cho & Yeo, 2017).

In this chapter, the region is not significant because the Korean social security system for the elderly has developed since the mid-2000s, and this system is mainly operated by the central government with common eligibility and benefit criteria in all regions. For example, firstly, the National Pension is managed by the NPS with the national legislation regardless of regions. Secondly, the central government is financing nearly 80% of the Basic Pension and the NBLS budget, and these subsidies are provided under the same rules on eligibility and benefit (MOHW, 2020). Therefore, the region could be insignificant on the poverty status of the elderly in more recent times.

1.4.4.7. Household (2): the number of household members (size)

The number of household members is significant on all relative and absolute poverty at the 1% level. If the elderly live with their adult children, they can share income of their

adult children. Whereas single elderly households are generally the most vulnerable to poverty and couple elderly households are also in danger of poverty (Ku & Kim, 2020; Park & Kim, 2016). For example, the poverty rates of single elderly households and couple elderly households were 70.9% and 47.1%, respectively, in 2011. These rates were considerably higher than the elderly living with working age household members of 18.7% in 2011 (Yun & Kwon, 2014).

1.4.4.8. Household (3): the number of pensioners (pens)

The number of pensioners is also significant on all relative and absolute poverty at the 1% level. As can be seen in Table 1.7, the number of pensioners sharply increased from 0.13 in 2003 to 0.44 in 2017 of the relative poverty elderly group and from 0.12 to 0.33 of the absolute poverty elderly group. In addition, social insurance income of the relative poverty elderly group increased from £12.9 in 2003 to £121.2 in 2017 per month and this amount of the absolute poverty elderly group also rose from £7.8 to £54.9 during the same period. Therefore, the expansion of public pension could have positive effects on elderly poverty.

Additional panel logistic regression (3): by two age groups

However, the older elderly and the younger elderly have the substantial gap in the coverage of the National Pension which is a centrepiece of the public pension system in Korea. To be specific, the National Pension covered 52.7% of the younger elderly aged 65-79 and distributed £238.2 per month to them in 2019; whereas the older elderly aged 80 and over were insured only 20.8% and received £130.2 per month in the same year (KOSTAT, 2020). Since the National Pension in Korea was introduced in 1988 as a contribution-based earning-related pension and its coverage was expanded by 2006, the

older elderly could not have sufficient contribution periods to the National Pension before retirement. Therefore, this chapter conducts the third additional analysis by two householder age groups, such as: (i) the younger elderly group: householders aged 65-79, and (ii) the older elderly group: householders aged 80 and over.

The number of pensioners is significant on the householder age of the younger elderly group at the 1% level in the relative and absolute poverty models. This implies that the pension receipt has positive effects on the poverty status of the younger elderly. However, the coefficients of the older elderly group have lower significance than those of the younger elderly group (A1.7 in appendices). This means that the Korean public pension does not help the older elderly sufficiently to overcome their poverty.

1.4.4.9. Household (4): financial support from adult children (childs)

Financial support from their adult children is also statistically significant on both relative and absolute poverty at the 1% level. Despite social expenditure expansion, the ratio of public transfer to household income of an elderly household was only one-fourth, and this figure was much smaller than the OECD average of 65.4% in 2016 (OECD, 2020). Therefore, family support from their adult children is still an important income source for elderly households.

1.4.4.10. Household (5): net assets (assets)

Net assets are statistically significant on relative poverty at the 1% level, but it is significant on absolute poverty at the 5% or 10% level. Since retirees can utilise their assets when their expenditure exceeds their income, assets can be also an important indicator of well-being (Ahn, 2018; OECD, 2013; Wolff, 2010). However, p-values are different between relative and absolute poverty. Absolute poverty households could be

relatively difficult to liquidate their assets because they do not have sufficient assets for their essential living condition.

To be specific, an absolute poverty elderly household possessed 93.4 thousand pounds of net assets in 2017 (Table 1.7), however it was lower than the median housing cost for the Korean 'Jeonse' of 104.6 thousand pounds in 2017 (Korea Real Estate Board, 2020). The Jeonse is a unique long-term lease system in Korea, and cheaper than a normal rent contract since a tenant pays only a lump sum deposit without a monthly rent and a landlord returns the deposit to the tenant when the rent contract finishes. An absolute poverty elderly household had smaller assets than this essential housing cost, so this household could be relatively difficult to utilise their assets. Whereas a relative poverty elderly household owned 119.9 thousand pounds in the same year (Table 1.7), and it was more than the cost of the Korean Jeonse. Therefore, a relative poverty household can utilise a fraction of assets when it is struggle to a financial difficulty.

1.5. Conclusion

After the Korean War (1950-1953), the Korean economy had started from a devastated territory, but came to change its position from a recipient of international assistance to a donor country. In this process, the Korea had focused on economic growth, but the welfare system in Korea had not sufficiently matured. Therefore, the Korean elderly have tended to face a high poverty risk after retirement. It is different from the elderly in other developed countries because they have well-developed public pension schemes, so they are less vulnerable to poverty (Korpi & Palme, 1998; Marchand & Smeeding, 2016; Meyer & Wu, 2018; OECD, 2019a). As a result, elderly poverty is considered as one of

the most critical issues in Korea (MOHW, 2018; Pew Research Centre, 2014), so the Korean government has enhanced social expenditure for the elderly recently. Therefore, this chapter analyses the trends and determinants of elderly poverty. This chapter can also suggest some implications for other countries where financial support programmes for the elderly have not sufficiently improved.

Trends of elderly poverty: This chapter calculates both relative and absolute poverty thresholds and identifies the relative and absolute poverty rates of the Korean elderly. Firstly, the relative poverty threshold doubled from £380.9 in 2003 to £773.3 in 2017 per month (Figure 1.1 and A1.1 in appendices). However, the absolute poverty threshold 1 (MCL1) increased from £249.1 to £350.5 during the same year. Secondly, this chapter displays that the relative poverty rate decreased by only 4.6%p from 48.5% in 2003 to 43.9% in 2017. However, the absolute poverty rate 1 (MCL1) dropped rapidly from 35.9% to 9.8% during the same period (Figure 1.2 and A1.1 in appendices).

Determinants of elderly poverty: This chapter conducts the Lasso and unpaired t-test to select more relevant independent variables and investigates the determinants of relative and absolute poverty using panel logistic regression. Firstly, the variables of householder employment, household size, the number of pensioners, and family support are all significant at the 1% level on both relative and absolute poverty. However, household region is not significant on both relative and absolute poverty.

Secondly, householder age has a positive coefficient on relative poverty, but it has negative coefficients on absolute poverty. In other words, the older elderly are more vulnerable to relative poverty. It is consistent with a well-known consensus since the older elderly tend to be unhealthy and difficult to have a job. However, this chapter shows that the younger elderly are more susceptible to absolute poverty. Therefore, this

chapter conducts the additional heterogenous analysis and finds that the older elderly could overcome their absolute poverty in later years thanks to the Basic Old-Age Pension implementation in 2008.

Thirdly, the self-reported physical health condition of householders is only significant on relative poverty. The healthy elderly householders tend to participate in the labour market more actively and work longer time, so they can have more wage and overcome their relative poverty. However, the unhealthy elderly householders show a lower employment rate and working hours, so they earn much smaller income than the relative poverty threshold. Meanwhile, they can overcome absolute poverty with their earned income and public transfer income regardless of their health condition.

Lastly, the variable of net assets is statistically significant on relative poverty at the 1% level, but it is significant on absolute poverty at the 5% or 10% level. This is because absolute poverty elderly households have smaller assets than the essential housing cost, so they could be relatively difficult to liquidate their assets.

Implications: The Korean social security system has been maturing substantially, therefore the absolute elderly poverty rate remarkably decreased. However, it is still insufficient to alleviate relative poverty of the elderly, so the elderly need to seek additional income sources (Kang, 2015; Kim et al., 2018). Therefore, householder employment, household size, the number of pensioners, and family support have commonly significant effects on elderly poverty.

This chapter finds different determinants between relative and absolute poverty. Firstly, the Basic Old-Age Pension (former the Basic Pension) has positive anti-poverty effects on absolute elderly poverty. The additional heterogenous analysis describes that

the Basic Old-Age Pension can have positive effects on the older elderly to overcome absolute poverty (A1.5 in appendices). This implies that the Basic Old-Age Pension can be a helpful income supplement of the National Pension for the older elderly. While the older elderly are not covered sufficiently by the National Pension because they tended to retire before the minimum ten contribution years (A1.7 in appendices).

Secondly, work incentive programmes (e.g., the Earned Income Tax Credit) can have positive effects on relative elderly poverty. In recent times, the labour market participation of the elderly has been regarded as an important anti-poverty measure in developed countries (OECD, 2019b). The employment rate of the Korean elderly is higher than other developed countries (OECD, 2020), and this rate increased from 26% in 2003 to 34% in 2017 (Table 1.7). Furthermore, in this chapter, self-reported physical health condition is significant on relative poverty. This indicates that healthy elderly can work longer hours and have more earned income, so they can overcome relative poverty. Work incentive programmes can facilitate more work activities of the elderly and reduce relative poverty more effectively.

In the future, social expenditure for the elderly will be increasing due to rapid population ageing, so the government debt as a percentage of GDP will increase from 41.9% in 2018 to 150%-196% in 2060 (OECD, 2018, 2020; Zoli, Wang, Laxton, Mursula & Yao, 2018). However, under the current social security system, the relative elderly poverty rate will be able to remain at a high level. Therefore, different approaches are needed to improve poverty reduction efficacy and efficiency of public transfer expenditure.

Limitations: This chapter describes that public transfer has positive effects on the poverty status of the Korean elderly, but it cannot identify how much each public

transfer programme reduces the elderly poverty rate. In addition, this chapter cannot separate the anti-poverty effects of public transfer programmes (e.g., the Basic Old-age Pension). This is because the KLIPS does not divide public transfer benefits in detail. Policy makers can find meaningful implications to design better anti-poverty measures through comparison of efficacy and efficiency among several public transfer programmes. Therefore, the chapter 2 will decompose and compare the anti-poverty efficacy and efficiency of public transfer programmes on elderly poverty in Korea.

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Appendices

A1.1. Poverty thresholds and poverty rates

A1.1.1. Poverty thresholds (GBP)

	KLIPS analysis				Official	
	Relative poverty	Absolute poverty 1 (MCL1)	Absolute poverty 2 (MCL2)	Absolute poverty 3 (MCL3)	Relative poverty	Absolute poverty (MCL)
2003	380.9	249.1	254.6	257.1	-	237.2
2004	400.0	257.4	266.7	267.8	-	245.5
2005	433.5	266.3	281.2	281.5	-	267.6
2006	465.2	272.4	287.4	290.8	444.1	278.9
2007	498.1	278.6	293.9	299.1	464.0	290.6
2008	497.5	288.6	307.8	312.7	483.6	308.7
2009	536.3	300.6	326.9	324.5	491.8	327.2
2010	580.4	308.2	334.8	332.7	523.0	336.2
2011	606.5	318.9	357.7	345.7	555.2	355.1
2012	645.8	329.9	378.1	357.3	590.4	368.9
2013	653.6	334.9	388.8	360.8	610.9	381.4
2014	674.4	339.2	388.8	363.5	626.3	402.3
2015	704.9	342.3	392.1	364.0	645.1	447.5
2016	740.6	345.1	396.6	365.1	708.1	-
2017	773.3	350.5	409.6	371.2	735.8	-

Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds, (3) Relative poverty threshold: set at 50% of equivalised disposable income of the KLIPS, (4) The official relative poverty threshold: 50% of median equivalised disposable income of the KHIES (2006-2016) and the Korea Survey of Household Finances and Living Conditions (2017) because the official poverty index changed in 2017, (5) The official relative poverty rate: the KHIES has collected single households since 2006, (6) The official absolute poverty threshold: the official MCL for a single household in each year, (7) The statutory poverty threshold changed from absolute poverty threshold to 30-50% of median income since 2015; Source: KLIPS analysis: Author calculation (KLIPS 7th wave – 21st wave microdata) and official: KOSTAT (2020)

A1.1.2. Poverty rates (%)

	KLIPS analysis								Official	
	65+ (and over 65)				64- (below 65)				65+	18-65
	R	A1	A2	A3	R	A1	A2	A3	R	R
2003	48.5	35.9	36.8	37.2	15.4	8.1	8.2	8.3	-	-
2004	46.8	28.6	29.3	29.7	15.1	6.4	6.7	6.7	-	-
2005	47.1	26.6	29.1	29.1	14.0	5.9	6.6	6.6	-	-
2006	47.8	25.4	27.9	28.3	14.6	5.6	6.2	6.3	42.8	11.1
2007	48.6	25.7	28.3	28.9	13.0	4.1	4.4	4.6	43.6	11.1
2008	49.5	24.4	27.6	28.5	15.0	7.4	8.0	8.1	44.1	11.5
2009	48.0	23.1	26.0	25.6	13.0	5.0	5.6	5.6	45.9	11.5
2010	50.8	20.9	24.4	23.9	12.5	4.2	5.0	4.9	46.3	11.3
2011	46.0	18.2	22.4	21.5	10.9	3.3	4.2	3.9	47.6	10.8
2012	45.7	17.5	21.9	20.0	11.3	3.3	4.1	3.8	47.2	10.0
2013	45.1	15.9	21.1	18.1	10.1	3.3	4.1	3.6	48.1	9.6
2014	43.4	15.5	20.0	17.8	10.6	3.2	3.8	3.4	47.4	9.3
2015	44.0	11.9	16.8	13.8	9.7	2.6	3.3	2.8	44.8	8.5
2016	42.0	10.6	15.2	12.4	10.2	2.8	3.4	3.0	46.5	9.0
2017	43.9	9.8	14.9	11.5	10.2	2.1	2.9	2.4	42.3	12.6

Note: (1) A1: the absolute poverty rate 1 (MCL1), A2: the absolute poverty rate 2 (MCL2), A3: the absolute poverty rate 3 (MCL3), R: the relative poverty rate, (2) The official poverty rate: based on the KHIES (2006-2016) and the Korea Survey of Household Finances and Living Conditions (2017) because the official poverty index changed in 2017, (3) The official relative poverty rate: the KHIES has collected single households since 2006; Source: KLIPS analysis: Author calculation (KLIPS 7th wave – 21st wave microdata) and official: KOSTAT (2020)

A1.2. Lasso (least absolute shrinkage and selection operator) logistic regression

A1.2.1. Potential variables

Category	Name	Description
Householder	*hage*	age, years
	i.hgen	dummy, gender, 0=male, 1=female
	i.hwed	dummy, marital status, 0=unmarried, widowed or divorced, 1=married or couple
	i.hwork	dummy, employment status, 0=employed, 1=unemployed (including economically inactive status)
	hworkyr	work years in lifetime
	i.wind	dummy, employment, type of industry, the Korean Standard Industrial Classification (KSIC), 0-20 (0: unemployed)
	i.wocc	dummy, employment, type of job, the Korean Standard Classification of Occupations (KSCO), 0-10 (0: unemployed)
	hedu	education years in lifetime
	i.hheal	dummy, self-reported health condition, 0=healthy, 1=unhealthy
Household	*i.region*	dummy, place of residence, 0=urban area (Seoul, Busan, Daegu, Incheon, Daejeon, Gwangju, and Ulsan), 1=rural area (province areas)
	size	the number of household member(s)
	lonum	the number of household member(s) aged below 65
	hinum	the number of household member(s) aged 65 and over
	workers	the number of worker(s) in a household
	pens	the number of pensioner(s) in a household
	i.nbls	dummy, 0=no financial support from the National Basic Livelihood Security (NBLS), 1=receiving the NBLS
	i.subs	dummy, 0=no financial support of other subsidies (including the Basic Pension and other subsidies), 1=receiving other subsidies
	i.childs	dummy, 0=no financial support from their adult children, 1=receiving financial support from their adult children
	l_assetp	net assets = assets - debt (log)
	cons	a constant term

A1.2.2. The result of the Lasso logistic regression

Category	Name	R	A1	A2	A3	Decision
Householder	*hage*	0.05	0.09	0.06	0.22	Selected
	0.hgen	-0.01	-	-	-	Selected
	0.hwed	0.09	0.07	0.08	-	(size)
	0.hwork	-0.16	-0.17	-0.16	-	Selected
	hworkyr	-	-	-	-	dropped
	4.wind	-	-	-	-0.04	(hwork)
	8.wocc	-	-	-	-0.04	(hwork)
	9.wocc	-	-	-	-0.01	(hwork)
	hedu	-0.27	-0.28	-0.29	-0.42	Selected
	0.hheal	-0.02	-0.04	-0.01	-0.08	Selected
Household	*0.region*	-	-	-	-	Selected
	size	-0.24	-0.24	-0.26	-0.22	Selected
	lonum	-	-0.04	-	-0.20	(size)
	hinum	-	-	-	-	dropped
	workers	-0.12	-0.13	-0.14	-0.27	(hwork)
	pens	-0.25	-0.21	-0.25	-0.10	Selected
	0.nbls	-0.14	-0.20	-0.18	-0.21	dropped
	0.subs	-	-0.02	-0.02	-0.21	dropped
	0.childs	0.18	0.13	0.15	-	Selected
	l_assetp	-0.21	-0.25	-0.24	-0.34	Selected
	cons	-1.51	-1.23	-1.34	0.14	

Note: (1) *hwed* is correlated with *size* (corr = 0.52), (2) *wind* and *wocc* are correlated with *hwork* (corr = -0.68 and -0.93) and the level of the coefficients are relatively low, (3) *region* is dropped in the Lasso regression, but this chapter adopts it because prior studies have different conclusions (e.g., significant: Choi (2007) and Choi and Ryu (2003); insignificant: Cho and Yeo (2017)), (4) *lonum* is correlated with *size* (corr = 0.88), (5) *workers* is correlated with *hwork* (corr = -0.88), (6) *nbls* and *subs* have many missing values in early years

A1.3. Unpaired t-test

A1.3.1. Comparison (1): Relative poverty elderly group

Householder age: 65+	Variables	>= Relative poverty line (N=8,550)	< Relative poverty line (N=9,731)	Diff.	p-value
Householder	*hage* (age, years)	70.96 [0.07] (70.82, 71.10)	75.31 [0.09] (75.13, 75.48)	4.34*** [0.11] (4.12, 4.57)	0.000
	hgen (dummy, 0=male)	0.18 [0.00] (0.17, 0.19)	0.48 [0.01] (0.47, 0.50)	0.30*** [0.01] (0.29, 0.32)	0.000
	hwork (dummy, 0=employed)	0.56 [0.01] (0.54, 0.57)	0.78 [0.00] (0.77, 0.79)	0.22*** [0.01] (0.21, 0.24)	0.000
	hedu (education years, lifetime)	10.01 [0.06] (9.90, 10.12)	5.96 [0.06] (5.84, 6.07)	-4.05*** [0.08] (-4.21, -3.89)	0.000
	hheal (dummy, 0=healthy)	0.24 [0.01] (0.23, 0.25)	0.51 [0.01] (0.50, 0.53)	0.28*** [0.01] (0.26, 0.29)	0.000
Household	*region* (dummy, 0=urban areas)	0.54 [0.01] (0.53, 0.56)	0.58 [0.01] (0.57, 0.59)	0.04*** [0.01] (0.02, 0.05)	0.000
	size (household size, persons)	2.46 [0.01] (2.43, 2.49)	1.67 [0.01] (1.65, 1.69)	-0.79*** [0.02] (-0.82, -0.75)	0.000
	pens (the number of pensioners)	0.57 [0.01] (0.56, 0.59)	0.30 [0.01] (0.29, 0.31)	-0.28*** [0.01] (-0.30, -0.26)	0.000
	childs (dummy, 0=no transfer from their children)	0.68 [0.01] (0.67, 0.70)	0.73 [0.01] (0.72, 0.74)	0.05*** [0.01] (0.03, 0.06)	0.000
	assets (net assets, log)	14.88 [0.00] (14.87, 14.88)	14.83 [0.00] (14.83, 14.83)	-0.05*** [0.00] (-0.05, -0.05)	0.000

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.3.2. Comparison (2): Absolute poverty 1 elderly group

Householder age: 65+	Variables	>= Absolute poverty line1 (N=14,200)	< Absolute poverty line1 (N=4,081)	Diff.	p-value
Householder	*hage* (age, years)	72.48 [0.07] (72.34, 72.61)	75.63 [0.13] (75.38, 75.88)	3.16*** [0.15] (2.87, 3.44)	0.000
	hgen (dummy, 0=male)	0.27 [0.00] (0.26, 0.28)	0.58 [0.01] (0.56, 0.60)	0.31*** [0.01] (0.29, 0.33)	0.000
	hwork (dummy, 0=employed)	0.62 [0.00] (0.61, 0.63)	0.85 [0.01] (0.83, 0.86)	0.22*** [0.01] (0.21, 0.24)	0.000
	hedu (education years, lifetime)	8.71 [0.05] (8.61, 8.81)	5.25 [0.09] (5.07, 5.43)	-3.46*** [0.10] (-3.66, -3.26)	0.000
	hheal (dummy, 0=healthy)	0.33 [0.010] (0.32, 0.34)	0.56 [0.01] (0.54, 0.57)	0.23*** [0.01] (0.21, 0.25)	0.000
Household	*region* (dummy, 0=urban areas)	0.55 [0.00] (0.54, 0.56)	0.60 [0.01] (0.58, 0.62)	0.05*** [0.01] (0.03, 0.07)	0.000
	size (household size, persons)	2.21 [0.01] (2.19, 2.23)	1.53 [0.01] (1.50, 1.55)	-0.69*** [0.02] (-0.72, -0.65)	0.000
	pens (the number of pensioners)	0.50 [0.01] (0.49, 0.51)	0.20 [0.01] (0.18, 0.21)	-0.30*** [0.01] (-0.32, -0.28)	0.000
	childs (dummy, 0=no transfer from their children)	0.73 [0.00] (0.72, 0.74)	0.64 [0.01] (0.62, 0.65)	-0.09*** [0.01] (-0.11, -0.07)	0.000
	assets (net assets, log)	14.86 [0.00] (14.86, 14.86)	14.82 [0.00] (14.82, 14.82)	-0.04*** [0.00] (-0.04, -0.04)	0.000

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.4. Pooled OLS and panel logistic regression (fixed effects and random effects model)

A1.4.1. Dependent variable (1): Relative poverty

Variables		POLS	Panel Logistic Regression	
			FE	RE
Householder	*hage* (age, years)	0.01*** [0.00] (0.01, 0.01)	0.07*** [0.01] (0.06, 0.09)	0.09*** [0.01] (0.08, 0.10)
	hgen (dummy, 0=male)	0.00 [0.01] (-0.02, 0.01)	(omitted)	0.24 [0.15] (-0.05, 0.53)
	hwork (dummy, 0=employed)	0.13*** [0.01] (0.12, 0.14)	0.94*** [0.09] (0.77, 1.12)	1.15*** [0.08] (1.00, 1.31)
	hedu (education years, lifetime)	-0.02*** [0.00] (-0.02, -0.02)	0.43 [0.30] (-0.15, 1.02)	-0.19*** [0.01] (-0.22, -0.16)
	hheal (dummy, 0=healthy)	0.06*** [0.01] (0.04, 0.07)	0.15** [0.07] (0.02, 0.28)	0.21*** [0.06] (0.09, 0.34)
Household	*region* (dummy, 0=urban areas)	0.01* [0.01] (0.00, 0.02)	-0.04 [0.19] (-0.42, 0.33)	0.11 [0.10] (-0.10, 0.31)
	size (household size, persons)	-0.10*** [0.00] (-0.10, -0.09)	-0.66*** [0.06] (-0.77, -0.56)	-0.77*** [0.04] (-0.86, -0.69)
	pens (the number of pensioners)	-0.07*** [0.01] (-0.08, -0.06)	-0.31*** [0.08] (-0.48, -0.14)	-0.45*** [0.07] (-0.58, -0.32)
	childs (dummy, 0=no transfer from their children)	-0.04*** [0.01] (-0.06, -0.03)	-0.31*** [0.08] (-0.45, -0.18)	-0.37*** [0.07] (-0.50, -0.24)
	assets (net assets, log)	-1.10*** [0.00] (-0.07, -0.06)	-2.89*** [0.76] (-4.38, -1.41)	-6.79*** [0.65] (-8.07, -5.51)
Constant		16.44*** [0.78] (14.92, 17.97)	-	97.01*** [9.63] (78.14, 115.87)
Observations		18,281	10,386	18,281
R-squared		0.2930	-	-

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Hausman Test: $chi^2(9) = 160.60$, $Prob > chi^2 = 0.0000$

A1.4.2. Dependent variable (2): Absolute poverty 1

Variables		POLS	Panel Logistic Regression	
			FE	RE
Householder	*hage* (age, years)	0.00*** [0.00] (0.00, 0.00)	-0.08*** [0.01] (-0.10, -0.07)	-0.02*** [0.01] (-0.03, -0.01)
	hgen (dummy, 0=male)	0.05*** [0.01] (0.04, 0.07)	(omitted)	0.31** [0.12] (0.07, 0.55)
	hwork (dummy, 0=employed)	0.11*** [0.01] (0.10, 0.12)	0.82*** [0.09] (0.64, 1.00)	1.15*** [0.08] (0.99, 1.31)
	hedu (education years, lifetime)	-0.01*** [0.00] (-0.01, -0.01)	0.10 [0.21] (-0.31, 0.52)	-0.13*** [0.01] (-0.16, -0.11)
	hheal (dummy, 0=healthy)	0.03*** [0.01] (0.02, 0.04)	0.07 [0.06] (-0.06, 0.20)	0.11* [0.06] (-0.01, 0.23)
Household	*region* (dummy, 0=urban areas)	0.03*** [0.01] (0.02, 0.04)	0.13 [0.22] (-0.31, 0.56)	0.18* [0.09] (0.00, 0.37)
	size (household size, persons)	-0.05*** [0.00] (-0.06, -0.05)	-0.37*** [0.06] (-0.48, -0.26)	-0.47*** [0.04] (-0.56, -0.39)
	pens (the number of pensioners)	-0.08*** [0.00] (-0.09, -0.07)	-0.37*** [0.06] (-0.52, -0.17)	-0.81*** [0.07] (-0.95, -0.67)
	childs (dummy, 0=no transfer from their children)	-0.14*** [0.01] (-0.15, -0.13)	-0.69*** [0.07] (-0.83, -0.54)	-0.93*** [0.07] (-1.06, -0.80)
	assets (net assets, log)	-0.48*** [0.03] (-0.55, -0.41)	-2.34** [0.95] (-4.20, -0.47)	-6.09*** [0.78] (-7.61, -4.57)
Constant		7.29*** [0.52] (6.28, 8.30)	-	91.45*** [11.47] (68.96, 113.94)
Observations		18,281	9,778	18,281
R-squared		0.1803	-	-

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Hausman Test: $chi^2(9) = 395.74$, Prob > $chi^2 = 0.0000$

A1.4.3. Dependent variable (3): Absolute poverty 2

Variables		POLS	Panel Logistic Regression	
			FE	RE
Householder	*hage* (age, years)	0.01*** [0.00] (0.00, 0.01)	-0.04*** [0.01] (-0.05, -0.02)	0.01 [0.01] (-0.01, 0.02)
	hgen (dummy, 0=male)	0.05*** [0.01] (0.03, 0.06)	(omitted)	0.26** [0.12] (0.02, 0.50)
	hwork (dummy, 0=employed)	0.12*** [0.01] (0.11, 0.14)	0.87*** [0.09] (0.70, 1.04)	1.17*** [0.08] (1.02, 1.32)
	hedu (education years, lifetime)	-0.01*** [0.00] (-0.01, -0.01)	0.20 [0.21] (-0.22, 0.61)	-0.13*** [0.01] (-0.16, -0.11)
	hheal (dummy, 0=healthy)	0.04*** [0.01] (0.03, 0.06)	0.10 [0.06] (-0.02, 0.22)	0.15*** [0.06] (0.04, 0.27)
Household	*region* (dummy, 0=urban areas)	0.03*** [0.01] (0.01, 0.04)	0.13 [0.21] (-0.29, 0.54)	0.13 [0.09] (-0.05, 0.31)
	size (household size, persons)	-0.06*** [0.00] (-0.07, -0.06)	-0.41*** [0.06] (-0.52, -0.30)	-0.52*** [0.04] (-0.60, -0.44)
	pens (the number of pensioners)	-0.08*** [0.01] (-0.09, -0.07)	-0.35*** [0.08] (-0.51, -0.19)	-0.71*** [0.07] (-0.84, -0.58)
	childs (dummy, 0=no transfer from their children)	-0.13*** [0.01] (-0.15, -0.12)	-0.55*** [0.07] (-0.69, -0.41)	-0.78*** [0.06] (-0.90, -0.65)
	assets (net assets, log)	-0.59*** [0.04] (-0.67, -0.52)	-1.63* [0.90] (-3.40, 0.13)	-6.03*** [0.73] (-7.47, -4.60)
Constant		8.91*** [0.57] (7.79, 10.04)	-	89.14*** [10.83] (69.92, 110.37)
Observations		18,281	10,398	18,281
R-squared		0.2054	-	-

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Hausman Test: $chi^2(9) = 308.54$, $Prob > chi^2 = 0.0000$

A1.4.4. Dependent variable (4): Absolute poverty 3

Variables		POLS	Panel Logistic Regression	
			FE	RE
Householder	*hage* (age, years)	0.00*** [0.00] (0.00, 0.00)	-0.08*** [0.01] (-0.09, -0.07)	-0.02*** [0.01] (-0.03, -0.01)
	hgen (dummy, 0=male)	0.05*** [0.01] (0.03, 0.07)	(omitted)	0.32** [0.12] (0.08, 0.56)
	hwork (dummy, 0=employed)	0.12*** [0.01] (0.11, 0.13)	0.85*** [0.09] (0.68, 1.03)	1.18*** [0.08] (1.02, 1.33)
	hedu (education years, lifetime)	-0.01*** [0.00] (-0.01, -0.01)	0.25 [0.21] (-0.17, 0.66)	-0.14*** [0.01] (-0.17, -0.12)
	hheal (dummy, 0=healthy)	0.03*** [0.01] (0.02, 0.05)	0.02 [0.06] (-0.10, 0.15)	0.07 [0.06] (-0.05, 0.19)
Household	*region* (dummy, 0=urban areas)	0.03*** [0.01] (0.02, 0.04)	0.15 [0.22] (-0.27, 0.57)	0.16* [0.09] (-0.02, 0.34)
	size (household size, persons)	-0.06*** [0.00] (-0.06, -0.05)	-0.39*** [0.06] (-0.50, -0.28)	-0.50*** [0.04] (-0.58, -0.41)
	pens (the number of pensioners)	-0.08*** [0.00] (-0.09, -0.07)	-0.39*** [0.06] (-0.56, -0.23)	-0.83*** [0.07] (-0.97, -0.69)
	childs (dummy, 0=no transfer from their children)	-0.14*** [0.01] (-0.15, -0.12)	-0.58*** [0.07] (-0.72, -0.44)	-0.83*** [0.07] (-0.96, -0.70)
	assets (net assets, log)	-0.55*** [0.04] (-0.62, -0.48)	-1.77* [0.91] (-3.56, 0.03)	-6.04*** [0.75] (-7.52, -4.57)
Constant		8.36*** [0.55] (7.28, 9.45)	-	90.96*** [11.14] (69.13, 112.80)
Observations		18,281	10,148	18,281
R-squared		0.1965	-	-

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

Hausman Test: $chi^2(9) = 437.26$, $Prob > chi^2 = 0.0000$

A1.5. Panel logistic regression (1): Heterogenous analysis by birth year cohorts, FE

A1.5.1. Dependent variables: (1) Relative poverty, (2) Absolute poverty 1

Variables		(1) Relative poverty		(2) Absolute poverty 1	
		born in 1943 or earlier	born after 1943	born in 1943 or earlier	born after 1943
Householder	*hage* (age, years)	0.08*** [0.01] (0.06, 0.10)	0.03 [0.02] (-0.01, 0.08)	-0.09*** [0.01] (-0.11, -0.07)	0.00 [0.03] (-0.06, 0.07)
	hgen (dummy, 0=male)	(omitted)	(omitted)	(omitted)	(omitted)
	hwork (dummy, 0=employed)	0.88*** [0.10] (0.68, 1.08)	1.12*** [0.17] (0.79, 1.46)	0.90*** [0.10] (0.71, 1.10)	0.38* [0.23] (-0.07, 0.83)
	hedu (education years, lifetime)	0.29 [0.37] (-0.45, 1.02)	0.67 [0.55] (-0.40, 1.74)	-0.12 [0.31] (-0.73, 0.48)	5.35 [429.62] (-836.68, 847.39)
	hheal (dummy, 0=healthy)	0.14* [0.08] (-0.01, 0.28)	0.21 [0.15] (-0.10, 0.51)	0.12* [0.07] (-0.01, 0.26)	-0.37* [0.65] (-0.77, 0.01)
Household	*region* (dummy, 0=urban areas)	-0.10 [0.21] (-0.51, 0.31)	0.24 [0.52] (-0.78, 1.26)	0.17 [0.24] (-0.30, 0.64)	-0.37 [0.65] (-1.64, 0.91)
	size (household size, persons)	-0.69*** [0.06] (-0.80, -0.57)	-0.50*** [0.16] (-0.81, -0.18)	-0.37*** [0.06] (-0.48, -0.25)	-0.45 [0.28] (-1.00, 0.10)
	pens (the number of pensioners)	-0.24** [0.10] (-0.43, -0.06)	-0.53*** [0.18] (-0.89, -0.18)	-0.30*** [0.09] (-0.48, -0.11)	-0.80*** [0.26] (-1.30, -0.29)
	childs (dummy, 0=no transfer from their children)	-0.32*** [0.08] (-0.48, -0.16)	-0.31** [0.15] (-0.61, 0.01)	-0.69*** [0.08] (-0.84, -0.53)	-0.74*** [0.23] (-1.19, -0.30)
	assets (net assets, log)	-2.69*** [0.84] (-4.34, -1.04)	-3.57** [1.79] (-7.09, -0.05)	-2.39** [1.02] (-4.40, -0.39)	-2.05 [2.57] (-7.09, 3.00)
Observations		8,126	2,260	8,583	1,195

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) Since householder gender is constant, *hgen* is omitted in FE; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.5.2. Dependent variables: (3) Absolute poverty 2, (4) Absolute poverty 3

Variables		(3) Absolute poverty 2		(4) Absolute poverty 3	
		born in 1943 or earlier	born after 1943	born in 1943 or earlier	born after 1943
Householder	*hage* (age, years)	-0.04*** [0.01] (-0.06, -0.03)	0.01 [0.03] (-0.05, 0.07)	-0.09*** [0.01] (-0.10, -0.07)	-0.02 [0.03] (-0.08, 0.04)
	hgen (dummy, 0=male)	(omitted)	(omitted)	(omitted)	(omitted)
	hwork (dummy, 0=employed)	0.93*** [0.10] (0.74, 1.12)	0.61*** [0.21] (0.21, 1.02)	0.92*** [0.10] (0.73, 1.12)	0.50** [0.22] (0.08, 0.92)
	hedu (education years, lifetime)	0.00 [0.29] (-0.56, 0.57)	11.01 [416.36] (-805.04, 827.06)	-0.04 [0.33] (-0.70, 1.12)	11.77 [579.27] (-1123.59, 1147.13)
	hheal (dummy, 0=healthy)	0.14** [0.07] (0.01, 0.276)	-0.16 [0.18] (-0.50, 0.19)	0.07 [0.07] (-0.06, 0.20)	-0.40** [0.19] (-0.77, -0.02)
Household	*region* (dummy, 0=urban areas)	0.08 [0.23] (-0.36, 0.53)	0.35 [0.59] (-0.81, 1.50)	0.15 [0.23] (-0.30, 0.61)	0.01 [0.62] (-1.20, 1.22)
	size (household size, persons)	-0.40*** [0.06] (-0.51, -0.29)	-0.69*** [0.25] (-1.18, -0.21)	-0.39*** [0.06] (-0.50, -0.28)	-0.41 [0.27] (-0.95, 0.12)
	pens (the number of pensioners)	-0.30*** [0.09] (-0.47, -0.12)	-0.69*** [0.22] (-1.13, -0.26)	-0.39*** [0.06] (-0.53, -0.18)	-0.70*** [0.25] (-1.19, -0.22)
	childs (dummy, 0=no transfer from their children)	-0.58*** [0.08] (-0.73, -0.43)	-0.43** [0.20] (-0.83, 0.03)	-0.58*** [0.08] (-0.73, -0.42)	-0.65*** [0.22] (-1.08, -0.22)
	assets (net assets, log)	-1.38 [0.97] (-3.28, 0.51)	-3.52 [2.44] (-8.29, 1.25)	-1.48 [0.98] (-3.40, 0.44)	-3.68 [2.53] (-8.65, 1.28)
Observations		8,973	1,425	8,864	1,284

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) Since householder gender is constant, *hgen* is omitted in FE; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.6. Panel logistic regression (2): Heterogenous analysis by gender groups, FE

A1.6.1. Dependent variables: (1) Relative poverty, (2) Absolute poverty 1

Variables		(1) Relative poverty		(2) Absolute poverty 1	
		Male	Female	Male	Female
Householder	*hage* (age, years)	0.10*** [0.01] (0.08, 0.12)	0.02 [0.01] (0.00, 0.05)	-0.04*** [0.01] (-0.07, -0.02)	-0.12*** [0.01] (-0.14, -0.10)
	hwork (dummy, 0=employed)	1.06*** [0.11] (0.86, 1.27)	0.52*** [0.17] (0.19, 0.85)	1.01*** [0.12] (0.77, 1.24)	0.51*** [0.15] (0.22, 0.80)
	hedu (education years, lifetime)	0.29 [0.32] (-0.35, 0.92)	4.23 [124.94] (-240.64, 249.11)	0.04 [0.44] (-0.83, 0.90)	0.14 [0.25] (-0.34, 0.62)
	hheal (dummy, 0=healthy)	0.17** [0.08] (0.00, 0.33)	0.10 [0.11] (-0.13, 0.32)	0.03 [0.09] (-0.16, 0.21)	0.11 [0.09] (-0.07, 0.29)
Household	*region* (dummy, 0=urban areas)	-0.05 [0.22] (-0.49, 0.38)	-0.21 [0.39] (-0.98, 0.55)	-0.56** [0.27] (-1.09, -0.02)	1.54*** [0.44] (0.67, 2.41)
	size (household size, persons)	-0.60*** [0.07] (-0.73, -0.47)	-0.75*** [0.10] (-0.96, -0.55)	-0.34*** [0.08] (-0.49, -0.19)	-0.31*** [0.09] (-0.49, -0.12)
	pens (the number of pensioners)	-0.35*** [0.10] (-0.54, -0.16)	-0.19 [0.17] (-0.52, 0.14)	-0.40*** [0.11] (-0.62, -0.18)	-0.27* [0.14] (-0.54, 0.01)
	childs (dummy, 0=no transfer from their children)	-0.34*** [0.08] (-0.51, -0.18)	-0.31** [0.14] (-0.57, -0.04)	-0.63*** [0.10] (-0.82, -0.44)	-0.82*** [0.12] (-1.05, -0.59)
	assets (net assets, log)	-3.04*** [0.83] (-4.67, -1.40)	-2.88 [1.96] (-6.72, 0.96)	-1.99* [1.11] (-4.17, 0.19)	-3.25* [1.88] (-6.93, 0.43)
Observations		7,080	3,306	5,287	4,491

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.6.2. Dependent variables: (3) Absolute poverty 2, (4) Absolute poverty 3

Variables		(3) Absolute poverty 2		(4) Absolute poverty 3	
		Male	Female	Male	Female
Householder	*hage* (age, years)	-0.01 [0.01] (-0.03, 0.01)	-0.07*** [0.01] (-0.09, -0.05)	-0.05*** [0.01] (-0.07, -0.03)	-0.11*** [0.01] (-0.13, -0.09)
	hwork (dummy, 0=employed)	1.01*** [0.11] (0.79, 1.23)	0.63*** [0.14] (0.35, 0.90)	1.02*** [0.12] (0.79, 1.25)	0.58*** [0.14] (0.29, 0.86)
	hedu (education years, lifetime)	0.27 [0.37] (-0.45, 1.00)	0.15 [0.27] (-0.39, 0.69)	0.21 [0.38] (-0.54, 0.96)	0.26 [0.26] (-0.24, 0.77)
	hheal (dummy, 0=healthy)	0.10 [0.09] (-0.06, 0.27)	0.08 [0.09] (-0.10, 0.26)	-0.01 [0.09] (-0.18, 0.17)	0.05 [0.09] (-0.13, 0.22)
Household	*region* (dummy, 0=urban areas)	-0.44* [0.26] (-0.94, 0.07)	1.10*** [0.39] (0.33, 1.87)	-0.43 [0.27] (-0.96, 0.09)	1.19*** [0.41] (0.39, 1.99)
	size (household size, persons)	-0.35*** [0.07] (-0.49, -0.21)	-0.41*** [0.09] (-0.59, -0.24)	-0.34*** [0.07] (-0.48, -0.20)	-0.37*** [0.09] (-0.55, -0.19)
	pens (the number of pensioners)	-0.33*** [0.10] (-0.54, -0.13)	-0.39*** [0.14] (-0.66, -0.13)	-0.40*** [0.11] (-0.62, -0.19)	-0.38*** [0.14] (-0.65, -0.11)
	childs (dummy, 0=no transfer from their children)	-0.53*** [0.09] (-0.71, -0.34)	-0.64*** [0.11] (-0.86, -0.41)	-0.56*** [0.10] (-0.75, -0.37)	-0.66*** [0.12] (-0.88, -0.43)
	assets (net assets, log)	-1.30 [1.05] (-3.35, 0.76)	-2.50 [1.77] (-5.97, 0.98)	-1.51 [1.06] (-3.60, 0.57)	-2.40 [1.81] (-5.95, 1.15)
Observations		5,780	4,618	5,557	4,591

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.7. Panel logistic regression (3): Heterogenous analysis by age groups, FE

A1.7.1. Dependent variables: (1) Relative poverty, (2) Absolute poverty 1

Variables		(1) Relative poverty		(2) Absolute poverty 1	
		Aged 65-79	Aged 80 and over	Aged 65-79	Aged 80 and over
Householder	*hage* (age, years)	0.10*** [0.01] (0.08, 0.12)	0.00 [0.03] (-0.06, 0.05)	-0.04*** [0.01] (-0.06, -0.02)	-0.21*** [0.02] (-0.26, -0.17)
	hgen (dummy, 0=male)	(omitted)	(omitted)	(omitted)	(omitted)
	hwork (dummy, 0=employed)	0.88*** [0.09] (0.70, 1.07)	0.96** [0.41] (0.16, 1.76)	0.75*** [0.11] (0.55, 0.96)	0.62** [0.28] (0.07, 1.16)
	hedu (education years, lifetime)	0.36 [0.30] (-0.22, 0.95)	(omitted)	0.01 [0.23] (-0.43, 0.46)	(omitted)
	hheal (dummy, 0=healthy)	0.12 [0.08] (-0.03, 0.27)	0.08 [0.19] (-0.30, 0.45)	0.01 [0.08] (-0.14, 0.16)	0.17* [0.15] (-0.13, 0.47)
Household	*region* (dummy, 0=urban areas)	1.12 [0.22] (-0.31, 0.55)	0.23 [0.70] (-1.15, 1.60)	0.12 [0.26] (-0.39, 0.63)	-0.75 [0.71] (-2.14, 0.64)
	size (household size, persons)	-0.59*** [0.06] (-0.71, -0.47)	-1.07*** [0.23] (-1.52, -0.61)	-0.32*** [0.07] (-0.45, -0.19)	-0.97*** [0.22] (-1.40, -0.54)
	pens (the number of pensioners)	-0.35*** [0.09] (-0.53, -0.17)	0.03 [0.30] (-0.55, 0.61)	-0.43*** [0.10] (-0.63, -0.23)	-0.27 [0.25] (-0.76, 0.22)
	childs (dummy, 0=no transfer from their children)	-0.32*** [0.08] (-0.47, -0.17)	-0.40 [0.25] (-0.89, 0.09)	-0.69*** [0.09] (-0.85, -0.52)	-0.92*** [0.19] (-1.28, -0.55)
	assets (net assets, log)	-2.60*** [0.83] (-4.22, -0.98)	-6.36** [2.99] (-12.22, -0.51)	-2.52** [1.07] (-4.63, -0.42)	-2.49 [2.45] (-7.28, 2.31)
Observations		8,386	1,107	6,991	1,874

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) Since householder gender and education years (aged 80 and over) are constant, they are omitted in FE; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

A1.7.2. Dependent variables: (3) Absolute poverty 2, (4) Absolute poverty 3

Variables		(3) Absolute poverty 2		(4) Absolute poverty 3	
		Aged 65-79	Aged 80 and over	Aged 65-79	Aged 80 and over
Householder	*hage* (age, years)	0.00 [0.01] (-0.02, 0.02)	-0.14*** [0.02] (-0.18, -0.10)	-0.04*** [0.01] (-0.06, -0.02)	-0.20*** [0.02] (-0.25, -0.16)
	hgen (dummy, 0=male)	(omitted)	(omitted)	(omitted)	(omitted)
	hwork (dummy, 0=employed)	0.82*** [0.10] (0.63, 1.02)	0.45* [0.26] (-0.07, 0.96)	0.77*** [0.10] (0.57, 0.97)	0.64** [0.27] (0.11, 1.16)
	hedu (education years, lifetime)	0.19 [0.23] (-0.27, 0.65)	(omitted)	0.21 [0.24] (-0.25, 0.68)	(omitted)
	hheal (dummy, 0=healthy)	0.05 [0.07] (-0.09, 0.20)	0.09 [0.14] (-0.19, 0.37)	-0.06 [0.07] (-0.21, 0.09)	0.14 [0.15] (-0.15, 0.43)
Household	*region* (dummy, 0=urban areas)	0.09 [0.25] (-0.39, 0.58)	0.04 [0.61] (-1.16, 1.25)	0.17 [0.25] (-0.32, 0.66)	-0.27 [0.62] (-1.49, 0.95)
	size (household size, persons)	-0.38*** [0.07] (-0.51, -0.25)	-0.76*** [0.20] (-1.16, 1.25)	-0.36*** [0.07] (-0.49, -0.23)	-0.76*** [0.20] (-1.16, -0.36)
	pens (the number of pensioners)	-0.46*** [0.10] (-0.65, -0.27)	-0.40* [0.24] (-0.87, 0.07)	-0.47*** [0.10] (-0.66, -0.28)	-0.62** [0.25] (-1.11, -0.13)
	childs (dummy, 0=no transfer from their children)	-0.58*** [0.08] (-0.74, -0.42)	-0.77*** [0.19] (-1.14, -0.41)	-0.58*** [0.08] (-0.75, -0.42)	-0.83*** [0.19] (-1.20, -0.45)
	assets (net assets, log)	-1.49 [1.03] (-3.50, 0.52)	-4.56* [2.53] (-9.51, 0.40)	-1.76* [1.03] (-3.78, 0.27)	-4.16* [2.53] (-9.12, 0.80)
Observations		7,506	1,968	7,280	1,940

Note: (1) Coefficients, standard errors (in square brackets), and 95% confidence intervals (in parentheses), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) Since householder gender and education years (aged 80 and over) are constant, they are omitted in FE; Source: Author's calculation (KLIPS 7th wave – 21st wave microdata)

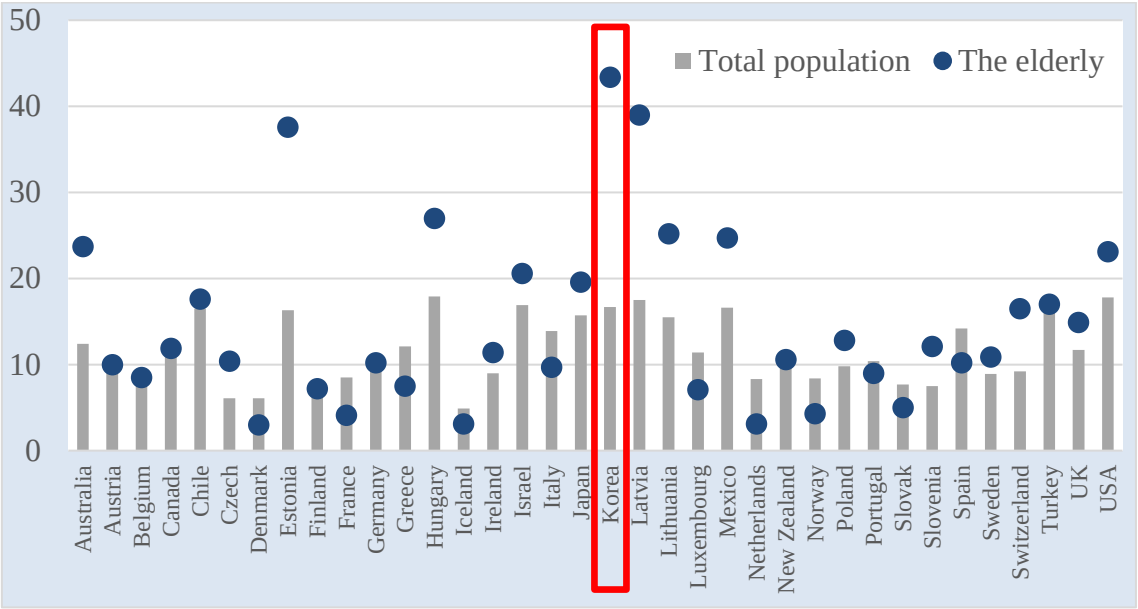
Chapter 2.

The efficacy and efficiency of public transfer programmes on elderly poverty in South Korea

2.1. Introduction

Due to the maturing of social security system, elderly (hereafter aged 65 and over) poverty has improved significantly in most developed countries (Korpi & Palme, 1998; Meyer & Wu, 2018; Organisation for Economic Co-operation and Development [OECD], 2019; Plotnick, 2012). South Korea (hereafter Korea) has also introduced major welfare programmes, such as: the National Pension in 1988, the National Basic Livelihood Security (NBLS) in 2000, and the Basic Old-Age Pension in 2008; and initiated the multi-layered benefits system for the elderly (Ministry of Health and Welfare in Korea [MOHW], 2018a). However, the relative poverty rate of people aged over 65 was 43.4% in 2018. This figure was the highest of the OECD member nations (Figure 2.1) and much higher than the total population's poverty rate in Korea (16.7%).

Figure 2.1. The poverty rates of the OECD member countries (%)



Note: (1) The poverty rate: the relative scale set at 50% of national median income, (2) The elderly: aged 65 over, (3) Data: 2018 or the latest year; Source: OECD (2020)

In the light of these circumstances, the Korean government announced the Proposal for the National Pension Reform in 2018 (Lee, 2019; MOHW, 2018a; Yun, 2019). This proposal was distinct from two previous the National Pension Reforms in 1998 and 2007. Firstly, this plan aimed for the National Minimum Income for the elderly to be one million Korean Won (equivalent to £667, hereafter 1 GBP = 1,500 Korean Won [KRW]) monthly per person. This income level was based on the subjective minimum living expenses for the elderly (MOHW, 2018a). Secondly, this plan suggested the following four combinations to support the cited income level with the National Pension and the Basic Pension (Table 2.1).

However, this plan was unable to muster sufficient public support in Korea and has been suspended because additional fiscal burden is a controversial issue related to Korea's rapidly ageing population (Choi, 2019; Kim, 2019; Tchoe & Kang, 2019; Yun, 2019). Due to the expenditure expansion on public pension and national health service,

the government debt to GDP will be increased from 41.9% in 2018 to 150%-196% in 2060 (OECD, 2018, 2020; Zoli, Wang, Laxton, Mursula & Yao, 2018). Moreover, some researchers cast a doubt on the anti-poverty effect of welfare expenditure (Kim & Kim, 2020; Ryu & Kim, 2019; Sung & Kim, 2018). In addition, others argue that the unemployed working age are economically more vulnerable than the elderly in the current welfare system (Hong, 2011; Kang, 2017; Nahm, 2018).

Table 2.1. The Proposal for the National Pension Reform 2018 in Korea

	Option 1 (Current structure)	Option 2 (Basic Pension)	Option 3 (National Pension)	Option 4 (National Pension)
Target income (monthly, thousand KRW)	867 (£578)	1,017 (£678)	919 (£613)	971 (£647)
Income replacement rate	52% (National Pension 40% + Basic Pension 12%)	55% (National Pension 40% + Basic Pension 15%)	57% (National Pension 45% + Basic Pension 12%)	62% (National Pension 50% + Basic Pension 12%)
Contribution rate (National Pension)	9% (current rate)	9% (current rate)	12% (since 2031)	13% (since 2036)
Basic Pension benefit (monthly, thousand KRW)	300 (£200)	300 (£200) 400 (£267, since 2022)	300 (£200)	300 (£200)

Note: (1) 1 GBP = 1,500 KRW, (2) Contribution rate in option 3: 10% in 2021-2025, 11% in 2026-2030, 12% since 2031, (3) Contribution rate in option 4: 10% in 2021-2025, 11% in 2026-2030, 12% in 2031-2035, 13% since 2036, (4) The Basic Pension benefit: 300 thousand KRW since 2021; Source: MOHW (2018a)

In this regard, it is essential to evaluate the anti-poverty achievements of the current public transfer programmes (Kang, 2017; Kim, 2017; Yoon, 2013). A large literature has evaluated the effect of a single programme on elderly poverty and has concluded that each programme has a substantial positive effect. However, it also has some limitations. Firstly, it cannot compare directly which a programme performs more effectively. This issue can be crucial for policy makers because they usually need to find better policy measures with finite resources. Secondly, it is difficult to identify potential different effects on the poor and the deep poor because prior studies usually

have focused on a single poverty threshold which is the same as the official poverty threshold in Korea set at 50% of median equivalised disposable income.

Some studies have compared the anti-poverty effects of multiple programmes together using the traditional analytical approach (Ben-Shalom, Moffitt & Scholz, 2012; Kang, 2017; Kim, 2017; Meyer & Wu, 2018). This method computes the gap between a pre-transfer income poverty rate and a post-transfer income poverty rate; and it regards this gap as the anti-poverty effect of a transfer programme. In this way, it is expedient and comprehensible, but it has additivity and path dependence problems when the analysis decomposes the effects of several programmes (Aristondo & Onaindia, 2019; Azevedo, Inchauste, Olivieri, Saavedra & Winkler, 2013; Fortin, Lemieux & Firpo, 2010; Gelbach, 2016; Hong, 2011; Ko, Woo, Ku & Lee, 2019; Shorrocks, 2013).

Therefore, this chapter examines the anti-poverty effects of several programmes with the Shapley decomposition method. Firstly, it analyses the four major programmes in Korea, such as: public pension (social insurance); the Basic Pension (a generous means-tested benefit); the NBLS (a strict means-tested benefit); and the Earned Income Tax Credit ([EITC], a tax credit). Secondly, it employs the Shapley decomposition instead of the traditional method. Lastly, it adopts both relative and absolute poverty thresholds to consider different characteristics of the poor and the deep poor.

This chapter is organised as follows. Section 2.2 reviews a relevant literature. Section 2.3 briefly explains the multi-tier benefits system in Korea. Section 2.4 introduces the Korea Welfare Panel Study (KOWEPS); establishes relative and absolute poverty thresholds; compares the traditional analysis and the Shapley decomposition; and describes efficiency evaluation indices. Section 2.5 computes the poverty thresholds and poverty rates; decomposes the anti-poverty contributions of the above four

programmes; and calculates the efficiency indices. Section 2.6 discusses the different trends of two poverty rates and potential behavioural responses. Finally, section 2.7 summarises the results of this chapter and suggests some implications for the next steps.

2.2. Literature review

It is a general premise that a welfare state should prioritise support for well-being of its residents, so the OECD members spent 46.2% of their budget on welfare and health in 2017 (OECD, 2020). At the same time, they are also faced with more criticism on the poverty reduction effect of welfare expenditure. Therefore, the efficacy and efficiency of welfare programmes are becoming more important indicators to evaluate policy performances (Kenworthy, 1999; Kim, 2009; Meyer & Mittag, 2019; Notten, 2015).

As more welfare programmes have been implemented in Korea, more researchers have analysed their anti-poverty effects. However, they generally evaluated a single public transfer programme, such as: (i) the National Pension: Chang (2019), and Sung and Kim (2018); (ii) the Basic Pension (including the Basic Old-Age Pension): Kim and Kang (2020), Lee, Ku, and Shon (2019), Lee and Moon (2014), and Seol and Lim (2019); (iii) the NBLS: Gim and Choi (2014), Hong (2002), and Jung, Kim, and Lim (2016); and (iv) the EITC: Hong, Moon, and Lee (2016). Only a few researchers have decomposed and compared the poverty alleviation effects of several programmes.

2.2.1. Anti-poverty effects of multiple public transfer programmes

Kim (2017) calculates the anti-poverty effects of public pension, the Basic Pension, the NBLS, and other subsidies in Korea using the KOWEPS from 2006 to 2015. This study

adopts the relative poverty threshold set at 50% of median equivalised disposable income. It points out that public pension had a larger anti-poverty effect (-4.6%p) on the poverty rate of the whole population than the Basic Pension (-3.6%p) and the NBLS (-1.5%p) in 2015. Meanwhile, the NBLS alleviated poverty more efficiently than the Basic Pension and public pension. However, this study has some limitations because it examines the whole population without categorising some sub-population groups (e.g., the elderly) and uses a single poverty threshold.

Kang (2017) also decomposes the anti-poverty efficacy of public pension, the Basic Pension, the NBLS, and the EITC using the KOWEPS in 2014. It adopts the relative poverty threshold which is the same as Kim (2017), but it separates the elderly from the entire population to capture different features. According to this study, public pension had the overwhelming anti-poverty efficacy for the elderly (-13.0%p) whereas the Basic Pension, the NBLS, and the EITC had small contributions below -1%p. Meanwhile, the Basic Pension had a wider coverage than other programmes. However, it decomposes a single year with a single poverty threshold.

The USA researchers also assess the efficacy of the USA's welfare programmes. Ben-Shalom, Moffitt and Scholz (2012) analyse the anti-poverty efficacy using the Survey of Income and Program Participation (SIPP) in 1984, 1993, and 2004. It adopts three poverty thresholds: (i) the deep poverty threshold: set at 50% of the official poverty threshold in the USA; (ii) the normal poverty threshold: set at the poverty threshold; and (iii) the near poverty threshold: set at 150% of the poverty threshold. It demonstrates that the Old-Age and Survivors Insurance (OASI), which is a social insurance programme similar to the National Pension in Korea, had the greatest efficacy (-8.0%p), and the EITC (-0.9%p) also had the prominent positive effect on the normal

poverty rate of the whole population in 2004.

Meyer and Wu (2018) also examine anti-poverty effects in the USA using the SIPP from 2008 to 2013. This study also uses three poverty thresholds the same as Ben-Shalom et al. (2012). It concludes that the Old-Age, Survivors, and Disability Insurance (OASDI) had the largest efficacy (-31.9%) on the whole population. However, the Supplemental Security Income, which is a means-tested benefit, alleviated poverty efficiently because it was designed to support the vulnerable.

In the UK, child poverty is considered as an urgent issue. Bradshaw and Huby (2014) analyse the effects of public transfer programmes on child poverty in the UK using the EU Statistics on Income and Living Condition in 2010. They decompose the poverty reduction effects of child benefits, old age benefits, housing benefits, work-related benefits, and social exclusion benefits (income support programmes which are not elsewhere classified). The relative child poverty rate set at 60% of national median income in the UK was 19.0% in 2010. The child benefits had the largest anti-poverty effect of 43%. In addition, the social exclusion benefits and the work-related benefits mitigated the poverty rate by 24% and 11%, respectively.

2.2.2. Literature using the Shapley decomposition

The traditional approach in the above literature has additivity and path dependence issues (Aristondo & Onaindia, 2019; Azevedo et al., 2013; Fortin et al., 2010; Gelbach, 2016; Hong, 2011; Kim, 2017; Ko et al., 2019; Shorrocks, 2013). Therefore, Hong (2011) adopts the Shapley decomposition to decompose the anti-poverty efficacy by income components in Korea. It analyses the KOWEPS in 2008 and adopts the Foster-Greer-Thorbecke (FGT) index as a decomposable poverty index. It uses the absolute

poverty threshold set at the Minimum Cost of Living (MCL) which was the official poverty threshold in Korea before 2015. It concludes that earned income (-64.1%p) had the greatest anti-poverty efficacy on the whole population. However, social insurance income (-3.1%p) and the NBLS (-1.1%p) had smaller efficacy than private transfer (-5.4%p). This indicates that the Korean welfare system did not support the residents sufficiently. However, this study does not include recently implemented benefits (e.g., the Basic Pension 2014). In addition, it does not evaluate the anti-poverty efficiency of programmes and it sets only one poverty threshold.

Yoo (2019) also adopts the Shapley decomposition and the FGT index to analyse the poverty reduction efficacy of each income component using the KOWEPS in 2016. It uses the relative poverty threshold set at 50% of median equivalised disposable income. It finds that public transfer income had the greatest poverty reduction effect (-17.9%p) on the Korean elderly, and then earned income (-16.3%p) and private transfer (-11.1%p) also had considerable positive effects. However, it does not decompose the contribution of each transfer programme separately and not assess their poverty alleviation efficiency. In addition, it adopts only a single poverty threshold.

According to literature review, this paragraph defines some issues. Firstly, this chapter also analyses the KOWEPS, because the KOWEPS has a variety of information on public transfer programmes in Korea (Hong, 2011; Kang, 2017; Kim, 2017; Yoo, 2019). Secondly, it examines the longitudinal changes of welfare programme expansions since the mid-2000s. The KOWEPS allows to identify these changes as the KOWEPS has been conducted annually since 2006. Thirdly, it adopts both relative and absolute poverty thresholds to capture different influences on the poor and the deep poor. Fourthly, it focuses on the elderly rather than the whole population because

elderly poverty is a widely recognised urgent issue in Korea (MOHW, 2018b). Fifthly, it employs the Shapley decomposition and the FGT index. Lastly, it evaluates both efficacy and efficiency of welfare programmes. Section 2.4 will discuss the above issues.

2.3. The public transfer programmes for the elderly in Korea

2.3.1. The multi-tier benefits system in Korea

Korea has the four-tier benefits system for the elderly (Table 2.2 and MOHW, 2018a). The zero and first tiers are public transfer programmes administered by the Korean government. The zero tier is the NBLS which is a strict means-testing programme for deep poor households. The first tier is a centrepiece of this system in most countries (OECD, 2019). In Korea, the National Pension is a mandatory and contribution-based social insurance programme, whereas the Basic Pension is a tax-financed non-contributory programme. Besides, occupational pensions are operated separately by the government for public officials.

Table 2.2. The multi-tier benefits system in Korea

Tier	Concept	Programmes	
3 Tier	Private, voluntary	Personal Pension	
2 Tier	Private, voluntary	Retirement Pension	
1 Tier	Public, mandatory, social insurance Public, means-testing	National Pension Basic Pension	(Occupational Pensions)
0 Tier	Public, means-testing	NBLS	

Note: Occupational pensions are operated for public officials (including public school teachers), military personnel and private school teachers separately by the Korean government; Source: Author's summary, GEPS (2020), MOHW (2018a), and OECD (2019)

The second and third tiers are voluntary based private pension programmes. The second tier is the Retirement Pension which is transforming from a lump-sum retirement allowance scheme. The third tier is the Personal Pension. The Korean government provides tax incentives to facilitate them, but their recipient ratios are still below 1% in this KOWEPS dataset.

Table 2.3. The social security system in Korea

	National Pension	Basic Pension	NBLS	EITC
Concept	Social insurance	Means-tested benefit	Means-tested benefit	Tax credit
Introduction	1988 (expanded by 2006)	2014 (the Basic Old-Age Pension from 2008)	2000 (reformed in 2015)	2009
Financial source	Contribution-based (9%) and funded pension	Tax-financed (non-contributory)	Tax-financed (non-contributory)	Tax-financed (non-contributory)
Eligibility	Age: 62 and over Contribution period: 10 years and over	Age: 65 and over Income: bottom 70%	Income: below 30-50% of median income	Income: yearly earned income below £13,333 (a single household)
Recipients	5.6 million	5.6 million	2.1 million 65+: 0.8 million	4.2 million 60+: 1.1 million
Benefits (£, monthly)	£269 (average)	£167-200 for the single elderly	Up to £351 for a single household (the Livelihood benefit)	£695 (average, yearly)
Budget (£, billion)	17.7	11.3	10.7	2.9

Note: (1) 1 GBP = 1,500 KRW, (2) The age eligibility of the National Pension is 62 years and over in 2020. It will increase to 65 years old by 2033, (3) The income threshold of the NBLS: the Livelihood Benefit set at 30% of median income, the Medical Benefit at 40%, the Housing Benefit at 45%, the Education Benefit at 50%, (4) Recipients: persons (the EITC: households), (5) Data: 2020; Source: Author's summary, KOSTAT (2020), Ministry of Education in Korea (2019, 2020), Ministry of Land, Infrastructure and Transport in Korea (2019, 2020), MOHW (2019, 2020, 2021), National Tax Service in Korea (2020), and NPS (2020, 2021)

Therefore, this chapter focuses on public pension (e.g., the National Pension and occupational pensions), the Basic Pension, and the NBLS which are the zero and first

tiers in the above system. Moreover, it will include the EITC. Firstly, earned income accounted for 52.5% of household income of the Korean elderly in 2016 (OECD, 2020). Secondly, single elderly households in Korea have been eligible for the EITC benefit since 2013, so 1.1 million households whose householders aged 60 and over received the EITC benefit in 2020 (Table 2.3 and National Tax Service in Korea [NTS], 2020). Lastly, the increasing labour market participation of the elderly is also regarded as a positive change for elderly poverty in developed countries (OECD, 2019).

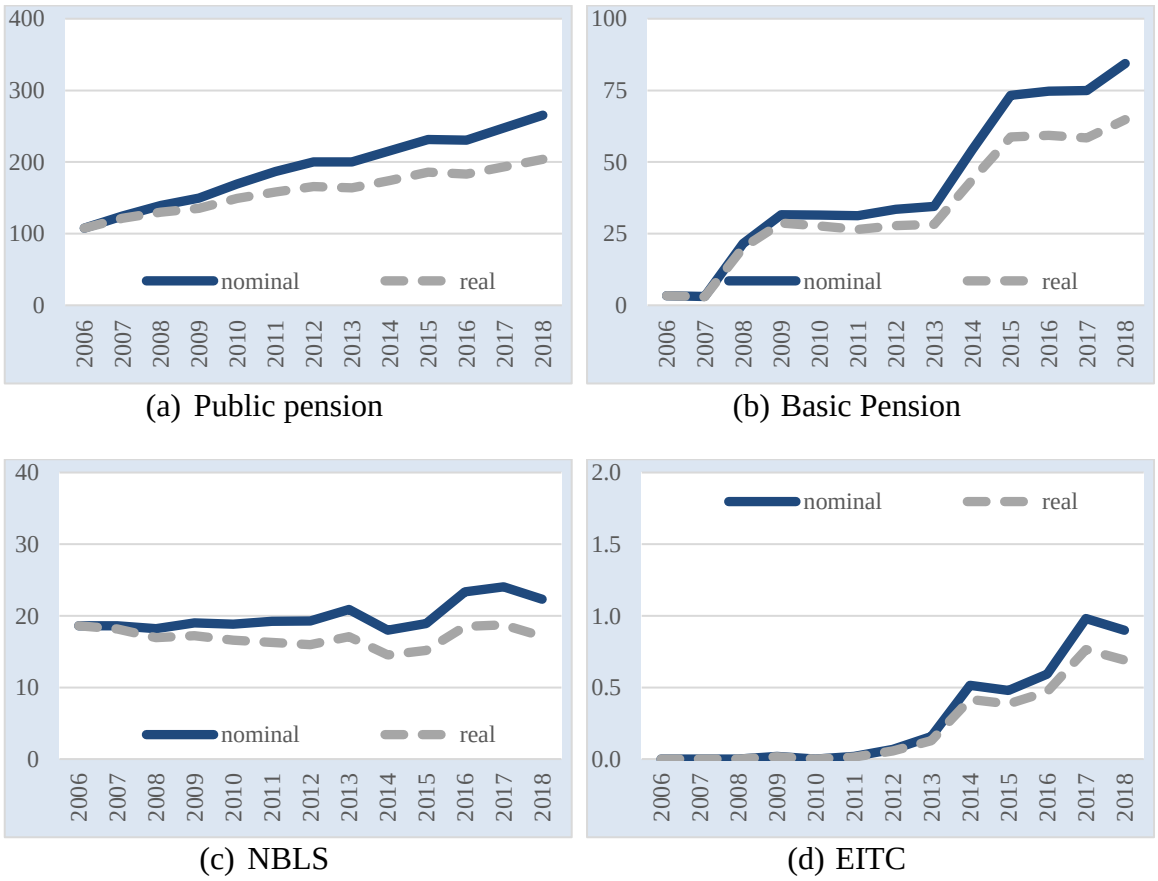
2.3.2. The public pension system

The Korean government has operated the National Pension for general residents and occupational pensions for public officials (including public school teachers), military personnel, and private school teachers. The National Pension is a central part of the public pension system in Korea and its recipients accounted for 87.9% of all pensioners in 2019 (GEPS, 2020; Ministry of National Defence in Korea, 2020; NPS, 2020; Statistics Korea [KOSTAT], 2020; Teacher's Pension in Korea, 2020). Therefore, this section introduces the National Pension as the representative pension scheme in Korea.

The National Pension was enacted in 1988 and it had spread to every business and workplace by 2006 (NPS, 2020). However, this pension was introduced much later than other countries. For example, many developed countries introduced their public pension schemes by the early twentieth century (e.g., Germany in 1889, France in 1905, and the UK in 1908). Furthermore, other developing countries also started public pension programmes ahead of Korea (e.g., Malaysia in 1951, Vietnam in 1962, and Indonesia in 1977) (Presidential Committee for Policy Planning in Korea [PCPP], 2008).

The National Pension covered 46.4% of the elderly in 2020. The average monthly benefit has increased (Figure 2.2 (a)) and it reached £268.6 in 2020 (KOSTAT, 2020; NPS, 2021). The contribution rate has been remaining at 9% of payroll (4.5% from an employer and 4.5% from an employee) since 1998 (Jung, Pirog & Lee, 2016; NPS, 2020; Yun, 2019). The income replacement rate for 40 years contribution is 43.5% in 2021, but it is scheduled to reduce from 50% in 2008 to 40% in 2028 by 0.5%p each year by the second reform in 2007 (NPS, 2020; Yun, 2019). A recipient needs to contribute for 10 years at least and be aged 62 years and over; and this age criterion will be increased up to 65 years by 2033 due to the first reform in 1998 (MOHW, 2018a).

Figure 2.2. Trends of the benefits of the four programmes (GBP)



(a) Public pension (b) Basic Pension

(c) NBLS (d) EITC

Note: (1) 1 GBP = 1,500 KRW, (2) Weighted average, (3) Monthly benefits, (4) Real benefits: adjusted by the Consumer Price Index, (5) Equivalence scale: square root of household size, (6) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013; Source: Author's calculation (KOWEPS 2nd wave - 14th wave microdata) and CPI (KOSTAT, 2020)

The National Pension is a defined benefit scheme. The simple benefit formula can be expressed as equation (2.1) (Chung, 2015; NPS, 2020). Its benefit is adjusted yearly by the Consumer Price Index (CPI) to maintain a pensioner's purchasing power (MOHW, 2020a; NPS, 2020). In equation (2.1), (i) *C* is a proportional constant related to the income replacement rate, (ii) *A* is the monthly average income of all contributors during the three years immediately prior to the initial pension benefit receipt, (iii) *B* is pensioner's individual lifetime average monthly income, and (iv) *N* is the number of contribution years more than 20 years. *A* is called the distributional factor and *B* is called the earning-related factor.

$$benefit = C \times (A + B) \times (1 + 0.05N) \quad (2.1)$$

Note: (1) *C*: a proportional constant related to the income replacement rate, (2) *A*: the monthly average income of all contributors during the three years immediately prior to the initial pension benefit receipt, (3) *B*: pensioner's individual lifetime average monthly income, and (4) *N*: the number of contribution years more than 20 years; Source: Chung (2015) and NPS (2020)

One of the most important issues is that the National Pension has a narrower coverage than in other developed countries (Choi & Han, 2016; Chun, 2020; Jones & Urasawa, 2014; OECD, 2018). This is because it has two significant loophole groups. Firstly, the older elderly are not covered sufficiently because the National Pension was expanded by 2006, so the older elderly had retired before the minimum contribution years. Therefore, the coverage rate of the older elderly (aged 80 and over) was only 20.8% in 2019; whereas this rate of the younger elderly (aged 65-79) was 52.7% (KOSTAT, 2020). Secondly, dual labour market is a serious problem of the working age (Hwang, 2016). For example, 98.0% of regular workers were insured but this rate for irregular workers (e.g., temporary workers) was only 61.0% in 2019 (Ministry of Employment and Labour in Korea, 2020).

In this regard, this chapter will explore some issues of public pension. Firstly, since its benefit is much higher than other programmes (Figure 2.2), public pension can have the largest anti-poverty efficacy even if it is not a means-testing programme but a contribution-based social insurance scheme (Ben-Shalom et al., 2012; Kang, 2017; Kim, 2017; Meyer & Mittag, 2019). Secondly, by the maturing of the pension system, it can have more efficacy in recent years. Lastly, it can have lower efficiency than a means-tested benefit because it is a universal pension programme (Meyer & Wu, 2018).

2.3.3. The Basic Pension

The Basic Old-Age Pension was introduced in July 2008 as a supplementary measure of the National Pension (MOHW, 2020a) because only 24.4% of the elderly received the National Pension benefit in 2009 (Chung, 2015). Even though it is called as a pension, it is a tax-financed subsidy. The monthly benefit was 100 thousand KRW (equivalent to £67) and it has provided a cash benefit (Lee & Wolf, 2014; NPS, 2020).

The Basic Old-Age Pension was expanded to the Basic Pension in July 2014 and its benefit doubled to 200 thousand KRW (£133). Moreover, the benefit increased again to 300 thousand KRW (£200) in 2021. Its benefit is adjusted by the CPI yearly to support living expenses of the elderly like the National Pension. It aims to cover 70% of the low-income elderly and 5.6 million received the benefit in 2020 (KOSTAT, 2020). It requires that adjusted monthly income, which is based on income and assets, is lower than 1,480,000 KRW (£987) for the single elderly and 2,368,000 KRW (£1,579) for the couple elderly in 2020 (MOHW, 2020a).

When it comes to important issues, firstly, some researchers argue that its coverage is too generous (Chun, 2020; Chung, 2015; OECD, 2016). Therefore, the

Basic Pension benefit can be provided to the non-poor elderly although it was introduced to alleviate elderly poverty as a supplement of the National Pension (OECD, 2016; Yun, 2019). The second issue is the fiscal sustainability pertinent to rapid population ageing in Korea. Its expenditure will be increased from 7.9 billion pounds in 2018 to 19.1 billion pounds in 2027 (National Assembly Budget office in Korea [NABO], 2018). Therefore, some insist that the Basic Pension needs to be restructured to focus on the deep poor elderly (Kim & Han, 2017; OECD, 2016; Yun et al., 2019).

Therefore, this chapter will check the changes in poverty reduction efficacy related to the Basic Pension expansions in 2008 and 2014 as the first issue of the Basic Pension. Secondly, this chapter will examine the anti-poverty efficiency because the Basic Pension has had generous eligibility since its expansions in 2008 and 2014. Lastly, this chapter will suggest some implications to improve its efficiency.

2.3.4. The National Basic Livelihood Security (NBLS)

The NBLS was established in 2000 after the Asian Financial Crisis 1997-1998 to support the minimum living condition for the deep poor (Chung, 2015; Lee & Phillips, 2011; MOHW, 2020a). The NBLS was designed to cover all poor households whose income is below the official poverty threshold, so it has been a major public assistance programme.

The NBLS was reformed in 2015 and changed its poverty threshold from the absolute poverty threshold equivalent to the MCL to the relative poverty threshold set at 30-50% of median income (MOHW, 2015). This is because the absolute poverty measure did not sufficiently support the social demand of well-being in Korea (Nam & Park, 2020; Yeo, Kim, Kim, Yang & Choi, 2005). The relative NBLS threshold has

been automatically adjusted by changes in median income. In addition, it was separated to the four sub-benefits by each threshold, such as: the Livelihood Benefit at 30% of median income, the Medical Benefit at 40%, the Housing Benefit at 45%, and the Education Benefit at 50%. Among them the Livelihood Benefit guarantees household income up to the above 30% as a cash subsidy. In other words, this benefit is equivalent to the difference between its 30% level and pre-transfer income (Lee, Ku & Shon, 2019; MOHW, 2020a).

In 2019, 2.1 million people received the NBLS benefits and among them 0.8 million were the elderly (KOSTAT, 2020). Its eligibility is stricter than the Basic Pension because it was implemented as a strict means-testing assistance. Firstly, its income eligibility is much lower than the Basic Pension. For example, the income threshold of the NBLS was 527,158-878,597 KRW (£351-£586) for a single household, while the Basic Pension had a higher threshold at 1,480,000 KRW (£987) in 2020. Secondly, the NBLS has the family support obligation rule which means those who have a working age spouse or adult children are not eligible to receive the benefit. This rule is scheduled to relax to reduce a blind spot of the NBLS since 2022 (MOHW, 2020b).

The most important issue of the NBLS is its strict eligibility and low coverage. Despite the NBLS expansion in 2015, only 3.5% of the population were covered by the NBLS in 2019 (KOSTAT, 2020). The minimum income of the Livelihood Benefit was in the bottom level of the OECD members in 2015 (OECD, 2018). Moreover, as can be seen in Figure 2.2 (c), the average benefit has been stagnant after 2015. Therefore, some researchers assert that the NBLS does not sufficiently assist the deep poor (Kim, 2017; OECD, 2014).

Therefore, firstly, this chapter will analyse whether the NBLS has adequate anti-poverty efficacy. Secondly, since it has strict income eligibility, it can have a higher positive efficacy on absolute poverty than on relative poverty. Lastly, it can have high efficiency because it is a strict means-testing programme.

2.3.5. The Earned Income Tax Credit (EITC)

The Korean EITC was implemented in 2009 to encourage the labour supply and self-support of low-income households in response to a working poor issue (Hwang, 2012; Jung & Park, 2013; NTS, 2020). Since the Korean EITC benchmarked the EITC in the USA, it also provides a refundable tax credit and has similar a three phases structure: phase-up, plateau, and phase-down stages (Hong, Moon & Lee, 2016; Park, 2011). Moreover, a single elderly household can have the EITC benefit since 2013 (Lee, Kwon & Moon, 2015; NTS, 2020).

The income eligibility of the EITC has more generous, such as: its income threshold for a single household (yearly £13,333) was higher than the NBLS (monthly £351-£586) and the Basic Pension (monthly £987) in 2020 (MOHW, 2020a; NTS, 2020). Its gross expenditure was 4.4 trillion KRW (2.9 billion pounds), and the number of recipients was 4.2 million households in 2020. Its yearly average benefit was approximately 1.0 million KRW (£695). Among them, 1.1 million senior households, whose householders aged 60 and over, received yearly benefit 1.1 million KRW (£746) (KOSTAT, 2020). The reason why the seniors take a considerable portion is that the average labour market exit age in Korea was 72.3 in 2018 (OECD, 2019), so the employment rate of the elderly was 31.3% and this figure was the second highest of the OECD member countries in 2018 (OECD, 2020).

In response to the working poverty issue, the total expenditure of the EITC increased remarkably by 768% and the number of recipients also rose by 513% between 2009 and 2020 (KOSTAT, 2020). However, the average benefit per household increased by only 35.7% and it is still much lower than other programmes (Figure 2.2 (d)). This indicates that the EITC has been developed to a wider coverage and smaller benefit scheme like the Basic Pension.

When it comes to research issues, firstly, this chapter will examine the poverty mitigation efficacy of the EITC. The efficacy can be lower than other programmes because its benefit is small (Figure 2.2 (d)). Secondly, it can have more impacts on relative poverty than on absolute poverty because the relative poverty elderly tend to have a higher employment rate than the absolute poverty elderly (Table 2.7).

2.4. Data and methodology

2.4.1. Data: The Korea Welfare Panel Study (KOWEPS)

The KOWEPS is a longitudinal dataset with the sample of nationally representative 7,000 households. It launched in 2006 and has been carried out annually by the Korea Institute for Health and Social Affairs (KIHASA) and the Seoul National University. It designates 50% of the sample for low-income households and contains specific information on public transfer programmes (KIHASA, 2020a; Kim, 2017). Therefore, it is a widely used dataset to examine the anti-poverty effects of the Korean public transfer programmes (Hong, 2011; Kang, 2017; Kim, 2017; Yoo, 2019).

This chapter analyses data from the 2nd wave to the 14th wave surveyed from

2007 to 2019 because the KOWEPS has collected the benefit of each public transfer separately from the 2nd wave (KIHASA, 2020a). This chapter can investigate the major changes in the Korean welfare system, such as: the implementation of the Basic Old-Age Pension in 2008, the Basic Pension in 2014, and the EITC in 2009; and the reform of the NBLS in 2015. It describes year of income data, since the KOWEPS has income data of a previous year (e.g., the 2nd wave: 2006).

Weights: This chapter uses the weights of the KOWEPS as probability weights (KIHASA, 2020a; OECD, 2013; Solon, Haider & Wooldridge, 2015; United Nations [UN], 2011). This is because the KOWEPS allocates half of sample to the poor (KIHASA, 2020a). If the weights are not adopted, the estimates cannot represent the target population systematically. This chapter adopts person weights (person weights = household weights × the number of household members) to compute the poverty rate, and the efficacy and efficiency indices. This is because the person weights are widely used to calculate a poverty rate and income inequality, and the official poverty rate in Korea is also using the person weights (Cheon, 2014; Kang, Park, Lee, Jung & Lee, 2011; KOSTAT, 2020; OECD, 2013; UN, 2011). Meanwhile, this chapter employs the household weights in the KOWEPS to compute the characteristics of elderly households.

2.4.2. Household income

Income components: This chapter divides household income into primary income, private transfer income, public transfer income, and tax and social security contribution (Table 2.4 and KIHASA, 2020a). Firstly, primary income includes wage, profit from self-employment, and property income. Secondly, private transfer means financial support from other households and non-governmental organisations. Thirdly, public

transfer contains public pension benefit, the Basic Pension benefit, the NBLS benefit, the EITC benefit, other social insurance benefits, and other means-tested benefits. Lastly, tax and social security contribution cover direct taxes and the compulsory contributions for public pension and the National Health Service.

Table 2.4. Income classification

Income components		Description
(1) Primary income		wages and salaries, profit from self-employment, and property income (e.g., interest, rent, and dividend)
(2) Private transfer		financial support from other households (e.g., children and relatives) and non-governmental organisations
Public transfer	(3) Public pension	National Pension benefit and occupational pension benefit
	(4) Basic Pension	Basic Old-Age Pension benefit and Basic Pension benefit
	(5) NBLS	National Basic Livelihood Security benefit
	(6) EITC	Earned Income Tax Credit benefit
	(7) Other social insurance	Employment Insurance benefit and Industrial Accident Compensation benefit
	(8) Other means-tested benefits	allowances for child-care, support for single parent families, and allowances for the disabled
(9) Tax and social security contribution		direct tax (e.g., income tax) and compulsory contributions for public pension, National Health Service, and Employment Insurance

Source: KOWEPS user's guide (KIHASA, 2020a) and KOWEPS codebook (KIHASA, 2020b)

This chapter decomposes the anti-poverty effects by nine income components (Table 2.4), such as: primary income, private transfer, public pension, the Basic Pension, the NBLS, the EITC, other social insurance, other means-tested benefits, and tax and social security contribution. Among the above nine components, this chapter focuses on the four main public transfer programmes: public pension, the Basic Pension, the NBLS,

and the EITC.

Disposable income: This chapter employs disposable income instead of gross income because it represents available income for consumption and savings. Therefore, it is regarded as a better income criterion to take household income statistics (OECD, 2013; UN, 2011). Disposable income includes primary income, private transfer, and public transfer, but subtracts tax and social security contribution (Disposable income = Primary income + Private transfer + Public Transfer – Tax and social security contribution, Table 2.4). Disposable income is equivalised by square root of household size to consider economies of scale in consumption (OECD, 2013).

The KOWEPS collects income data at a household unit, but the public pension benefit is provided to an individual pensioner (KIHASA, 2020a). This chapter considers all the elderly in a household as recipients if the household has a public pension benefit (Kang, 2017). Otherwise, the NBLS benefit and the EITC benefit are provided to a household unit, and the Basic Pension benefit is provided to all the elderly in a household if its income is below the income eligibility.

2.4.3. Poverty thresholds

This chapter uses both absolute and relative poverty thresholds as a deep poverty index and a poverty index, respectively. They allow to compare different effects of public transfer programmes on both deep poor and poor groups. Firstly, the absolute poverty threshold is anchored at the first official MCL surveyed in 1999 (KIHASA, 1999). This chapter adjusts it by price changes of 372 items included in the MCL 1999 as essential consumption items for the deep poor (KIHASA, 1999; KOSTAT, 2019a). Therefore, it can represent the lifestyle of the deep poor. The absolute poverty threshold is

equivalised by the OECD modified scale like the Korean official MCL (MOHW, 2017).

Table 2.5. Multiple poverty thresholds

Poverty threshold	Description
Absolute poverty threshold	anchored at the initial MCL 1999 and adjusted by price changes in all 372 items (the MCL 1999 has 372 items and maintaining the same items and weights)
Relative poverty threshold	set at 50% of median equivalised disposable income in each year (equal to the official statistics in Korea and the OECD)

Secondly, the relative poverty threshold is set at 50% of median equivalised disposable income in each year. It is the same to the official poverty threshold for taking statistics in Korea and the OECD (KOSTAT, 2019b; OECD, 2013).

2.4.4. Efficacy evaluation: The Shapley decomposition

The traditional method: Several prior studies calculate the poverty reduction effect of a public transfer programme as the poverty rate difference between in pre-transfer income and post-transfer income. (Ben-Shalom et al., 2012; Ji, 2018; Kang, 2017; Kim, 2017; Meyer & Wu, 2018). For example, if the poverty rates in pre-transfer income and post-transfer income are 30% and 10% respectively, the anti-poverty efficacy of this transfer income is 20%p (20%p = 30% − 10%). However, the traditional method has some limitations when the effects of several public transfer programmes are calculated (Aristondo & Onaindia, 2019; Azevedo et al., 2013; Fortin et al., 2010; Gelbach, 2016; Hong, 2011; Kim, 2017; Ko et al., 2019; Shorrocks, 2013).

Firstly, some researchers compute the anti-poverty effect of each transfer programme separately (Ben-Shalom et al., 2012; Choi & Hahn, 2019; Kang, 2017; Kim, 2017; Lee & Choi, 2018; Meyer & Mittag, 2019). For example, the anti-poverty effects

of benefit A and benefit B can be calculated as equation (2.2). However, the sum of E(A) and E(B) cannot be equal to the total effect of two programmes (e.g., $E(A+B) \neq E(A) + E(B)$). Therefore, this method cannot maintain the decomposition identity (Chantreuil & Trannoy, 2013; Shorrocks, 2013).

$$\begin{aligned} \mathrm{E(A)} &= \mathrm{pr\ (pre\text{-}transfer\ income + A) - pr\ (pre\text{-}transfer\ income)} \\ \mathrm{E(B)} &= \mathrm{pr\ (pre\text{-}transfer\ income + B) - pr\ (pre\text{-}transfer\ income)} \end{aligned} \tag{2.2}$$

Note: E(A) and E(B) are the anti-poverty effects of benefit A and B, pr (x) is the poverty rate of income x

Secondly, others accumulate each benefit on pre-transfer income sequentially (Chung, 2016; Ko et al., 2019; Lee, Lee & Lee, 2015; Meyer & Wu, 2018). However, an addition order can be arbitrary. For example, E(A) and E(B) can be calculated by either equation (2.3) or (2.4). This method has the path dependence issue (Azevedo et al., 2013; Fortin et al., 2010; Gelbach, 2016; Shorrocks, 2013). That means that the efficacy can be different by an addition order (e.g., $E_1(A) \neq E_2(A), E_1(B) \neq E_2(B)$).

$$\begin{aligned} \mathrm{E_1(A)} &= \mathrm{pr\ (pre\text{-}transfer\ income + A) - pr\ (pre\text{-}transfer\ income)} \\ \mathrm{E_1(B)} &= \mathrm{pr\ (pre\text{-}transfer\ income + A + B) - pr\ (pre\text{-}transfer\ income + A)} \end{aligned} \tag{2.3}$$

or

$$\begin{aligned} \mathrm{E_2(B)} &= \mathrm{pr\ (pre\text{-}transfer\ income + B) - pr\ (pre\text{-}transfer\ income)} \\ \mathrm{E_2(A)} &= \mathrm{pr\ (pre\text{-}transfer\ income + A + B) - pr\ (pre\text{-}transfer\ income + B)} \end{aligned} \tag{2.4}$$

Note: E(A) and E(B) are the anti-poverty effects of benefit A and B, pr (x) is the poverty rate of income x

The Shapley decomposition: The Shapley decomposition is originated from the cooperative game theory and extended to applied economics (Chantreui & Trannoy, 2013; Shorrocks, 2013). It considers marginal contributions of game players and computes a weighted average of each player's marginal contributions in all possible cases (Roth, 1988). This decomposition has the decomposition identity and is

independent from a calculation order. It can be applied to decompose a poverty rate by income components (Shorrocks, 2013) and some researchers have used the Shapley decomposition to analyse poverty, income inequality and consumption (Aristondo & Onaindia, 2020; Atkinson, Leventi, Nolan, Sutherland & Tasseva, 2017; Azevedo et al., 2013; Hong 2011; Jung, Kim & Lim, 2016; Ko et al., 2019; Park, 2017; Yoo, 2019). This chapter calculates a contribution of each income component based on the DASP package in Stata published by Araar and Duclos (Araar & Duclos, 2013). Meanwhile, decomposition analysis calculates the contribution of each component to total changes based on correlations, so it cannot be generally interpreted as causal parameters (Fortin et al., 2010). This chapter also considers the results of the Shapley decomposition as the contributions to reductions in poverty rates of income components.

The contribution of a player *i* can be expressed as equation (2.5). The marginal effect of the player *i* is an incremental value when the player *i* collaborates with other players. This can be computed as the difference between the marginal effects of a subset S and a subset S-$\{i\}$ (equal to $[v(S) - v(S - i)]$). In addition, all marginal effects are weighted according to a probability of each case by $(s-1)!\,(n-s)!/n!$. To be specific, *n* players in a universal set *N* can make n! cases and the subset *S* of *N* can make $(s-1)!$ different orders because this subset *S* should include the player *i*. The complement set of the subset *S* can consist of $(n-s)!$ orders. Therefore, the weighted average of the marginal contributions of the player *i* can be expressed as equation (2.5) (Aristondo & Onaindia, 2020; Ko et al., 2019; Lee & Lee, 2017; Roth, 1988).

$$C_i(v) = \sum_{\substack{S \subset N \\ i \in S}} \frac{(s-1)!\,(n-s)!}{n!}\,[v(S) - v(S-i)] \qquad (2.5)$$

Note: N is a universal set, S is a subset, $v(x)$ is the value function of a set *x*

The Foster-Greer-Thorbecke (FGT) index: For the Shapley decomposition, we need to adopt a decomposable poverty index like the FGT index. It can be expressed as equation (2.6). The parameter α can be zero, one, or two. In this chapter, α is zero and $FGT_{\alpha=0}$ is the poverty rate when a poverty threshold is *z* (Foster, Greer & Thorbecke, 1984; Hong, 2011). This chapter decomposes the FGT index according to income components as expressed in equation (2.7). Household income *Y* is the sum of income component S_k (Araar & Duclos, 2013; Hong, 2011; Yeo et al., 2005).

$$\hat{P}(z;\alpha) = \frac{\sum_{j=1}^{m} w_j \left(\frac{z - y_j}{z}\right)_+^{\alpha}}{\sum_{i=1}^{n} w_i} \tag{2.6}$$

$$\hat{P}(z;\alpha;Y) = \frac{\sum_{j=1}^{m} w_j \left(\frac{z - Y}{z}\right)_+^{\alpha}}{\sum_{i=1}^{n} w_i} \tag{2.7}$$

$$Y = \sum_{k=1}^{K} S_k$$

Note: $x_+ = \max(x, 0)$, w_i is a weight of a household *i*, w_j is a weight of a poor household *j*, y_j is household income of a poor household *j*, S_k is household income components, z is a poverty threshold

2.4.5. Efficiency evaluation criteria

Several papers identify poverty alleviation efficiency of public transfer programmes (Caminada & Goudswaard, 2008; Creedy, 1996; Devereux et al., 2017; Gao, Yang & Li, 2015; Ji, 2018; Meyer & Wu, 2018; Notten, 2015; Sulaiman, Goldberg, Karlan & Montesquiou, 2016). They generally focused on both coverage (recipient) and expenditure (benefit).

This chapter establishes the following four efficiency criteria (Table 2.6). Firstly, the chapter examines how much a public transfer programme covers the poor population.

At this point, two possible errors can be made, such as an exclusion error and an inclusion error (Devereux et al., 2017; Kleven & Kopczuk, 2011). The exclusion error can be measured when a benefit does not reach eligible recipients ($A \ / \ (A+B)$ in Figure 2.3). Meanwhile, the inclusion error can be identified when a benefit reaches ineligible recipients ($C \ / \ (B+C)$ in Figure 2.3).

Table 2.6. Four efficiency evaluation criteria

Category	Criteria	Details
Coverage (recipient)	Coverage rate	$Poor\ recipients\ /\ All\ poor\ population$ (%)
	Mis-targeting rate	$Non-poor\ recipients /\ All\ recipients$ (%)
Expenditure (benefit)	Expenditure efficiency rate	$Transfer\ delivered\ to\ the\ poor /\ Total\ transfer\ expenditur$ (%)
	Poverty reduction rate	$Poverty\ rate\ decrement /\ Total\ transfer\ expenditure$ (%p/billion GBP)

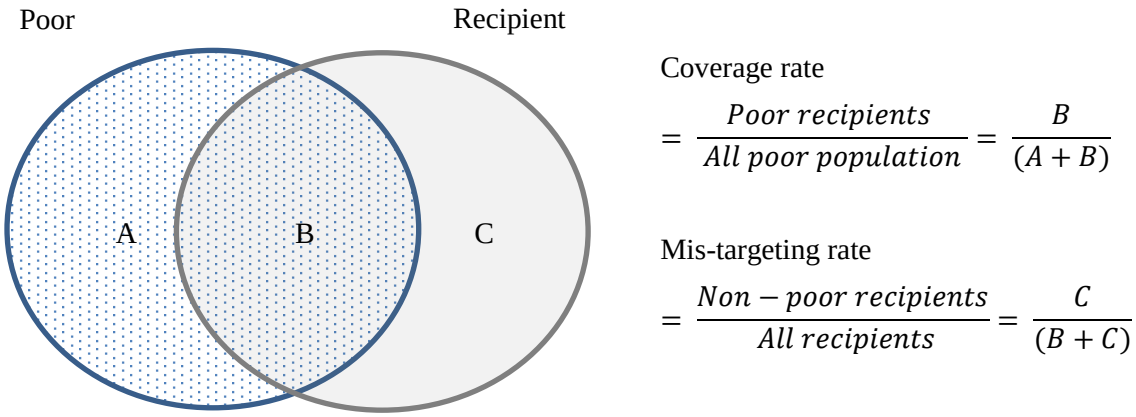
Note: The four criteria calculate the figures among the population and benefit of the elderly; Source: Author's revision, Creedy (1996), Devereux et al. (2017), Gao, Yang and Li (2015) and Ji (2018)

This chapter employs the coverage rate (equal to 1 – the exclusion error: $B \ / \ (A+B)$ in Figure 2.3) and the mis-targeting rate (equal to the inclusion error: $C \ / \ (B+C)$ in Figure 2.3). In other words, the coverage rate is the proportion of the poor recipients in the poor population (potentially eligible people). In addition, the mis-targeting rate is the proportion of the non-poor recipients (potentially ineligible people) in all recipients.

Secondly, in terms of expenditure, benefits can be delivered to both eligible recipients and ineligible recipients. The expenditure efficiency rate is the proportion of the benefits delivered to the poor in the total transfer expenditure. In addition, this chapter identifies how efficiently a programme reduces the poverty rate. The poverty reduction rate is the proportion of the poverty rate decrement in the total transfer

expenditure (Table 2.6).

Figure 2.3. Criteria on the coverage efficiency



Note: (1) A: the exclusion error can be measured when a benefit does not reach eligible recipients, B: well-targeted for eligible beneficiaries, C: the inclusion error can be identified when a benefit reaches ineligible recipients, (2) The poor population (Blue dotted circle, A+B), (3) The recipients of a benefit (Grey circle, B+C); Source: Author's revision, Devereux et al. (2017) and Gao, Yang and Li (2015)

The above four criteria are summarised in Table 2.6. The criteria calculate the figures among the population and benefit of the elderly. In addition, a public transfer programme which has a high coverage rate, a low mis-targeting rate, a high expenditure efficiency rate, and a high poverty reduction rate can be considered as an efficient programme.

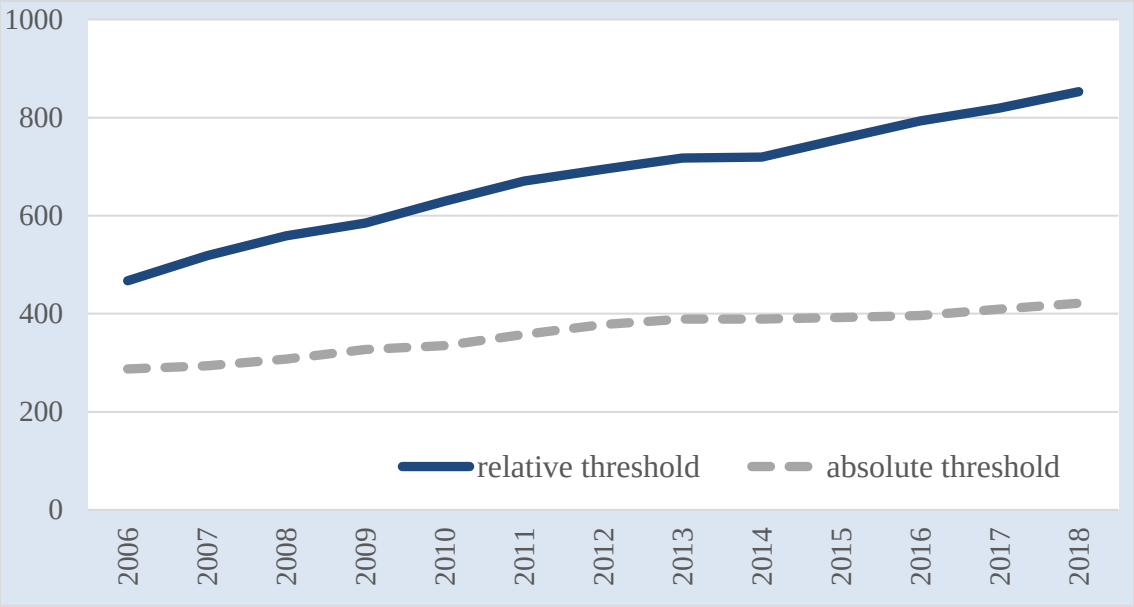
2.5. Findings

2.5.1. Poverty thresholds and poverty rates

Poverty thresholds: The relative poverty threshold rose by 82.5% from £467.2 in 2006 to £852.8 in 2018 per month and the absolute poverty threshold increased by 46.6% from £287.4 to £421.4 during the same period (Figure 2.4 and A2.1 in appendices). The National Minimum Income of £667, which was proposed by the Korean government in

2018, positioned between the two thresholds. As can be seen in Table 2.5, the relative poverty threshold is set at 50% of median equivalised disposable income, and the absolute poverty threshold is adjusted by price changes of all 372 items in the initial MCL. The relative poverty threshold increased more than the absolute poverty threshold because the median income rose more than the price changes.

Figure 2.4. Trends of the poverty thresholds (GBP)

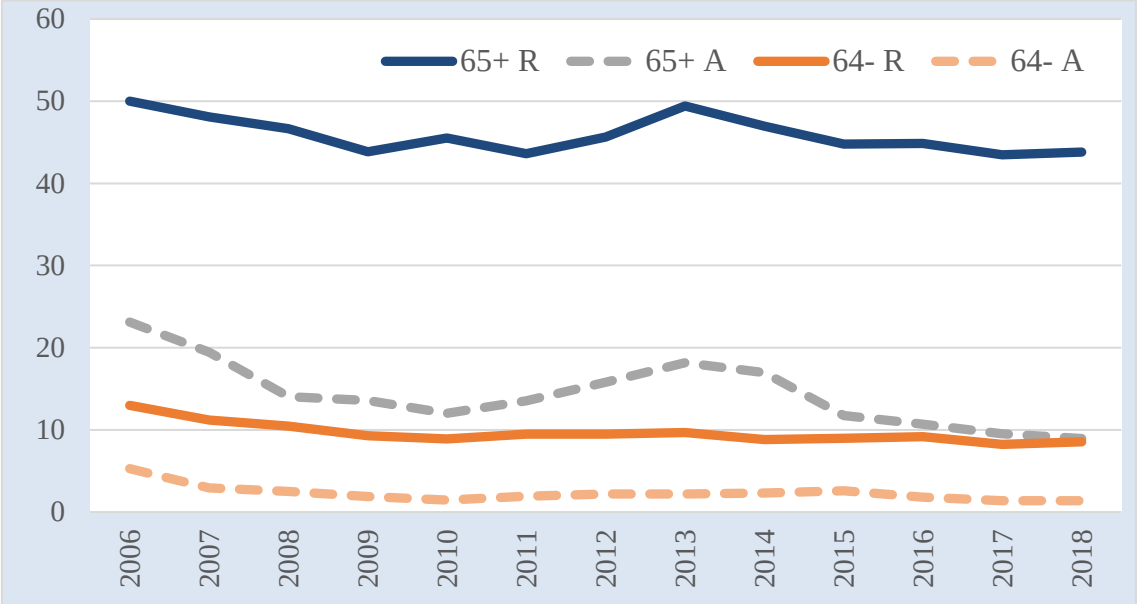


Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds, (3) The poverty thresholds: the relative poverty threshold set at 50% of median equivalised disposable income and the absolute poverty threshold anchored at the initial MCL 1999 and adjusted by price changes in 372 items (maintaining the same items and weights); Source: Author calculation (KOWEPS 2nd wave – 14th wave microdata) and price changes (KOSTAT, 2020)

Poverty rates: The relative elderly poverty rate declined slightly from 50.0% in 2006 to 43.8% in 2018, but the absolute elderly poverty rate decreased sharply from 23.1% to 9.0% at the same time (Figure 2.5 and A2.1 in appendices). The two poverty rates of the elderly fluctuated by the early-2010s and then have decreased. Several public transfer expansions could have positive anti-poverty effects, such as: the Basic Pension implementation in 2014, the NBLS reform in 2015, and the EITC eligibility relaxation for single elderly households in 2013. Otherwise, two poverty rates of the non-elderly decreased steadily for 12 years, but it also presents that the Korean elderly

have suffered severe poverty compared to the non-elderly (OECD, 2020).

Figure 2.5. Trends of the poverty rates (%)



Note: (1) 65+: age 65 and over, 64-: age below 65, (3) A: the absolute poverty rate, R: the relative poverty rate; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

2.5.2. Characteristics of elderly households

Householder and household: The two poor elderly households tend to have older, female, less educated, and unemployed householders than the whole elderly households. In addition, poor elderly households have fewer household members than 2 persons (Table 2.7). Meanwhile, 36% of elderly householders have a job, and the employment rate (1 – employment; an employed householder is coded as 0) of the Korean elderly was the second highest of the OECD member countries in 2018 (OECD, 2020).

Income: The two poor elderly groups have smaller primary income than the whole elderly group because they have low employment rates and small household members. In addition, they also have smaller public pension benefits than the whole elderly group since the poor elderly could not have sufficient contributions to public pension before retirement. This implies that contribution based public pension

programmes could retain the income gap among the elderly (Choi, 2018; Hwang, 2016).

Table 2.7. Characteristics of elderly households

Householder age		65+ (65 and over)			64- (below 65)		
Poverty status		All	Relative poverty	Absolute poverty	All	Relative poverty	Absolute poverty
House-holder	Age (year)	72.88	74.99	76.27	46.79	49.92	50.42
	Gender (0=male)	0.30	0.44	0.54	0.11	0.30	0.26
	Education (0=below college)	0.15	0.06	0.05	0.44	0.23	0.28
	Employment (0=employed)	0.64	0.75	0.84	0.11	0.44	0.56
House-hold	Size (persons)	2.31	1.82	1.59	3.53	2.97	2.72
Income (£, month, equivalised)	Disposable income	1,066.9	441.6	258.7	1,616.1	338.3	-303.6
	Primary income	643.0	111.1	35.6	1,642.2	201.2	-319.0
	Private transfer	191.9	174.4	117.1	74.3	75.4	65.8
	Public pension	197.8	46.7	25.2	27.4	19.2	17.9
	Basic Pension	46.7	68.4	64.8	3.0	5.6	4.7
	NBLS	20.2	38.2	33.4	8.7	60.5	39,4
	EITC	0.3	0.3	0.1	0.7	1.4	0.5
	Other social insurance	9.4	2.0	0.1	9.2	5.7	4.8
	Other means-tested benefits	18.9	20.0	12.5	26.0	34.5	23.6
	Tax and social security contribution	61.3	19.5	30.0	175.3	65.1	141.2
Observations		29,937	18,724	6,549	43,128	6,823	1,753

Note: (1) 1 GBP = 1,500 KRW, (2) Weighted average, (3) Equivalence scale: square root of household size, (4) Data: between 2006 and 2018, (5) Disposable income = Primary income + Private transfer + Public Pension + Basic Pension + NBLS + EITC + Other social insurance + Other means-tested benefits – Tax and social security contribution; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Instead, the two poor elderly groups have more the Basic Pension benefits and the NBLS benefits than the whole elderly group. This is because the above two benefits are targeted to the poor elderly as tax-financed means-testing programmes. Meanwhile, the EITC benefit is at a very low level for the three elderly groups and the absolute poverty group has the smallest EITC benefit of the three groups.

2.5.3. Anti-poverty efficacy

Table 2.8 presents the result of the Shapley decomposition. The figures represent the contributions of nine income components to overcome poverty. In other words, 100 + the sums of nine contributions are equal to the poverty rates in each year ($100 + \sum_{i=1}^{9} C_i = poverty\ rate$). Among the nine income components, primary income makes the greatest contribution to both relative and absolute poverty.

Between 2006 and 2018, primary income and private transfer displayed the opposing trends in relative and absolute poverty. Firstly, the contribution of primary income to relative poverty improved from -31.56%p to -33.85%p; while its contribution to absolute poverty deteriorated slightly from -42.81%p to -42.29%p. Secondly, the contribution of private transfer to relative poverty worsened from -8.54%p to -7.33%p; whereas it enhanced from -19.38%p to -20.81%p to absolute poverty.

2.5.3.1. Public pension

The contribution of public pension is the largest of the four public transfer programmes (Table 2.8). The anti-poverty effects continued to rise between 2006 and 2018 (Figure 2.6 (a)) because its average benefit and coverage were increased by the expansion of the public pension system (Figure 2.2 (a) and Figure 2.7 (a)). This is consistent with prior studies in Korea (Kang, 2017; Kim, 2017; MOHW, 2020b). Moreover, the OASDI (or

the OASI) in the USA also has the most important anti-poverty impact (Ben-Shalom et al., 2012; Meyer & Wu, 2018).

Table 2.8. The Shapley decomposition by income components (%p)

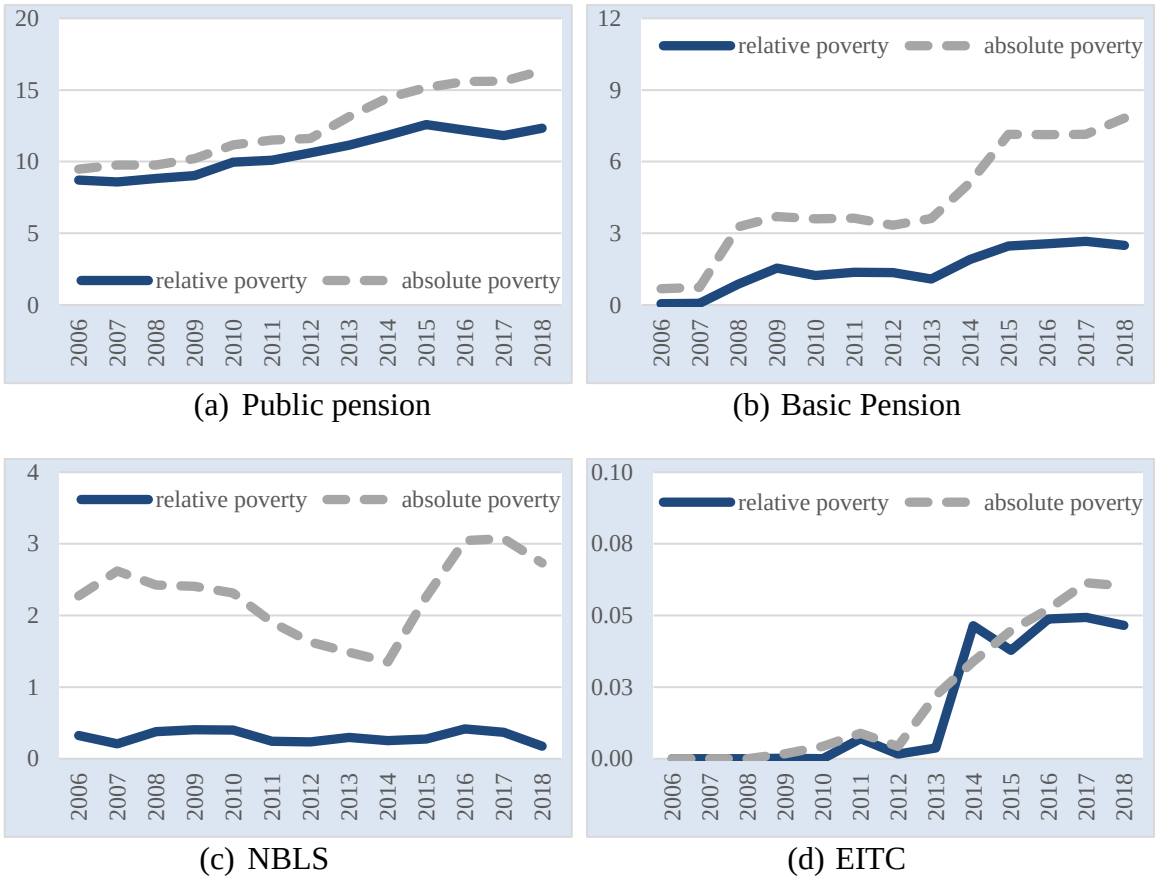
Contributions	Relative poverty			Absolute Poverty		
	2006	2018	Changes 2018-2006	2006	2018	Changes 2018-2006
Primary income	-31.56	-33.85	-2.29	-42.81	-42.29	0.53
Private Transfer	-8.54	-7.33	1.21	-19.38	-20.81	-1.43
Public pension	-8.71	-12.33	-3.62	-9.48	-16.36	-6.88
Basic Pension	-0.05	-2.49	-2.44	-0.68	-7.82	-7.15
NBLS	-0.33	-0.17	0.15	-2.27	-2.73	-0.46
EITC	0.00	-0.06	-0.06	0.00	-0.05	-0.05
Other social insurance	-0.58	-0.76	-0.18	-0.62	-0.94	-0.31
Other means-tested benefits	-1.16	-0.43	0.73	-2.66	-1.55	1.11
Tax and social security contribution	0.93	1.24	0.31	1.02	1.49	0.46
Sum of contributions	-50.00	-56.20	-6.20	-76.88	-91.05	-14.17
Poverty rate	50.00	43.80	-6.20	23.12	8.95	-14.17

Note: (1) The poverty rate = 100 + the sum of the contributions of Primary income, Private Transfer, Public pension, Basic Pension, NBLS, EITC, Other social insurance, Other means-tested benefits, and Tax and social security contribution, (2) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013, (3) Changes: the contributions in 2018 – the contributions in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Public pension has the second contribution to relative poverty among the nine income components, but it ranks third in absolute poverty behind private transfer. The first implication is that public pension provides limited support to the absolute poverty elderly. Since public pension programmes are contribution-based social insurance schemes, the absolute poverty elderly tend to have small pension benefits (Table 2.7). Secondly, private transfer has an important positive influence on the absolute poverty elderly. The public transfer can have a crowding out effect on family support from adult

children, however this effect can be small on the absolute poverty elderly who generally have insufficient pension benefits (Kang, 2011; Shin, Nam & Lee, 2014).

Figure 2.6. Anti-poverty efficacy of the four programmes (%p)



(a) Public pension (b) Basic Pension

(c) NBLS (d) EITC

Note: (1) The anti-poverty efficacy is calculated by the Shapley decomposition, (2) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

2.5.3.2. The Basic Pension

The contribution of the Basic Pension ranks second in relative and absolute poverty of the four cited programmes. While its contributions improved two times in 2008-2009 and 2014-2015, thanks to the implementation of the Basic Old-Age Pension in July 2008 and the Basic Pension in July 2014, its contributions were flat in other years (Figure 2.6 (b)).

In terms of absolute poverty, its contribution increased more than ten times and the increment of the Basic Pension (-7.15%p) is slightly larger than that of public pension (-6.88%p). The implementation of the Basic Old-Age Pension and the Basic Pension could have considerable positive effects on absolute poverty. However, public pension has a two times higher contribution than the Basic Pension. Moreover, further expansion of the Basic Pension will be difficult because its expenditure will be sharply increased by the rapidly ageing population (Chun, 2020; Kim & Kim, 2020; NABO, 2018). This implies that its contribution can be stagnant in the future.

2.5.3.3. The NBLS

The anti-poverty effects of the NBLS have remained at a low level (Table 2.8 and Figure 2.6 (c)). It has had more positive effects on absolute poverty (-2.73%p in 2018) than on relative poverty (-0.17%p) because it has tight eligibility as a strict means-testing programme. To be specific, its income requirement, which is set at 30-50% of median income, is stricter than the relative poverty threshold (MOHW, 2020a).

The contribution to absolute poverty reduced from 2010 to 2014 because its coverage rate decreased (Figure 2.9 (a)). During this period, the Korean government launched the Social Security Information System (SSIS) to integrate the information on income, assets, and other benefit receipts. The SSIS sought to check the eligibility of applicants thoroughly to prevent benefit fraud, so the coverage rate could be reduced (Nam & Park, 2020). However, its contribution rate to absolute poverty increased after the NBLS expansion in 2015.

2.5.3.4. The EITC

The contribution of the Korean EITC is very small: -0.06%p of relative poverty and

-0.05%p of absolute poverty (Table 2.8 and Figure 2.6 (d)). This is because the EITC benefit is smaller than the benefits of the other programmes, even though 1.1 million senior households (householders aged 60 and over) received the EITC benefit in 2020 (Table 2.3). The contribution to elderly poverty has slightly increased since 2013 when single elderly households were eligible to the EITC.

It is important to note that the contribution to the non-elderly was also nearly -0.05%p in both poverty in 2018 (A2.2 in appendices). This contrasts to the USA where the EITC has considerable anti-poverty efficacy (Ben-Shalom et al., 2012; Meyer & Wu, 2018). This is because the USA government provided 44.3 billion pounds to 25 million households with the yearly average benefit for a household £1,758 in 2020 (1 GBP = 1.4 USD), while the Korean government spent only 2.9 billion pounds for 4.2 million households with the average benefit per household £695 in 2020 (Internal Revenue Service in the USA, 2021; NTS, 2020).

2.5.4. Anti-poverty efficiency

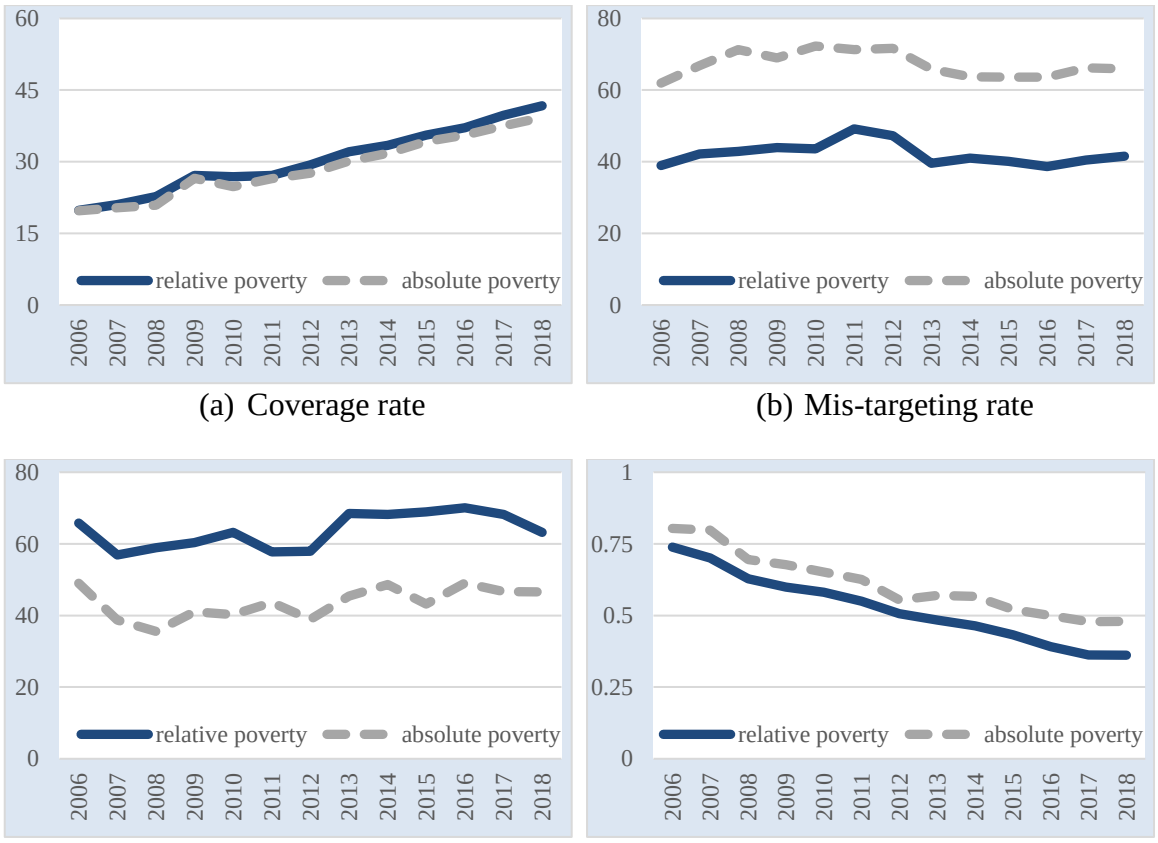
2.5.4.1. Public pension

Coverage rate: The coverage rate was doubled from 2006 to 2018 by the expansion of the public pension system. However, it was still remaining at a low level approximately 40%: 41.7% of the relative poverty elderly and 39.3% of the absolute poverty elderly in 2018. Its coverage rate is much lower than in other developed countries (OECD, 2019).

Mis-targeting rate: The mis-targeting rate of relative poverty increased from 39.0% in 2006 to 41.5% in 2018 and this rate of absolute poverty also rose from 61.9% to 66.0%. These rates are higher than other means-testing programmes. This implies that the number of non-poor pensioners increased more than poor pensioners because

the public pension programmes have been operated as contribution-based social insurance. As a result, the pension inequality could worsen among the elderly (Choi, 2018; Hwang, 2016).

Figure 2.7. Anti-poverty efficiency of public pension (%, %p/billion GBP)



(a) Coverage rate (b) Mis-targeting rate

(c) Expenditure efficiency (d) Poverty reduction efficiency

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients ⁄ All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor ⁄ Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement ⁄ Total transfer expenditure (%p/billion GBP); Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Expenditure efficiency rate: The rate of relative poverty slightly decreased from 65.8% in 2006 to 63.2% in 2018 and this rate of absolute poverty also declined from 49.0% to 46.6%. This indicates that more pension benefits were provided to the non-poor elderly. This is because the pension benefit is proportionate to the contribution periods and lifetime wage, as can be seen in equation (2.1) (Choi, 2018; Hwang, 2016).

Poverty reduction efficiency rate: This rate decreased continuously since 2006

even though the anti-poverty efficacy increased (Figure 2.6 (a) and A2.3 in appendices). This is because the mis-targeting rate and the expenditure efficiency rate commonly deteriorated. However, it can be inevitable because public pension is not a means-testing programme but a contribution-based social insurance scheme.

2.5.4.2. The Basic Pension

Coverage rate: The coverage rate increased remarkably in 2008 when the Basic Old-Age Pension was implemented, and it reached nearly 75% in both relative and absolute poverty in 2018. These figures are very similar between relative and absolute poverty (A2.3 in appendices) because the income eligibility of the Basic Pension is higher than the relative poverty threshold. However, it also implies that a quarter of the poor elderly cannot receive the Basic Pension benefit, it can be a loophole of the current system.

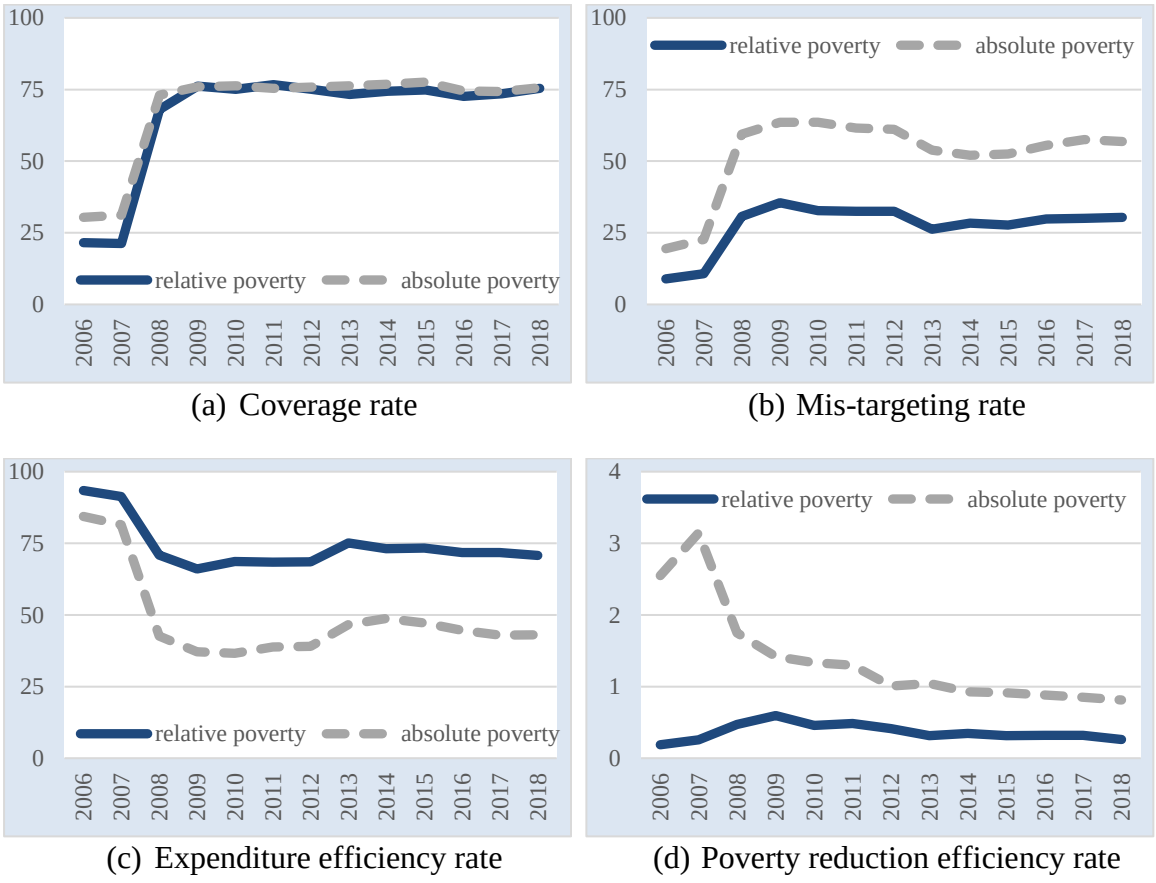
Mis-targeting rate: This rate increased sharply to 30.7% of relative poverty and to 59.4% of absolute poverty in 2008 and remained at a high level afterward. This suggests that more than half of the non-absolute poverty elderly received this benefit. In other words, the coverage of the Basic Pension is too generous, so it leads to the inefficiency in its poverty reduction.

Expenditure efficiency rate: This rate also deteriorated since 2008 and decreased to 70.8% of relative poverty and 43.1% of absolute poverty in 2018. Although the Basic Pension aims to support the poor elderly, it also aids the non-poor elderly. It is the similar result of the above mis-targeting rate. Therefore, it is required to be restructured for the poor elderly (Chun, 2020; Chung, 2015; OECD, 2016; Yun, 2019).

Poverty reduction efficiency rate: Its poverty reduction efficiency rate of relative poverty is at a low level. This is because the Basic Pension has limited efficacy on

relative poverty (Table 2.8). Meanwhile, this rate of absolute poverty is higher than other programmes, but it has declined continuously since 2008 (Figure 2.6 (b)). This is because the mis-targeting rate and the expenditure efficiency rate worsened like public pension. However, it can be an important issue for the Basic Pension, since it is a tax-financed programme, and its expenditure will be sharply increased due to rapidly ageing population.

Figure 2.8. Anti-poverty efficiency of the Basic Pension (%, %p/billion GBP)



(a) Coverage rate (b) Mis-targeting rate

(c) Expenditure efficiency rate (d) Poverty reduction efficiency rate

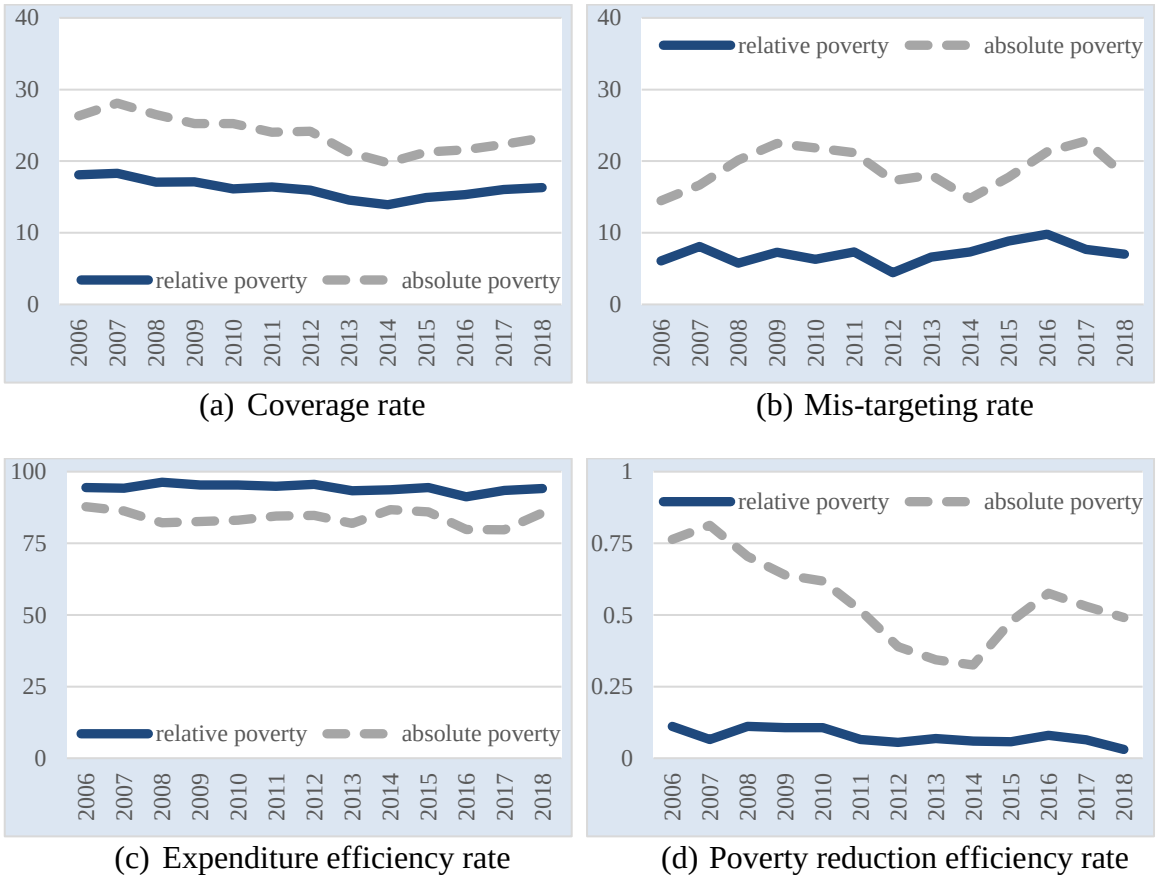
Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients / All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor / Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement / Total transfer expenditure (%p/billion GBP); Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

2.5.4.3. The NBLS

Coverage rate: The rate slightly decreased from 18.1% in 2006 to 16.3% in 2018 of

relative poverty and it also declined from 26.3% to 23.3% of absolute poverty. In other words, the NBLS was designed as a backbone in the Korean public assistance system but it supports less than a quarter of the deep poor elderly. Between relative and absolute poverty, the NBLS covers a higher portion of the absolute poverty elderly than that of the relative poverty elderly because it has stricter income eligibility than the relative poverty threshold.

Figure 2.9. Anti-poverty efficiency of the NBLS (%, %p/billion GBP)



(a) Coverage rate (b) Mis-targeting rate

(c) Expenditure efficiency rate (d) Poverty reduction efficiency rate

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients / All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor / Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement / Total transfer expenditure (%p/billion GBP); Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Mis-targeting rate: This rate is much lower than other programmes, such as only 7.0% of relative poverty and 18.1% of absolute poverty in 2018. It indicates that the NBLS is well targeted to the poor elderly. To be specific, this rate decreased in the

early-2010s when the SSSI was introduced, and then it has fluctuated since 2015 when the NBLS was expanded.

Expenditure efficiency rate: This rate is higher than other programmes, such as 94.1% of relative poverty and 85.6% of absolute poverty in 2018. This implies that its benefit is very efficiently delivered to the poor elderly (MOHW, 2020b). Moreover, a deep poor household can have more benefit inversely proportional to its income because the amount of the Livelihood Benefit of the NBLS is equivalent to the difference between pre-transfer income and its guaranteed minimum income.

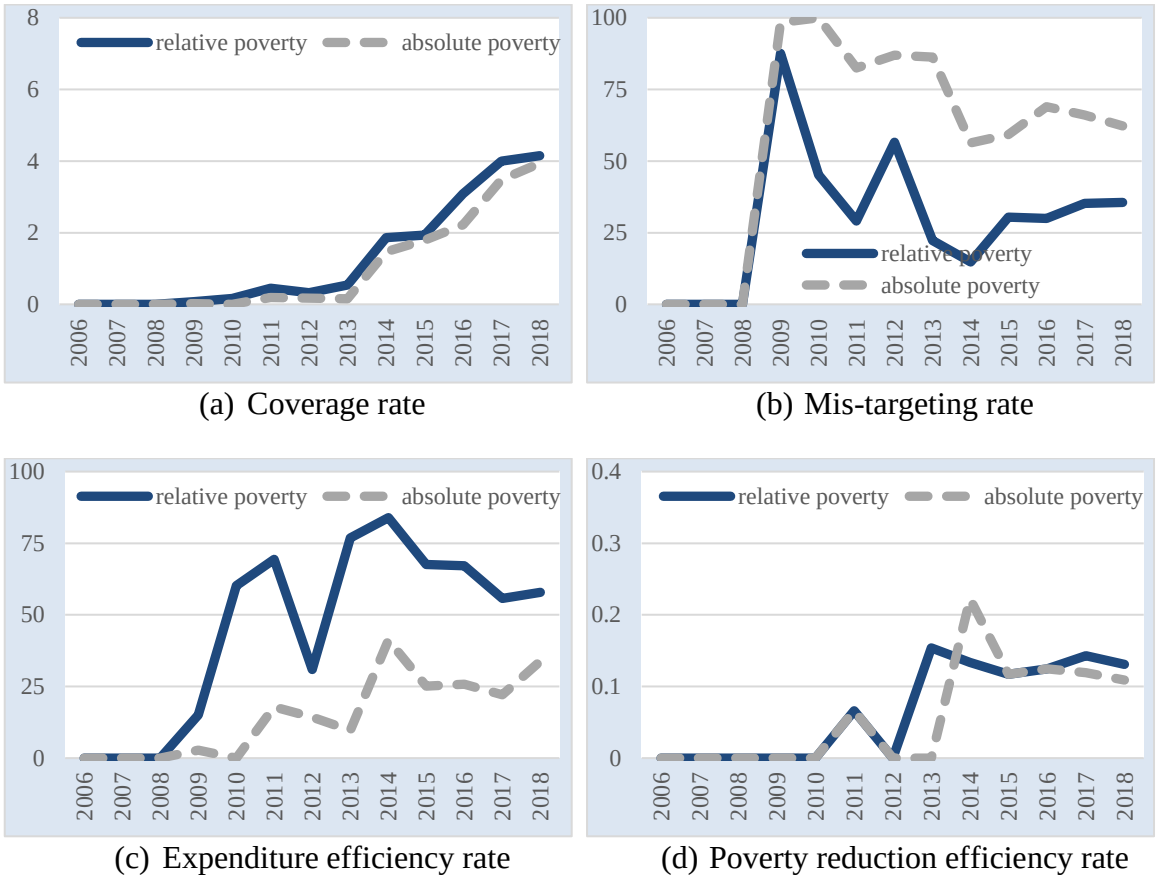
Poverty reduction efficiency rate: Its rate of relative poverty has remained at a low level and the rate of absolute poverty tends to decrease except for 2015-2016 when the NBLS was expanded. This trend is similar to the anti-poverty efficacy of the NBLS (Figure 2.6 (c)). This implies that the NBLS does not sufficiently support the vulnerable.

2.5.4.4. The EITC

Coverage rate: This rate is the lowest level of the four programmes, such as only 4.2% of relative poverty and 3.9% of absolute poverty in 2018. This is because the EITC has a higher income threshold than the two poverty thresholds, so some of non-poor households can have the EITC benefit. This rate has increased since 2013 when single elderly households were entitled to this EITC benefit.

Mis-targeting rate: This rate tends to decrease since 2013 and reached 35.6% of relative poverty and 62.2% of absolute poverty in 2018. The relative poverty elderly have a higher employment rate than the absolute poverty elderly (Table 2.7), so the mis-targeting rate of relative poverty is lower than that of absolute poverty. This suggests that the EITC can be suitable for the relative poverty elderly.

Figure 2.10. Anti-poverty efficiency of the EITC (%, %p/billion GBP)



(a) Coverage rate (b) Mis-targeting rate

(c) Expenditure efficiency rate (d) Poverty reduction efficiency rate

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients ⁄ All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor ⁄ Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement ⁄ Total transfer expenditure (%p/billion GBP), (5) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Expenditure efficiency rate: The relative poverty elderly have a much higher expenditure efficiency rate than the absolute poverty elderly. To be specific, this rate reached 57.9% of relative poverty and 33.8% of absolute poverty in 2018. This is because the relative poverty elderly have a higher employment rate than the absolute poverty elderly (Table 2.7). This implies that the EITC can support the relative poverty elderly more efficiently than the absolute poverty elderly.

Poverty reduction efficiency rate: This rate is lower than other programmes as its anti-poverty efficacy and coverage rate have remained at the lowest level of the four

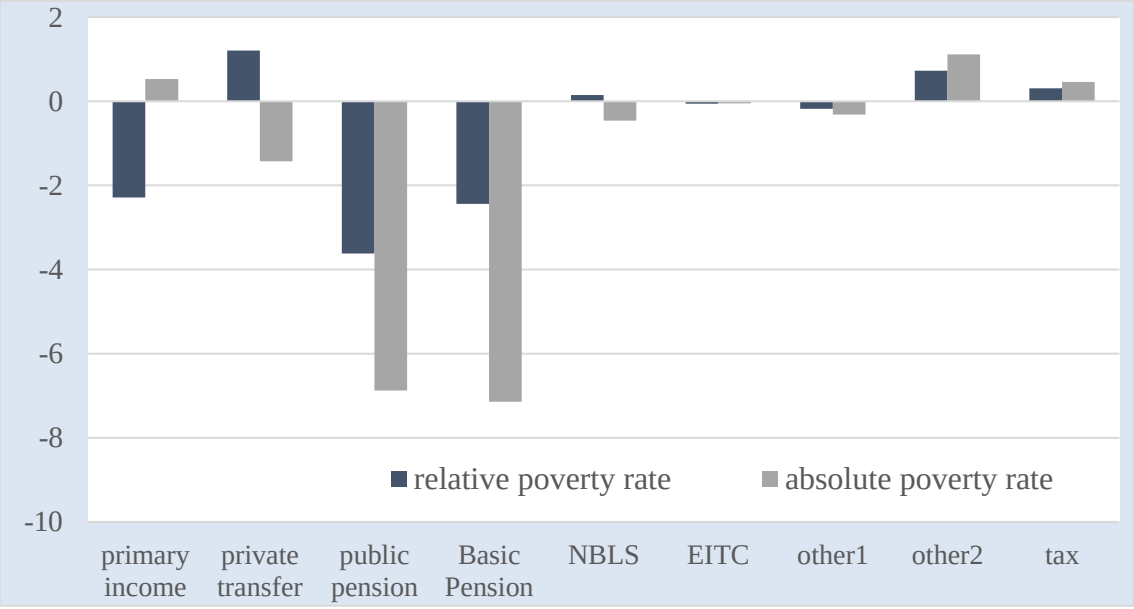
programmes. Meanwhile the poverty reduction efficiency rate increased slightly since 2013 and it remained at a similar level. This trend is similar to its anti-poverty efficacy.

2.6. Further topics

2.6.1. Differences between the relative and absolute poverty rates

As described in Figure 2.5, the two poverty rates have had a larger gap in recent years. The relative poverty rate decreased by -6.20%p; while the absolute poverty rate dropped by -14.17%p from 2006 to 2018 (Table 2.8). The difference of -7.97%p (-7.97%p = -14.17%p – (-6.20%p)) can be divided into the four main parts, as follows: (i) primary income (+2.82%p), (ii) private transfer (-2.63%p), (iii) public pension (-3.26%p), and (iv) the Basic Pension (-4.70%p).

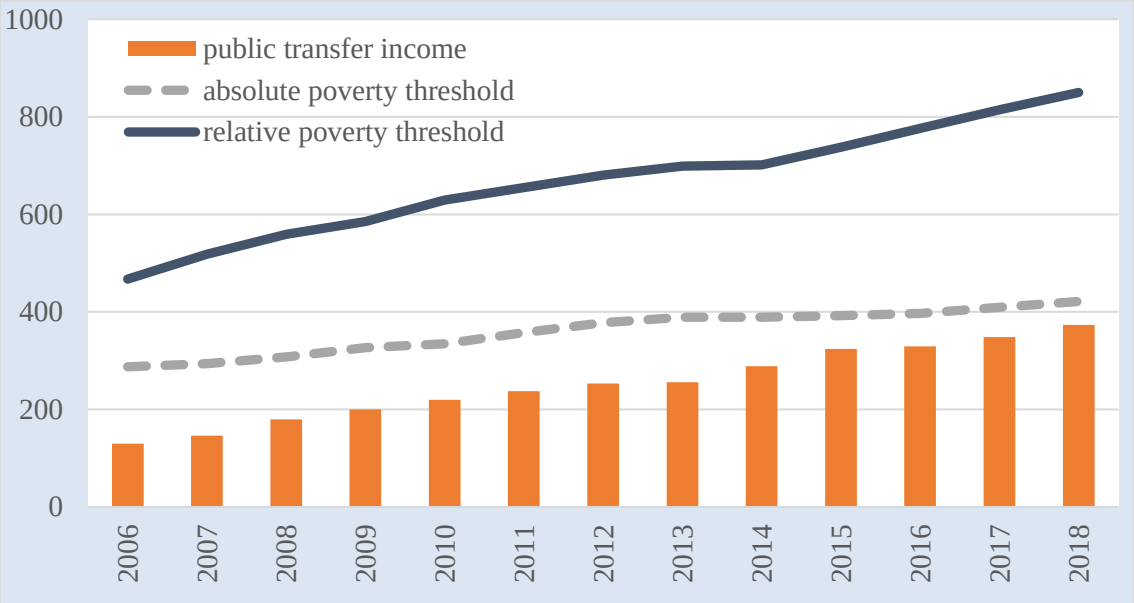
Figure 2.11. Anti-poverty contributions by income components (%p)



Note: (1) The anti-poverty efficacy is calculated by the Shapley decomposition, (2) Positive contributions raise the poverty rates, but negative contributions reduce the poverty rates, (3) Other1: other social insurance, other2: other means-tested benefits, tax: tax and compulsory social insurance; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Among the four components, (i) primary income and (ii) private transfer have the opposite effects on relative poverty and absolute poverty (Figure 2.11). To be specific, firstly, in terms of (i) primary income, the employment rate of elderly householders increased from 36.4% in 2006 to 38.9% in 2018, but this rate of absolute poverty elderly householders dropped from 22.8% to 13.7%. This implies that absolute poverty elderly households can experience difficulties to overcoming poverty through their primary income, so this change can increase their poverty threat. Secondly, (ii) private transfer raises the relative poverty rate, but it reduces the absolute poverty rate. As the absolute poverty elderly have smaller public transfer benefits than the relative poverty elderly (Table 2.7), they can experience a smaller crowding out effect of family support (Kang, 2011; Shin et al., 2014).

Figure 2.12. Poverty thresholds and public transfer income (GBP)



Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds and monthly public transfer income, (3) Public transfer: public pension, the Basic Pension, the NBLS and the EITC; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

(iii) Public pension and (iv) the Basic Pension benefits reduced the two poverty rates. However, their contributions to absolute poverty are higher than to relative

poverty. This is because public pension has not yet matured and the Basic Pension does not provide a sufficient benefit, so the two benefits are not enough to overcome relative poverty. Furthermore, the Korean transfer programmes commonly have developed to wide coverage and small benefit schemes. As illustrated in Figure 2.12, the four public transfer benefits (public pension, the Basic Pension, the NBLS, and the EITC) accounted for 88.5% of the absolute poverty threshold, but only 43.9% of the relative poverty threshold in 2018. Therefore, public pension and the Basic Pension can have more anti-poverty effects on absolute poverty than on relative poverty.

2.6.2. Behavioural responses

According to the labour-leisure choice model, when people receive public transfer benefits, they tend to prefer more leisure and reduce labour supply. However, prior studies do not consider the potential behavioural responses (Ben-Shalom et al., 2012; Hong, 2011; Ji, 2018; Kang, 2017; Kim, 2017; Meyer & Wu, 2018; Yoo, 2019). The main reason is that empirical studies have reached no consensus about the effects of the behavioural responses. Therefore, some studies describe this issue only in the discussion section (Ben-Shalom et al., 2012; Meyer & Wu, 2018).

An extensive literature in Korea also has provided different results regarding the behavioural responses of public transfer programmes. Due to the insufficient public transfer benefit, much literature concludes that the elderly are still forced to participate in the labour market to make ends meet (Kang, 2015; Kim, Baek & Lee, 2018). Indeed, the employment rate of the Korean elderly householders increased from 36.4% in 2006 to 38.9% in 2018 even though the social expenditure for the elderly has sharply increased.

To be specific, firstly, some researchers insist that the National Pension benefit can reduce the labour supply of the elderly (Jeon, 2010; Park & Choi, 2018), but others disagree because the National Pension benefit is too small to cover living expenses, so the Korean elderly tend to take a job to earn additional income (Kang, 2015; Ko et al., 2019). Secondly, some point out that the Basic Pension benefit reduces the labour supply of the elderly (Ko et al., 2019), while others argue that its benefit has no significant crowding-out effect on the labour supply (Lee et al., 2019; Lee, Park & Kim, 2015; Sung & Lee, 2018). The reason is that the Basic Pension distributes a small benefit like the National Pension, so it is not sufficient for the elderly.

With regard to the NBLS and the EITC, relevant research usually analyses the labour supply of the working age, so available papers focused on the elderly are very limited. Thirdly, some find that the NBLS can reduce the labour supply of the elderly (Jeon, 2019), while other research suggests that working time of the elderly recipients increased (Ko et al., 2019). Lastly, the EITC has no significant effect on the labour supply of the elderly (Shin & Song, 2018).

Therefore, this chapter does not consider the potential behavioural responses. As discussed above, a crowding-out effect on the labour supply of the elderly is still a controversial issue. Moreover, the employment rate of the Korean elderly increased despite the public transfer expansion. Finally, other factors also have effects on the labour supply of the elderly, such as health condition, educational attainment, and retirement system (Kang, 2015; Kang, 2016).

2.7. Conclusion

After the Asian Financial Crisis in 1997-1998, the Korean government has developed the welfare system, for example: the NBLS in 2000, the Basic Old-Age Pension in 2008, the EITC in 2009 and the Basic Pension in 2014 (Han, 2020; Kim, 2009; Nahm, 2018; Ramesh, 2003; Wilding, 2008). Therefore, the welfare expenditure per GDP was sharply scaled up from 2.6% in 1990 to 12.2% in 2019 (OECD, 2020). However, criticism has also emerged that the welfare programmes do not enable sufficient achievements for elderly poverty (Kang, 2017; Kim & Kim, 2020; MOHW, 2018a; Yun, 2019). In particular, the relative elderly poverty rate in Korea is still the highest of the OECD member countries (Figure 2.1). Therefore, the evaluation of the anti-poverty effects is becoming a crucial issue (Kang, 2017; Kim, 2017).

Poverty thresholds and poverty rates: This chapter defines both relative and absolute poverty thresholds. The relative poverty threshold increased sharply by 82.5% from £467.2 in 2006 to £852.8 in 2018 and the absolute poverty threshold increased by 46.6% from £287.4 to £421.4. Over the same period, the relative elderly poverty rate decreased slightly from 50.0% to 43.8%, while the absolute elderly poverty rate reduced rapidly from 23.1% to 9.0%.

Efficacy evaluation: This chapter conducts the Shapley decomposition to avoid additivity and path dependence problems of the traditional decomposition. Firstly, public pension has the greatest effect on elderly poverty amongst the four programmes because the public pension benefit is much higher than in other programmes (Table 2.7). That is consistent with other studies (Ben-Shalom et al., 2012; Kang, 2017; Kim, 2017; Meyer & Wu, 2018). Furthermore, its contribution increased continuously from 2006 to 2018. Secondly, the Basic Pension ranks second and its contribution increased sharply in 2008-2009 and 2014-2015 due to its expansions in 2008 and 2014. Thirdly, the

NBLS has small anti-poverty effects. Its contribution is larger to absolute poverty than to relative poverty since its income eligibility is stricter than the relative poverty threshold. Lastly, the EITC has limited effects on relative and absolute poverty.

Efficiency evaluation: This chapter sets the four efficiency criteria on coverage and expenditure. Firstly, the coverage rate of public pension doubled from 2006 to 2018, but this rate was still around 40% in 2018. Secondly, the Basic Pension supports 75% of the poor elderly after its expansion, while its inefficiency also increased, such that 56.8% of recipients were not classified as the absolute poor elderly in 2018. Thirdly, the NBLS has high efficiency thanks to its strictness, but its coverage rate was smaller than a quarter of both poverty in 2018. Lastly, the EITC has high efficiency regarding relative poverty compared to absolute poverty because the employment rate of the relative poverty elderly is higher than that of the absolute poverty elderly.

Implications: The Proposal for the National Pension Reform suggested by the Korean government in 2018 could not make progress, however it has meaningful implications. This proposal included the National Minimum Income for the elderly and the four alternatives (Lee, 2019; MOHW, 2018a; Yun, 2019). A further reform will be discussed in the foreseeable future, because elderly poverty is still an urgent issue; while the National Pension fund will be depleted in 2057 and the Basic Pension expenditure puts a massive burden on the government budget due to the rapidly ageing population (Kim & Kim, 2020; MOHW, 2018a; NABO, 2018; NPS, 2018). Therefore, this chapter makes some recommendations.

Firstly, the consensus about the level of the National Minimum Income can be an important beginning point as a policy goal. The 2018 proposal set the minimum income at one million KRW (£667) per month based on the subjective minimum living

expenses of the elderly (Lee, 2019; MOHW, 2018a). However, it was higher than the absolute poverty threshold calculated in this chapter (£421.4) in 2018 and the income threshold of the Livelihood Benefit (£334.4) in the NBLS in 2018 (MOHW, 2020a). Furthermore, some researchers have urged that the poverty threshold for an elderly household needs to be 50-65% of a working age household in Korea (Jeon, 2003; Kim & Lee, 2019; Seok, 2017). In addition, half of the Korean population preferred the existing pension benefit level and 63.4% answered that the current contribution rate of 9% of the National Pension was burdensome (MOHW, 2018a). Therefore, the target income needs to be more realistic and acceptable to the Korean population.

Secondly, the multi-layered benefits system needs to guarantee the National Minimum Income for all the elderly. The public pension needs to be a centrepiece of the system. This is because public pension currently has the largest anti-poverty effect, and the coverage rate of the National Pension benefit will be increased to 88.9% of the elderly in 2060 through the expansion of the public pension system (NPS, 2018). Furthermore, in this regard, the Basic Pension needs to be restructured from a wide coverage and small benefit structure to a targeted coverage and sufficient benefit system (Chun, 2020; Kim & Han, 2017; OECD, 2016; Yun, 2019; Yun et al., 2019). Therefore, its income eligibility needs to be lower than the relative poverty threshold.

Lastly, customised approaches are needed for two poverty groups. The NBLS is required to focus more on absolute poverty (Ko et al., 2019; OECD, 2018). Its poverty threshold was the lowest level in the OECD members (OECD, 2018), so this level needs to be upgraded to the National Minimum Income. In addition, the EITC can have a more active role for the relative poverty elderly because this group has a higher employment rate than the absolute poverty elderly (Table 2.7). The EITC recipients in

the USA are generally positioned near the poverty line and they are more likely to overcome poverty thanks to the EITC benefit (Meyer & Wu, 2018). In the light of this, the EITC benefit in Korea also needs to be increased to motivate the labour supply of the elderly in relative poverty (Lee et al., 2015).

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Appendices

A2.1. Poverty thresholds and poverty rates

	Poverty thresholds (£, monthly)		Poverty rates (%)			
	Relative threshold	Absolute threshold	65 and over relative	65 and over absolute	below 64 relative	below 64 absolute
2006	467.2	287.4	50.00	23.12	12.98	5.28
2007	518.5	293.9	48.11	19.47	11.21	2.95
2008	559.0	307.8	46.67	14.04	10.46	2.52
2009	585.1	326.9	43.85	13.56	9.30	1.90
2010	629.2	334.8	45.51	12.00	8.89	1.47
2011	670.7	357.7	43.60	13.55	9.50	1.91
2012	694.7	378.1	45.62	15.80	9.48	2.21
2013	717.3	388.8	49.42	18.18	9.68	2.20
2014	719.6	388.8	46.97	16.98	8.82	2.33
2015	756.9	392.1	44.78	11.75	8.99	2.59
2016	793.2	396.6	44.84	10.69	9.17	1.80
2017	819.1	409.6	43.48	9.54	8.23	1.38
2018	852.8	421.4	43.80	8.95	8.55	1.38

Note: (1) 1 GBP = 1,500 KRW, (2) The relative poverty threshold: set at 50% of median equivalised disposable income in each year, (3) The absolute poverty threshold: anchored at the initial MCL 1999 and adjusted by price changes in 372 items (maintaining the same items and weights); Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata) and price changes (KOSTAT, 2020)

A2.2. The Shapley decomposition by income components

A2.2.1. Relative poverty, aged 65 and over (%p)

	2006	2007	2008	2009	2010	2011	2012
Primary income	-31.56	-33.79	-34.70	-36.28	-34.47	-35.18	-32.79
Private Transfer	-8.54	-9.18	-8.06	-8.63	-8.42	-9.48	-9.39
Public pension	-8.71	-8.58	-8.83	-9.02	-9.96	-10.10	-10.60
Basic Pension	-0.05	-0.06	-0.88	-1.55	-1.23	-1.36	-1.36
NBLS	-0.33	-0.21	-0.38	-0.40	-0.40	-0.24	-0.23
EITC	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
Other social insurance	-0.58	-0.23	-0.61	-0.58	-0.61	-0.55	-0.66
Other means-tested benefits	-1.16	-1.04	-0.82	-0.66	-0.66	-0.64	-0.50
Tax	0.93	1.20	0.94	0.97	1.27	1.16	1.16
Poverty rate	50.00	48.11	46.67	43.85	45.51	43.60	45.62
	2013	2014	2015	2016	2017	2018	changes
Primary income	-30.19	-31.28	-31.79	-32.02	-33.58	-33.85	-2.29
Private Transfer	-7.92	-8.03	-8.27	-7.84	-8.02	-7.33	1.21
Public pension	-11.15	-11.85	-12.59	-12.19	-11.81	-12.33	-3.62
Basic Pension	-1.09	-1.91	-2.47	-2.56	-2.66	-2.49	-2.44
NBLS	-0.30	-0.25	-0.27	-0.42	-0.37	-0.17	0.15
EITC	-0.02	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06
Other social insurance	-0.62	-0.39	-0.37	-0.58	-0.73	-0.76	-0.18
Other means-tested benefits	-0.48	-0.54	-0.68	-0.61	-0.60	-0.43	0.73
Tax	1.20	1.25	1.27	1.12	1.31	1.24	0.31
Poverty rate	49.42	46.97	44.78	44.84	43.48	43.80	-6.20

Note: (1) The anti-poverty efficacy is calculated by the Shapley decomposition, (2) The poverty rate = 100 + the sum of the contributions of Primary income, Private Transfer, Public pension, Basic Pension, NBLS, EITC, Other social insurance, Other means-tested benefits, and Tax and social security contribution, (3) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013, (4) Tax: Tax and compulsory social security contribution, (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

A2.2.2. Absolute poverty, aged 65 and over (%p)

	2006	2007	2008	2009	2010	2011	2012
Primary income	-42.81	-44.64	-46.73	-46.88	-46.88	-46.61	-43.88
Private Transfer	-19.38	-20.92	-22.14	-22.05	-22.52	-21.55	-22.62
Public pension	-9.48	-9.77	-9.77	-10.20	-11.17	-11.50	-11.62
Basic Pension	-0.68	-0.73	-3.27	-3.70	-3.60	-3.63	-3.33
NBLS	-2.27	-2.62	-2.42	-2.41	-2.31	-1.91	-1.63
EITC	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
Other social insurance	-0.62	-0.39	-0.60	-0.70	-0.72	-0.76	-0.84
Other means-tested benefits	-2.66	-2.42	-2.10	-1.54	-1.77	-1.44	-1.29
Tax	1.02	0.97	1.08	1.05	0.97	0.95	1.02
Poverty rate	23.12	19.47	14.04	13.56	12.00	13.55	15.80
	2013	2014	2015	2016	2017	2018	changes
Primary income	-42.15	-41.70	-41.39	-40.36	-42.33	-42.29	0.53
Private Transfer	-20.36	-19.65	-21.22	-22.20	-21.05	-20.81	-1.43
Public pension	-13.13	-14.46	-15.18	-15.59	-15.62	-16.36	-6.88
Basic Pension	-3.62	-5.12	-7.15	-7.13	-7.15	-7.82	-7.15
NBLS	-1.49	-1.35	-2.26	-3.05	-3.07	-2.73	-0.46
EITC	0.00	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05
Other social insurance	-0.78	-0.61	-0.62	-0.85	-0.98	-0.94	-0.31
Other means-tested benefits	-1.38	-1.31	-1.55	-1.60	-1.55	-1.55	1.11
Tax	1.10	1.24	1.15	1.50	1.34	1.49	0.46
Poverty rate	18.18	16.98	11.75	10.69	9.54	8.95	-14.17

Note: (1) The anti-poverty efficacy is calculated by the Shapley decomposition, (2) The poverty rate = 100 + the sum of the contributions of Primary income, Private Transfer, Public pension, Basic Pension, NBLS, EITC, Other social insurance, Other means-tested benefits, and Tax and social security contribution, (3) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013, (4) Tax: Tax and compulsory social security contribution, (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

A2.2.3. Relative poverty, aged below 65 (%p)

	2006	2007	2008	2009	2010	2011	2012
Primary income	-81.95	-84.23	-84.54	-85.63	-86.37	-86.22	-86.24
Private Transfer	-2.30	-2.57	-2.60	-2.69	-2.56	-2.48	-2.51
Public pension	-1.71	-1.56	-1.67	-1.44	-1.33	-1.42	-1.39
Basic Pension	-0.01	-0.01	-0.10	-0.11	-0.11	-0.12	-0.10
NBLS	-0.43	-0.39	-0.43	-0.53	-0.48	-0.31	-0.35
EITC	0.00	0.00	0.00	-0.04	-0.03	-0.05	-0.01
Other social insurance	-0.46	-0.26	-0.28	-0.24	-0.21	-0.17	-0.31
Other means-tested benefits	-0.87	-0.77	-0.83	-0.81	-0.88	-0.64	-0.50
Tax	0.70	1.00	0.90	0.80	0.86	0.90	0.88
Poverty rate	12.98	11.21	10.46	9.30	8.89	9.50	9.48
	2013	2014	2015	2016	2017	2018	changes
Primary income	-85.82	-86.99	-86.71	-87.10	-87.85	-88.16	-6.21
Private Transfer	-2.46	-1.80	-2.15	-1.82	-2.06	-1.49	0.81
Public pension	-1.64	-1.61	-1.46	-1.53	-1.49	-1.33	0.37
Basic Pension	-0.14	-0.13	-0.12	-0.15	-0.13	-0.17	-0.16
NBLS	-0.32	-0.34	-0.32	-0.34	-0.27	-0.31	0.12
EITC	-0.02	-0.03	-0.08	-0.06	-0.07	-0.05	-0.05
Other social insurance	-0.30	-0.28	-0.28	-0.26	-0.31	-0.29	0.17
Other means-tested benefits	-0.61	-0.64	-0.75	-0.57	-0.63	-0.54	0.33
Tax	0.99	0.64	0.86	1.01	1.03	0.89	0.19
Poverty rate	9.68	8.82	8.99	9.17	8.23	8.55	-4.44

Note: (1) The anti-poverty efficacy is calculated by the Shapley decomposition, (2) The poverty rate = 100 + the sum of the contributions of Primary income, Private Transfer, Public pension, Basic Pension, NBLS, EITC, Other social insurance, Other means-tested benefits, and Tax and social security contribution, (3) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013, (4) Tax: Tax and compulsory social security contribution, (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

A2.2.4. Absolute poverty, aged below 65 (%p)

	2006	2007	2008	2009	2010	2011	2012
Primary income	-87.90	-90.17	-90.56	-90.89	-91.42	-91.75	-91.19
Private Transfer	-3.45	-3.33	-3.50	-3.55	-3.64	-3.21	-3.47
Public pension	-1.81	-1.70	-1.67	-1.56	-1.68	-1.63	-1.70
Basic Pension	-0.01	-0.02	-0.10	-0.11	-0.11	-0.11	-0.10
NBLS	-1.03	-1.24	-1.25	-1.43	-1.25	-1.18	-1.19
EITC	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
Other social insurance	-0.38	-0.49	-0.26	-0.30	-0.29	-0.27	-0.29
Other means-tested benefits	-0.75	-0.75	-0.76	-0.78	-0.74	-0.50	-0.48
Tax	0.62	0.66	0.61	0.51	0.61	0.58	0.64
Poverty rate	5.28	2.95	2.52	1.90	1.47	1.91	2.21
	2013	2014	2015	2016	2017	2018	changes
Primary income	-91.02	-91.28	-90.74	-91.25	-91.29	-91.51	-3.61
Private Transfer	-3.45	-2.98	-3.04	-2.98	-3.08	-2.94	0.52
Public pension	-1.89	-1.92	-2.00	-2.15	-2.19	-2.24	-0.43
Basic Pension	-0.09	-0.14	-0.19	-0.17	-0.21	-0.22	-0.20
NBLS	-1.08	-1.08	-1.21	-1.30	-1.49	-1.38	-0.35
EITC	-0.02	-0.01	-0.03	-0.01	-0.02	-0.04	-0.04
Other social insurance	-0.28	-0.32	-0.36	-0.42	-0.50	-0.57	-0.19
Other means-tested benefits	-0.64	-0.57	-0.71	-0.73	-0.58	-0.67	0.09
Tax	0.67	0.63	0.86	0.81	0.75	0.93	0.32
Poverty rate	2.20	2.33	2.59	1.80	1.38	1.38	-3.90

Note: (1) The anti-poverty efficacy is calculated by the Shapley decomposition, (2) The poverty rate = 100 + the sum of the contributions of Primary income, Private Transfer, Public pension, Basic Pension, NBLS, EITC, Other social insurance, Other means-tested benefits, and Tax and social security contribution, (3) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013, (4) Tax: Tax and compulsory social security contribution, (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2^{nd} wave – 14^{th} wave microdata)

A2.3. Anti-poverty efficiency of public transfer programmes

A2.3.1. Public pension, aged 65 and over (%, %p/billion GBP)

Relative poverty (poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	19.8	21.0	22.7	27.1	26.9	27.1	29.4
Mis-targeting rate	39.0	42.2	42.9	43.9	43.6	49.2	47.2
Expenditure efficiency rate	65.8	56.9	59.0	60.4	63.2	57.8	57.9
Poverty reduction efficiency rate	0.74	0.70	0.63	0.60	0.58	0.55	0.51
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	32.1	33.4	35.6	37.1	39.7	41.7	21.9
Mis-targeting rate	39.6	41.0	40.1	38.7	40.5	41.5	2.5
Expenditure efficiency rate	68.5	68.3	68.9	70.1	68.2	63.2	-2.6
Poverty reduction efficiency rate	0.48	0.46	0.43	0.39	0.36	0.36	-0.38
Absolute poverty (deep poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	19.7	20.4	20.9	26.5	24.8	26.4	27.6
Mis-targeting rate	61.9	66.9	71.3	68.9	72.3	71.3	71.7
Expenditure efficiency rate	49.0	38.7	35.6	41.0	40.2	43.6	38.9
Poverty reduction efficiency rate	0.80	0.80	0.70	0.68	0.65	0.63	0.55
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	30.1	31.7	34.2	35.6	37.5	39.3	19.5
Mis-targeting rate	65.9	63.7	63.6	63.6	66.2	66.0	4.0
Expenditure efficiency rate	45.4	48.7	43.2	49.0	46.7	46.6	-2.4
Poverty reduction efficiency rate	0.57	0.57	0.52	0.50	0.48	0.48	-0.33

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients ⁄ All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor ⁄ Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement / Total transfer expenditure (%p/billion GBP), (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

A2.3.2. The Basic Pension, aged 65 and over (%, %p/billion GBP)

Relative poverty (poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	21.5	21.3	68.1	76.2	75.1	76.7	75.1
Mis-targeting rate	8.9	10.7	30.7	35.5	32.7	32.5	32.5
Expenditure efficiency rate	93.4	91.3	70.9	66.0	68.7	68.4	68.6
Poverty reduction efficiency rate	0.19	0.26	0.47	0.60	0.46	0.49	0.41
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	73.3	74.4	74.8	72.6	73.4	75.4	53.9
Mis-targeting rate	26.3	28.4	27.7	29.8	30.1	30.4	21.5
Expenditure efficiency rate	75.2	73.1	73.3	71.8	71.8	70.8	-22.6
Poverty reduction efficiency rate	0.31	0.35	0.32	0.32	0.32	0.26	0.07
Absolute poverty (deep poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	30.4	31.2	73.0	76.0	76.3	75.4	75.9
Mis-targeting rate	19.5	22.7	59.4	63.6	63.6	61.5	61.1
Expenditure efficiency rate	84.4	81.5	42.6	37.1	36.6	38.8	39.0
Poverty reduction efficiency rate	2.55	3.14	1.75	1.42	1.34	1.30	1.01
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	76.3	76.8	77.6	74.5	74.3	75.6	45.2
Mis-targeting rate	53.8	52.1	52.5	55.5	57.5	56.8	37.4
Expenditure efficiency rate	46.7	48.8	47.2	44.6	43.0	43.1	-41.3
Poverty reduction efficiency rate	1.04	0.93	0.91	0.88	0.85	0.80	-1.75

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients / All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor ⁄ Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement / Total transfer expenditure (%p/billion GBP), (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

A2.3.3. The NBLS, aged 65 and over (%, %p/billion GBP)

Relative poverty (poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	18.1	18.3	17.1	17.1	16.1	16.4	16.0
Mis-targeting rate	6.1	8.1	5.8	7.3	6.3	7.3	4.4
Expenditure efficiency rate	94.5	94.2	96.3	95.3	95.4	94.9	95.5
Poverty reduction efficiency rate	0.11	0.07	0.11	0.11	0.11	0.06	0.05
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	14.6	13.9	14.9	15.3	16.1	16.3	-1.8
Mis-targeting rate	6.6	7.3	8.8	9.8	7.7	7.0	0.9
Expenditure efficiency rate	93.4	93.7	94.4	91.2	93.4	94.1	-0.3
Poverty reduction efficiency rate	0.07	0.06	0.06	0.08	0.06	0.03	-0.08
Absolute poverty (deep poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	26.3	28.1	26.5	25.2	25.2	24.0	24.2
Mis-targeting rate	14.5	16.7	20.1	22.5	21.9	21.2	17.3
Expenditure efficiency rate	87.8	86.3	82.2	82.6	83.1	84.5	84.7
Poverty reduction efficiency rate	0.76	0.81	0.70	0.64	0.62	0.52	0.39
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	21.2	19.8	21.3	21.6	22.3	23.3	-3.1
Mis-targeting rate	18.0	14.8	17.7	21.3	22.8	18.1	3.6
Expenditure efficiency rate	82.0	86.7	85.9	79.8	79.7	85.6	-2.2
Poverty reduction efficiency rate	0.34	0.33	0.48	0.58	0.53	0.47	-0.29

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients / All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor ⁄ Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement / Total transfer expenditure (%p/billion GBP), (5) Changes: the figures in 2018 – the figures in 2006; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

A2.3.4. The EITC, aged 65 and over (%, %p/billion GBP)

Relative poverty (poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	-	-	-	0.1	0.2	0.5	0.3
Mis-targeting rate	-	-	-	87.6	45.2	29.0	56.6
Expenditure efficiency rate	-	-	-	15.1	60.2	69.3	30.9
Poverty reduction efficiency rate	-	-	-	0.00	0.00	0.07	0.00
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	0.5	1.9	1.9	3.1	4.0	4.2	4.2
Mis-targeting rate	22.3	14.8	30.4	30.0	35.2	35.6	35.6
Expenditure efficiency rate	76.9	83.9	67.6	67.2	55.7	57.9	57.9
Poverty reduction efficiency rate	0.15	0.13	0.12	0.12	0.14	0.13	0.13
Absolute poverty (deep poor)							
	2006	2007	2008	2009	2010	2011	2012
Coverage rate	-	-	-	0.0	0.0	0.2	0.2
Mis-targeting rate	-	-	-	98.4	100.0	82.5	86.9
Expenditure efficiency rate	-	-	-	2.8	0.0	17.8	14.2
Poverty reduction efficiency rate	-	-	-	0.00	0.00	0.07	0.00
	2013	2014	2015	2016	2017	2018	changes
Coverage rate	0.2	1.5	1.8	2.2	3.5	3.9	3.9
Mis-targeting rate	86.3	56.4	59.3	68.9	66.1	62.2	62.2
Expenditure efficiency rate	9.7	41.2	25.1	25.7	22.1	33.8	33.8
Poverty reduction efficiency rate	0.00	0.22	0.12	0.12	0.12	0.13	0.13

Note: (1) Coverage rate: Poor recipients / All poor population (%), (2) Mis-targeting rate: Non-poor recipients ⁄ All recipients (%), (3) Expenditure efficiency rate: Transfer delivered to the poor ⁄ Total transfer expenditure (%), (4) Poverty reduction rate: Poverty rate decrement / Total transfer expenditure (%p/billion GBP), (5) Changes: the figures in 2018 – the figures in 2006, (6) EITC: implemented in 2009 and a single elderly household has been eligible to the EITC benefit since 2013; Source: Author's calculation (KOWEPS 2nd wave – 14th wave microdata)

Chapter 3.

The effects of COVID-19 and response measures on poverty, income and consumption in South Korea

3.1. Introduction

The COVID-19 pandemic presents not only public health challenges but also socio-economic issues (International Labour Organisation [ILO], 2020a; Organisation for Economic Co-operation and Development [OECD], 2020b; United Nations [UN], 2020a). This infectious disease has had unprecedented influences all around the world since the start of 2020 (Ferguson et al., 2020). The World Health Organisation (WHO) declared it as a global pandemic in March 2020 (WHO, 2020), over 167 million were confirmed as positive and 3.4 million passed away as of 26th May 2021 (Johns Hopkins University, 2021).

COVID-19 has delivered significant negative effects on the supply and demand sides in the global economy (Baldwin & Mauro, 2020; Boone, Haugh, Pain & Salins, 2020; Carlsson-Szlezak, Reeves & Swartz, 2020). This shrinking economy has adverse influences on employment, earnings, and household livelihood (Han, Meyer & Sullivan, 2020). The world economy is expected to shrink by approximately -3.3% (International Monetary Fund [IMF], 2021b; OECD, 2021) in 2020. Furthermore, 114 million jobs are expected to be destroyed by the impact of this pandemic (ILO, 2021), and 60 million people fell into deep poverty in 2020 (Lakner, Mahler, Negre & Prydz, 2020).

Therefore, more vigorous policy responses are required to support the vulnerable until the economy has recovered securely from the COVID-19 pandemic (IMF, 2021a; OECD, 2020b; UN, 2020a). Many countries have implemented more active fiscal measures and some governments, such as: Hong Kong, Serbia, Singapore, South Korea (hereafter Korea), and the USA, have introduced universal transfer programmes to help their citizens extensively and directly (Korean government, 2020a; Prady, 2020).

In response to the outbreak, the Korean government has controlled this pandemic well without a national lockdown (Aum, Lee & Shin, 2020; Dighe et al., 2020; ILO, 2020b; Lee, Heo & Seo, 2020). Korea suffered from COVID-19 transmission at the initial stage, but Korea has flattened the curve successfully (ILO, 2020b; Lee et al., 2020; Moradi & Vaezi, 2020; OECD, 2020a; You, 2020). However, it has experienced economic damage, so the Korean government has implemented fiscal and monetary measures equivalent to 16% of its national GDP to overcome economic hardship (Bank of Korea [BOK], 2020a, 2020b; Ministry of Economy and Finance in Korea [MOEF], 2020d, 2020e). As a result, the Korean economy has shown relatively robust resilience from this severe pandemic (IMF, 2021a; MOEF, 2020d; OECD, 2020b).

Among its stimulus packages, the Emergency Disaster Relief Funds (hereafter the relief) have triggered serious political debates because this relief is the first-ever universal transfer programme in Korea (Kim & Lee, 2020; Kim, Koh & Lyou, 2020). During previous economic crises, the Korean government introduced means-tested benefits only for the deep poor (Ministry of Health and Welfare in Korea [MOHW], 1999, 2010). Initially, the Korean government designed this relief as a means-testing transfer programme for 70% of low-income households (Korean government, 2020b, 2020c). However, it was converted to a universal programme through discussions in the National Assembly in Korea (Kim B., 2020; Ministry of the Interior and Safety in Korea [MOIS], 2020a).

An extensive literature focuses on both (i) the economic impacts of the pandemic and (ii) the positive effects of the government measures. Firstly, several researchers have emphasised that this pandemic has had disproportionate effects on the labour market. In other words, the pandemic and social distancing have had more negative effects on non-essential and physical proximity jobs (Oh & Lee, 2020; Palomino, Rodríguez & Sebastian, 2020). In general, low income, low educated, and low skilled workers tend to have the above jobs, so the vulnerable have suffered more serious negative impacts (Adams-Prassl, Boneva, Golin & Rauh, 2020; Dang, Huynh & Nguyen, 2020; ILO & United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2020; Mongey, Pilossoph & Weinberg, 2020; Sanchez, Parra, Ozden & Rijkers, 2020). Secondly, others have analysed the effects of stimulus packages on poverty, household income and household consumption expenditure. They describe that government benefits have had positive anti-poverty effects on the vulnerable (Brewer & Tasseva, 2020; Han et al., 2020; Martin, Markhvida, Hallegatte &

Walsh, 2020).

Several Korean researchers have paid attention to the second topic. To be specific, the effect of the relief on consumption has been one of the most highlighted issues. The relief has two key aims: (i) providing an income supplement and (ii) promoting consumption (Korean government, 2020a). Several papers focus on the second aim. They conclude that this relief induced more consumption expenditure as 24-78% of its benefit (Gim, Lee & Cho, 2021; Hong, 2020; Kim et al., 2020; Korea Development Institute [KDI], 2020; Lee, Kang & Woo, 2021). However, the above first aim of the relief has been largely disregarded.

This chapter will analyse the economic effects of the pandemic and the government measures on poverty, household income and household consumption expenditure in Korea. Firstly, the chapter will compare the effects of this pandemic to the two previous critical economic crises: the Asian Financial Crisis 1997-1998 and the Global Financial Crisis 2008-2009. These two shocks are recognised as the most important crises in the Korean economy since the 1990s (Kim & Lee, 2020; Lee & Lee, 2020; MOEF, 2020e; Oh, 2020; Yeo & Kim, 2020; Yoo, 2020). Secondly, it will identify whether the pandemic has had disproportionate effects on the vulnerable (e.g., female, young, and elderly households). Several papers stress that this pandemic has delivered harder impacts on the vulnerable (Adams-Prassl et al., 2020; Dang et al., 2020; ILO & UNESCAP, 2020; Mongey et al., 2020; Oh & Lee, 2020; Sanchez et al., 2020), so poverty can deteriorate (Lakner et al., 2020; Sumner, Hoy & Ortiz-Juarez, 2020). Lastly, it will suggest some policy implications to improve the Korean welfare system.

This chapter consists of six sections. Section 3.2 reviews the literature on the effects of the pandemic and response measures. Section 3.3 introduces the three major

crises: (i) the Asian Financial Crisis 1997-1998, (ii) the Global Financial Crisis 2008-2009, and (iii) the COVID-19 pandemic 2020. Section 3.4 describes the Korea Household Income and Expenditure Survey (KHIES); adopts changes-in-changes (CC) as an alternative model of difference-in-differences (DD); establishes relative and absolute poverty thresholds; and defines variables. Section 3.5 estimates the effects of the above three crises and the government measures on poverty, income, and consumption expenditure focusing on the vulnerable. Lastly, section 3.6 summarises findings and discusses policy implications.

3.2. Literature review

3.2.1. COVID-19 and effects

COVID-19 and social distancing measures have brought negative effects to the labour market. Several researchers consider how the pandemic has affected people's ability to do their jobs under lockdown measures. In addition, they also emphasise that the pandemic can exacerbate work ability impairment for some types of jobs.

Palomino, Rodríguez and Sebastian (2020) calculate the Lockdown Working Ability index in the European countries using the EU Labour Force Survey in 2018. This index has three main components: essentiality, closure (by a government decision), and teleworking; so essential, not closed by authorities, and remote working jobs can have high scores. In addition, they insist that low educated workers have a lower point (0.33) than high educated workers (0.68), so low educated workers can be more vulnerable than high educated workers under lockdown. Therefore, they estimate that the relative poverty rate, which is set at 60% of national median wage, will increase by

4.9%p in the overall Europe under two months of lockdown. In terms of geographical differences, they conclude that Eastern and Southern countries have lower scores than Western and Northern nations. Therefore, the poverty rate will increase more in Croatia 8.5%p and Lithuania 7.3%p than in the UK 3.7%p, Germany 3.7%p and France 3.5%p.

Oh and Lee (2020, 2021) estimate the effect of the pandemic on the labour market in Korea. They analyse the Korean Labour and Income Panel Study in 2018 and conclude that 35% of jobs in Korea can be endangered during the COVID-19 pandemic. They point out that non-essential, no working at home, and high physical proximity jobs are more vulnerable to the pandemic. Furthermore, low income, low educated and low skilled workers tend to have the above jobs. Therefore, low-income households are faced with harder impacts, and the relative poverty rate, which is set at 60% of median income, is expected to increase by 6.4%p in 2020. However, this study does not consider the effect of the government measures (e.g., the relief), so this research can overestimate the negative effect of the pandemic.

Nam and Lee (2020) analyse the effect of COVID-19 on working age households in Korea using the KHIES in 2019 and 2020. They adopt DD and divide the Korean households into three groups according to the householder's employment type: a permanent worker group, a temporary worker group, and a self-employed worker group. They compare household income between the first half of 2019 and the first half of 2020 to identify the influence of the pandemic in 2020. They conclude that the self-employed worker group had the hardest damage of the above three groups. However, they do not examine the parallel trends assumption which is an important assumption of DD. In addition, they analyse only working age households, even though elderly households accounted for 21.8% in Korea in 2019 (KOSTAT, 2021a).

3.2.2. Response measures and effects

In response to the COVID-19 pandemic, many governments have expanded fiscal assistance for their residents. Therefore, several researchers have analysed the potential positive effects of these measures on poverty, household income, and household consumption expenditure. They have focused on the effects on the vulnerable who have been faced with more negative impacts from the pandemic.

The UK government has provided the Coronavirus Job Retention Scheme (the furlough scheme). This was designed to compensate 80% of wage and it has the benefit limit up to £2,500 per month (UK government, 2021). Brewer and Tasseva (2020) simulate the effects of the pandemic and the government measures using the UKMOD, which is a tax-benefit microsimulation model for the UK. According to their simulation, household income in the UK will decrease by 7.9%, so the relative poverty rate set at 60% of median income will increase from 17.4% to 19.8%. The furlough scheme has more positive effects on middle-income households than on high-income households because it has the benefit limit. In addition, the existing public transfer programmes (e.g., the Universal Credit) have more anti-poverty effects on low-income households.

Han, Meyer and Sullivan (2020) identify the anti-poverty effects of the public transfer programmes in the USA using the Basic Monthly Current Population Survey in 2020. They have paid attention to the fact that the poverty rate improved despite the unemployment rate increase in the first half of 2020. They estimate the counterfactual pre-transfer income and its poverty rate. They conclude that the government measures (e.g., the Economic Impact Payments and unemployment insurance benefits) reduced the USA official poverty rate by 4.2%p from 13.5% of the counterfactual pre-transfer

poverty rate to 9.3% of the actual post-transfer poverty rate in June 2020. Furthermore, they stress that the deep poor faced more severe impacts from the pandemic, but the government measures had more positive effects to mitigate their poverty threat.

Martin, Markhvida, Hallegatte and Walsh (2020) conduct a case study in San Francisco Bay Area in the USA using the SimplyAnalytics platform based on the USA Census. They set two poverty thresholds: (i) the poverty threshold: the Low Income Level of the Department of Housing and Urban Development in the USA equivalent to annual income of $25,844 and (ii) the deep poverty threshold: the half of (i) set at $12,922. According to their simulation, firstly, the poverty rate will rise from 17.1% to 25.9% on the condition that this area is under a three-month lockdown. However, this rate will be decreased from 25.9% to 19.1% by stimulus packages. Secondly, the deep poor can be faced with more severe negative impacts, but the government measures can reduce the poverty rate to nearly half. To be specific, the deep poverty rate will be increased from 1.7% to 9.5% due to lockdown, but it will be declined from 9.5% to 4.9% by stimulus packages. Therefore, this study describes that the stimulus packages in the USA have positive anti-poverty effects.

Meanwhile, some Korean researchers focus on the effect of the relief on household consumption expenditure. Lee, Kang and Woo (2021) analyse the KHIES in 2019 and 2020 to identify the above effect in Korea. Since this relief was distributed between May and August 2020, they compare the first quarter to the second/third quarters in 2020 using DD and CC. They conclude that this relief facilitated consumption expenditure as 65-78% of the benefit. However, they do not investigate the parallel trends assumption of DD. In addition, the marginal propensity to consume of the relief is still a controversial issue and it has wide range of values, such as: 24.4%

(Kim et al., 2020), 29.1% (Gim et al., 2021), and 26.2-36.1% (KDI, 2020). The above 65-78% could be overestimated, because the KHIES collects the relief, the Employment Insurance benefits, and other means-tested benefits in the same category as the social benefits (Table 3.4 and KOSTAT, 2019c).

From the discussion above, this paragraph defines some research issues. Firstly, this chapter will analyse the effects of the COVID-19 pandemic and the government measures on poverty, household income and household consumption expenditure. To be specific, it will detect whether the pandemic has more negative effects on the vulnerable and the government interventions decrease their poverty risk effectively. Therefore, it sets two poverty thresholds and conducts CC at 5%, 25%, 50%, 75%, and 95% percentiles of income and expenditure. In addition, this chapter examines the effects of the pandemic on vulnerable groups (female, young, and elderly households). Secondly, the KHIES provides a useful dataset, so it will use the KHIES like the above two Korean papers (Lee et al., 2021; Nam & Lee, 2020). The KHIES is an official nationwide household survey, and its microdata is available since 1990 (KOSTAT, 2019c), so it allows to compare the effect of the pandemic to previous economic crises.

Thirdly, it will regard the government measures including the relief as the social benefits in the KHIES (Lim et al., 2016; Nam & Lee, 2021; Song, 2021). In other words, it separates (i) the effect of the pandemic as the changes in non-social benefits income (non-social benefits income = disposable income – the social benefits) and (ii) the effect of the government measures as the changes in the social benefits (Table 3.4). Lastly, it employs a CC model instead of DD. This is because the KHIES was redesigned in 2017, 2018, and 2019, respectively (KOSTAT, 2020a), so the parallel trends assumption is difficult to be investigated. These issues will be discussed in section 3.4.

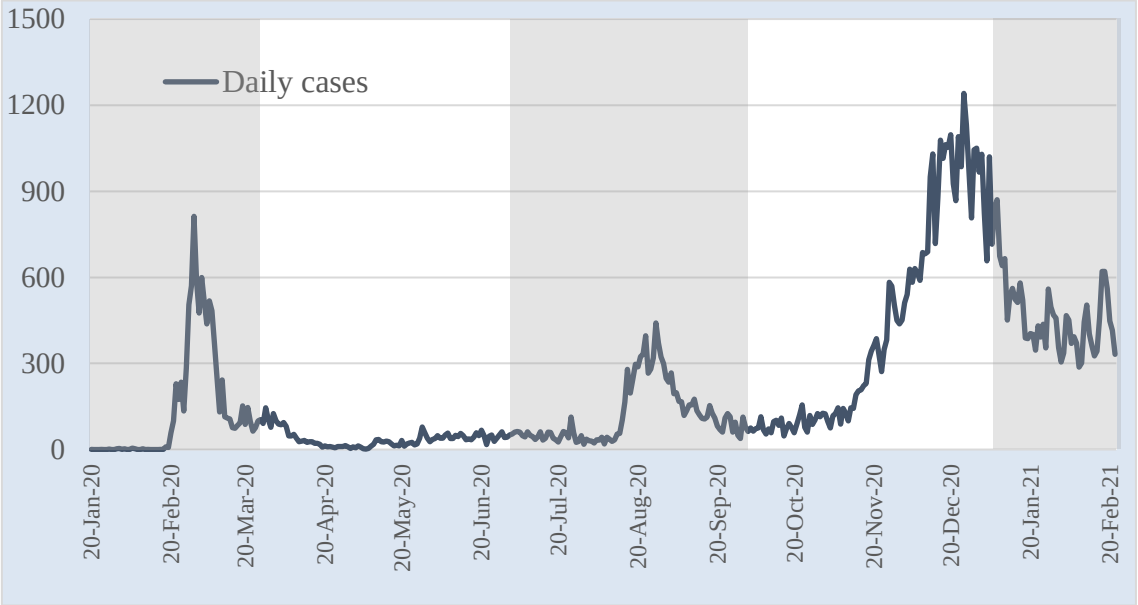
3.3. COVID-19 and its economic effects in Korea

3.3.1. The COVID-19 pandemic and social distancing

The COVID-19 pandemic: Korea has managed the spread of the disease well without a national lockdown (Aum et al., 2020; Dighe et al., 2020; ILO, 2020b; Lee et al., 2020; Moradi & Vaezi, 2020; OECD, 2020a; You, 2020). Its 3T strategy (testing, tracing, and treating) and transparent information sharing are considered as the most important factors of this achievement (Argente, Hsieh & Lee, 2020; Lee et al., 2020). Therefore, as of 26th May 2021, the number of cumulative cases and deaths are 137,682 and 1,940, respectively, and these figures are much smaller than in other nations (Johns Hopkins University, 2021; Statistics Korea [KOSTAT], 2021b).

As illustrated in Figure 3.1, the daily confirmed cases of COVID-19 have shown fluctuations and the pandemic in Korea can be classified in three waves: (i) the first wave in the first quarter 2020, (ii) the second wave in the third quarter 2020, and (iii) the third wave from the fourth quarter 2020 to the first quarter 2021 (KOSTAT, 2021b; Seong et al., 2021). In the first wave, the first confirmed case was reported on 20th January 2020 and the number of cases rapidly increased in February and March. At the time, Korea was one of the worst affected countries (ILO, 2020b; Jung, Lee & Song, 2020; Lee & Choi, 2020; OECD, 2020a). The cumulative confirmed cases were 9,887 in the first quarter 2020 (Korea Disease Control and Prevention Agency [KDCA], 2020a). In the second quarter, the COVID-19 contagion was relatively stable, so new positive cases of 2,963 were smaller than other quarters (KDCA, 2020b). The second wave in the third quarter had 11,039 new cases (KDCA, 2020c).

Figure 3.1. The trend of COVID-19 cases in Korea (daily new cases)



Note: (1) Daily new confirmed cases (persons), (2) The three peaks: the first, second, and third waves, (3) The three grey shadow boxes: the first and third quarters 2020, and the first quarter 2021; Source: KOSTAT (2021b)

Social distancing: In response to the first wave, since February 2020 the Korean government implemented social distancing measures instead of lockdown measures (Central Disaster and Safety Countermeasures Headquarters in Korea [CDSCH], 2020). Firstly, the Korean government imposed some restrictions to suppress the pandemic such as: wearing a face mask, meetings (up to 4 persons allowed), social events (up to 99 persons), and indoor dining in restaurants (until 10:00 pm only) in Seoul as of 26th May 2021. Secondly, schools were closed, and online classes were provided during the pandemic hikes. In other periods, the Korean government has restricted the attendance rate of a school (e.g., 1/3 or 2/3 of its capacity) according to the regional situation, so both physical and online classes were conducted (e.g., physical class: 3 days and online class: 2 days per week). The College Scholastic Ability Test (similar to the A-level in the UK), usually held in November, was postponed until December 2020 (Ministry of Education in Korea [MOE], 2020a, 2020b). Lastly, the government advised non-essential workers to work at home to reduce face-to-face contacts (CDSCH, 2020).

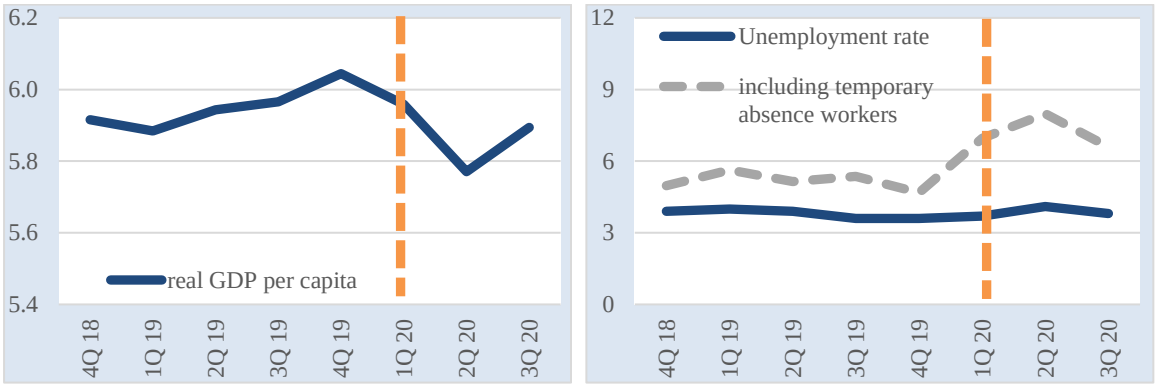
3.3.2. Economic impacts

The pandemic and social distancing measures have delivered immediate and disproportionate impacts on the labour market (MOEF, 2020e). The real GDP per capita in Korea decreased by 1.4% from £6,044 in the fourth quarter 2019 to £5,959 in the first quarter 2020 (Figure 3.2 (a); hereafter 1 GBP = 1,500 Korean Won [KRW]). The unemployment rate was 3.7% and this figure was similar to the last quarter of 3.6% (Blue line in Figure 3.2 (b)); while the number of temporary absence workers, which includes paid leave workers and unpaid leave less than 6 months workers (KOSTAT, 2019d), rapidly increased from 300 thousand in the fourth quarter 2019 to 924 thousand in the first quarter 2020 (KOSTAT, 2021a). Therefore, the unemployment rate with temporary absence workers increased from 4.7% to 7.0% (Grey line in Figure 3.2 (b)). This means that employers usually imposed temporary absence to their workers instead of mass layoffs (MOEF, 2020e; Oh, 2020; Park & Yoo, 2020). However, temporary absence workers are categorised as employed workers, so the unemployment rate seems to be stable (KOSTAT, 2019c; Oh, 2020). In the second quarter 2020, the real GDP per capita diminished again by 3.2% compared to the first quarter, and the unemployment rate including temporary absence workers increased to 8.0%.

Temporary absence workers: The temporary absence workers increase has some implications. Firstly, during the pandemic, the number of temporary absence workers increased considerably compared to the previous two crises (Figure 3.4 (b) and 3.5 (b)). This is because the pandemic is not a structural problem and the economy can recover after the pandemic, so employers tend to prefer temporary absence to layoffs. In addition, the Korean government expanded the job retention scheme to alleviate negative shocks in the labour market (MOEF, 2020d, 2020e). This policy direction is

common in other developed countries (OECD, 2020c). Secondly, the coverage of the job retention scheme among temporary absence workers increased, but only 22% of them received the benefits from the government in 2020. This indicates that nearly 80% could still be in unpaid absence (Korea Employment Information Service [KEIS], 2021; KOSTAT, 2021a). Therefore, the pandemic can have negative impacts on the labour market and household income in Korea.

Figure 3.2. Economic impacts (1): The COVID-19 pandemic (thousand GBP, %)



(a) Real GDP per capita (b) Unemployment rate

Note: (1) The real GDP per capita: quarterly, seasonally adjusted, 1 GBP = 1,500 KRW, (2) The unemployment rate: quarterly, seasonally adjusted, temporary absence workers: quarterly, not seasonally adjusted; Source: BOK (2021) and KOSTAT (2021)

Thirdly, the pandemic has disproportionate effects, so the vulnerable (e.g., female, young, and elderly workers) can have more negative effects (Oh & Lee, 2020; Park & Yoo, 2020; Song, 2021; Yoo, 2020). For example, the number of female workers in temporary absence increased rapidly from 179 thousand in the fourth quarter 2019 to 595 thousand in the first quarter 2020 (KOSTAT, 2021a). Lastly, some conventional indices (e.g., the unemployment rate) cannot present exactly the difficulties in the labour market because the official statistics consider temporary absence workers as employed workers (KOSTAT, 2019c, 2019d; Oh, 2020). Therefore, this chapter describes the unemployment rate including temporary absence workers.

3.3.3. Response measures

The Korean government has provided fiscal and monetary measures along with the current welfare system (BOK, 2020a, 2020b; ILO, 2020b; MOEF, 2020d; OECD, 2020a). To be specific, the government introduced stimulus packages equivalent to 16% of its nominal GDP, and the BOK cut the official base rate from 1.25% to 0.5%. Therefore, the Korean economy started recovering in the third quarter 2020. The real GDP per capita increased by 2.1% from £5,771 in the second quarter 2020 to £5,894 in the third quarter 2020, and the cited unemployment rate including temporary absence workers decreased to 6.6% (Figure 3.2 (b)). The Korean economy has shown relatively robust resilience from the pandemic. According to the IMF and the OECD, the GDP growth rate in Korea is expected at -1.0% in 2020 and it is the best performance among the OECD members (IMF, 2021b; MOEF, 2020d; OECD, 2021).

The Emergency Disaster Relief Funds: The relief is a centrepiece of the Korean stimulus packages. This relief is the first universal transfer in Korea and was designed as a one-off payment (Kim & Lee, 2020; Kim et al., 2020). The National Basic Livelihood Security (NBLS) has been operated since 2000 as a means-tested benefit for the deep poor, but the Korean government introduced this additional measure considering the substantial impacts of the pandemic on the labour market. The relief was planned to support the economically vulnerable and boost consumption (Korean government, 2020a). In addition, it was also aimed to help local small businesses.

In this regard, the Korean government initially announced that it would cover 70% of low-income households (Korean government, 2020b, 2020c). However, through political debates in the National Assembly in Korea, it was transformed into a universal

benefit (MOIS, 2020a). This is because the Korean political parties pledged a universal benefit during the general election campaign in April 2020 (Kim B., 2020; Park Y., 2020). It was distributed between May and August 2020, and 99% of the benefit delivered in May. Finally, 14.2 trillion KRW which is equivalent to 95 billion pounds was paid by August (Korea Research Institute for Local Administration [KRILA], 2020; MOIS, 2020d).

To be specific, the relief has the following specific characteristics. Firstly, the amount of benefit was proportionate to household size regardless of household income, such as: 400,000 KRW equivalent to £267 for a single household, and 600,000 KRW (£400), 800,000 KRW (£533), and 1 million KRW (£667) for two, three, and four and more member households, respectively (Korean government, 2020a). Secondly, the beneficiaries needed to spend the benefit by the end of August, otherwise the remaining balance was scheduled to expire after the deadline. This implies that policy makers had the intention to facilitate consumption in a short-term (Kim & Oh, 2020). This is because household consumption expenditure decreased in the first quarter 2020 compared to the first quarter 2019 (KOSTAT, 2020a; MOEF, 2020a).

Thirdly, it was provided in four modes: (i) a direct deposit to a credit/debit card, (ii) cash, (iii) a prepaid card, and (iv) a gift voucher (MOIS, 2020a). Among them 66.1% of the benefit was delivered as a credit/debit card deposit (MOIS, 2020d). Whereas a cash benefit was only allowed for the poor, such as the recipients of the NBLS (MOIS, 2020b). Lastly, except for a cash benefit, the relief was only accepted at local small businesses to support local economy (Kim & Lee, 2020; Kim et al., 2020).

The relief has some differences to the furlough scheme in the UK (UK government, 2021). Firstly, the furlough scheme has been provided to retained workers,

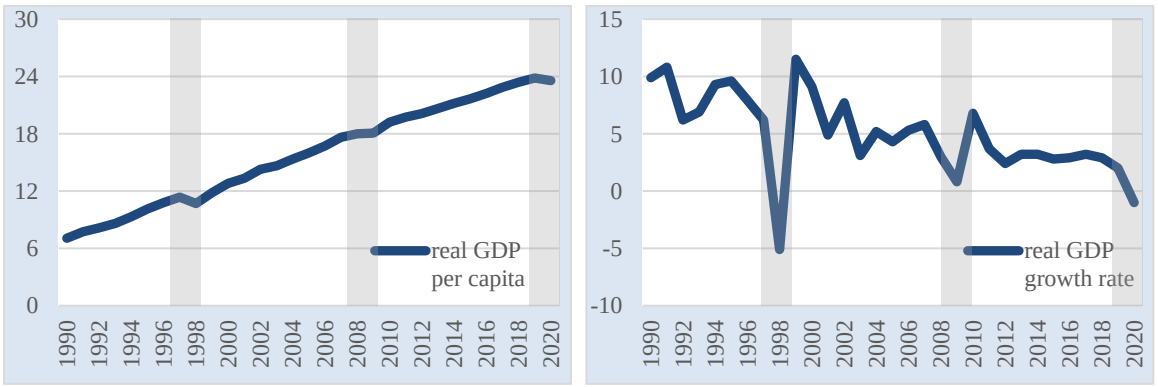
but the Korean relief was distributed to all residents as a universal transfer. Secondly, the furlough scheme compensates 80% of wage and its benefit has the limit up to £2,500 per month whereas the relief benefit was only related to household size. Lastly, the furlough scheme has been paid on a monthly basis since May 2020, but the relief was disbursed only once between May and August 2020.

Universal versus targeted benefit: Generally, a targeted benefit is considered as more desirable because it can be more efficient and acceptable for social justice (Han et al., 2020; IMF, 2021a; OECD, 2020b; Sanchez et al., 2020; UN, 2020a). However, it can also have disadvantages, for example administrative time and cost to set optimal eligibility and to screen recipients (Kim & Kwon, 2020; Prady, 2020).

3.3.4. Two previous economic crises

In this chapter, the economic impacts of the pandemic will be compared to the two critical shocks. The three grey shadow boxes in Figure 3.3 illustrate when the Korean economy experienced significant economic depressions.

Figure 3.3. The long-term trend of the economic growth in Korea (thousand GBP, %)



(a) Real GDP per capita (b) Real GDP growth rate

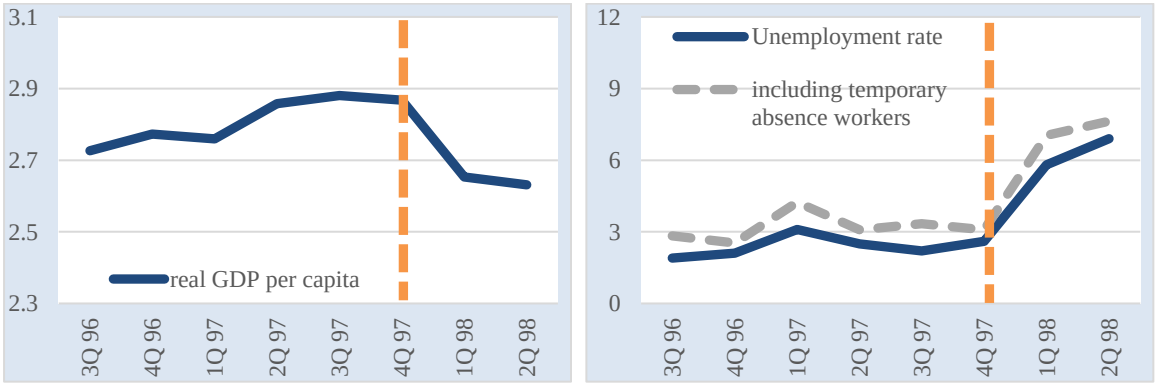
Note: (1) The real GDP per capita: yearly, year on year, 1 GBP = 1,500 KRW, (2) The real GDP growth rate: yearly, year on year, (3) The three grey shadow boxes: the Asian Financial Crisis 1997-1998, the Global Financial Crisis 2008-2009, and the COVID-19 pandemic 2020; Source: BOK (2021) and KOSTAT (2021)

The three economic shocks include (i) the Asian Financial Crisis 1997-1998, (ii) the Global Financial Crisis 2008-2009, and (iii) the COVID-19 pandemic 2020. The two former crises are considered as the most important economic downturns in the Korean economy since the 1990s (Kim & Lee, 2020; Lee & Lee, 2020; MOEF, 2020e; Yeo & Kim, 2020; Yoo, 2020). Meanwhile previous epidemics did not spread widely in Korea, so they had only limited economic impacts (Oh, 2020).

3.3.4.1. The Asian Financial Crisis

This crisis was caused by internal and structural problems in the Korean economy (MOEF, 1998, 1999). In 1997, 6 of top 30 large conglomerates (the so-called Korean 'Chaebol') went into bankruptcy; it led to insolvency problems in the financial sector; and then the Korean foreign exchange market suffered rapid capital outflow. Therefore, the Korean government signed the IMF Stand-By Arrangement to receive financial assistance from the IMF in December 1997.

Figure 3.4. Economic impacts (2): The Asian Financial Crisis (thousand GBP, %)



(a) Real GDP per capita (b) Unemployment rate

Note: (1) The real GDP per capita: quarterly, seasonally adjusted, 1 GBP = 1,500 KRW, (2) The unemployment rate and temporary absence workers: quarterly, not seasonally adjusted; Source: BOK (2021) and KOSTAT (2021)

Since this crisis was based on structural problems, the Korean economy had to endure severe restructuring, mass layoffs, and economic recession for several years.

Therefore, as expressed in Figure 3.4, the real GDP per capita plummeted by 7.5% from £2,867 in the fourth quarter 1997 to £2,653 in the first quarter 1998, and the unemployment rate sharply increased from 2.6% to 5.8% during the same period. The number of temporary absence workers remained at a low level unlike the COVID-19 pandemic because several enterprises went into bankruptcy directly due to the massive economic shock (Oh, 2020; Park & Yoo, 2020).

However, the Korean government did not have even basic social security programmes at the time (MOHW, 1998, 1999). As a result, this crisis had the worst impacts on poverty and household livelihood (Yoo, 2020). Not only that, but this crisis has left hysteresis effects so far. Firstly, the young generation during the Asian Financial Crisis still has had difficulties in employment, earnings, and marriage (Choi, Choi & Son, 2020). Secondly, the old generation also has experienced long-lasting poverty (Noh & Kim, 2019).

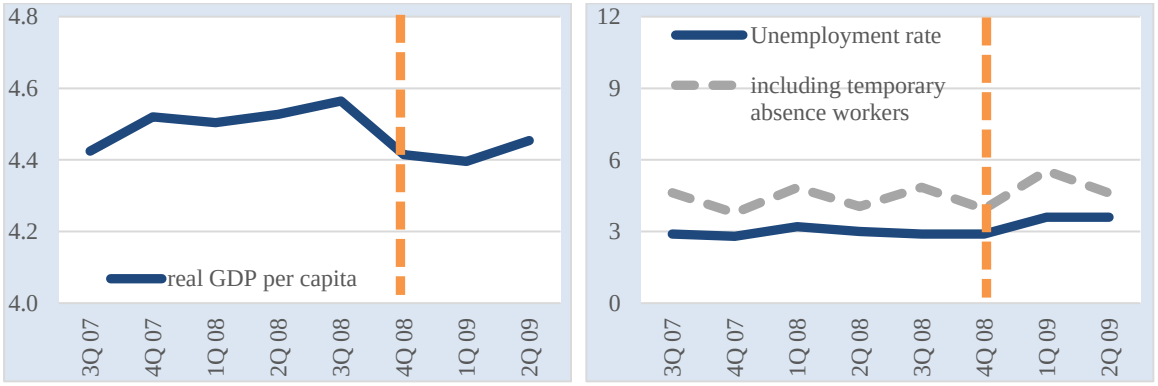
3.3.4.2. The Global Financial Crisis

This second crisis was derived from the financial market in the USA and spread to Korea in late 2008 (MOEF, 2009). This crisis delivered relatively milder influences than the Asian Financial Crisis (Oh, 2020; Yoo, 2020). The first reason is that this crisis did not originate from internal problems. Secondly, the Korean government supplied vast stimulus packages to overcome this crisis (Kim, 2012). Lastly, after the Asian Financial Crisis, the Korean government established the welfare system, including the NBLS in 2000 and the Basic Old-Age Pension in 2008 (MOHW, 2009, 2010).

As illustrated in Figure 3.5, its economic impacts were small compared to the Asian Financial Crisis and the COVID-19 pandemic. The real GDP per capita decreased

by 3.3% from £4,564 in the third quarter 2008 to £4,415 in the fourth quarter 2008, but the Korean economy grew since the second quarter 2009. In addition, the unemployment rate was stable at nearly 3% and the number of temporary absence workers also had little fluctuation (Oh, 2020).

Figure 3.5. Economic impacts (3): The Global Financial Crisis (thousand GBP, %)



(a) Real GDP per capita (b) Unemployment rate

Note: (1) The real GDP per capita: quarterly, seasonally adjusted, 1 GBP = 1,500 KRW, (2) The unemployment rate: quarterly, seasonally adjusted, temporary absence workers: quarterly, not seasonally adjusted; Source: BOK (2021) and KOSTAT (2021)

This section has briefly compared the effects of the three economic crises on the real GDP per capita and the labour market. Firstly, the Asian Financial Crisis 1997-1998 had significant economic shocks, but the Korean government did not establish the basic social safety net. After this crisis, poverty issue was highlighted as an urgent issue, so the Korean government introduced the NBLS as a means-tested benefit in 2000. Secondly, the Global Financial Crisis delivered relatively small impacts on the Korean economy and the NBLS could mitigate the negative effects on the deep poor. Lastly, the COVID-19 pandemic has had immediate and disproportionate effects on the labour market, and the Korean government introduced the relief as a universal benefit. In this regard, section 3.5 will analyse more specific changes in poverty, household income and household consumption expenditure during the three crises.

3.4. Data and methodology

3.4.1. Data: The Korea Household Income and Expenditure Survey (KHIES)

The KHIES is a repeated cross-sectional survey conducted by the KOSTAT quarterly (KOSTAT, 2019c). It has a nationally representative sample of 7,200 households and a wide range of information on household income and consumption expenditure. Its microdata is available from 1990, so it allows to analyse the long-term trends of household income and consumption expenditure including the Asian Financial Crisis 1997-1998 and the Global Financial Crisis 2008-2009. In addition, it also contains the latest data including the effect of COVID-19 (Lee et al., 2021; Nam & Lee, 2020). Therefore, it can be an adequate dataset to compare the effects of this pandemic to the cited two economic crises.

However, due to its redesign, the KHIES has some limitations. In recent times, the KOSTAT reorganised this survey (Table 3.1). This is because poverty and household livelihood have been regarded as most important issues in Korea, so policy makers and researchers have required more accurate data (Kang & Lee, 2019; KOSTAT, 2018). The first limitation is that it is difficult to evaluate the parallel trends assumption of a DD model since the KHIES does not have sufficient pre-treatment data. This issue will be explained in section 3.4.2. Secondly, the survey did not collect quarterly expenditure data in 2017 and 2018 (KOSTAT, 2019c). Therefore, this chapter cannot conduct the CC analysis on consumption expenditure between the fourth quarter 2019 and the first quarter 2020, because the expenditure data in the four quarter 2018 (the pre-treatment data of the control group) are not available.

This chapter uses the KHIES to analyse three separate two-year datasets: (i) the

Asian Financial Crisis: from the third quarter 1996 to the second quarter 1998, (ii) the Global Financial Crisis: from the third quarter 2007 to the second quarter 2009, and (iii) the COVID-19 pandemic: from the fourth quarter 2018 to the third quarter 2020. Meanwhile, the dataset for the Asian Financial Crisis does not include single households because the KHIES has only started surveying one-person households since 2006 (KOSTAT, 2019c).

Table 3.1. Revision of the KHIES in 2017, 2018, and 2019

Year	2016	2017	2018	2019-2020
Sample size (households)	8,700	5,500	8,000	7,200
Survey items	Income and expenditure	Income	Income	Income and expenditure

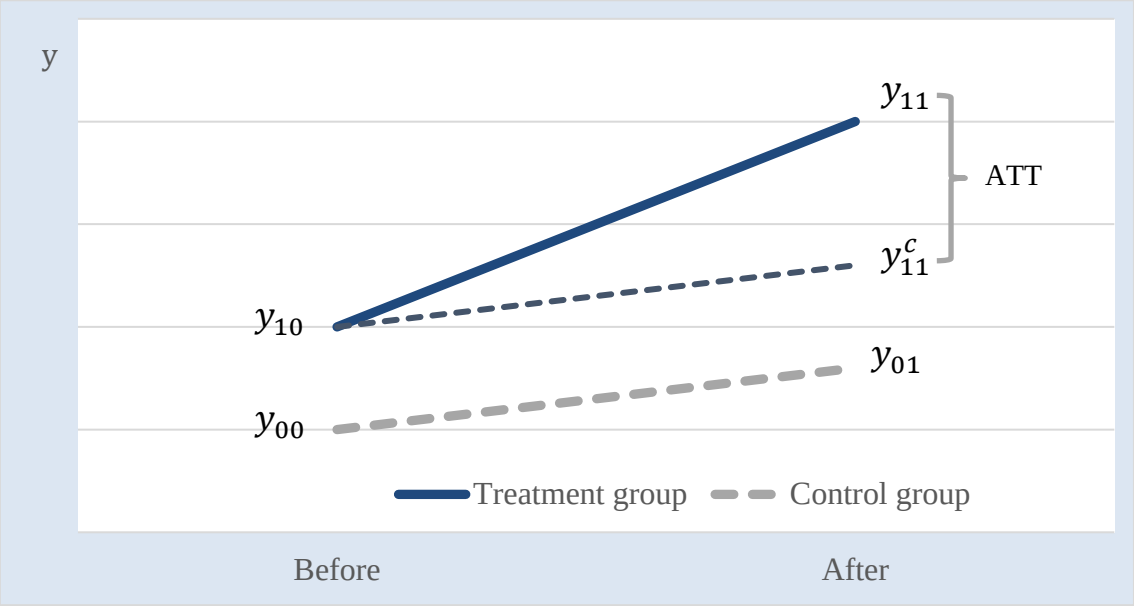
Note: The KHIES collected yearly expenditure data in 2017 and 2018; Source: KOSTAT (2019c)

Weights: This chapter uses the weights of the KHIES as probability weights (KOSTAT, 2019c; OECD, 2013; Solon, Haider & Wooldridge, 2015; UN, 2011). To be specific, this chapter converts household weights to person weights (person weights = household weights × the number of household members) to calculate the poverty rate and to conduct the CC analysis. This is because the person weights are generally used to estimate a poverty rate and income distribution (Cheon, 2014; Kang, Park, Lee, Jung & Lee, 2011; KOSTAT, 2021a; OECD, 2013; UN, 2011). Therefore, the person weights are suitable for the CC analysis which utilises the distribution of income. In addition, the official poverty rate and income quantile statistics in Korea are also using the person weights (KOSTAT, 2021a). Meanwhile, it employs the household weights to describe the characteristics of elderly households.

3.4.2. Changes-in-Changes

As illustrated in Figure 3.6, the effect of a treatment (e.g., a policy intervention or an event) can be measured as $E(y_{11}) - E(y_{11}^c)$ (Cunningham, 2021; Hill, Griffiths & Lim, 2018; Wooldridge, 2012; Yoon et al., 2012). However, the outcome of the treated group in the treatment period in the absence of the treatment (y_{11}^c) is unobservable, so DD and CC take different approaches to estimate the value of y_{11}^c.

Figure 3.6. A treatment effect (an example)



Note: The subscript *it* means group (*i*) and time (*t*). *i*=0 for a control group, *i*=1 for a treatment group, *t*=0 for a pre-treatment period, and *t*=1 for a post-treatment period; Source: Author's summary and Hill et al. (2018)

Difference-in-differences: DD is one of the most popular research design models in social sciences to measure the effect of a policy intervention or an event. DD allows to identify the average treatment effect on the treated (ATT) under some assumptions (Angrist & Pischke, 2009; Cunningham, 2021; Hill et al., 2018; Kang, Lee, Park & Yoon, 2014; Wooldridge, 2012; Yoon et al., 2012).

The variables in Figure 3.6 can be decomposed as Table 3.2 (Angrist & Pischke, 2009; Cunningham, 2021; Hill et al., 2018; Yoon et al., 2012). Firstly, *A* and *B* are unobservable fixed effects of each group. DD assumes that they are time invariant

between pre- and post-treatment periods within groups, but they can have different values between the treatment group and the control group ($A \neq B$). Secondly, *T* is time effects. DD assumes that it is the same for all units if the treatment is not implemented (the parallel trends assumption). Lastly, *D* is the ATT which means the average changes in the treatment group by the treatment. The first difference eliminates the unobservable fixed effects of each group (*A* and *B*), so DD can control the unobserved heterogeneity of two groups. The second difference removes the time effects under the parallel trends assumption. Consequently, a DD analysis can calculate the ATT ($=D$).

Table 3.2. Difference-in-differences

Group	Variable	Component	1st difference	2nd difference
Control group	y_{00}	A	T	D
	y_{01}	A + T		
Treatment group	y_{10}	B	T + D	
	y_{11}	B + T + D		

Note: (1) *A* and *B* are unobservable fixed effects of each group, (2) *T* is time effects, (3) *D* is the ATT (the average treatment effect on the treated), (4) The subscript *it* means group (*i*) and time (*t*). *i*=0 for a control group, *i*=1 for a treatment group, *t*=0 for a pre-treatment period, and *t*=1 for a post-treatment period; Source: Author's summary, Cunningham (2021), and Hill et al. (2018)

The above difference-in-differences of the two groups can be separated into the ATT and the non-parallel trends bias (Cunningham, 2021). Firstly, the difference-in-differences $[(E(y_{11}) - E(y_{10})) - (E(y_{01}) - E(y_{00}))]$ can be expressed as the first line of equation (3.1). Secondly, zero value term $(E(y_{11}^c) - E(y_{11}^c))$ added to the difference-in-differences of the two groups as the second line. Lastly, the ATT $(E(y_{11}) - E(y_{11}^c))$ can be isolated from non-parallel trends bias $[(E(y_{11}^c) - E(y_{10})) - (E(y_{01}) - E(y_{00}))]$ as the third line. If the non-parallel trends bias is zero (the treatment group and the control group have the parallel trends), DD can calculate

the ATT as difference-in-differences. It indicates why the parallel trends assumption is essential for a DD model.

$$
\begin{aligned}
&[(E(y_{11}) - E(y_{10})) - (E(y_{01}) - E(y_{00}))] \\
&= [(E(y_{11}) - E(y_{10})) - (E(y_{01}) - E(y_{00}))] + [\big(E(y_{11}^{c}) - E(y_{11}^{c})\big)] \\
&= [\big(E(y_{11}) - E(y_{11}^{c})\big)] + [(E(y_{11}^{c}) - E(y_{10})) - (E(y_{01}) - E(y_{00}))]
\end{aligned}
\tag{3.1}
$$

Note: The subscript *it* means group (*i*) and time (*t*). *i*=0 for a control group, *i*=1 for a treatment group, *t*=0 for a pre-treatment period, and *t*=1 for a post-treatment period

As described above, DD can calculate the ATT as difference-in-differences with a simple and convenient design (Angrist & Pischke, 2009; Cunningham, 2021). In addition, DD can eliminate the unobserved heterogeneity among two groups. A DD model with a time variable and a group variable can be expressed as equation (3.2). G_i is a group dummy variable (if i=0 for a control group, i=1 for a treatment group), T_t is a time dummy variable (if t=0 for a pre-treatment period, t=1 for a post-treatment period), $G_i \times T_t$ is an interaction term of G_i and T_t, and ε_{it} is an error term. The coefficient of the interaction term β_3 is the ATT.

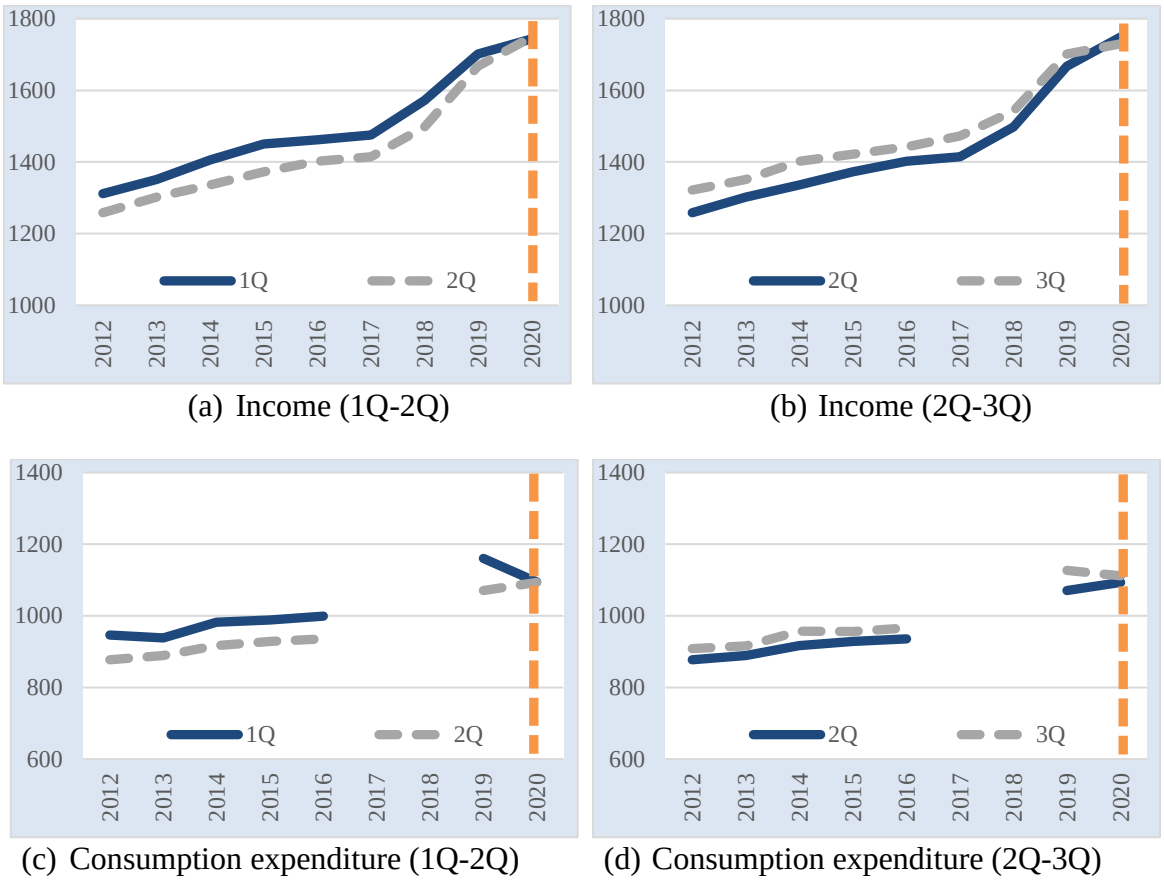
$$
y_{it} = \beta_0 + \beta_1 G_i + \beta_2 T_t + \beta_3 (G_i \times T_t) + \varepsilon_{it} \tag{3.2}
$$

Note: G_i is a group dummy variable ($i = 0$ for a control group, $i = 1$ for a treatment group), T_t is a time dummy variable ($t = 0$ for a pre-treatment period, $t = 1$ for a post-treatment period), $G_i \times T_t$ is the interaction term of G_i and T_t, and ε_{it} is an error term

Even though the advantages of DD, this chapter needs to review the feasibility of a DD analysis because of the recent redesign of the KHIES. Some Korean researchers adopted the DD model to analyse the effects of the COVID-19 pandemic and the relief using the KHIES, but they did not investigate the parallel trends assumption (Lee et al., 2021; Nam & Lee, 2020). The parallel trends assumption is untestable because y_{11}^{c} is counterfactual value. Alternatively, this assumption can be

investigated indirectly using pre-treatment leads.

Figure 3.7. Parallel trends in household income and consumption expenditure (GBP)



(a) Income (1Q-2Q) (b) Income (2Q-3Q)

(c) Consumption expenditure (1Q-2Q) (d) Consumption expenditure (2Q-3Q)

Note: (1) 1 GBP = 1,500 KRW, (2) Equivalence scale: square root of household size, (3) Household consumption expenditure data in 2017 and 2018 are not available because the KHIES did not collect quarterly household expenditure data in 2017 and 2018; Source: Author's calculation (KHIES microdata)

To investigate the parallel trends assumption, we can exploit the seasonality in household income and expenditure (Chung, 2009; KOSTAT, 2020a; Lee & Ku, 2015; Shin & Han, 2016), and it can be expressed graphically as Figure 3.7. In general, household income and expenditure in Korea are larger in the first and third quarters than in the second quarter because of the Lunar New Year in the first quarter and the Korean Thanksgiving Day in the third quarter. However, income and expenditure show different trends only in 2020. To be specific, household income and consumption expenditure in the second quarter were similar to the first and third quarters in 2020.

The pandemic and the relief distributed since May can have effects on these exceptional situations in 2020.

In general, 2-4 periods of pre-treatment data are required to investigate the parallel trends assumption (Angrist & Pischke, 2009; Autor, 2003; Gertler, Martinez, Premand, Rawlings & Vermeersch, 2016; Kahn-Lang & Lang, 2020; Sohn & Lee, 2018). However, the KHIES did not collect quarterly expenditure data in 2017 and 2018 (Table 3.1 and KOSTAT, 2019c), so the parallel trends assumption in expenditure is hard to be evaluated (Figure 3.7 (c) and (d)).

In addition, DD has some issues to be discussed as it identifies the ATT. Firstly, the pandemic has had more severe impacts on the vulnerable (Adams-Prassl et al., 2020; Dang et al., 2020; ILO & UNESCAP, 2020; Mongey et al., 2020; Oh & Lee, 2020; Sanchez et al., 2020), but the heterogeneous effects of the pandemic cannot be captured exactly through the ATT because it literally describes the average effect (Athey & Imbens, 2006; Yoon et al., 2012). Secondly, the ATT of a DD model can be affected by outliers. This chapter analyses household income and expenditure data in the KHIES, and these data have the right-skewed distributions due to outliers (Lee et al., 2021).

Changes-in-Changes: CC is one of the generalised DD approaches. A CC model estimates the counterfactual distribution of y_{11}^{c} based on the distributions of $y_{00}, y_{01}, and\ y_{10}$ because these three variables are observable (Athey & Imbens, 2006; Asteriou, Pilbeam & Sarantidis, 2019; Imbens & Wooldridge, 2007; Jung, Lee & Kim, 2013; Kottelenberg & Lehrer, 2017; Melly & Santangelo, 2015a).

CC has two key assumptions which are less restrictive than the assumptions of DD (Athey & Imbens, 2006; Jung et al., 2013; Kottelenberg & Lehrer, 2017; Lee et al.,

2021; Melly & Santangelo, 2015a). Firstly, in terms of identification strategy, CC assumes time invariance of the distribution of unobservables in each group between pre- and post-treatment in the absence of a treatment (the time invariance within groups assumption). In other words, the changes in the distribution of unobserved factors do not affect the changes in outcomes between pre- and post-treatment in each group. Therefore, CC can identify the changes in the outcomes of the control group as the time effects, and the changes in the treatment group as the treatment and time effects. Meanwhile, CC does not impose a restriction on the distribution of unobserved factors between groups. Secondly, CC assumes that higher unobservables correspond to strictly higher outcomes (the strict monotonicity assumption). This condition is important because CC utilises an inverse function to estimate the counterfactual distribution of y_{11}^{c}.

Table 3.3. DD and CC

	DD	CC
Assumptions	parallel trends between groups time invariance within groups	time invariance within groups strict monotonicity
Advantages	separating the ATT simple and convenient	less strict assumptions heterogeneous treatment effects robust to outliers
Limitations	stricter assumptions unsuitable for heterogeneous effects vulnerable to outliers	only strictly monotonic functions complicated

Source: Author's summary, Angrist & Pischke (2009), Athey & Imbens (2006), Cunningham (2021), and Yoon et al. (2012)

As can be seen in equation 3.3, a CC model estimates the distribution of y_{11}^{c} using the distributions of $y_{00}, y_{01}, and\ y_{10}$, which are observable. The counterfactual distribution of y_{11}^{c} can be estimated as $F_{y,01}^{-1}\left(F_{y,00}(y_{10})\right)$ (Athey & Imbens, 2006). $F_{y,it}$ is the cumulative distribution function (CDF) of y_{it} and F^{-1} is the inverse function of F.

$$\tau^{CiC} = E(y_{11}) - E(y_{11}^{c}) = E(y_{11}) - E[F_{y,01}^{-1}\left(F_{y,00}(y_{10})\right)] \qquad (3.3)$$

Note: F is the cumulative probability function and F^{-1} is the inverse function of F, subscript it: $i = 0$ for a control group and $i = 1$ for a treatment group, $t = 0$ for a pre-treatment period and $t = 1$ for a post-treatment period

A CC model has three advantages over a DD model. Firstly, CC does not require the parallel trends assumption and it can estimate the counterfactual distribution of y_{11}^{c} with a pre- and a post-treatment period data (Asteriou et al., 2019; Melly & Santangelo, 2015a). So, this chapter can estimate the effects of three critical shocks and the government measures using three separate two-year datasets despite the redesign of the KHIES. Secondly, CC can analyse a treatment effect at each quantile (e.g., 5%, 25%, 50%, 75%, and 95%), so it can identify the disproportionate effects of the crises. Lastly, CC estimates can be robust to outliers which generally exist in income and expenditure data. Therefore, CC can be a useful complement of DD and some researchers also have used CC to identify the effect of a treatment (Asteriou et al., 2019; Jung et al., 2013; Kottelenberg & Lehrer, 2017; Lee et al., 2021; Melly & Santangelo, 2015a; Roller & Steinberg, 2020; Valente, 2019). This chapter adopts the CC algorithm developed by Melly and Santangelo (2015b).

In addition, this chapter conducts quantile DD (Athey & Imbens, 2006; Kim, 2016; Villa, 2016). The results of quantile DD are generally similar to CC. Some estimates have different p-values (A3.3 in appendices) because quantile DD and CC adopt different approach to estimate the counterfactual distributions of y_{11}^{c} (Athey & Imbens, 2006). In addition, this chapter compares yearly changes in income and consumption expenditure (A3.4 in appendices).

This paragraph discusses the above assumptions of CC. Firstly, the time invariance within groups assumption is untestable because this assumption is related to

unobservables. This chapter designates a treatment and a control groups as the same quarters, respectively (e.g., a control group: the first quarters in 2019 and 2020; and a treatment group: the second quarters in 2019 and 2020) to minimise the potential effects of seasonality between different quarters (Figure 3.7). In addition, it conducts the Lasso to select more relevant control variables to control for more covariates. Secondly, due to the strict monotonicity assumption, this chapter cannot conduct a CC analysis on the social benefits directly. This is because the social benefits include means-tested benefits for low-income households (Table 3.4), so 75.4% of the Korean households had zero value of the social benefits in 2019. This means that the strict monotonicity assumption can be violated in the social benefits. Thus, this chapter regards the effects of the social benefits as the differences between disposable income and non-social benefits income.

3.4.3. Household income and consumption expenditure

Household income: This chapter calculates disposable income and then equivalises it by square root of household size. This disposable income includes wages, profit from self-employment, property income, private transfer income, and public transfer income, but it deducts direct taxes and social security contributions (Table 3.4). The OECD and the UN recommend using disposable income to reflect available financial resources for consumption and savings of a household (OECD, 2013; UN, 2011). Meanwhile the KHIES collects data at a household unit, so this chapter equivalises household income by square root of household size to consider economies of scale in consumption.

The social benefits: The social benefits in the KHIES include the relief, the NBLS benefit, the Employment Insurance benefit, and other means-tested benefits (Table 3.4). Therefore, the changes in the social benefits can capture additional response

measures of the Korean government in an economic downturn (Lim et al., 2016; Nam & Lee, 2021). Therefore, this chapter identifies (i) the negative impacts of economic shocks as the changes in non-social benefits income (non-social benefits income = disposable income - the social benefits) and (ii) the positive effects of government measures as the changes in the social benefits. This chapter will measure the effect of the social benefits as the difference between disposable income and non-social benefits income due to the strict monotonicity assumption of CC as mentioned in section 3.4.2.

Table 3.4. Income and consumption expenditure classification

Category	Components	Description
Income	Disposable income	wages, profit from self-employment, property income, private transfer, and public transfer (deducts direct taxes and social security contributions)
	Social benefits	Emergency Disaster Relief Funds, Employment Insurance benefit, NBLS benefit, and other public assistance
	Non-social benefits income	Disposable income – Social benefits
Consumption expenditure	Consumption expenditure	food, alcohol and tobacco, clothing, housing, home appliance, health, transport, communication, entertainment, education (public and private), restaurants, miscellaneous
	Essential consumption	food, housing, home appliance, health, transport, communication, education (public)
	Non-essential consumption	Consumption expenditure – Essential consumption expenditure

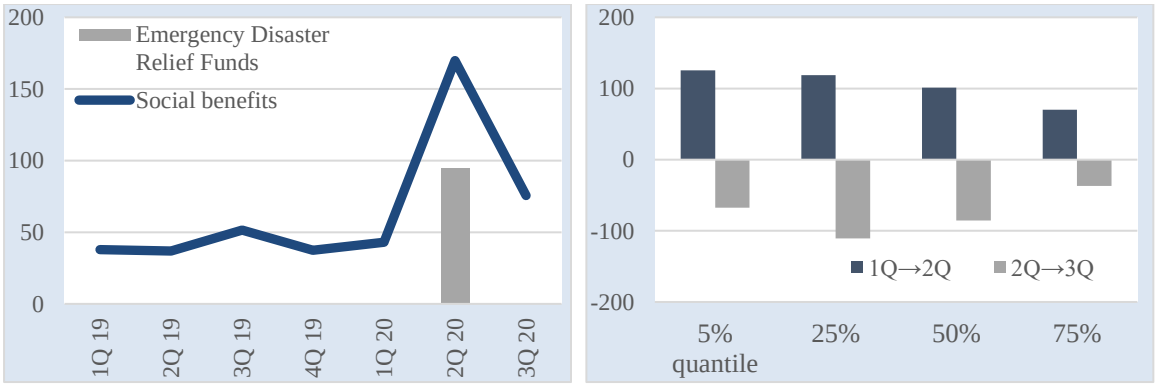
Note: Income and expenditure are equivalised by square root of household size; Source: Author's summary and KOSTAT (2019c)

Nearly 95 billion pounds of the relief accounted for 74.8% of the social benefits increment between the first quarter and the second quarter 2020 (Figure 3.8 (a) and KRILA, 2020; MOIS, 2020d). Since the relief was a one-off payment (Kim & Lee, 2020; Kim et al., 2020), the amount of the social benefits rapidly decreased in the next

quarter. Therefore, 5%, 25%, 50%, and 75% percentiles were faced with high volatility in household income around the relief payment (Figure 3.8 (b)). Therefore, this chapter will recognise that fluctuations in the social benefits during the COVID-19 pandemic are largely caused by the relief payment (Nam & Lee, 2021).

Household expenditure: This chapter also equivalises household consumption expenditure by square root of household size. And it separates consumption expenditure into essential consumption expenditure and non-essential consumption expenditure. The KHIES classifies consumption items into 12 categories (KOSTAT, 2019c). Among them, as can be seen in Table 3.4, essential consumption expenditure includes expenditure on food, housing, home appliance, health, transport, communication, and public education (Lee & Choi, 2015; Son, Kang & Jung, 2019).

Figure 3.8. Changes in the social benefits (billion GBP, GBP)



(a) Changes in the social benefits (b) Effects on household income

Note: (1) 1 GBP = 1,500 KRW, (2) (b) is the result of the CC analysis on the level of equivalised disposable income, (3) Income 95% percentile is excluded due to high standard error; Source: Author's calculation (KHIES microdata), KRILA (2020), and MOIS (2020d)

3.4.4. Poverty thresholds

This chapter uses both absolute and relative poverty thresholds to analyse the different trends of the deep poor and the poor. Firstly, as a deep poverty index, the absolute

poverty threshold is anchored at the first Korean official Minimum Cost of Living (MCL) surveyed in 1999 (KIHASA, 1999). It is adjusted by price changes of all 372 items which were included in the initial MCL as essential consumption items for the deep poor (KIHASA, 1999; KOSTAT, 2019a). Therefore, it can reflect the lifestyle of the deep poor. The absolute poverty threshold is equivalised by the OECD modified scale which was the same as the Korean official MCL equivalisation (MOHW, 2017).

Table 3.5. Multiple poverty thresholds

Poverty threshold	Description
Absolute poverty threshold	anchored at the initial MCL 1999 and adjusted by price changes in all 372 items (the MCL 1999 has 372 items and maintaining the same items and weights)
Relative poverty threshold	set at 50% of median equivalised disposable income (equal to the official statistics in Korea and the OECD)

Secondly, as a poverty index, the relative poverty threshold is set at 50% of median equivalised disposable income. It is the same criterion to the official poverty threshold for taking statistics in Korea (KOSTAT, 2019b), and the widely used approach to take poverty statistics internationally (OECD, 2013; UN, 2011).

3.4.5. Dependent, independent, and control variables

Dependent variables: This chapter defines the following four dependent variables: (i) equivalised disposable income, (ii) equivalised non-social benefits income, (iii) equivalised consumption expenditure, and (iv) equivalised essential consumption expenditure. This chapter conducts the CC analysis at 5%, 25%, 50%, 75%, and 95% percentiles in income and consumption expenditure. It allows us to identify whether this pandemic has delivered disproportionate impacts on the poor (Adams-Prassl et al., 2020;

Dang et al., 2020; ILO & UNESCAP, 2020; Mongey et al., 2020; Oh & Lee, 2020; Sanchez et al., 2020) and how much the government policies have affected each percentile (Brewer & Tasseva, 2020; Han et al., 2020; Martin et al., 2020). The bottom 5% in income can represent the recipients of the Livelihood Benefit (a cash benefit) of the NBLS, because the Livelihood Benefit covers approximately bottom 4-5% of low-income percentiles (Kim T. & Lee J., 2020).

All dependent variables are logged to compare the effects of the pandemic to the two previous crises, because each coefficient can be interpreted as a percentage change of an independent variable on a dependent variable (Hill et al., 2018; Wooldridge, 2012). Minus or zero figures are imputed to one to be logged.

Independent variables: The CC approach needs to adopt a group variable and a time variable (Melly & Santangelo, 2015b). Firstly, this chapter sets the control group at an earlier quarter and the treatment group at a later quarter. It can catch the short-term changes of the crises. Moreover, it can consider the seasonality in household income and consumption expenditure (Figure 3.7). This chapter compares three quarterly changes per crisis, such as: (i) from the fourth quarter 2019 (t-1) to the first quarter 2020 (t), (ii) from the first quarter (t) to the second quarter 2020 (t+1), and (iii) from the second quarter (t+1) to the third quarter 2020 (t+2) for the COVID-19 analysis. Secondly, this chapter sets the time dummy variable which has value of 0 before each crisis and 1 otherwise.

Control variables: This chapter also adopts control variables to control for observables. To select more relevant variables, this chapter conducts the Lasso (least absolute shrinkage and selection operator) and reviews nine potential variables (Belloni, Chernozhukov, Hansen & Kozbur, 2016; Lee & Hong, 2018; Tibshirani, 1996). It

conducts lasso linear command with plugin option in Stata (Stata Press, 2019) and selects five control variables: (i) householder age (*hage*), (ii) householder gender (*hgen*, dummy), (iii) householder educational attainment (*hedu*, dummy), (iv) the number of workers in a household (*workers*), and (v) the public pension receipt of a household (*pens*, dummy) (Table 3.6 and A3.1 in appendices).

Table 3.6. Control variables

Category	Variable	Description
House-holder	*hage*	age, years
	hgen	dummy, gender, 0=male, 1=female
	hedu	dummy, educational attainment, 0=below college, 1=college and over
Household	*workers*	persons, the number of worker(s) in a household
	pens	dummy, public pension receipt, 0=no receipt, 1=receipt

Note: The list of nine potential control variables and the result of the Lasso are in A3.1 in appendices

3.5. Findings

3.5.1. Characteristics of households in each crisis

Householder: Table 3.7 describes the characteristics of householders and households in the one-year period around each crisis. The KHIES has surveyed single households since 2006, so the figures of the Asian Financial Crisis express the characteristics of two or more member households (KOSTAT, 2019c). Firstly, the householder age increased from 42.2 years old during the Asian Financial Crisis to 52.4 years old during the COVID-19 pandemic due to population ageing in Korea. Secondly, the ratio of female householders increased from 0.14 to 0.28 because life expectancy of female (86.3 years) is longer than that of male (80.5 years) in 2021 (KOSTAT, 2021a). Thirdly, the

educational attainment of householders improved from 0.31 to 0.48 with the development of education system. Lastly, the employment rate of householders (1 – employment; an employed householder is coded as 0) declined from 89% to 81%.

Table 3.7. Characteristics of households in each crisis

		Asian Financial Crisis (3Q 1997 – 2Q 1998)	Global Financial Crisis (3Q 2008 – 2Q 2009)	COVID-19 pandemic (4Q 2019 – 3Q 2020)
Householder	Age (year)	42.24	49.41	52.35
	Gender (0=male)	0.14	0.28	0.28
	Education (0=below college)	0.31	0.36	0.48
	Employment (0=employed)	0.11	0.22	0.19
Household	Size (persons)	3.63	2.86	2.41
	Workers (persons)	1.44	1.25	1.26
	Public pension (0=no recipients)	0.02	0.13	0.21
	Basic Pension (0=no recipients)	0.00	0.22	0.21
Income (£, month, equivalised)	Disposable income	670.6	1,029.4	1,637.9
	Social benefits	1.8	17.6	88.7
Expenditure (£, month, equivalised)	Consumption expenditure	438.3	725.8	1,040.6
	Essential expenditure	279.9	453.7	648.4
Observations		27,695	31,221	24,867

Note: (1) 1 GBP = 1,500 KRW, (2) Weighted average, (3) Equivalence scale: square root of household size, (4) The KHIES has collected single households since 2006 (KOSTAT, 2019c); Source: Author's calculation (KHIES microdata)

Household: Firstly, the household size decreased from 3.63 to 2.41 due to the increase of single households (KOSTAT, 2021a). Secondly, the number of workers in a

household also decreased from 1.44 to 1.26 persons. Lastly, thanks to the expansion of the Korean welfare system, the coverage of public pension and the Basic Pension expanded from 0.0 to 0.2, respectively.

Income: Equivalised disposable income increased from £670.6 to £1,637.9 per month. And more importantly, the amount of the social benefits increased remarkably. To be specific, it was only £1.8 per month and 0.3% of equivalised disposable income during the Asian Financial Crisis. This is because the Korean government did not establish basic welfare programmes at the time (MOHW, 1998, 1999). During the Global Financial Crisis, the social benefits increased to £17.6 per month and 1.7% since the NBLS had been operated since 2000 (MOHW, 2020). Furthermore, these figures rose remarkably to £88.7 per month and 5.4% during the COVID-19 pandemic thanks to the relief (KOSTAT, 2020b; MOEF, 2020b).

Expenditure: Equivalised consumption expenditure increased from £438.3 to £1,040.6 per month. And equivalised essential consumption expenditure also increased from £279.9 to £648.4. The proportion of essential consumption expenditure in consumption expenditure was between 62% and 64%.

3.5.2. Effects on poverty

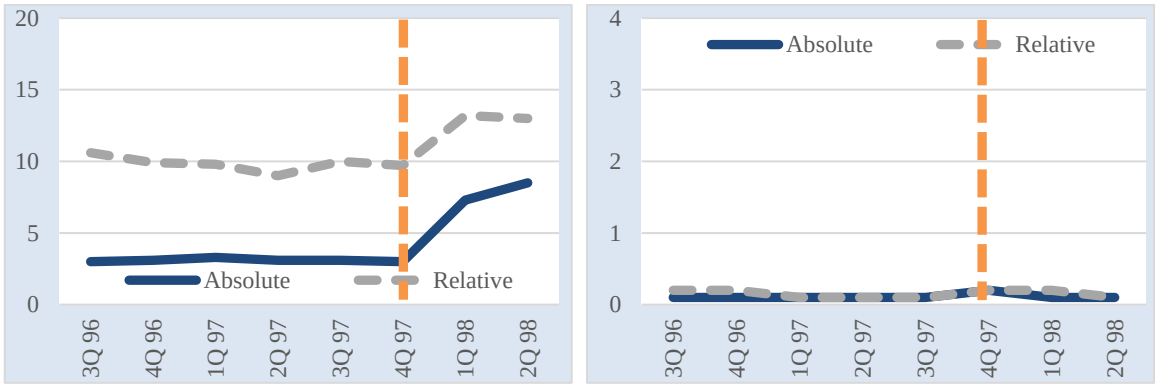
3.5.2.1. The Asian Financial Crisis

The relative poverty rate rose sharply from 9.7% in the fourth quarter 1997 to 13.2% in the first quarter 1998 and absolute poverty rate also increased from 3.0% to 7.3% (Figure 3.9 (a)). This is because the Asian Financial Crisis had unprecedented impacts on the Korean economy, so the economy shrunk rapidly in 1998 (Figure 3.3 and MOEF, 1999). Meanwhile, the KHIES did not include single households before 2006

(KOSTAT, 2019c), so the poverty rate could be underestimated compared to the following crises. This is because single households are more likely to be in poverty in Korea (Ku & Kim, 2020; Park & Kim, 2016).

However, the welfare system in Korea did not provide adequate benefits for the residents (MOHW, 1998, 1999). The anti-poverty effect of the social benefits can be measured as the difference between the actual poverty rate based on disposable income and the counterfactual poverty rate based on non-social benefits income (disposable income – the social benefits, Table 3.4). The anti-poverty effect remained at a very low level of 0.1-0.2%p in relative and absolute poverty (Figure 3.9 (b)).

Figure 3.9. Effects on the poverty rate (1): The Asian Financial Crisis (%, %p)



(a) Poverty rates (b) Anti-poverty effects of the social benefits

Note: (1) Orange dotted lines: the quarter when the crisis happened (t), (2) The anti-poverty effect = the non-social benefits income poverty rate - the disposable income (including the social benefits) poverty rate; Source: Author's calculation (KHIES microdata)

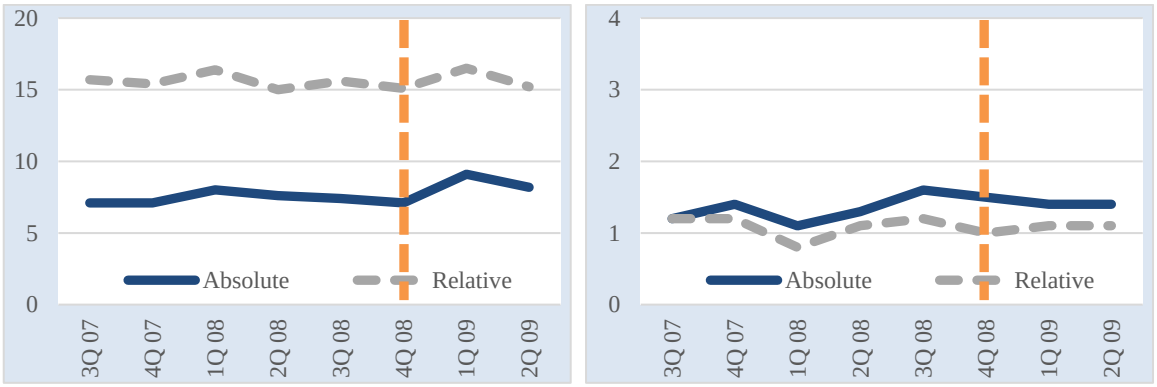
3.5.2.2. The Global Financial Crisis

The relative poverty rate increased from 15.1% in the fourth quarter 2008 to 16.5% in the first quarter 2009 and the absolute poverty rate also rose from 7.1% to 9.1% (Figure 3.10 (a)). These increments are smaller than the Asian Financial Crisis, because the Global Financial Crisis gave relatively endurable effects to the Korean economy (Figure 3.3 and Oh, 2020) and the economy could be recovered soon by substantial fiscal and

monetary measures (Kim, 2012; MOEF, 2009).

The anti-poverty effects of the social benefits were 1.1%p of relative poverty and 1.4%p of absolute poverty in the first quarter 2009 (Figure 3.10 (b)), and these figures are larger than the Asian Financial Crisis. This is because the NBLS was introduced in 2000 (MOHW, 2020), so poor households could have the NBLS benefit from the Korean government. In addition, these effects remained at a similar level approximately 1.0%p of relative poverty and 1.5%p of absolute poverty during the Global Financial Crisis (A3.2 in appendices). This is because the Korean government did not implement an additional large-scale benefit (e.g., the relief).

Figure 3.10. Effects on the poverty rate (2): The Global Financial Crisis (%, %p)



(a) Poverty rates (b) Anti-poverty effects of the social benefits

Note: (1) Orange dotted lines: the quarter when the crisis happened (t), (2) The anti-poverty effect = the non-social benefits income poverty rate - the disposable income (including the social benefits) poverty rate; Source: Author's calculation (KHIES microdata)

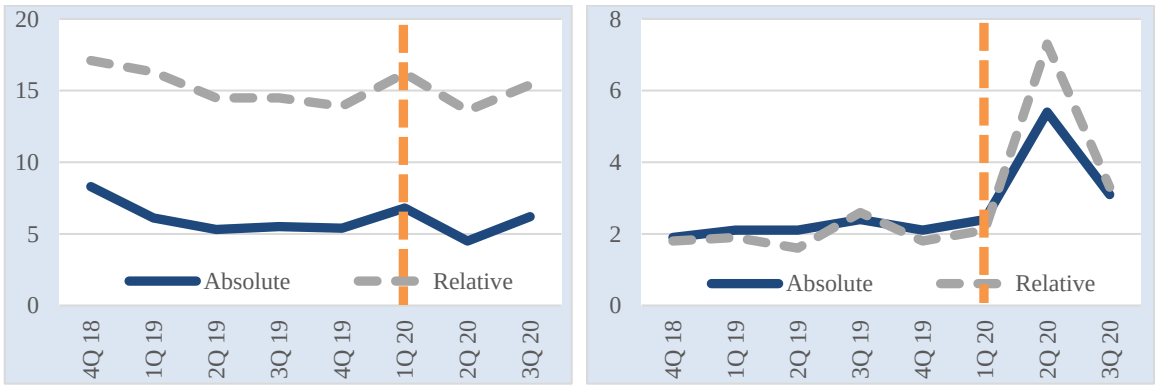
3.5.2.3. The COVID-19 pandemic

The pandemic has delivered prompt negative effects on poverty compared to the two previous crises (Figure 3.11 (a)). For example, during the previous crises, the poverty rate started increasing from the next quarter (t+1) of each shock (the first quarter 1998 in Figure 3.9 (a); and the first quarter 2009 in Figure 3.10 (a)). However, during the pandemic, the poverty rate increased in the initial quarter (t): the relative poverty rate

increased from 13.9% in the fourth quarter 2019 to 16.2% in the first quarter 2020, and the absolute poverty rate also rose from 5.4% to 6.8% (Figure 3.11 (a) and A3.2 in appendices). This is because the pandemic has brought more severe short-term impacts to the labour market than the two crises (MOEF, 2020e). To be specific, the number of temporary absence workers increased sharply (Figure 3.2 (b)) and female, young, elderly workers have been more likely to be in temporary absence (Oh & Lee, 2020; Park & Yoo, 2020; Yoo, 2020).

Whereas, in the second quarter 2020, the poverty rates temporarily improved due to the relief distribution since May 2020. To be specific, the relative poverty rate decreased from 16.2% in the first quarter 2020 to 13.6% in the second quarter 2020. The absolute poverty rate also declined from 6.8% to 4.5% in the same quarter. However, the relative and absolute poverty rates increased again in the third quarter.

Figure 3.11. Effects on the poverty rate (3): The COVID-19 pandemic (%, %p)



(a) Poverty rates (b) Anti-poverty effects of the social benefits

Note: (1) Orange dotted lines: the quarter when the crisis happened (t), (2) The anti-poverty effect = the non-social benefits income poverty rate - the disposable income (including the social benefits) poverty rate; Source: Author's calculation (KHIES microdata)

As illustrated in Figure 3.11 (b), the social benefits could not alleviate poverty threat in the first quarter 2020. For example, the anti-poverty effects slightly increased: from 1.8%p in the fourth quarter 2019 to 2.1%p in the first quarter 2020 of relative

poverty and from 2.1%p to 2.4%p of absolute poverty (A3.2 in appendices). These figures were much smaller than the poverty rate increments. However, the anti-poverty effects of the social benefits sharply increased in the second quarter 2020: from 2.1%p in the first quarter 2020 to 7.3%p in the second quarter 2020 of relative poverty and from 2.4%p to 5.4%p of absolute poverty. This implies that the government measures have had positive anti-poverty effects during the pandemic. The relief accounted for 74.8% of the social benefits increment in the second quarter 2020 (Figure 3.8 (a)), so the relief could largely contribute to this poverty reduction. In the third quarter, the anti-poverty effects sharply decreased to approximately 3%p on both poverty because the relief was a one-off payment (Kim & Lee, 2020; Kim et al., 2020) and 99% of the relief was distributed in May 2020 (KRILA, 2020; MOIS, 2020d).

In this regard, this paragraph discusses some limitations of the response measures. Firstly, the pandemic has the instant impacts on poverty, but the measures could not mitigate the initial poverty threat effectively. This is because introducing the relief took a long administrative process for design, discussion, approval, and distribution. Secondly, the positive effects were temporary in the second quarter 2020 and the relief generated high volatility since it was a one-off payment benefit (Kim & Lee, 2020; Kim et al., 2020). Lastly, during the pandemic, the anti-poverty effects remained at approximately 2-3%p except for the second quarter 2020 when the relief was distributed. This means that the current social security system without the relief in Korea still has played a limited role to mitigate poverty risk in the pandemic.

3.5.3. Effects on household income

3.5.3.1. The Asian Financial Crisis

In terms of the (1) Equivalised disposable income, all five income percentiles (5%, 25%, 50%, 75%, and 95%) commonly experienced statistically significant income reductions in the fourth quarter 1997 or the first quarter 1998 (Table 3.8). These effects were more severe on low-income percentiles, such as: (i) bottom 5% suffered the most serious income decrease by 33.4%, and (ii) 25% percentile faced 13.7% of income reduction in the first quarter 1998. In addition, high-income percentiles (95% and 75%) also experienced income decreases. This is because several large conglomerates and financial companies went into bankruptcy (MOEF, 1998, 1999), so some of high skilled and high educated workers lost their jobs. Moreover, this crisis left long-term effects (Oh, 2020). In the second quarter 1998, household income also declined at all percentiles, and it was significant at 50% percentile at the 10% level.

Table 3.8. Effects on household income (1): The Asian Financial Crisis

Dependent variable: (1) Disposable income (log) and (2) Non-social benefits income (log)						
Percentile	3Q 1997 → 4Q 1997		4Q 1997 → 1Q 1998		1Q 1998 → 2Q 1998	
	(1)	(2)	(1)	(2)	(1)	(2)
5%	0.011 [0.048]	0.009 [0.057]	-0.334*** [0.059]	-0.339*** [0.066]	-0.078 [0.095]	-0.091 [0.110]
25%	-0.027 [0.017]	-0.028 [0.018]	-0.137*** [0.020]	-0.135*** [0.018]	-0.033 [0.026]	-0.038 [0.025]
50%	-0.027* [0.016]	-0.027* [0.016]	-0.090*** [0.016]	-0.087*** [0.015]	-0.034* [0.019]	-0.038** [0.017]
75%	-0.024 [0.015]	-0.024 [0.017]	-0.053*** [0.016]	-0.052*** [0.016]	-0.023 [0.016]	-0.025 [0.015]
95%	-0.041* [0.024]	-0.040* [0.023]	0.021 [0.025]	0.020 [0.020]	-0.012 [0.025]	-0.012 [0.022]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)); Source: Author's calculation (KHIES microdata)

The effect of the social benefits can be measured as the difference between

changes in the income (1) and (2). In other words, we can understand that the social benefits have anti-poverty effects: if the income (1) which includes the social benefits decreases less than the income (2); or if the income (1) increases despite an income (2) reduction. These differences are very small, but only bottom 5% in the second quarter 1998 has a slightly larger difference than other income percentiles. This is because the Korean government did not have basic welfare programmes at the time (e.g., the NBLS was established in 2000), but it introduced a provisional livelihood security programme for the deep poor and distributed a cash benefit from April 1998 (MOHW, 1998, 1999).

3.5.3.2. The Global Financial Crisis

The income (1) decreased at all income percentiles in the first quarter 2009, and 25%, 50%, and 75% percentiles have statistically significant coefficients at the 10% level. Bottom 5% experienced the largest income (1) decrease by 12.2%, but it is not significant. These income reductions are much smaller than the Asian Financial Crisis. Moreover, the income (1) increased in the second quarter 2020, because the Global Financial Crisis had relatively manageable impacts on the Korean economy (Figure 3.3).

When it comes to the effects of the social benefits, the NBLS had been operated by the Korean government since 2000, so bottom 5% could alleviate their income reduction from 25.4% of the income (2) to 12.2% of the income (1) in the first quarter 2009. This gap is much higher than the Asian Financial Crisis. However, the other income percentiles have very small differences between the income (1) and (2). This is because the NBLS was designed as a strict means-testing programme (MOHW, 2020), so it covered only the deep poor. At the time, the Korean government preferred a means-tested benefit and was reluctant to introduce a universal transfer programme (Kim & Lee, 2020).

Table 3.9. Effects on household income (2): The Global Financial Crisis

Dependent variable: (1) Disposable income (log) and (2) Non-social benefits income (log)						
Percentile	3Q 2008 → 4Q 2008		4Q 2008 → 1Q 2009		1Q 2009 → 2Q 2009	
	(1)	(2)	(1)	(2)	(1)	(2)
5%	0.050 [0.068]	0.107 [0.096]	-0.122 [0.089]	-0.254** [0.103]	0.179 [0.111]	0.246 [0.169]
25%	-0.012 [0.022]	-0.013 [0.022]	-0.040* [0.023]	-0.041 [0.026]	0.028 [0.028]	0.030 [0.032]
50%	-0.011 [0.017]	-0.013 [0.017]	-0.031* [0.019]	-0.033* [0.017]	0.017 [0.018]	0.016 [0.021]
75%	-0.016 [0.018]	-0.015 [0.016]	-0.032* [0.018]	-0.035* [0.017]	0.011 [0.018]	0.011 [0.022]
95%	-0.019 [0.028]	-0.018 [0.026]	-0.028 [0.033]	-0.024 [0.026]	0.002 [0.028]	0.004 [0.026]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)); Source: Author's calculation (KHIES microdata)

3.5.3.3. The COVID-19 pandemic

COVID-19 delivered immediate negative effects on household income, so all percentiles faced income reductions in the first quarter 2020. This is because the pandemic has had severe short-term impacts on the labour market (MOEF, 2020e). However, it has disproportionate effects on the vulnerable (Nam & Cho, 2021; Oh & Lee, 2021; Song, 2021; Yoo, 2020). To be specific, firstly, in the first quarter 2020, bottom 5%, 25%, and 50% percentiles experienced more reductions in the income (1) and (2) than 75% and 95% percentiles. Secondly, the income (2) reduction at bottom 5% of 23.9% in the second quarter 2020 was much higher than other percentiles of 1-3% decrease. This implies that COVID-19 could give more critical effects to low-income percentiles (KOSTAT, 2020a; MOEF, 2020a).

Despite the immediate effects of the pandemic, the social benefits had limited

effects in the first quarter 2020. In other words, the coefficients of the income (1) and (2) had small differences except for bottom 5%. This implies that the current social security net could not sufficiently stabilise the initial impacts of the pandemic. In the second quarter 2020, the social benefits had positive effects on household income (KOSTAT, 2020b; MOEF, 2020b). Even though all income percentiles faced reductions in the income (2), their income (1) increased.

Table 3.10. Effects on household income (3): The COVID-19 pandemic

Dependent variable: (1) Disposable income (log) and (2) Non-social benefits income (log)						
Percentile	4Q 2019 → 1Q 2020		1Q 2020 → 2Q 2020		2Q 2020 → 3Q 2020	
	(1)	(2)	(1)	(2)	(1)	(2)
5%	-0.150 [0.096]	-0.093 [0.210]	0.262*** [0.099]	-0.239 [0.311]	-0.150* [0.079]	0.672 [0.496]
25%	-0.103*** [0.026]	-0.112*** [0.030]	0.128*** [0.028]	-0.026 [0.035]	-0.101*** [0.025]	0.033 [0.039]
50%	-0.068*** [0.020]	-0.063*** [0.024]	0.072*** [0.022]	-0.025 [0.022]	-0.057*** [0.020]	0.028 [0.021]
75%	-0.028 [0.024]	-0.026 [0.029]	0.037 [0.025]	-0.025 [0.025]	-0.017 [0.022]	0.033 [0.020]
95%	-0.005 [0.042]	-0.008 [0.045]	0.025 [0.038]	-0.013 [0.040]	0.047 [0.034]	0.069** [0.035]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)); Source: Author's calculation (KHIES microdata)

However, the positive effects have two limitations. Firstly, the income (1) significantly increased at 5%, 25%, and 50% percentiles, but it was insignificant at 75% and 95% percentiles. COVID-19 has had more severe effects on low-income percentiles. However, this relief was distributed for all households and the amount of benefit was proportionate to household size regardless of income (Korean government, 2020a; MOIS, 2020a). Consequently, its effects at top 95% and 75% percentiles were small and

insignificant in the second quarter 2020. This implies that the relief was not effective for high-income percentiles. Whereas the furlough benefit in the UK has more positive effects on middle-income households than high-income households as it was designed to have the benefit limit £2,500 per month (Brewer & Tasseva, 2020).

Secondly, the above positive effects were temporary, and it made high income volatility. For example, bottom 5%, 25% and 50% percentiles experienced significant income decreases by 15.0%, 10.1% and 5.7% in the third quarter 2020, respectively. This is because the relief was a one-off payment (Kim & Lee, 2020; Kim et al., 2020) and 99% of the relief was distributed in May 2020 (KRILA, 2020; MOIS, 2020d). Therefore, this relief led to high volatility in the social benefits during the COVID-19 pandemic. This means that the relief did not act as an economic stabiliser and it raised income fluctuations, so government measures need to be sustainable for the vulnerable.

3.5.4. Effects on household consumption expenditure

3.5.4.1. The Asian Financial Crisis

In terms of the (1) Equivalised consumption expenditure, the crisis had serious impacts on household consumption expenditure (Table 3.11). Firstly, all percentiles were faced with consumption reductions in the fourth quarter 1997. In addition, the Korean households reduced expenditure more than their income decrease. This is because households tend to reduce their expenditure from the initial stage of an economic depression to prepare potential further shocks (Baldwin & Mauro, 2020; Carlsson-Szlezak et al., 2020; Lee & Lee, 2020; Nam & Cho, 2021; Yoo, 2020). Moreover, top 95% also reduced their expenditure by 12.1% in the fourth quarter 1997. This implies that the Asian Financial Crisis had negative impacts at all percentiles. Secondly,

consumption expenditure at 5%, 25%, 50%, and 75% percentiles significantly decreased in the first quarter 1998, as well.

The expenditure (2) was more stable than the expenditure (1). However, the expenditure (2) significantly decreased at 5%, 25%, 50%, and 75% percentiles in the first quarter 1998. This is because the Korean government pronounced long-term restructuring plans of its economy (MOEF, 1998, 1999), so the Koreans were able to anticipate the long-lasting recession and would cut expenditure on essential items.

Table 3.11. Effects on household consumption expenditure (1): The Asian Financial Crisis

Dependent variable: (1) Consumption expenditure (log) and (2) Essential consumption expenditure (log)						
Percentile	3Q 1997 → 4Q 1997		4Q 1997 → 1Q 1998		1Q 1998 → 2Q 1998	
	(1)	(2)	(1)	(2)	(1)	(2)
5%	-0.044* [0.026]	0.028 [0.024]	-0.135*** [0.024]	-0.078*** [0.024]	-0.052 [0.034]	0.010 [0.034]
25%	-0.040** [0.016]	-0.008 [0.013]	-0.135*** [0.016]	-0.077*** [0.014]	-0.017 [0.019]	-0.001 [0.016]
50%	-0.035** [0.016]	0.002 [0.013]	-0.128*** [0.014]	-0.074*** [0.015]	-0.008 [0.016]	0.000 [0.015]
75%	-0.054*** [0.018]	0.013 [0.016]	-0.086*** [0.018]	-0.061*** [0.018]	-0.005 [0.017]	-0.015 [0.018]
95%	-0.121*** [0.044]	-0.082* [0.044]	0.019 [0.037]	0.053 [0.039]	-0.034 [0.036]	-0.026 [0.036]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)); Source: Author's calculation (KHIES microdata)

3.5.4.2. The Global Financial Crisis

This crisis had relatively soft shocks on the expenditure (1). Firstly, although the expenditure (1) decreased in the first two quarters at all percentiles (Table 3.12), their decrements are smaller than the Asian Financial Crisis. For example, 25% and 50%

percentiles decreased the expenditure (1) by 13.5% and 12.8% in the first quarter 1998 (during the Asian Financial Crisis), but the reductions alleviated to 7.8% and 6.4% in the first quarter 2009 (during the Global Financial Crisis), respectively. Secondly, the expenditure (1) increased significantly in the second quarter 2009.

Table 3.12. Effects on household consumption expenditure (2): The Global Financial Crisis

Dependent variable: (1) Consumption expenditure (log) and (2) Essential consumption expenditure (log)						
Percentile	3Q 2008 → 4Q 2008		4Q 2008 → 1Q 2009		1Q 2009 → 2Q 2009	
	(1)	(2)	(1)	(2)	(1)	(2)
5%	-0.012 [0.027]	-0.004 [0.024]	-0.106*** [0.027]	-0.083*** [0.026]	0.080*** [0.027]	0.092*** [0.031]
25%	-0.018 [0.016]	-0.025 [0.013]	-0.078*** [0.015]	-0.083*** [0.014]	0.063*** [0.018]	0.046*** [0.017]
50%	-0.017 [0.015]	-0.021* [0.013]	-0.064*** [0.014]	-0.064*** [0.013]	0.060*** [0.017]	0.055*** [0.017]
75%	-0.022 [0.016]	-0.022 [0.016]	-0.031* [0.017]	-0.020 [0.018]	0.054*** [0.020]	0.065*** [0.018]
95%	-0.038 [0.031]	-0.067* [0.038]	0.087** [0.034]	0.174*** [0.039]	0.013 [0.033]	0.044 [0.039]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)); Source: Author's calculation (KHIES microdata)

The changes in the expenditure (1) and (2) show relatively similar trends unlike the Asian Financial Crisis. At the time, inflation pressure on essential goods could have crucial impacts on the Korean consumer's behaviour (MOEF, 2009, 2010). For example, food price increased by 12.9%, and home appliance price also rose by 9.0% from 2007 to 2009 (KOSTAT, 2021a). Therefore, the Korean households could try to reduce their essential consumption as well as non-essential consumption.

3.5.4.3. The COVID-19 pandemic

This chapter cannot conduct the CC analysis on the expenditure (1) and (2) between the fourth quarter 2019 and the first quarter 2020 (Table 3.13) because the KHIES did not collect quarterly expenditure data in 2017 and 2018 (KOSTAT, 2019c). In other words, the pre-treatment dataset of the control group (expenditure data in the fourth quarter 2018) is not available.

Table 3.13. Effects on household consumption expenditure (3): The COVID-19 pandemic

Dependent variable: (1) Consumption expenditure (log) and (2) Essential consumption expenditure (log)				
Percentile	1Q 2020 → 2Q 2020		2Q 2020 → 3Q 2020	
	(1)	(2)	(1)	(2)
5%	0.162*** [0.031]	0.147*** [0.032]	-0.008 [0.028]	0.010 [0.030]
25%	0.107*** [0.022]	0.115*** [0.021]	0.003 [0.021]	-0.016 [0.019]
50%	0.086*** [0.020]	0.070*** [0.019]	0.014 [0.018]	0.037** [0.020]
75%	0.065*** [0.025]	0.064** [0.026]	0.017 [0.024]	0.028 [0.030]
95%	0.102 [0.063]	0.116** [0.053]	-0.025 [0.068]	-0.156 [0.094]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)), (4) This chapter cannot conduct the CC analysis between the fourth quarter 2019 and the first quarter 2020 because the KHIES did not collect quarterly expenditure data in 2017 and 2018, so the pre-treatment control group data (expenditure in the fourth quarter 2018) are not available; Source: Author's calculation (KHIES microdata)

Household consumption expenditure was expected to decrease in the first quarter 2020 (Nam & Cho, 2021; Nam & Lee, 2021; Yoo, 2020). Due to the first wave of the pandemic, consumption expenditure decreased compared to the first quarter 2019 (KOSTAT, 2020a; MOEF, 2020a). In the second quarter 2020, the expenditure (1) increased at all percentiles because 90% of the relief which distributed as a credit/debit card deposit was spent in this quarter (KDI, 2020; MOIS, 2020d). In the third quarter,

the expenditure (1) increased at 25%, 50% and 75%, but the figures were not significant.

The trends of the expenditure (1) and (2) are similar. The first reason is that the relief had similar effects among consumption items. For example, the relief increased expenditure of most consumption items by 10-20% similarly (Hong, 2020). Secondly, the pandemic and social distancing could have tangible effects on consumer's behaviour (Kim & Oh, 2020).

However, the government measures have two limitations. Firstly, consumption increased significantly in the second quarter 2020, but the increments diminished and insignificant in the third quarters 2020. This is because the relief was a one-off payment (Kim & Lee, 2020; Kim et al., 2020) and most of the relief was spent in the second quarter (KDI, 2020; MOIS, 2020d). Secondly, it seems that the relief cannot prevent the consumption reduction at the initial stage of the pandemic (Lee & Lee, 2020; Yoo, 2020). This is because the relief took a long administrative process to be implemented.

3.5.5. Further analysis: Effects of COVID-19 on vulnerable groups

3.5.5.1. Vulnerable groups: female, young, and elderly households

The pandemic and social distancing measures have delivered more negative effects on female, young, and elderly workers in Korea (Kim H., 2020; Oh & Lee, 2020, Park & Yoo, 2020). This is because they are more likely to be employed in physical proximity sectors (Oh, 2020; Song, 2021; Yoo, 2020). Other specific changes can also have more negative impacts on the vulnerable groups. Firstly, female workers can be worse affected by school closure because females usually take care of their children (Kim, 2021; Song, 2021). Secondly, the young generation tends to be struggling to enter the labour market due to decreased recruitment caused by the pandemic (MOEF, 2020e).

Lastly, the elderly suffered more negative effects from the pandemic because they are clinically vulnerable to the transmission risk. Therefore, this chapter conducts CC on the three vulnerable groups to identify further policy implications.

This paragraph defines the above vulnerable groups. Firstly, a female household is that its householder is a female. Secondly, a young household is one whose head is aged below 35. This age threshold considers the average first marriage age (male: 33.23, female: 30.78 in 2020) and the legal age definition of youth (between 19 and 34) in Korea (Framework Act on the Youth 2020, Article 3; Kim & Chio, 2017; KOSTAT, 2021a). Lastly, an elderly household is one whose head is aged 65 and over. This age criterion is the same as that in the official statistics and the legal age threshold of the Basic Pension in Korea (Basic Pension Act 2020, Article 3; KOSTAT, 2019c).

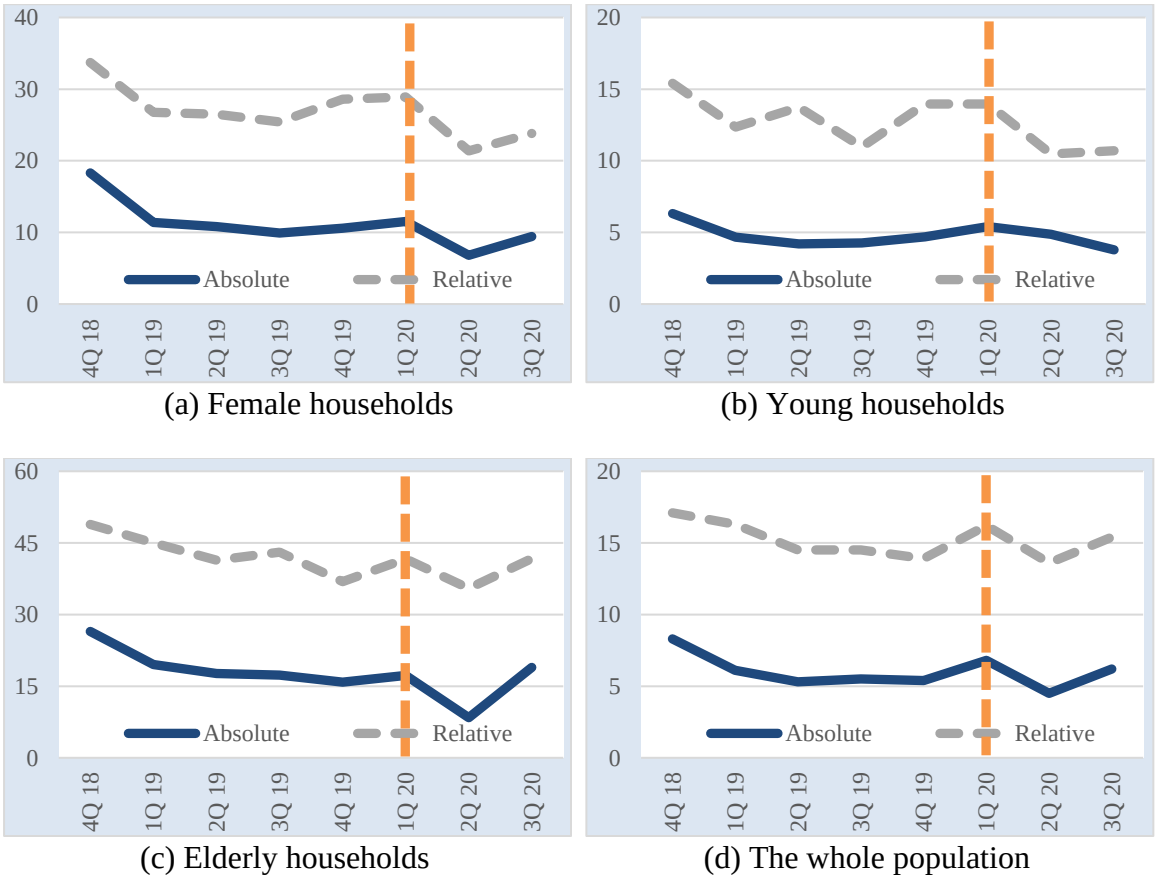
3.5.5.2. Effects on poverty

Female households: The poverty rate of female households is higher than that of the whole population (Figure 3.12) because females generally have a weak position in the labour market (Marchand & Smeeding, 2016; Seok & Kim, 2012; Yeo, 2019). Due to the pandemic, the relative poverty rate of female households increased from 28.6% in the fourth quarter 2019 to 28.9% in the first quarter 2020, and their absolute poverty rate also rose from 10.6% to 11.5%. The relief had positive anti-poverty effects, for example: the relative poverty rate decreased from 28.9% in the first quarter 2020 to 21.4% in the second quarter 2020, and the absolute poverty rate also reduced from 11.5% to 6.8%. However, in the third quarter 2020, the relative poverty rate increased to 23.8% and the absolute poverty rate rose to 9.4% because the relief was a one-off payment.

Young households: The absolute poverty rate of young households increased

from 4.7% in the fourth quarter 2019 to 5.4% in the first quarter 2020, but the relative poverty rate of young households remained at 14.0% in the two quarters. In the second quarter 2020, the relief positively reduced the poverty rate, such as: the relative poverty rate decreased from 14.0% in the first quarter 2020 to 10.5% in the second quarter 2020, and the absolute poverty rate also declined from 5.4% to 4.9%. Young households showed resilience from the pandemic in the third quarter 2020 when the relative poverty rate remained at a similar level and the absolute poverty rate decreased to 3.8%.

Figure 3.12. Effects on the poverty rate (4): The COVID-19 pandemic, vulnerable groups (%)



(a) Female households (b) Young households

(c) Elderly households (d) The whole population

Note: (1) orange dotted lines: the quarter when the crisis happened (t), (2) female households whose heads are female, (3) young households whose heads are aged between below 35, (4) elderly households whose heads are aged 65 and over; Source: Author's calculation (KHIES microdata)

Elderly households: The poverty rate of elderly households is much higher than that of the whole population (Figure 3.12) because of the insufficient public pension

system in Korea (OECD, 2018; Yeo, 2019). Due to the pandemic, the relative poverty rate of elderly households increased from 36.9% in the fourth quarter 2019 to 41.6% in the first quarter 2020, and the absolute poverty rate rose from 15.8% to 17.3%. The relief had temporary anti-poverty effects, so the relative poverty rate decreased rapidly from 41.6% in the first quarter 2020 to 35.5% in the second quarter 2020, and the absolute poverty rate also declined from 17.3% to 8.4%. However, in the third quarter 2020, the relative poverty rate increased to 41.7% and the absolute poverty rate also rose to 18.9%.

3.5.5.3. Effects on household income

Female households: Table 3.14 describes the result of the CC analysis at the median equivalised disposable income of the three vulnerable groups. Female households suffered more severe impacts (-9.5%) from the pandemic than the whole population (-6.8%) in the first quarter 2020. The income (1) increased by 13.5% in the second quarter 2020 due to the relief, but the income (1) reduced by 8.5% in the third quarter 2020. This indicates that female households faced high volatility in household income after the relief payment.

Young households: Young households suffered more with the income (1) reduction of 16.3% in the first quarter 2020. The severe economic impacts and economic uncertainty arising from the pandemic may be leading to reduction in the marriage and fertility rates of the young generation (Kim, Kim, Park & Lee, 2020). Preliminary studies also point out a similar possibility in other developed economies (Aassve, Cavalli, Mencarini, Plach & Bacci, 2020; Voicu & Bădoi, 2021). This issue is more critical in Korea because the total fertility rate in Korea was 0.84 in 2020 (KOSTAT, 2021a) and it was already the lowest level in the world in 2019 (UN, 2020b).

The relief also had positive effects on young households in the second quarter 2020, and they were more resilient to the pandemic than the whole population in the third quarter.

Elderly households: Elderly households also suffered from severe impacts of the pandemic. The income (1) decreased by 9.9% in the first quarter 2020. The relief had positive effects and the income (1) increased by 11.9% in the second quarter 2020. However, they experienced a severe income (1) reduction of 13.2% in the third quarter.

Table 3.14. Effects on household income (4):
The COVID-19 pandemic, vulnerable groups

Dependent variable: (1) Disposable income (log) and (2) Non-social benefits income (log)						
	4Q 2019 → 1Q 2020		1Q 2020 → 2Q 2020		2Q 2020 → 3Q 2020	
	(1)	(2)	(1)	(2)	(1)	(2)
Female	-0.095* [0.049]	-0.092** [0.045]	0.135** [0.056]	-0.005 [0.058]	-0.085* [0.046]	0.051 [0.065]
Young	-0.163*** [0.052]	-0.154** [0.063]	0.101** [0.051]	-0.017 [0.063]	-0.008 [0.052]	0.087 [0.072]
Elderly	-0.099** [0.043]	-0.113** [0.050]	0.119** [0.052]	-0.039 [0.058]	-0.132*** [0.050]	0.029 [0.056]
All	-0.068*** [0.020]	-0.063*** [0.024]	0.072*** [0.022]	-0.025 [0.022]	-0.057*** [0.020]	0.028 [0.021]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)), (4) CC at 50% percentile, (5) Female: female households, young: young households, Elderly: elderly households, and All: the whole population, (6) The female households analysis excludes household gender from control variables; Source: Author's calculation (KHIES microdata)

3.5.5.4. Effects on household consumption expenditure

Table 3.15 describes the result of the CC analysis at the median equivalised consumption expenditure of each group. This analysis cannot compare consumption expenditure between the fourth quarter 2019 and the first quarter 2020. This is because the KHIES did not collect quarterly expenditure data in 2017 and 2018, so this analysis

cannot construct the pre-treatment data of the control group (the fourth quarter of 2018).

Female households: The expenditure (1) increase of female households (11.0%) was higher than the whole population (8.6%) in the second quarter 2020. The first reason is that low-income households generally spent a higher portion of the relief than high-income households (Kim & Oh, 2020; Lee et al., 2021; Nam & Cho, 2021), and the average equivalised disposable household income of female households (£1,375.3) was lower than that of the whole households (£1,650.5) in the second quarter 2020. Secondly, households who had more negative impacts from the pandemic tended to spend more of the relief benefit (Gim et al., 2021). In the first quarter 2020, female households suffered a greater income (1) decrease (9.5%) than the whole population (6.8%), and they increased consumption in the second quarter owing to the relief. Lastly, the income (1) of female households increased (13.5%) more than the whole population (7.2%) in the second quarter 2020 by the relief (Table 3.14), so the relief could facilitate more consumption of female households.

Young households: Consumption expenditure of young households increased in the second quarter 2020, but this increase was not statistically significant (Table 3.15) and the level of increment (7.8%) was lower than the whole population (8.6%). This is because the number of young stock investors (age 20-29) increased remarkably by 180% from 382 thousand in 2019 to 1.1 million in 2020 (Korea Securities Depository [KSD], 2020, 2021). This implies that young households utilised the relief to invest for future consumption. In addition, a stock market boom could induce more investment of young households, for example: the Korea Composite Stock Price Index, which is a representative stock market index in Korea, sharply increased from 1,457.64 in March 2020 to 3,266.23 in January 2021 (KOSTAT, 2021a).

Table 3.15. Effects on household consumption expenditure (4): The COVID-19 pandemic, vulnerable groups

Dependent variable: (1) Consumption expenditure (log) and (2) Essential consumption expenditure (log)				
	1Q 2020 → 2Q 2020		2Q 2020 → 3Q 2020	
	(1)	(2)	(1)	(2)
Female	0.110*** [0.040]	0.079** [0.044]	0.023 [0.032]	0.045 [0.036]
Young	0.078 [0.055]	0.033 [0.075]	0.017 [0.051]	0.083 [0.056]
Elderly	0.100** [0.046]	0.110** [0.049]	0.023 [0.040]	0.045 [0.051]
All	0.086*** [0.020]	0.070*** [0.019]	0.014 [0.018]	0.037** [0.020]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)), (4) CC at 50% percentile, (5) Female: female households, young: young households, elderly: elderly households, and All: the whole population, (6) The female households analysis excludes household gender from control variables, (7) This chapter cannot conduct the CC analysis between the fourth quarter 2019 and the first quarter 2020 because the KHIES did not collect quarterly expenditure data in 2017 and 2018, so the pre-treatment control group data (expenditure in the fourth quarter 2018) are not available; Source: Author's calculation (KHIES microdata)

Elderly households: Elderly households showed a higher consumption expenditure increase (10.0%) than the whole population (8.6%) in the second quarter 2020. The reasons seem to be similar to female households. Firstly, the average equivalised disposable household income of elderly households (£1,157.8) was much lower than that of the whole households (£1,650.5) in the second quarter 2020, so elderly households tended to spend more of the relief benefit than the whole population (Kim & Oh, 2020; Lee et al., 2021; Nam & Cho, 2021). Secondly, elderly households experienced a larger income (1) reduction of 9.9% than the whole population of 6.8% in the first quarter 2020, so the relief could facilitate more consumption for elderly households (Gim et al., 2021). Lastly, the income (1) of elderly households increased by 11.9% in the second quarter, which was higher than that of the whole population (7.2%). Therefore, elderly households could spend a larger portion of the relief than the whole

population.

3.5.5.5. Effects on health and education expenditure

Health expenditure: The pandemic could have significant effects on health expenditure. The health expenditure in the KHIES includes health service (e.g., out-patient services) and medical consumables (e.g., face masks). The pandemic has had the opposite effects on the two components.

Table 3.16. Effects on household consumption expenditure (5): The COVID-19 pandemic, health expenditure

Dependent variable: Health expenditure (log)		
Percentile	1Q 2020 → 2Q 2020	2Q 2020 → 3Q 2020
5%	0.984 [0.659]	0.589 [0.555]
25%	0.126* [0.074]	0.147** [0.064]
50%	0.111** [0.056]	0.055 [0.052]
75%	-0.022 [0.071]	0.006 [0.053]
95%	0.097 [0.090]	-0.004 [0.079]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)), (4) This chapter cannot conduct the CC analysis between the fourth quarter 2019 and the first quarter 2020 because the KHIES did not collect quarterly expenditure data in 2017 and 2018, so the pre-treatment control group data (expenditure in the fourth quarter 2018) are not available; Source: Author's calculation (KHIES microdata)

Firstly, out-patient care spending slightly decreased from £50.9 in 2019 to £49.9 in 2020 per month (KOSTAT, 2021b) because of the concern about contagion risk in hospitals (MOHW, 2021). Secondly, expenditure on medical consumables rapidly increased from £5.2 in 2019 to £13.4 in 2020 per month (KOSTAT, 2021b), as the Korean government has urged wearing a face mask since January 2020 (KDCA, 2020d).

Consequently, health expenditure generally increased in the second and third quarters 2020 (Table 3.16). Also, the trend of health expenditure has no distinct differences among the five percentiles. This is because the National Health Service in Korea covered 99% of residents and 1.5 million of the deep poor could have the Medical Benefit of the NBLS in 2019 (KOSTAT, 2021a), so the residents could access the healthcare service.

Education: The COVID-19 pandemic can have effects on education expenditure for children due to school closure. Therefore, a CC analysis was conducted on education expenditure which includes tuition fees and other costs for nurseries, receptions, primary schools, secondary schools, and private education institutes (e.g., cram schools). This section sets the age threshold of a child as 19, which is the graduation age from secondary school in Korea, and it adds the number of children as a control variable.

Due to social distancing measures, the Korean government has imposed school closure or attendance rate restrictions (e.g., 1/3 or 2/3 of capacity), so schools have provided online classes or mixed classes (physical and online classes) (CDSCH, 2020; Kim, 2021; MOE, 2020a, 2020b). Some papers point out that vulnerable students could experience difficulties in having an adequate educational environment (Lee, 2021; Park M., 2020). Education expenditure has had disproportionate effects on the five percentiles, for example: 25% and 50% percentiles show high volatility, whereas 75% and 95% percentiles have stable changes (Table 3.17). This implies that the pandemic has brought more severe effects to poor households (KOSTAT, 2021a). Therefore, COVID-19 have widened the education gap between high-income and low-income students (Seoul Education Policy Institute [SEPI], 2021).

Table 3.17. Effects on household consumption expenditure (6):
The COVID-19 pandemic, education expenditure

Dependent variable: Education expenditure for children (log)		
Percentile	1Q 2020 → 2Q 2020	2Q 2020 → 3Q 2020
5%	0.000 [0.000]	0.000 [0.000]
25%	-4.913*** [1.876]	4.611*** [1.669]
50%	-0.225 [0.154]	0.240 [0.205]
75%	0.004 [0.117]	0.160** [0.078]
95%	0.051 [0.140]	0.059 [0.094]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)), (4) This analysis added the number of children as a control variable, (5) This chapter cannot conduct the CC analysis between the fourth quarter 2019 and the first quarter 2020 because the KHIES did not collect quarterly expenditure data in 2017 and 2018, so the pre-treatment control group data (expenditure in the fourth quarter 2018) are not available; Source: Author's calculation (KHIES microdata)

To sum up, firstly, the government measures had positive effects on household income of the vulnerable groups in the second quarter 2020, but they faced considerable income decreases in the third quarter. Secondly, the relief had positive effects on consumption expenditure of female and elderly households, but it did not have significant effects on young households. Instead, the number of young stockholders increased sharply between 2019 and 2020 (KSD, 2020, 2021). Lastly, health expenditure rose due to increased medical consumables consumption (e.g., face masks) and education expenditure has had disproportionate effects on poor households.

3.6. Conclusion

The COVID-19 pandemic has had severe impacts on public health and economy (ILO, 2020a; OECD, 2020b; UN, 2020a). At the same time, it made policy makers pay more their attention to the welfare system and its limitations (ILO & UNESCAP, 2020; No, 2020). This could provide an important opportunity to review the welfare system in crisis (Baldwin & Mauro, 2020; Brodeur, Gray, Islam & Bhuiyan, 2020; LePan, 2020). For example, as happened in 2000, the Korean government introduced the NBLS as a backbone of public assistance system after the Asian Financial Crisis (MOHW, 2020). Thus, this chapter analyses the effects of the pandemic and the government measures on poverty, household income, and household consumption expenditure to find policy implications.

To be specific, firstly, this chapter establishes the two poverty thresholds and conducts the CC analysis at 5%, 25%, 50%, 75%, and 95% percentiles of household income and consumption expenditure to identify the disproportionate effects of the pandemic. Secondly, this chapter examines the effects of the pandemic on the vulnerable groups (female, young, and elderly households). Thirdly, it compares the effects of pandemic to those of the Asian Financial Crisis 1997-1998 and the Global Financial Crisis 2008-2009. Lastly, it separates (i) the impacts of each crisis as the changes in non-social benefits income (disposable income - the social benefits) and (ii) the positive effects of government measures as the changes in the social benefits.

Effects on poverty: The pandemic has immediate negative effects on the poverty rate in the first quarter 2020. This is because the pandemic delivered severe short-term impacts on the labour market compared to the two previous crises (MOEF, 2020e). However, the existing social security net could not mitigate the initial poverty threat. In the second quarter 2020, the poverty rate decreased due to the relief distribution.

However, the poverty rate deteriorated again in the third quarter 2020 because the relief was a one-off payment (Kim et al., 2020; Kim & Lee, 2020).

Effects on income: The pandemic has had more negative effects on low-income households and the vulnerable groups. The Korean government distributed the relief which was a universal programme (Kim B., 2020; MOIS, 2020a) and its benefit was proportionate to household size regardless of income (Korean government, 2020a). In the second quarter, household income increased at all income percentiles, but high-income percentiles (75% and 95%) had insignificant effects. Moreover, low-income percentiles (5%, 25% and 50%) and the vulnerable groups were faced with an income decrease in the third quarter 2020 as the relief was a one-off benefit (Kim & Lee, 2020; Kim et al., 2020).

Effects on consumption expenditure: Even though this chapter could not analyse the initial consumption changes due to lack of data availability (KOSTAT, 2020a), consumption expenditure was expected to decrease in the first quarter 2020 (KOSTAT, 2020a; MOEF, 2020a). The relief could not alleviate the initial consumption shrink because of the administrative process in design, approval, and distribution. In the second quarter 2020, consumption expenditure increased thanks to the relief distribution (Gim et al., 2021; KDI, 2020; Lee et al., 2021). However, this effect was temporary since the relief was designed as a one-off payment (Kim & Lee, 2020; Kim et al., 2020).

In addition, the consumption expenditure of young households did not increase significantly in the second quarter 2020. Instead, the number of young stockholders (age 20-29) rapidly increased by 180% between 2019 and 2020 (KSD, 2020, 2021). In terms of education expenditure, the pandemic has had disproportionate effects, and it can worsen education inequality between high-income and low-income households (Lee,

2021; Park M., 2020; SEPI, 2021).

Implications: The COVID-19 pandemic has brought disproportionate and instant damage to the Korean economy, but the response measures could not alleviate the shock sufficiently. This is because the existing social security net (except for the relief) has played a limited role during the pandemic. In addition, the relief had only temporary positive effects on poverty, income, and consumption.

The first issue with the relief is its coverage and the amount of benefit. The COVID-19 pandemic has brought harder impacts to low-income households and the vulnerable groups, so a means-tested benefit could be more efficient than a universal transfer (Han et al., 2020; IMF, 2021a; OECD, 2020b; Sanchez et al., 2020; UN, 2020a). However, the relief was designed as a universal programme (Kim B., 2020; MOIS, 2020a) and the amount of benefit was only related to household size not income (Korean government, 2020a). Consequently, it had insignificant effects at top 95% and 75% percentiles in the second quarter 2020. Therefore, the government assistance should be more concentrated on economically vulnerable groups. An income criterion (e.g., initial design of the relief in Korea) or a benefit limit (e.g., the furlough scheme in the UK) can be a useful option.

Secondly, immediate and sustainable measures are more required than a discretionary one-off payment, so improving the current welfare system can be a feasible option. A country which has well-developed social security net can better respond to crises (ILO, 2020a). This is because welfare system can act as a countercyclical stabiliser in an economic downturn. However, the relief could not prevent the initial economic shocks in the first quarter 2020 (KOSTAT, 2020a; MOEF, 2020a) due to administrative process. In addition, the relief had temporary positive

effects, but it also delivered high income volatility to low-income households and the vulnerable groups. Expanding the current system can be a feasible alternative to provide a timely and persistent remedy (Chang, 2020; No, 2020; OECD, 2020a).

Thirdly, unlike the two previous crises, the number of temporary absence workers sharply increased (KOSTAT, 2020a; MOEF, 2020e; Oh, 2020) during the COVID-19 pandemic. However, the government job retention scheme covered only 22% of them in 2020 (KEIS, 2021; KOSTAT, 2021a). Financial support needs to focus on those who most damaged to alleviate their negative impacts more effectively. Furthermore, in the long term, only 40% of temporary absence workers can return to their office (Park & Yoo, 2020). This implies that the pandemic can have long-lasting negative effects on the labour market. Therefore, more active employment policies are required to stabilise these effects (Kim H., 2020).

The last issue is potential long-term impacts on the pupils. During the Asian Financial Crisis 1997-1998, the young generation found it hard to get a job, and they are still suffering from difficulties in employment, earnings, and marriage (Choi et al., 2020). During the COVID-19 pandemic, education inequality has been one of the most crucial issues. This is because vulnerable students are often difficult to have an appropriate educational environment, so education disparities can be widening (Lee, 2021; Park M., 2020; SEPI, 2021). Therefore, the reducing educational disparity should be one of the most important issues to be focused upon.

Limitations: This chapter analyses the effects of the pandemic and the government measures using the KHIES. However, it has some limitations. Firstly, the KHIES does not separate the relief from other benefits in the social benefits (KOSTAT, 2019c), so the chapter cannot clearly divide the effects of the relief on poverty, income,

and consumption expenditure. Secondly, the KHIES did not collect quarterly expenditure data in 2017 and 2018 (KOSTAT, 2019c), so it was not possible to conduct the CC analysis on consumption expenditure between the fourth quarter 2019 and the first quarter 2020.

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Appendices

A3.1. The Lasso (least absolute shrinkage and selection operator) linear regression

A3.1.1. Potential variables

Category	Name	Description
Householder	*hage*	age, years
	i.hgen	dummy, gender, 0=male, 1=female
	i.hwork	dummy, employment status, 0=employed, 1=unemployed (including economically inactive status)
	i.hedu	dummy, educational attainment, 0=below college, 1= college and over
Household	*size*	the number of household member(s)
	workers	the number of worker(s) in a household
	i.old	dummy, old household, 0=householder aged below 65, 1=householder aged 65and over
	i.pens	dummy, public pension receipt, 0=no receipt, 1=receipt
	i.bpens	dummy, the Basic Pension receipt, 0=no receipt, 1=receipt
	cons	a constant term

A3.1.2. The result of the Lasso linear regression

Category	Name	Income	Expenditure	Decision
Householder	*hage*	0.14	0.17	Selected
	0.hgen	0.02	0.02	Selected
	0.hwork	0.21	0.01	(workers)
	0.hedu	-0.24	-0.21	Selected
Household	*size*	-0.16	-0.10	(workers)
	workers	0.31	0.12	Selected
	0.old	0.12	0.18	(hage)
	0.pens	-0.13	-0.05	Selected
	0.bpens	-0.01	-	dropped
	cons	0.00	0.00	

Note (1) *hwork* is correlated with *workers* (corr=-0.59), (2) *size* is correlated with *workers* (corr=0.42) and considered when equivalised income and consumption expenditure, (3) *old* is correlated with *hage* (corr=0.71), (4) *bpens* is dropped in expenditure model

A3.2. Poverty thresholds and poverty rates

A3.2.1. The Asian Financial Crisis

	Poverty thresholds		Poverty rates					
			Absolute			Relative		
	Absolute	Relative	Dispos-able income (1)	Non-social benefits income (2)	Anti-poverty effects (2)-(1)	Dispos-able income (1)	Non-social benefits income (2)	Anti-poverty effects (2)-(1)
3Q 1996	190.9	323.4	3.0	3.1	0.1	10.6	10.9	0.2
4Q 1996	190.9	310.2	3.1	3.1	0.1	9.9	10.1	0.2
1Q 1997	200.3	324.0	3.3	3.4	0.1	9.8	9.9	0.1
2Q 1997	200.3	314.3	3.1	3.2	0.1	9.0	9.1	0.1
3Q 1997	200.3	339.7	3.1	3.2	0.1	10.0	10.1	0.1
4Q 1997	200.3	316.3	3.0	3.2	0.2	9.7	9.8	0.2
1Q 1998	214.0	297.5	7.3	7.4	0.1	13.2	13.4	0.2
2Q 1998	214.0	275.4	8.5	8.6	0.1	13.0	13.0	0.1

Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds, (3) The absolute poverty thresholds: anchored at the initial MCL 1999 and adjusted by price changes in 372 items (the MCL 1999 has 372 items and maintaining the same items and weights), (4) The relative poverty thresholds: set at 50% of median equivalised disposable income, (5) Non-social benefits income = disposable income – the social benefits, (6) The anti-poverty effect = the non-social benefits income poverty rate - the disposable income (including the social benefits) poverty rate; Source: Author's calculation (KHIES microdata)

A3.2.2. The Global Financial Crisis

	Poverty thresholds		Poverty rates					
			Absolute			Relative		
	Absolute	Relative	Dispos-able income (1)	Non-social benefits income (2)	Anti-poverty effects (2)-(1)	Dispos-able income (1)	Non-social benefits income (2)	Anti-poverty effects (2)-(1)
3Q 2007	293.9	476.3	7.1	8.4	1.2	15.7	16.9	1.2
4Q 2007	293.9	476.0	7.1	8.6	1.4	15.4	16.7	1.2
1Q 2008	307.8	490.8	8.0	9.1	1.1	16.4	17.1	0.8
2Q 2008	307.8	479.9	7.6	8.9	1.3	15.0	16.1	1.1
3Q 2008	307.8	499.0	7.4	9.0	1.6	15.6	16.8	1.2
4Q 2008	307.8	489.3	7.1	8.6	1.5	15.1	16.1	1.0
1Q 2009	326.9	488.4	9.1	10.5	1.4	16.5	17.5	1.1
2Q 2009	326.9	484.6	8.2	9.6	1.4	15.2	16.4	1.1

Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds, (3) The absolute poverty thresholds: anchored at the initial MCL 1999 and adjusted by price changes in 372 items (the MCL 1999 has 372 items and maintaining the same items and weights), (4) The relative poverty thresholds: set at 50% of median equivalised disposable income, (5) Non-social benefits income = disposable income – the social benefits, (6) The anti-poverty effect = the non-social benefits income poverty rate - the disposable income (including the social benefits) poverty rate; Source: Author's calculation (KHIES microdata)

A3.2.3. The COVID-19 pandemic

	Poverty thresholds		Poverty rates					
			Absolute			Relative		
	Absolute	Relative	Dispos-able income (1)	Non-social benefits income (2)	Anti-poverty effects (2)-(1)	Dispos-able income (1)	Non-social benefits income (2)	Anti-poverty effects (2)-(1)
4Q 2018	421.4	686.8	8.3	10.2	1.9	17.1	18.9	1.8
1Q 2019	431.7	760.3	6.1	8.2	2.1	16.3	18.2	1.9
2Q 2019	431.7	746.8	5.3	7.5	2.1	14.5	16.1	1.6
3Q 2019	431.7	773.9	5.5	7.9	2.4	14.5	17.1	2.6
4Q 2019	431.7	775.9	5.4	7.5	2.1	13.9	15.7	1.8
1Q 2020	438.9	771.0	6.8	9.1	2.4	16.2	18.4	2.1
2Q 2020	438.9	805.7	4.5	9.9	5.4	13.6	20.8	7.3
3Q 2020	438.9	786.6	6.2	9.3	3.1	15.4	18.7	3.3

Note: (1) 1 GBP = 1,500 KRW, (2) Monthly poverty thresholds, (3) The absolute poverty thresholds: anchored at the initial MCL 1999 and adjusted by price changes in 372 items (the MCL 1999 has 372 items and maintaining the same items and weights), (4) The relative poverty thresholds: set at 50% of median equivalised disposable income, (5) Non-social benefits income = disposable income – the social benefits, (6) The anti-poverty effect = the non-social benefits income poverty rate - the disposable income (including the social benefits) poverty rate; Source: Author's calculation (KHIES microdata)

A3.3. The results of CC and quantile DD

A3.3.1. Effects on household income (1): The Asian Financial Crisis

Dependent variable: Equivalised disposable income (log)

Percentile	3Q 1997 → 4Q 1997		4Q 1997 → 1Q 1998		1Q 1998 → 2Q 1998	
	CC	DD	CC	DD	CC	DD
5%	0.011 [0.048]	-0.043 [0.040]	-0.334*** [0.059]	-0.248*** [0.048]	-0.078 [0.095]	-0.138** [0.055]
25%	-0.027 [0.017]	-0.027 [0.019]	-0.137*** [0.020]	-0.129*** [0.019]	-0.033 [0.026]	-0.059*** [0.021]
50%	-0.027* [0.016]	-0.020 [0.016]	-0.090*** [0.016]	-0.083*** [0.016]	-0.034* [0.019]	-0.043** [0.017]
75%	-0.024 [0.015]	-0.020 [0.016]	-0.053*** [0.016]	-0.072*** [0.017]	-0.023 [0.016]	-0.021 [0.017]
95%	-0.041* [0.024]	-0.068** [0.029]	0.021 [0.025]	-0.018 [0.030]	-0.012 [0.025]	-0.029 [0.032]

Note: (1) Coefficients and standard errors (in square brackets), (2) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (3) CC: Bootstrapped 100 times per dependent variable (default in the algorithm developed by Melly and Santangelo (2015b)); Source: Author's calculation (KHIES microdata)

A3.3.2. Effects on household income (2): The Global Financial Crisis

Dependent variable: Equivalised disposable income (log)

Percentile	3Q 2008 → 4Q 2008		4Q 2008 → 1Q 2009		1Q 2009 → 2Q 2009	
	CC	DD	CC	DD	CC	DD
5%	0.050 [0.068]	-0.058 [0.045]	-0.122 [0.089]	-0.173*** [0.046]	0.179 [0.111]	0.078 [0.056]
25%	-0.012 [0.022]	-0.027 [0.021]	-0.040* [0.023]	-0.043** [0.021]	0.028 [0.028]	-0.008 [0.022]
50%	-0.011 [0.017]	-0.016 [0.017]	-0.031* [0.019]	-0.048*** [0.018]	0.017 [0.018]	0.018 [0.017]
75%	-0.016 [0.018]	-0.039** [0.020]	-0.032* [0.018]	-0.021 [0.019]	0.011 [0.018]	0.007 [0.020]
95%	-0.019 [0.028]	-0.021 [0.031]	-0.028 [0.033]	-0.036 [0.033]	0.002 [0.028]	0.000 [0.033]

Note: The same to A3.3.1.; Source: Author's calculation (KHIES microdata)

A3.3.3. Effects on household income (3): The COVID-19 pandemic

Dependent variable: Equivalised disposable income (log)

Percentile	4Q 2019 → 1Q 2020		1Q 2020 → 2Q 2020		2Q 2020 → 3Q 2020	
	CC	DD	CC	DD	CC	DD
5%	-0.150 [0.096]	-0.158** [0.077]	0.262*** [0.099]	0.149* [0.080]	-0.150* [0.079]	-0.137** [0.066]
25%	-0.103*** [0.026]	-0.080*** [0.026]	0.128*** [0.028]	0.079*** [0.028]	-0.101*** [0.025]	-0.082*** [0.025]
50%	-0.068*** [0.020]	-0.061*** [0.023]	0.072*** [0.022]	0.059*** [0.023]	-0.057*** [0.020]	-0.059*** [0.021]
75%	-0.028 [0.024]	-0.072*** [0.023]	0.037 [0.025]	0.058** [0.025]	-0.017 [0.022]	-0.056** [0.022]
95%	-0.005 [0.042]	-0.078* [0.045]	0.025 [0.038]	-0.027 [0.046]	0.047 [0.034]	0.015 [0.043]

Note: The same to A3.3.1.; Source: Author's calculation (KHIES microdata)

A3.3.4. Effects on household consumption expenditure (1): The Asian Financial Crisis

Dependent variable: Equivalised consumption expenditure (log)

Percentile	3Q 1997 → 4Q 1997		4Q 1997 → 1Q 1998		1Q 1998 → 2Q 1998	
	CC	DD	CC	DD	CC	DD
5%	-0.044* [0.026]	-0.075*** [0.028]	-0.135*** [0.024]	-0.156*** [0.027]	-0.052 [0.034]	-0.078*** [0.027]
25%	-0.040** [0.016]	-0.055*** [0.017]	-0.135*** [0.016]	-0.133*** [0.016]	-0.017 [0.019]	-0.024 [0.017]
50%	-0.035** [0.016]	-0.048*** [0.015]	-0.128*** [0.014]	-0.125*** [0.015]	-0.008 [0.016]	-0.014 [0.015]
75%	-0.054*** [0.018]	-0.054*** [0.017]	-0.086*** [0.018]	-0.109*** [0.018]	-0.005 [0.017]	-0.008 [0.018]
95%	-0.121*** [0.044]	-0.127*** [0.040]	0.019 [0.037]	-0.038 [0.038]	-0.034 [0.036]	-0.086** [0.036]

Note: The same to A3.3.1.; Source: Author's calculation (KHIES microdata)

A3.3.5. Effects on household consumption expenditure (2): The Global Financial Crisis

Dependent variable: Equivalised consumption expenditure (log)

Percentile	3Q 2008 → 4Q 2008		4Q 2008 → 1Q 2009		1Q 2009 → 2Q 2009	
	CC	DD	CC	DD	CC	DD
5%	-0.012 [0.027]	-0.054* [0.029]	-0.106*** [0.027]	-0.092*** [0.031]	0.080*** [0.027]	0.013 [0.034]
25%	-0.018 [0.016]	-0.021 [0.017]	-0.078*** [0.015]	-0.100*** [0.016]	0.063*** [0.018]	0.052*** [0.017]
50%	-0.017 [0.015]	-0.028* [0.016]	-0.064*** [0.014]	-0.080*** [0.016]	0.060*** [0.017]	0.052*** [0.016]
75%	-0.022 [0.016]	-0.017 [0.017]	-0.031* [0.017]	-0.049*** [0.018]	0.054*** [0.020]	0.044** [0.018]
95%	-0.038 [0.031]	-0.057* [0.034]	0.087** [0.034]	0.040 [0.034]	0.013 [0.033]	0.003 [0.033]

Note: the same to A3.3.1.; Source: Author's calculation (KHIES microdata)

A3.3.6. Effects on household consumption expenditure (3): The COVID-19 pandemic

Dependent variable: Equivalised consumption expenditure (log)

Percentile	1Q 2020 → 2Q 2020		2Q 2020 → 3Q 2020	
	CC	DD	CC	DD
5%	0.162*** [0.031]	0.122*** [0.040]	-0.008 [0.028]	-0.057 [0.035]
25%	0.107*** [0.022]	0.082*** [0.025]	0.003 [0.021]	0.012 [0.024]
50%	0.086*** [0.020]	0.098*** [0.022]	0.014 [0.018]	-0.008 [0.021]
75%	0.065*** [0.025]	0.061*** [0.023]	0.017 [0.024]	0.001 [0.024]
95%	0.102 [0.063]	0.097 [0.067]	-0.025 [0.068]	-0.065 [0.062]

Note: (1) – (3) the same to A3.3.1., (4) This study cannot conduct CC and DD analyses between the fourth quarter 2019 and the first quarter 2020 because the KHIES did not collect quarterly expenditure data in 2017 and 2018, so the pre-treatment control group data (expenditure in the fourth quarter 2018) are not available.; Source: Author's calculation (KHIES microdata)

A3.4. Year-on-year comparison

A3.4.1. The Asian Financial Crisis

		3Q (t-1)			4Q (t)		
		1996	1997	Diff.	1996	1997	Diff.
Income	Disposable income	699.5	740.7	41.2	680.9	687.2	6.3
	Social benefits	2.0	2.4	0.4	1.8	2.0	0.2
	Non-social benefits income	697.6	738.3	40.7	679.1	685.2	6.1
Consumption expenditure	Consumption expenditure	447.6	482.9	35.3	460.8	457.9	-2.8
	Essential consumption	265.9	281.8	15.9	255.7	263.1	7.4
	Non-essential consumption	181.7	201.1	19.4	205.1	194.9	-10.2
		1Q (t+1)			2Q (t+1)		
		1997	1998	Diff.	1997	1998	Diff.
Income	Disposable income	718.6	656.7	-61.9	690.8	601.9	-88.9
	Social benefits	2.1	1.0	-1.1	1.7	1.3	-0.4
	Non-social benefits income	716.5	655.7	-60.8	689.2	600.7	-88.5
Consumption expenditure	Consumption expenditure	481.6	432.4	-49.2	463.5	394.2	-69.3
	Essential consumption	278.0	261.9	-16.1	254.4	229.6	-24.7
	Non-essential consumption	203.6	170.5	-33.1	209.1	164.6	-44.5

Note: Diff. = the figures in a former year – the figures in a later year; Source: Author's calculation (KHIES microdata)

A3.4.2. The Global Financial Crisis

		3Q (t-1)			4Q (t)		
		2007	2008	Diff.	2007	2008	Diff.
Income	Disposable income	1,051.6	1,105.2	53.6	1,046.3	1,082.2	35.9
	Social benefits	14.3	15.6	1.3	14.5	16.6	2.1
	Non-social benefits income	1,037.2	1,089.6	52.3	1,031.9	1,065.6	33.8
Consumption expenditure	Consumption expenditure	447.6	482.9	35.3	460.8	457.9	-2.8
	Essential consumption	265.9	281.8	15.9	255.7	263.1	7.4
	Non-essential consumption	181.7	201.1	19.4	205.1	194.9	-10.2
		1Q (t+1)			2Q (t+1)		
		2008	2009	Diff.	2008	2009	Diff.
Income	Disposable income	1,097.9	1,096.0	-1.8	1,054.8	1,055.7	0.9
	Social benefits	12.7	14.5	1.8	14.7	16.1	1.4
	Non-social benefits income	1,085.2	1,081.5	-3.6	1,040.1	1,039.6	-0.5
Consumption expenditure	Consumption expenditure	807.4	779.9	-27.4	743.8	753.2	9.4
	Essential consumption	472.2	458.5	-13.6	403.7	410.9	7.1
	Non-essential consumption	335.2	321.4	-13.8	340.1	342.3	2.2

Note: Diff. = the figures in a former year – the figures in a later year; Source: Author's calculation (KHIES microdata)

A3.4.3. The COVID-19 pandemic

		4Q (t-1)			1Q (t)		
		2018	2019	Diff.	2019	2020	Diff.
Income	Disposable income	1,521.1	1,722.1	201.0	1,701.6	1,743.8	42.2
	Social benefits	32.7	41.8	9.0	42.2	48.9	6.7
	Non-social benefits income	1,488.4	1,680.3	191.9	1,659.4	1,694.9	35.5
Consumption expenditure	Consumption expenditure	-	1,112.7	-	1,160.3	1,094.4	-65.9
	Essential consumption	-	625.2	-	671.0	679.1	8.1
	Non-essential consumption	-	487.5	-	489.3	415.3	-74.0
		2Q (t+1)			3Q (t+2)		
		2019	2020	Diff.	2019	2020	Diff.
Income	Disposable income	1,667.8	1,749.0	81.3	1,701.2	1,730.1	28.9
	Social benefits	41.0	191.9	150.9	56.1	85.4	29.3
	Non-social benefits income	1,626.8	1,557.1	-69.7	1,645.1	1,644.6	-0.5
Consumption expenditure	Consumption expenditure	1,070.7	1,093.3	22.6	1,126.8	1,111.7	-15.0
	Essential consumption	576.5	646.8	70.3	643.4	680.9	37.4
	Non-essential consumption	494.2	446.5	-47.7	483.3	430.8	-52.5

Note: (1) Diff. = the figures in a former year – the figures in a later year; (2) The KHIES did not collect quarterly expenditure data in 2017 and 2018; Source: Author's calculation (KHIES microdata)