

# Empirical Study of Multidimensional Poverty and Well-being: Evidence from Japan

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Empirical Study of Multidimensional Poverty and  
Well-being: Evidence from Japan

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## -Abstract-

A decreasing trend of extreme poverty has prevailed worldwide because of worldwide economic growth and international efforts at poverty reduction such as the Millennium Development Goals (MDGs) advocated by the United Nations. Nevertheless, as many researchers have pointed out, the benefits of growth have not been equally distributed. Consequently, globalization has been raising inequality and poverty in economically developed countries. According to recent OECD statistics, the relative poverty ratios of most OECD countries have increased from the mid-1980s to the mid-2010s.

Economists and policymakers have long been interested in income distribution, partially because changes in income disparity and poverty are expected to affect numerous social outcomes such as national health, educational achievement, social mobility, trust, and crime. Reducing excessive income disparity and poverty is the consensus choice of policy for building a harmonious society.

Nevertheless, as Amartya Sen pointed out with his capability approach, inequality and poverty include multidimensional aspects. In reality, shortages of nonmonetary factors such as leisure time spent with family members and social relations in society sometimes play a more important role in human well-being than monetary factors such as income. Therefore, for poverty analysis, nonmonetary dimensions such as time and social relations should be regarded as important dimensions.

Based on the problem consciousness explained above, this dissertation presents an investigation of multidimensional poverty and well-being in Japan. Specifically, it presents the following assessments: (1) what multiple poverty situations people are facing, along with socioeconomic factors, influence people's well-being and daily activities; (2) what socioeconomic factors affect multidimensional poverty including the time dimension; and (3) whether higher education can truly reduce the risk of multidimensional poverty.

This dissertation comprises six main chapters. Chapter 1 describes recent trends of inequality and poverty around the world and, after reviewing earlier reports of the relevant literature, presents research objectives and the potential contributions of this dissertation. Additionally, it provides a theoretical framework for the analysis of multidimensional poverty and well-being in Japan.

Chapter 2 measures the multidimensional poverty index based on the method used by Alkire and Foster (2011a) using individual data from the Japanese Study of Stratification, Health, Income, and Neighborhood (J-SHINE; 2010, 2012). After setting

three dimensions of poverty (income, living time, and social inclusion), the index presents multidimensional poverty effects on key health indicators of self-rated health (SRH) and psychological distress (K6), while controlling other important variables. Results obtained from the analysis confirm the practical relevance of multidimensional poverty for predicting health indicators.

Chapter 3 describes an examination of the relations between income and time poverty, and physical activities, using the household micro-dataset in Japan. The estimation results obtained from econometric models reveal that time poverty is closely associated with low frequency of reading and short duration of sleeping. Indeed, analysis results show differences between women and men. For men, individuals who are deprived in two dimensions of poverty tend not to participate in sports. In addition, lack of leisure time might prevent them from actively reading, while getting less sleep. For women, time poverty is an important determinant of visiting interesting places and reading actively.

Chapter 4 presents estimation of the socioeconomic causes of interdependent multidimensional (IMD) poverty by considering two interdependent dimensions: income and leisure time. Using panel data from a Japan Household Panel Survey (JHPS2011-JHPS2014), this chapter presents specific quantification of the degree of substitution between income and leisure time via the estimation of CES-utility function, following the methodology provided by Merz and Rathjen (2014). After the quantification, we examine socioeconomic factors that influence each IMD poverty regime. Results suggest that not a few single-parent households confront interdependent multidimensional poverty. In addition, full-time employed couples with preschool children particularly confront IMD poverty, using their incomes to compensate for their time deficit.

Chapter 5 investigates the effects of university enrollment and graduation on interdependent multidimensional poverty. Using the analytical method called propensity score matching, we examine the true effects of college entrance and graduation on the risks of income poverty and IMD poverty. Estimation results suggest a poverty reduction effect of a college degree for men for both income poverty and IMD poverty. However, for women, the effect of a college degree on IMD poverty reduction is much weaker than in the case of men. It can be considered that the difficulty of work–life balance and low wage levels of female workers affect the results for Japan.

Chapter 6 presents a summary and conclusions of this dissertation. The conclusions support the view that multiple dimensions of poverty are more closely associated with people's well-being such as self-rated health and physical activities. Particularly, the time dimension plays an extremely important role in Japan because not a few groups are regarded as time poor. Policy implications are suggested based on empirical evidence.

# Chapter 1: Introduction

## 1.1 Current Status of Inequality and Poverty

Thomas Hobbes (1651) argued that nations act selfishly just as human beings do. Each country has been driven continuously by the pursuit of power and wealth during past centuries. Fortunately, many countries in the world have enjoyed their golden ages of growth since World War II. Herculean efforts for postwar reconstruction led to great development, particularly in Western European and eastern Asian countries. By virtue of that global economic growth, most world citizens have become richer than ever. However, as every coin has two sides, the benefits of global growth have not been equally distributed. That imbalance has raised social issues such as inequality and poverty.

A recent OECD study has revealed that the income gap separating the top 10 percent and the bottom 10 percent among OECD countries is now at its highest level in the past 30 years (OECD, 2011a). Figure 1-1 presents the Gini coefficients (a representative measure of inequality) of most OECD countries, which have grown more than 2 percentage points from the mid-1980s to the mid-2010s, although only Turkey has posted a decreasing level of Gini coefficient. Today, the richest 10% of the population in the OECD area earn 9.5 times more than the poorest 10% (OECD, 2011a).

Economists and policymakers have long been interested in income distribution, partly because changes in income disparity are expected to affect numerous social outcomes such as national health, educational achievement, social mobility, trust, and crime (Wilkinson and Pickett, 2007; Bagchi and Svejnar, 2015). Reducing excessive income disparity is the consensus choice of policy for building a harmonious society. Economists who have specifically examined rising income inequality have already identified some important factors related to the trend: technological change, growth of financial services, changing pay norms, reduced roles of trade unions, and scaling back of redistributive tax-and-transfer policies (Atkinson, 2015). Recently, Piketty (2014) provided a new perspective: inequality is not an accident but is instead the result of a feature of capitalism. He pointed out in his book “Capital in the 21st Century” that the rate of return on capital ( $r$ ) is constantly greater than the rate of economic growth ( $g$ ). Piketty (2014) also argued that the change in global inequality has depended primarily on technological progress such as the IT revolution of the leading economically developed countries and its prevalence among all the countries of the world.



## 1.2 Globalization and Poverty

Many researchers who agree with Piketty and Lee's ideas associate them with the relation that prevails among globalization, inequality, and poverty. They endorse the idea that globalization positively affects income inequality and poverty (Lee, 2014). However, the relations between globalization, income inequality, and poverty are complex. Not a few researchers have argued that globalization promotes economic growth and poverty reduction, although widespread criticisms exist.

Libertarians assert that the process of globalization actually provided excellent opportunities for humankind to contribute to the decline of poverty around the world during the past several decades. Figure 1-2 presents the trend of the headcount ratio which represents extreme poverty. The World Bank uses the poverty line defined as the "\$1.9-a-day" at 2011 PPP level. This extreme or absolute poverty line represents the share of the population living on expenditures of less than US\$1.9 per day. As the figure shows, eastern Asia and Pacific countries show strong performance related to poverty reduction. In the past two decades, the region reduced the population in poverty by 56.7 percentage points, down to 3.5 percent. The level approaches the World Bank's global target of 3.0 percent in 2030. The reduction is largely explained by the economic growth of China. Eastern Europe and Central Asia have maintained a slow but steady decline in the headcount ratio to around 2 percent. Poverty estimates in southern Asia indicate substantial progress, particularly in the five years up to 2013. Poverty reduction in southern Asia has been driven mainly by India's economic growth (World Bank, 2016).

Not a few workers in economically developing countries such as China and India have found new jobs because of expanding foreign trade and investment. In addition, poor people can newly access capital. They have more opportunities to learn new skills. The globalization process opens markets, spreads knowledge of advanced technology, and expands the division of labour, which also improves wages and incomes for people in these regions. Consequently, extreme poverty has declined dramatically in economically developing countries through integration of the global economy. They have reduced their extreme poverty by slashing protective tariffs and by increasing their participation in world trade.

However, it is somewhat complex to describe the benefits of globalization in economically developed regions, where there are almost no extremely poor people. The reasons for opposition to globalization are related mainly to three aspects of its impact: (1) the fragility of valued local and indigenous cultures in society facing the onslaught of global mass production and cultural homogenization, (2) the economic devastation of

billions of dollars of volatile short-term capital stampeding around the globe in herd-like crushes, and (3) the losses of jobs, wages, and incomes of poorer people to competitive international trade and foreign investment, along with the weakening ability of the state to compensate for this damage and to alleviate poverty (Bardhan, 2006).

Therefore, a salient concern of globalization's critics is its impact on rising inequality in economically developed countries. As shown in Figure 1-1, inequality has risen in most OECD countries in the past three decades. In recent years, wage differences between skilled workers and unskilled workers have been growing, or between regular workers and non-regular workers in economically developed countries. How can globalization change the form of income distribution? Atkinson (2015) emphasized that through the enlargement of globalization, advanced economies face increased competition with immigrants from countries where wages of unskilled workers are lower. Industries that rely heavily on unskilled workers find it difficult to continue to compete within the country. As a result, jobs are lost or outsourced to lower-wage countries. However, globalization increases demand for higher-educated workers. Therefore, a handful of highly skilled workers in economically developed countries can obtain more money, reflecting production shifts towards high-skill sectors. Atkinson's theory can partially clarify the reasons underlying rising inequality and poverty in economically developed countries.

### 1.3 Inequality and Poverty in Japan

Regarding inequality and poverty, this dissertation primarily addresses the Japanese experience. The analysis related to Japan is of particular interest, not only because Japan caught up with other economically developed countries within a very short time and became the world's second largest economy after the WW II, but also because its dramatic change of industrial structure has given rise to several pressing social issues even now. As Piketty (2014) emphasized, understanding the current circumstances of expanding inequality and poverty in representative countries can help us to derive and clarify reasons underpinning increasing inequality and poverty throughout the world.

Many Japanese people agreed with the idea that Japan was an egalitarian society until the late 1980s. However, income inequality has increased since the beginning of the 1990s as a consequence of the economic bubble and its eventual collapse, in addition to other rapid social changes such as its aging population and declining birthrate (Tachibanaki, 2009). Japan is now confronting poverty and income inequality, which both pose severe social problems just as they do in other economically developed countries.

Actually, the OECD reported in recent years that Japan has high rates of relative poverty, which is defined as a state in which the household income is at a level below half of the median of equilibrated income (OECD, 2016a). Figure 1-3 shows that Japan's relative poverty rate is 16%: sixth among all OECD members. With 16 percent of children (age 0–17) and 14 percent of working-generation (age 18–64) living in poverty, groups such as children and the working generation are confronting poverty risks in Japan along with elderly people.

“Working poor” is a neologism describing a phenomenon by which people are unable to realize an acceptable livelihood despite being employed as workers. The “working poor” phenomenon often occurs among irregular workers, who now account for approximately one-third of the nation's workers in Japan. In addition, Abe (2008) claimed that approximately one in every 6.5 children is living in relative poverty now. What is worrisome is the replication of poverty as children from low-income families are unable to benefit from higher education and other cultural resources. Because child poverty is partly attributable to the existence of single parent families, and because the poverty rate of single-parent households in Japan is now the highest among OECD nations, the government must ensure access to high-quality childcare, particularly to compensate for increasingly common circumstances of single parenthood. In doing so, it can help to break the cycle of disadvantage from one generation to the next. According to OECD data (2016b), childcare costs for single parents vary among OECD countries. In Japan, childcare costs for a lone parent account for over 20% of net income, although the United States spends over half of income on childcare costs (Figure 1-4). Moreover, childcare costs for a dual-earner couple in Japan claims more income than the OECD average. The Japanese government improved its child-raising support payment (called “*kodomo teate*” in Japanese) from 2011. Some examples are that government provides ¥15,000 per month for each child under age three for Japanese or foreign parents who are living with their children in Japan. Nevertheless, some large cities such as Tokyo are facing a severe shortage of day care centers for young children. Consequently, it is still necessary to take more political action for child support systems to help employees to raise children in Japan.

Many studies have examined changes in income inequality and the factors that have brought about these changes. The various causes of income inequality and poverty in Japan can be summarized by two main factors: (1) endogenous factors such as reforms of the wage system (Uni, 2008a; Uni, 2008b), non-regularization of employment (Ota, 2005; Tachibanaki and Urakawa, 2006), population aging (Ohtake, 2003), and others; and (2) exogenous factors such as a demand shift towards skilled labour and changes in relative

factor prices by trade (Sakurai, 2000; Sakurai, 2004) (Figure 1-5).

Regarding the poor working generation, Tachibanaki and Urakawa (2006) described that the type of household most affected by the rise in unstable employment has been single-person households of working age, which is a main cause of rising poverty. Ota (2005) and Uni (2008a) also presented the view that poverty in Japan's young generation is mainly attributable to the effects of a rapid increase of non-regularization since the economic recession occurred in the 1990s.

Regarding exogenous factors, Atkinson (2015) argued that globalization contributes to the growth of wage differences between skilled workers and unskilled workers, which should be regarded as a main reason for inequality in Japan. However, he also presented an opposite perspective that a country with highly skilled labourers might receive benefit from globalization because it can fully offer advanced products and services. In addition, Uni (2008a) argued that the influence of IT and globalization on wages is unlikely to bring wage inequality in Japan. The influence of IT and globalization on wages is reflected mainly in the institutional reactions of enterprises. These institutional reactions are influenced by various internal and external changes in the enterprise, such as aging of the employees and deregulation.

Several economists including Atkinson (2015) and Boyer (2016) have recommended that the Japanese government take some appropriate political actions to reduce expanding income inequality and poverty. In addition, working long hours has become an important issue in Japan because it is expected to affect Japanese people's quality of life directly. According to OECD statistics, workers in 2014 worked for about 1,729 hours in Japan on average, 1,789 hours in United States, 1,473 hours in France, and 1763 hours in the OECD average level (Figure 1-6). Average working hours per year in Japan have been declining gradually during recent decades. They dropped below that of the US after the mid-1990s. However, some reports of the relevant literature suggest that this large decline in hours worked was mainly attributable to the severe and prolonged recession in Japan during the 1990s (Japan's lost decade) and the polarization of employment. Furthermore, since the 1990s, part-time employees and retirees going to work began to contribute to a large percentage of the nation's labour force. Actually, from a Japanese time-use survey, "Survey on Time Use and Leisure Activities", Kuroda (2010) found that the average hours spent for market work per week among full-time male employees has increased during the last three decades (Figure 1-7). Consequently, it is difficult to say that Japanese working hours have become shorter than before.

In 2016, death from overwork became a hot topic again in Japan when a young female employee at the advertising giant Dentsu Inc. committed suicide, mainly because

of her excessive working hours. The phenomenon is called “Karoshi” in Japan. Overwork and excessive stress cause severe health problems such as cerebral/heart diseases, mental disorders, and eventually, death. Since then, the Japanese government has set a cap on overtime hours as part of its “work style reform” agenda.

In addition, an increase in unstable work and overwork might engender an increase in the risk of the social exclusion from Japanese society. The concept of social exclusion is regarded as covering a remarkably wide range of social and economic problems. According to Sen (2000), social exclusion is directly a part of capability poverty. It reflects a situation of exclusion from social relations, and engenders other deprivations as well, thereby limiting people’s leisure opportunities further. For Abe (2012), the lack of social relations and social participation is closely related to income poverty in Japan. Moreover, Ikeda et al. (2013) emphasized that good social relationships can contribute to good health conditions for Japanese people. Therefore, it has become necessary to use a class of multidimensional poverty measures rather than other measures merely addressing particular monetary aspects such as income if one wants to capture the poverty trend based on the complex situations of Japanese society.

#### 1.4 Growing Argument Related to Multidimensional Poverty

##### 1.4.1 Multiple Perspectives for Defining Poverty

Philosophically, Bossuet’s phrase about living “under a roof of falling tiles” aptly describes multidimensional poverty. People know that, in their condition, multiple disadvantages are going to keep striking at them, although they might not know which problems will strike, or when, or how (Alkire et al., 2015).

Amartya Sen (1985b) urges that “human lives are battered and diminished in all kinds of different ways.” Thereby, poverty must be viewed more broadly and more multidimensionally than merely inadequately using readily available economic metrics. He argues that poverty demands emphasis upon the moral significance of individuals’ capabilities of achieving the kind of life they have reason to value. Consequently, in the context of Sen’s account, poverty or inequality includes not having sufficient earnings or savings to ensure basic needs (monetary deprivation), as well as being denied access to political participation, education, or social included role in society (non-monetary deprivation). Sen recognizes that poverty is sometimes related to the norms and customs of a society in which someone lives. Full participation in a wealthy society might require more money than participation in a poor one (Deaton, 2006).

In addition, Tsui (2002) favored a multidimensional perspective to poverty where

“human deprivation is visualized not through income as an intermediary of basic needs but in terms of shortfalls from the minimum level of basic needs themselves.” Deaton (2006) argued that poverty is a multidimensional phenomenon encompassing lack of access to various basic necessities such as nutrition, health, education, housing, security, and opportunities for future improvement.

#### 1.4.2 Monetary Dimensions and Non-Monetary Dimensions

Sen’s understanding of poverty based on a capability approach has attracted many scholars. To capture a multidimensional picture of one’s living situation, Oxford Poverty & Human Development Initiative (OPHI) published the Multidimensional Poverty Index (MPI) for analysis of multiple poverty variables. The MPI uses information from 10 indicators organized into three dimensions (Table 1-1): health, education, and living standards (Alkire et al., 2016).

Researchers select multiple dimensions for measuring poverty based mainly on (1) monetary dimensions (e.g., income, consumption, assets, wealth, housing conditions), and (2) non-monetary dimensions (e.g., food, water, educational attainment, skills, well-being, security, social inclusion) (Alkire and Foster, 2011b). However, few of them have drawn attention explicitly to the time dimension. Capabilities that Sen emphasized toward poverty reduction are defined as individual’s freedom and opportunities to achieve the kind of life that they have reason to value (Sen, 1992). In this context, securing leisure time for the realization of various opportunities should be regarded as a candidate for use as a poverty dimension because time is regarded as a basic resource to enable and restrict individuals’ activity. Since Vickery (1977) provided a new way of analyzing leisure time, earlier reports of the relevant literature have highlighted the situation of time poverty, and have demonstrated that not a few people or groups nowadays are lacking time. For example, Harvey and Mukhopadhyay (2007) reported a high time-poverty rate for single-parent households in Canada. Ishi and Urakawa (2014) found that in Japan as well, and showed that not only single-parent households but also double earner (both full time employed) couples with small children are greatly deprived in terms of time resources.

#### 1.4.3 Measurement of Multidimensional Poverty

As Alkire and Foster (2011b) described, methods of measuring poverty can be affected by the way in which we grasp poverty. For this reason, the measurement methodologies of poverty can be of important and practical relevance (Alkire and Foster, 2011b)

The multiple measurements of poverty mainly include two distinct steps:

identification and aggregation. Identification means to identify the poor: “who is poor.” Alkire and Foster method (AF method) counts the overlapping or simultaneous deprivations that a person or households experience in different indicators of poverty. In the identification step, several appropriate dimensions for explaining the situation of deprivation on quality of life are selected first. The indicators which estimate the level of deprivation might assign equal weights or different weights for each dimension. Next, choose poverty lines (or cut-offs (Alkire and Foster (2011a))) for each dimension/indicator. The poverty line is useful to identify the lower distribution.

Secondly, the aggregation step is accomplished by selecting a poverty index, which brings poor people together into an overall indicator of poverty. The widely used aggregation poverty measures are, for instance, the headcount ratio, poverty gap, and the FGT index.

Much attention has been devoted to the aggregation step in poverty measurement through which the data are combined into an overall indicator of multidimensional poverty. However, each aggregation technique relies on a prior identification step (Alkire and Foster, 2011a). Consequently, devoting more attention to the identification of multiple poverty is likely to be an ethical way for economists’ thinking, whereas the aggregation step is an analytical tool for the multidimensional measurement of inequality and poverty.

To reveal a comprehensive picture of social problems in Japan, several approaches are applied in this dissertation to identify multidimensional poverty, as presented in Figure 1-8: a “union” approach, an “intersection” approach, and a “compensation” approach. First, a “union” approach indicates that we regard persons who are deprived in a single dimension as poor. Most economists employ this approach, and use economic resources such as income or consumption expenditure as at least one dimension to estimate poverty. However, the “union” approach might engender exaggerated estimates of poverty, because it overly regards numerous people as poor once the dimensions that are considered increase. Second, an “intersection” approach regards a person who is deprived in all dimensions as poor. This approach might be too strict sometimes, compared to a “union” approach, because very few people will be included in an extreme multiple poverty situation.

In a “compensation approach,” the possibility of substitution among dimensions will be considered. Interdependent multiple poverty measures are estimated based on the form of a utility function. As the example in Figure 1-8 shows, income can compensate insufficient leisure time to some degree because people can purchase housework services from the market and vice versa.

## 1.5 Analytical Framework

Although many reports of the relevant literature have already shown that monetary poverty has several important effects on human well-being, very few studies have examined the effects of multiple poverty dimensions (time, social relation, education and others). As one of the few related studies, Oshio and Kan (2014) investigated the relations between health and multidimensional poverty in Japan using AF method. They found that multidimensional poverty is more useful for predicting poor self-rated health and high psychological distress. However, this analysis did not examine the time dimension specifically. In Japan, the lack of leisure hours caused by long working and commuting times is regarded as strongly related to severe health problems (Iwasaki et al., 2006). As represented by the term “Karoshi,” many Japanese studies have found an association between working hours and cerebrovascular/ cardiovascular disease (Ohtsu et al., 2013). To ascertain the determinants of health more clearly, an analysis should be conducted while incorporating the viewpoint of securing a minimum amount of leisure hours.

Figure 1-9 depicts the framework of this dissertation based on the multiple poverty measures described in the previous section. First, the empirical analysis presented in chapter 2 investigates the effects of multidimensional poverty including income poverty, time poverty, and social exclusion, on key health indicators in Japan: self-rated health (SRH) and psychological distress (K6), based on the multidimensional poverty approach presented by Alkire and Foster (2011a). The contribution of this paper in the field of multiple poverty studies is to examine leisure time specifically, and to emphasize the impact of multidimensional poverty, including the time dimension, on an individual’s health.

In addition, many empirical results of studies suggest that people who actively engage in physical activities are more likely to show better health status and well-being. Consequently, chapter 3 specifically examines relations between income and time poverty, and physical activity. Therefore, this chapter presents estimation of the effects of multiple poverty dimensions on the degree of daily recreational activities using the household micro-dataset in Japan. Actually, the estimation results show that time poverty is highly associated with a low frequency of reading and short-duration sleeping. Indeed, different results are obtained for women and men by checking the effects of cross terms. For men, individuals who are deprived in two dimensions of poverty tend not to participate in sports. In addition, lack of leisure time might prevent them from actively reading, while getting less sleep. For women, time poverty is also an important determinant to visit interesting

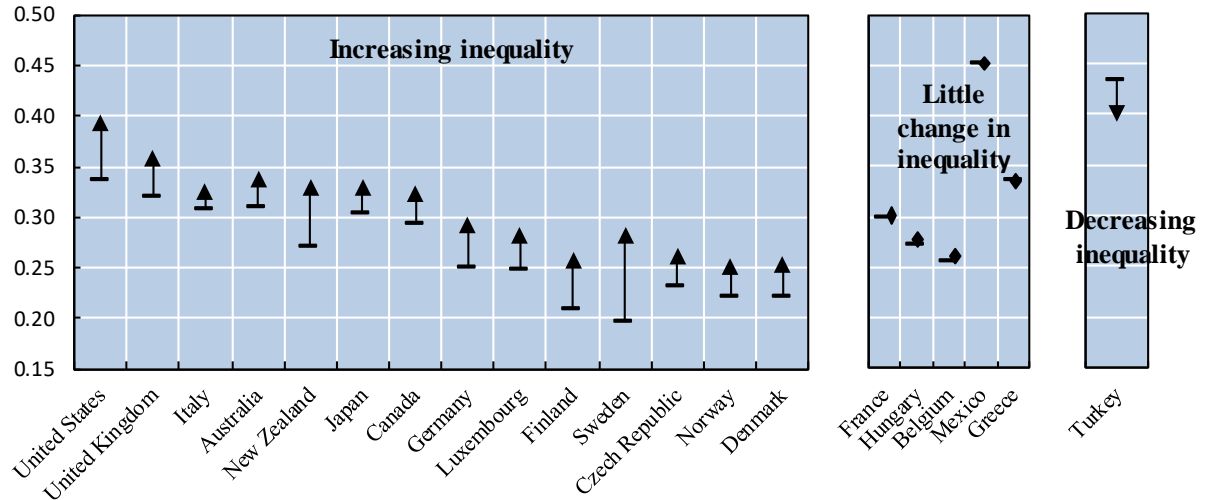


places and to read actively. An important contribution to this paper is to confirm the importance of the time dimension, and to emphasize the direct relation between multiple poverty dimensions and people's well-being.

Regarding the analysis of income and time, Ishi and Urakawa (2014) reported that time poverty can be reduced by payment for housework services. Empirical results obtained from this analysis found that the head ratio of income poor people increased by 2 points after time adjustment, and confirmed a tradeoff relation between money and time. However, using a compensation approach, Merz and Rathjen (2014) found an important fraction of time poor people who are unable to substitute their time deficit by income. Therefore, in chapter 4, using the CES well-being function, we found some new multiple poverty situations defined as interdependent multidimensional poverty given by Merz and Rathjen (2014). This study revealed that households with very young children are multidimensionally poor because they cannot compensate poverty in one dimension by the other above poverty situation. The contribution of this study is to find more severe poverty situations by considering both income and time. This study provides more valuable policy implications for Japan's government.

Based on the results obtained from Chapter 4, the study in Chapter 5 undertakes consideration of how we should go about fighting poverty. Chapter 5 examines the potential impact of higher education on interdependent multiple poverty. The contribution of this analysis is to highlight the importance of accessing higher education because it can help young people grow into a person capable of escaping from the multifarious poverty that the person can expect to confront in the future. In Chapter 6, this dissertation suggests and discusses several policy implications that promise to be more successful in helping governments and policymakers decide to invest in human capital, which is the best solution for reducing poverty in Japan.

Figure 1-1: Income inequality in OECD countries  
Gini Coefficient, Mid-1980s and 2014

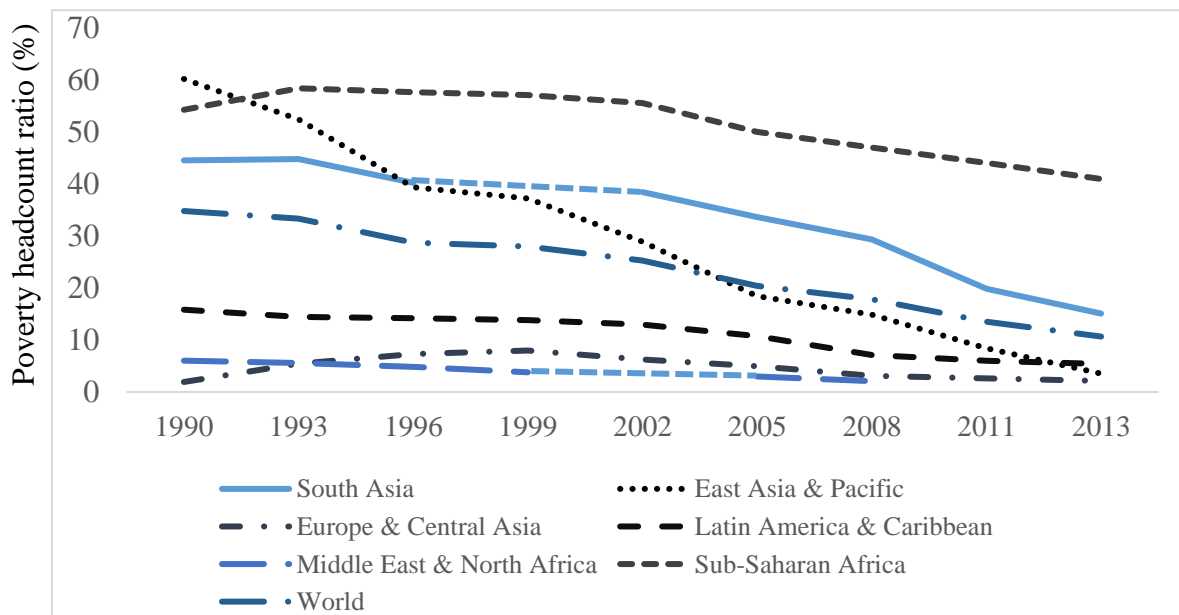


Note: “Little change” in inequality refers to a change of less than 2 percentage points.

Source: OECD (2011a) p.24.

OECD Database on Household Income Distribution and Poverty.

Figure 1-2: Trend of extreme poverty (Headcount ratio) by region  
[1990–2013].



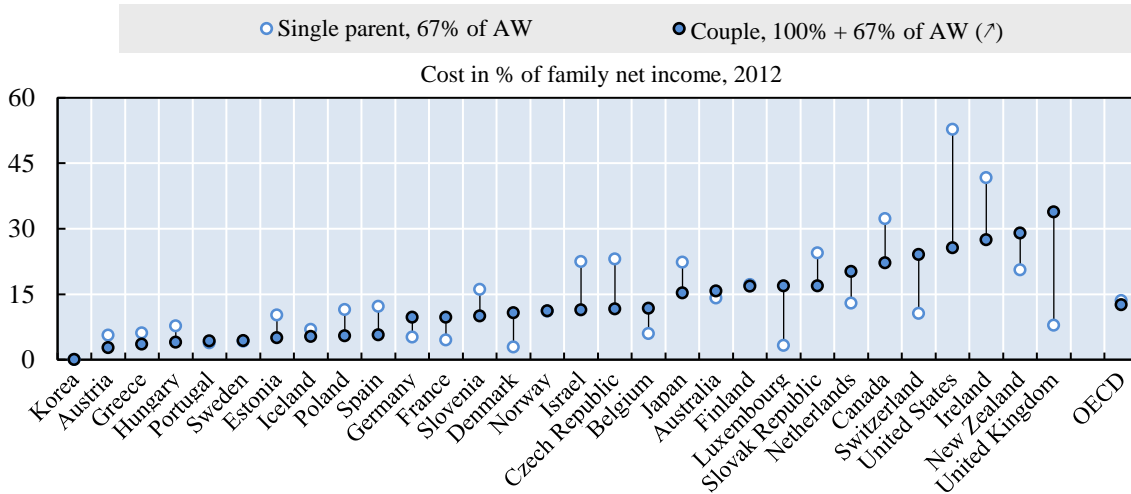
Source: World Bank (2016) p.39.

Figure 1-3: Relative poverty rate in OECD (2012 or latest available year).

Relative poverty rates (50% median income)								
	Entire population	Rank	Children (age 0-17)	Rank	Working-age population (age 18-65)	Rank	Retirement-age population (over 65)	Rank
Australia	14%	9	13%	14	11%	13	34%	2
Austria	10%	20	10%	21	9%	22	11%	13
Belgium	10%	17	11%	19	10%	17	11%	14
Canada	12%	14	14%	13	12%	12	-	-
Denmark	5%	33	3%	34	7%	31	5%	26
Finland	7%	31	3%	33	7%	30	9%	17
France	8%	28	11%	19	8%	27	4%	28
Germany	8%	24	7%	31	8%	24	9%	15
Greece	15%	7	21%	5	16%	3	7%	22
Iceland	6%	32	8%	29	6%	32	3%	31
Israel	18%	2	25%	2	15%	5	21%	6
Italy	13%	12	18%	9	12%	10	9%	15
Japan	16%	6	16%	11	14%	6	19%	8
Korea	15%	8	9%	24	10%	14	49%	1
Luxembourg	8%	24	13%	17	8%	28	3%	30
Mexico	19%	1	23%	4	16%	2	27%	3
Netherlands	8%	30	10%	23	8%	24	2%	33
New Zealand	10%	19	13%	15	9%	21	8%	19
Norway	8%	28	6%	32	10%	17	4%	27
Poland	10%	17	13%	16	10%	14	8%	19
Portugal	13%	11	18%	8	13%	9	8%	21
Spain	14%	9	21%	6	14%	7	7%	24
Sweden	9%	23	8%	27	9%	20	9%	17
Switzerland	9%	22	8%	30	6%	32	23%	4
Turkey	18%	4	26%	1	14%	8	17%	9
United Kingdom	11%	15	10%	21	10%	16	13%	11
United States	18%	3	21%	6	16%	1	21%	5
OECD	11%		13%		10%		13%	

Source: OECD (2016b) *OECD Factbook 2015–2016*, p.57.

Figure 1-4: Childcare costs in the OECD countries.



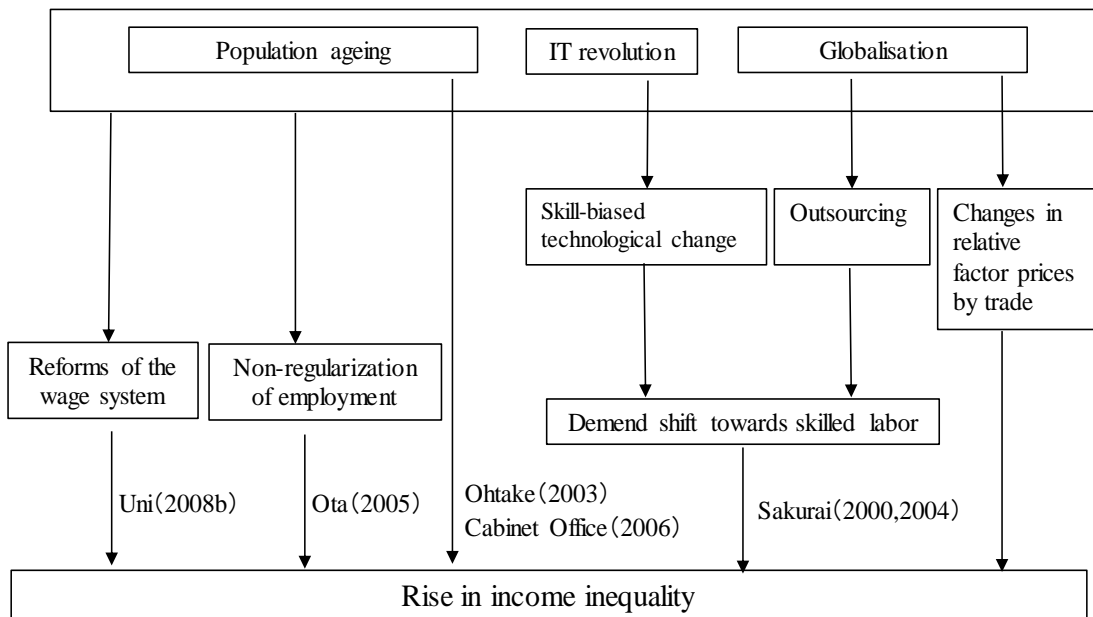
Note: figure shows out-of-pocket costs for full-time care at a typical childcare center:

- i) a single parent with full-time earnings of 67% of average earnings, and
- ii) a couple with full-time earnings of 100+67% of average earnings.

“AW” stands for average wage. The OECD average is unweighted.

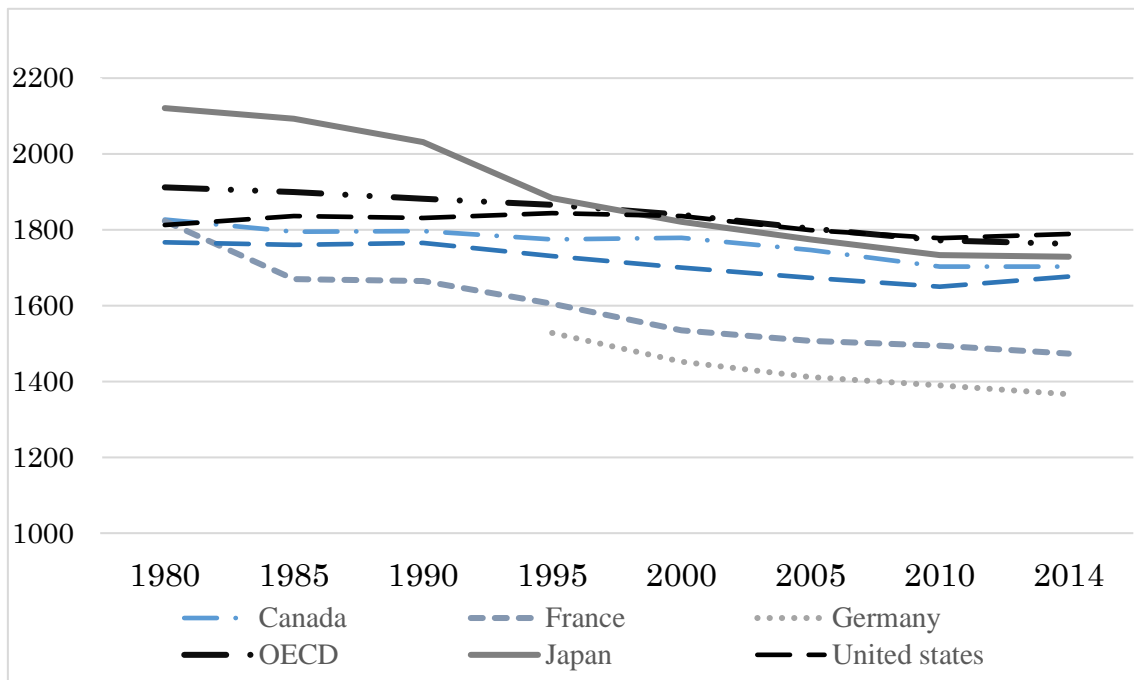
Source: OECD (2016c) p.30

Figure 1-5: Causes of the rising wage inequality in Japan.



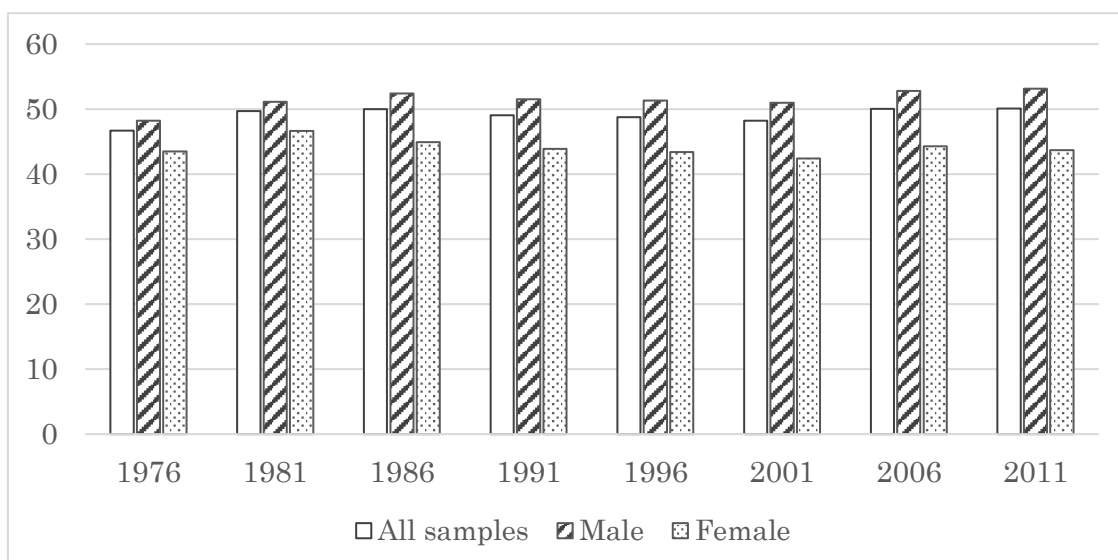
Source: Added to Uni (2008) p.81.

Figure 1-6: Average labour hours per person in all employment (in years).



Source: OECD (2016a) p.233 (Table L) (<https://data.oecd.org/emp/hs-worked.htm>)

Figure 1-7: Trends in work hours per week (per full-time employee).



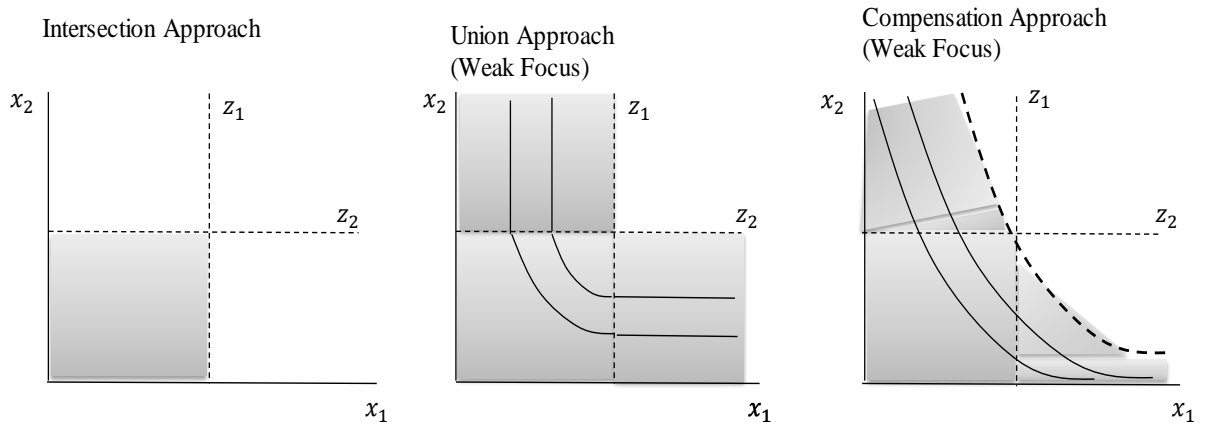
Source: Kuroda (2010) p.489, Table 2.

Table 1-1: Dimensions, indicators, deprivation cutoffs and weights of the MPI

Dimension of poverty	Indicator	Deprived if	Weight
Education	Years of Schooling	No household member aged 10 years or older has completed five years of schooling	1/6
	Child School Attendance	Any school-aged child is not attending school up to the age at which he/she would complete class 8	1/6
Health	Child Mortality	Any child has died in the family in the five-year period preceeding the survey	1/6
	Nutrition	Any adult under 70 years of age, or any child for whom there is nutritional information is undernourished in terms of weight for age	1/6
Living Standard	Electricity	The household has no electricity	1/18
	Improved Sanitation	The household's sanitation facility is not improved (according to MDG guidelines), or it is improved but shared with other households	1/18
	Improved Drinking Water	The household does not have access to improved drinking water (according to MDG guideline) or safe drinking water is at least a 30-minute walk from home, roundtrip	1/18
	Flooring	The household has a dirt, sand, dung or 'other' (unspecified) type of floor	1/18
	Cooking Fuel	The household cooks with dung, wood or charcoal	1/18
	Assets ownership	The household does not own more than one radio, TV, telephone, bicycle, motorbike or refrigerator and does not own a car or truck	1/18

Source: Alkire et al. (2016) p.5

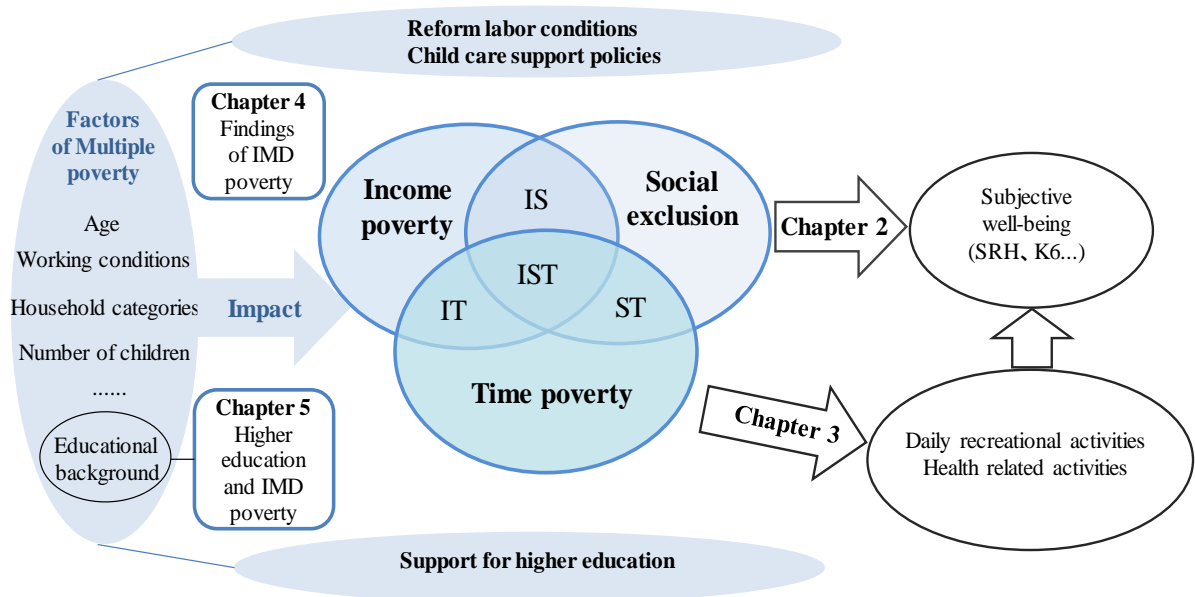
Figure 1-8: Identification of multidimensional poverty with intersection, union, and compensation approach.  
(Two-dimensional case)



Note: Shaded area represents multidimensional poverty;  $x_1$  and  $x_2$  are dimension quantities, whereas  $z_1$  and  $z_2$  are poverty dimension thresholds

Source: Merz and Rathjen (2014) p.455

Figure 1-9: Framework of the paper.



## Chapter 2: Effects of multidimensional poverty on health indicators in Japan: income, living time, and social inclusion

### 2.1 Introduction

The measurement of multidimensional poverty has been developed and improved recently. An origin of the multidimensional poverty approach, Sen's capabilities approach, proposed the characterization of poverty from the viewpoint of the degree of freedom that people can achieve (Sen, 1992). Based on the capabilities approach, many studies measured deprivation on widely diverse dimensions such as access to education, living standards, social relations, and health conditions, rather than merely examining income. In terms of the methodology for identification, Atkinson (2003) discussed a 'counting approach' that summarizes the number of dimensions on which people are deprived.

In recent work, Alkire and Foster (2011a) provided a multidimensional approach (hereafter, AF method) that embodied Sen's capabilities theory and which was motivated by Atkinson's 'counting method' of measuring deprivation. The poverty measurement by AF method can be conceptualized as the following two main steps: identification of who is poor, and aggregation of information related to poverty across society (Alkire and Santos, 2013). For the identification of poverty, both the indicators' cutoffs  $z_j$  on each dimension and the poverty cut-off  $k$ , which is the number of weighted deprivations required to be considered multidimensionally poor, are considered. For that reason, the AF methodology is said to follow a dual cut-off method of identification (Alkire and Santos, 2013). For measurement of the aggregated poverty indicator, most FGT measures can reflect the width and depth of deprivation from multiple dimensions.

Actually, AF method has been applied to multidimensional poverty analysis to assess various trends of poverty over time in countries and regions throughout the world (Batana, 2013; Battiston et al., 2013; Santos, 2013; Yu, 2013). In these studies, researchers selected important dimensions for measuring poverty based on (1) human psychological needs (e.g., food and water, educational attainment, housing conditions, security) and (2) philosophical human value (e.g., income and wealth, well-being, social inclusion, skills) (Alkire, 2002). However, few such studies have drawn attention explicitly to the time dimension. Capabilities toward poverty reduction that Sen emphasized are defined as individual freedom and opportunities to achieve the kind of life that they have reason to



value (Sen, 1992). In this context, securing living hours for the realization of various opportunities should be regarded as a candidate poverty dimension. Time is a finite resource along with money. It can play a salient role in fulfilling basic needs of life (Vickery, 1977).

Previous reports of the relevant literature have specifically described situations of time poverty. They have demonstrated that not a few people or groups nowadays are adversely affected by a lack of time. For example, Harvey and Mukhopadhyay (2007) reported a high time-poverty rate for single-parent households in Canada. After analyzing conditions in Japan, Ishi and Urakawa (2014) showed that not only single-parent households but also double earner (both full-time employed) couples with small children are greatly deprived of time resources.

Importantly, the measurement of poverty incorporating the viewpoint of living hours is expected to complement government efforts at health improvement of people. From European data, Nolan and Marx (2009) observed that low income alone is insufficient to predict who is experiencing poor health and access to health services. Rather, recent studies have demonstrated clear correlation between time poverty and health. For example, Bittman (2002), using Time Use Survey in Australia, demonstrated that women who have less discretionary time are more likely to have poor health.<sup>1</sup> These studies fundamentally addressed income and time dimensions. They did not compare the independent effects of respective dimensions and the composite effects multiple dimensions. Regarding relations between health and multidimensional poverty, Oshio and Kan (2014) investigated them in Japan using AF methodology and found that multidimensional poverty is more useful for predicting poor self-rated health and high psychological distress. However, this analysis was conducted on a single-year basis. It did not treat the time dimension.

In Japan, the lack of leisure hours caused by long working and commuting time and other factors is regarded as strongly related to severe health problems (Iwasaki et al., 2006). As represented by the term ‘Karoshi,’ much Japanese research shows an association between working hours and cerebrovascular/ cardiovascular disease (Ohtsu et al., 2013). To ascertain the determinants of health more clearly, an analysis incorporating the viewpoint of the securing a minimum amount of leisure hours should be conducted. Therefore, in this study using Japanese micro-panel data, we examine how multi-dimensional poverty, including that of the time dimension, is associated with health.

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<sup>1</sup> However, Kalenkoski et al. (2011) showed a positive relation between time poverty and subjectively evaluated health levels using the American Time Use Survey. Regarding this result, they pointed out that it is likely attributable to the fact that employed people have, on average, better health status than those who are not employed, and are also more likely to be time-poor.

## 2.2 Data and Measurement

### 2.2.1 Data

Data used for this study were obtained from the Japanese Study of Stratification, Health, Income, and Neighborhood (J-SHINE) conducted by University of Tokyo. J-SHINE is an ongoing longitudinal panel data originally intended for about 4000 adults, aged 20–55 years, who were selected randomly from urban and suburban municipalities in the greater Tokyo metropolitan area in Japan<sup>2</sup>. J-SHINE, which included various fields of questions such as income, employment status, living hours, and health conditions, was conducted to clarify complex associations between socioeconomic factors and health. From the study, we excluded students and limited respondents to the samples who answered both questionnaires in 2010 and 2012. The final estimation samples comprised 2425 individuals in 2010 and 2349 individuals in 2012. We mainly addressed six household categories to assess circumstances of multidimensional poverty.

- Couples with children who are all older than 6
- Couples with one child younger than 6
- Couples with two or more children younger than 6
- Couples without children
- Single parent with children
- One-person household

Table 2-1 presents the demographic structures of samples in 2010 and 2012. The ratios of respective household types in the data were presented as follows: Couples with children who are all older than 6 [38.3% in 2010, 46.2% in 2012], Couples with one child younger than 6 [13.2% in 2010, 11.3% in 2012], Couples with two or more children younger than 6 [19.1% in 2010, 15.5% in 2012], Couples without children [17.7% in 2010, 18.5% in 2012], Single parent with children [3.0% in 2010, 2.8% in 2012], and One-person households [8.1% in 2010, 5.2% in 2012].

Regarding academic background, about 40% of the householders were respondents who had graduated from a four-year college or graduate school. Regarding employment status, about 50% were engaged in work as full-time employed, where Full time employed 1 means regular employees and Full time employed 2 means contract or dispatched full time but limited-term workers.

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<sup>2</sup> Regarding the detailed characteristics of J-SHINE data, refer to Takada et al. (2014).

### 2.2.2 Poverty dimension

Our poverty measure in this paper followed the multidimensional methodology reported by Alkire and Foster (2011a). The AF methodology consists of an identification step and an aggregation step. At the identification step, we selected dimensions (indicators) and two cutoffs to identify who poor people using a ‘dual cutoff’ method. At the aggregation step, we mainly addressed the headcount ratio. For simplicity, all weights were assigned equally to each dimension.

We specifically examined three dimensions of poverty: 1. income, 2. living time and 3. social inclusion. Then we investigated the effects on two indicators of health: self-rated health (SRH) and psychological distress (K6). By assessing poverty from three dimensions of income, living time, and social inclusion, we clarified the following: (1) What households are likely to fall into time and other dimensions of poverty? (2) Does multiple poverty that includes a time concept prevent people from achieving good health conditions? (3) Are there any gender differences in the effects of multidimensional poverty on health?

In applying a dual cutoff approach, let  $D(\cdot)$  denote the number of deprivations in poverty dimensions. The three union sets were defined as  $D(1)=1$  indicating income poverty,  $D(2)=1$  indicating time poverty, and  $D(3)=1$  denoting social connection poverty. The full intersection set,  $D(1,2,3)=3$  includes individuals who were deprived in all three poverty dimensions. In addition,  $D(1,3)=2$  denotes individuals who have both income poverty and social connections poverty. Therefore, multidimensional poverty was defined as  $D(1,2,3)\geq k$ , where  $k=1, 2$  or  $3$ . Here,  $k$  represents the number of deprivations necessary to be judged multidimensionally poor. An individual was regarded as multidimensional poor if the person’s  $D(\cdot)$  was above a certain aggregated level of cutoff. For example,  $D(1,2,3)\geq 2$  denotes individuals who were deprived in at least two of three poverty dimensions. The dual cutoff set also includes unidimensional poverty (if  $k=1$ ) and full intersection set (if  $k=3$ ). Indicators and the certain level of cutoff for three dimensions were defined as described below.

#### (i) Dimension 1: Household income

The poverty line of income can be chosen in two ways: an absolute level and a relative level. OECD defines relative income poverty by measuring the ratio of the number of people who fall below the poverty line. The poverty line was set as half of the median of equivalent household income of the total population. According to this definition of income poverty, the average poverty rate of Japan for entire population was

16% in 2012, ranking high (sixth) among OECD 34 countries (OECD, 2016, p.57). Importantly, Japan's poverty rates surpass OECD average for all of three age-groups (age 0-17, age 18-65, age 65 and over).

For the study, the reported household annual income by J-SHINE was divided by the square root of the number of family members, to adjust for household size. According to the calculation of the data, the poverty line was defined as JPY 1.84 million (equivalent to about USD 15,543) for each household per year. Therefore, a person for whom the equivalent annual income was less than JPY 1.84 million will be regarded as having been deprived on the income dimension.

(ii) Dimension 2: Living hours

Definitions of time poverty vary among studies. This study defined the time-poverty line as mainly following the method applied by Ishii and Urakawa (2014), which considered the disposable time and minimum time necessary for housework.

The estimation procedure was summed in three main steps: First, it defined the essential time ( $T_e$ ) spent for basic activities (sleeping, eating, personal care (excretion, bathing, getting dressed, etc.)), which included the minimum leisure time required (one hour per day during Monday–Friday and three hours per day on Saturday and Sunday) in basic activities. Second, it defined the minimum time necessary for housework ( $T_1$ ), consisting of housework, nursing care, child care, and shopping, based on a 2011 Survey on Time Use and Leisure Activities conducted by the Ministry of Internal Affairs and Communications (MIC). Third, the working and commuting time ( $T_w$ ) were calculated from the data for each responded household.

As the time spent for basic activities ( $T_e$ ), the study used the average time spent in an entire week by men and women, separately, who were aged 20–64 years. The time for basic activities included 7.5 hours per day for men and 7.2 hours per day for women for sleeping, 1.1 hours per day for men and 1.5 hours per day for women for taking personal care, and 1.5 hours per day for men and 1.6 hours per day for women for eating. Following the example of earlier studies, this study further included the minimum leisure time required in the basic activity time.

Regarding the minimum time required for housework ( $T_1$ ), it represents the least time necessary for housework without outsourcing the series of household chores such as cooking, washing, taking care of children, elderly people, or disabled people, and shopping (dining out or ordering food delivery, purchasing prepared food, using housework-related services in the market economy, etc.), for each household type to be analyzed, the study applied the average time spent for housework at households with at

least one adult who did not work outside the home. More specifically, as a reference, the study used the time spent for housework at households with a husband working outside the home and wife not working outside the home for households comprising a married couple and children and households only of a married couple. For one-person households and single-parent households, the study applied the housework time of households without a member working outside the home<sup>3</sup>.

Consequently, the disposal week time ( $T_a$ ) is calculated as Total time (V) - ( $T_e$ ) - ( $T_l$ ). According to these procedures, an individual is regarded as suffering from time-poverty if the disposal time is less than the working and commuting time ( $T_w$ ). Table 2-2 presents the time spent for basic activities and the minimum time required for housework for six household types.

### (iii) Setting dimension 3: Social inclusion

Social inclusion is a multidimensional general concept that refers not only to material, economic, or health deprivation, but also to deprivation from social relations and participation in society. For Abe (2012), the lack of social relations and social participation has been brought up in relation to poverty in Japan. Moreover, Ikeda et al. (2013) emphasized that good social relationships can contribute to good health conditions for Japanese people. The concrete contents of questionnaires related to social exclusion are the following.

#### [Question]

“Now we will ask you a question about social exclusion and social support. If you encounter some trouble, how often you will contact or communicate with your family members, partners, neighbors, or friends?”

#### [List]

- (1) Often. (2) Sometimes. (3) A little. (4) Never.
- (5) I have no family member, partner, neighbor, or friend I can talk with.

We produce a dummy variable for social exclusion in considering the additional dimension of multidimensional poverty, to which we allocated a 1 if an individual's

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<sup>3</sup> Because many men living alone are likely to outsource much of their housework by, for instance, dining outside instead of cooking at home, the minimum housework time required at female one-person households was substituted for that at male one-person households.

respondent was “Never” or “I have no family member, partner, neighbor, or friend I can talk with.”

### 2.2.3 Health indicators

Regarding health indicators, we considered self-rated health (SRH) and Kessler 6 (K6). Binary variables for two health indicators were constructed. The questionnaire related to responders’ self-rated health conditions is formulated with five choices: good, somewhat good, average, somewhat poor, and poor. If the respondent answered poor or somewhat poor, then the respondent was treated as poor SRH.

For measuring psychological distress, Kessler 6 (K6) scores were used in this study. The K6 comprises six-item psychological questions about depressive and anxiety symptoms that an individual has experienced during a 30-day reference period: 1) nervousness, 2) hopelessness, 3) restlessness or fidgeting, 4) severe depression, 5) lack of motivation, and 6) worthlessness rated on a five-point scale (0=not at all, 1, 2, 3, and 4=all of the time). The summation of K6 scores gives a final score of 0–24. Here, respondents whose K6 scores were greater than seven were regarded as persons confronting high risk of psychological distress, according to the identification of earlier Japanese research (Sakurai et al., 2011).

Table 2-3 presents descriptive statistics of health and poverty measures. About 10% of respondents reported poor self-rated health (SRH) in both years (2010, 2012). About 20% of respondents were regarded as people whose levels of K6 are high. Regarding categories of poverty, we considered the rates of respondents only from each type of poverty and multiple poverty. Here, income poverty means  $D(1)=1$  &  $D(1, 2, 3)=1$ . People who are both deprived of income and other dimensions are excluded. In 2010, people in time poverty are about 11%. This figure was followed by 8% of income poverty and 3% of social exclusion. As a whole, no large differences of health and poverty measures during two years were found, but in 2012, the number of people in non-poverty had increased by about 5 percentage points.

## 2.3 Data Analysis

### 2.3.1 Headcount ratios by dimension

Based on settings of multidimensional poverty, we first specifically examined the characteristics of three unidimensional types of poverty ( $D(1)=1$ ,  $D(2)=1$ , and  $D(3)=1$ ) by different categories. Table 2-4 presents the situation of unidimensional poverty status by six categories: gender, partner, age class, household type, householders’ educational

level, and respondents' working conditions.

According to the table, the poverty ratios of three dimensions decreased from 2010 to 2012 for both men and women. In addition, respondents with no partner face high risk of falling into the categories of low income, lack of leisure time, and social exclusion. Regarding the age group, respondents in their twenties and thirties reported higher income poverty in 2010 than in 2012. Regarding household type categories, single parent households with children reported the highest income poverty ratio (41.1% in 2010 and 37.9% in 2012) and the highest time poverty ratio (37.0% in 2010 and 36.4% in 2012). One-person households and couples with children younger than six also showed high time-poverty rates. These results correspond to the findings reported by Ishii and Urakawa (2014).

Next, examining effects of the household head's educational level, people with low educational attainment (junior-high or high school graduates) reported higher risk of low income. Nevertheless, people with higher educational background (who had graduated from four-year college or graduate school) had high poverty ratios in the time dimension and social inclusion. In addition, regarding working conditions, regular full-time employed workers showed the lowest rates of income poverty, but reported the highest time poverty rates among all working conditions, which indicates a tradeoff between money and time. Self-employed workers also showed high income poverty ratios. Contract or dispatched full-time but limited-term workers showed high rates for social exclusion, particularly in 2010.

### 2.3.2 Descriptive statistics for poverty and health

Table 2-5 presents the proportions of people with poor health (poor SRH and psychological distress ( $K6 \geq 7$ )) for respective poverty type and gender in 2010 and 2012. Regarding poverty types, we considered three unidimensional poverty types ( $D(1)=1$ ,  $D(2)=1$ , and  $D(3)=1$ ) and two multidimensional poverty types ( $D(1,2,3) \geq 1$  and  $D(1,2,3) \geq 2$ ).

For poor SRH, we first observed that among unidimensional poverty of three types, 17.7% (in 2010) and 18.2% (in 2012) of people who fall into income poverty ( $D(1)=1$ ) perceived themselves as having poor SRH, compared to 10.4% (in 2010) and 9.6% (in 2012) of the entire sample. In total, the proportions of men with poor SRH is higher than those of women in 2010 and in 2012. The rates of people who fall into time poverty ( $D(2)=1$ ) and are in poor SRH are lower than the cases of income poverty (9.0% in 2010, and 10.6% in 2012), the proportion of women with poor SRH and time poverty is much higher (11.9% in 2010, 14.1% in 2012) than those of men (6.4% in 2010, and 7.5% in

2012). Regarding social exclusion ( $D(3)=1$ ), the proportions of people who reported poor health were 17.5% (in 2010) and 23.7% (in 2012) in total. That figure showed the highest influence compared to other two poverty dimensions. Regarding the multidimensional poverty, we observed that 28.3% (in 2010) and 21.9% (in 2012) of people who fall into at least two of three poverty dimensions ( $D(1,2,3)\geq 2$ ) assessed their health as poor. Therefore, results suggest that people with multidimensional poverty status tend to fall into poorer health than those affected by one-dimensional poverty.

Related to the results of psychological distress ( $K6\geq 7$ ), results show that low levels of income and social connections are particularly related to a higher proportion of psychological distress. Among income-poor people, the rates of people with a high score of K6 were almost 42% in 2010 and 2012. In addition, men who were income-poor showed worse mental health than in the case of women in 2010 and 2012. Regarding people who fall into multidimensional poverty, results show that multiple poverty statuses increased the risk of high K6 in several situations. For example, people who had at least two of the three poverty dimensions ( $D(1,2,3)\geq 2$ ) reported that 50% of them marked high K6 score in 2012, which was very high compared to the average proportion of people who have psychological distress (22.8%).

#### 2.4 Panel Data Analysis

In the study, panel logit analysis is conducted to estimate how each binary variable showing a poverty regime affects health conditions. Table 2-6 shows the estimated results of their relation. In econometric analyses, each dummy variable that represents poor SRH and high Kessler 6 scores was used as the explained variable. For key independent variables, five variables of multiple poverty were constructed as follows: three unidimensional poverty types (only income poverty, only time poverty, only social exclusion, and multidimensional poverty (income poverty and time poverty, income poverty and social exclusion, time poverty and social exclusion, and full dimensional poverty). Other control covariates were the following: a spouse dummy (1 if spouse exists, otherwise 0), a number of children dummy (one child, and more than two children and no child (reference)), a working conditions dummy (business executive, full time employed 1 full time employed 2, part time employed, self-employed, and no work (reference)). We decided which model (fixed effects model or random effects model) should be employed according to Hausman test results. As a result, random effects models were applied for two econometric models.

Regarding the estimation results, the association with poor SRH was highly



significant at the 1% level for income poverty, and at the 5% level for social exclusion. In addition, multiple poverty ( $D(1,2,3) \geq 2$ ) is highly associated with poor SRH. We were able to confirm a clear correlation between multiple poverty and people's poor health. Additionally, we observed that some variables such as single status, meaning people who have no partner, were also linked with poor SRH. As with results on poor SRH, regarding the influences on K6 score, we observed that each unidimensional poverty type of low income and social exclusion, and multiple poverty situations were related closely with poor mental health of people. In addition, people with no partner or children readily fell into the status of psychological distress. The effects of time poverty on health was not so strong compared to the other two poverty dimensions (income and social exclusion), but multiple poverty situations negatively affect people's health. For that reason, public policies aimed at the broader concept of poverty including the time dimension as well as monetary dimension should be reinforced.

## 2.5 Conclusion

For the present study, we investigated the effects of multidimensional poverty on key health indicators in Japan using panel data from Japanese study of stratification, Health, Income, and neighborhood (J-SHINE). By considering the multi-dimensionality poverty index, we can identify people in poor SRH and psychological distress more adequately than the mere usage of a one-dimensional poverty such as income. The study included time as a key poverty dimension for estimation, and investigated how multiple poverty including the time dimension prevented people from maintaining their health condition.

We first observed that the proportion of income poverty for women was higher than that for men in 2010 and 2012. However, in terms of the dimensions of time and social inclusion, the poverty ratios for men were much higher than for women. Gender differences are strongly related to the fact that male people work mainly as regular employees and women mainly work as non-regular workers or leave the labour market to care for their children. Similar to the results reported by Ishii and Urakawa (2014), we confirmed that lone parent households are associated with higher risks of time and income poverty, comparing to other household types. In addition, households with children younger than six years old presented high poverty ratios related to the time dimension. Moreover, we observed that one-person households marked high poverty ratios for the social inclusion dimension.

In the latter part, using the results of panel logit estimation, we confirmed the validity

of multiple poverty for identifying people with poor SRH and psychological distress. For both SRH and psychological distress, we noticed that the multiple dimensions of poverty were more useful to predict people's poor health, which was consistent with results obtained from cross-section analysis of Oshio and Kan (2014). Regarding one-dimensional poverty types, monetary variables are key determinants of poor SRH and mental health, but social exclusion is also an important factor for predicting people's health.

Finally, several policy implications are described based on results obtained from the current study. First, many JSHINE data respondents are young people in Tokyo areas. Therefore, the estimation results probably clarified the severe situation of working and commuting time of workers and social exclusion of one-person households in Tokyo. People living in time poverty were particularly observed in the case of full-time employees and full-time working couples with preschool children. Policymakers should reconsider tightening regulations on overtime work, reflecting the trend of spreading long working hours at many firms. In addition, the working environment might be regarded as a risk factor of increasing the probability of social exclusion, because male and full time employees reported high ratios of deprivation of social inclusion. Takekawa et al. (2014) urged that there must be clear awareness of social exclusion when discussing policy options for poverty alleviation, particularly for working generations. Atkinson and Marlier (2010) reported that promotion of social inclusion will be helpful to create a society that is safer and more stable, which should be regarded as a necessary condition for sustainable economic growth and development. Consequently, to enhance their health condition, it is necessary to consider socially supportive policies such as improving the quality of working conditions for working generations.

Second, policy support for housework and child care particularly should be strengthened, especially for single-parent households, which must confront high risks of both income and time poverty. It has been difficult for single parents to work for a long time because of housework and childcare burdens, but their wage levels are lower than in other OECD countries. Not only in Japan, but also in some other economically developed countries, a phenomenon exists by which couples in more affluent regions have fewer children (Tachibanaki, 2010), partly because of the increase of economic well-being and time costs of having children. Policies prompting enforcement of work-leisure balance should be implemented to help people who have children to realize a better work-life balance.

The current studies have been affected by several limitations. First, we have not investigated which combination of poverty dimensions will affect health indicators more

because of data constraints. It is necessary to continue our studies by expanding the sample size or using another survey. Second, for simplification, we assigned equal weight to each dimension of poverty. However, it is necessary to investigate how different weights can be expected to affect the estimation results. We should consider how poverty is related to health conditions and health behaviors.

Table 2-1: Basic statistics of variables

	2010 (N=2425)		2012 (N=2349)	
	Mean	Std.Dev	Mean	Std.Dev
<i>Sex</i>				
Male	43.8%	0.50	43.0%	0.50
Female	56.2%	0.50	57.0%	0.50
<i>Partner</i>				
Yes	88.3%	0.32	91.4%	0.28
No	11.7%	0.32	8.6%	0.28
<i>Age</i>				
20s	14.6%	0.35	8.3%	0.28
30s	42.1%	0.49	38.2%	0.49
40s	43.3%	0.50	53.6%	0.50
<i>Household type</i>				
Couple with children who are all older than 6	38.3%	0.49	46.2%	0.50
Couple with one children younger than 6	13.2%	0.34	11.3%	0.32
Couple with more than two children younger	19.1%	0.39	15.5%	0.36
Couple without children	17.7%	0.38	18.5%	0.39
Single-parent with children	3.0%	0.17	2.8%	0.17
One-person household	8.1%	0.27	5.2%	0.22
<i>Householders' educational level</i>				
Junior-high / High school graduates	23.0%	0.42	23.1%	0.42
Two-year college / technical college	36.0%	0.48	36.5%	0.48
Four-year college / graduate school	40.3%	0.49	39.9%	0.49
<i>Working conditions</i>				
Company/organization executives	2.4%	0.15	2.6%	0.16
Full time employed 1	44.0%	0.50	43.6%	0.50
Full time employed 2	5.9%	0.23	5.7%	0.23
Part time employed	17.8%	0.38	18.1%	0.38
Self-employed	6.3%	0.24	6.3%	0.24
No work	23.5%	0.42	23.6%	0.42

Source: Authors' calculations based on J-SHINE 2010-2012.

Note: Full time employed 1 represents regular employed workers;

Full time employed 2 represents contract or dispatched full-time but limited term workers.

Table 2-2: Minimum time required for basic activities and housework by household types

	7 days (V) (hours) week	Essential time (Te)		Tm (V-Te) week	Minimum time required for the housework T1				Total week	Disposal time Ta (Tm-T1) week	
		Leisure (weekday) day	Leisure (weekend) day		Housework day	Nursing/ Caring day	Childcare day	Shopping day			
											week
<b>Couple with children</b>											
with children who are all older than 6	336	165.5	2.0	6.0	170.5	5.5	0.2	0.4	1.2	50.9	119.6
with one child younger than 6	336	165.5	2.0	6.0	170.5	4.0	0.1	5.0	1.1	71.3	99.2
with two or more children younger than 6	336	165.5	2.0	6.0	170.5	3.7	0.1	6.2	1.0	77.0	93.5
Harvery and Mukhopadhyey (2007)	336	175.0	4.0	4.0	161.0	-	-	-	-	74.6	86.4
<b>Couple without children</b>											
Vickery (1977)	336	162.8	2.0	5.0	173.2	-	-	-	-	74.6	86.4
<b>Single parent with children</b>											
Harvery and Mukhopadhyey (2007)	168	83.2	1.0	3.0	84.8	3.5	0.1	1.1	1.0	39.3	45.5
Vickery (1977)	168	87.5	2.0	2.0	80.5	-	-	-	-	52.0	28.5
<b>One-person household</b>											
Vickery (1977)	168	81.4	1.0	2.5	86.6	-	-	-	-	31.0	55.6

Source: Authors' calculations based on Survey on Time Use and Leisure Activities 2011.

Table 2-3 Health and poverty measures

	2010 (N=2425)		2012 (N=2349)	
	Mean	Std.Dev	Mean	Std.Dev
<i>Well-being</i>				
Poor self-rated health	10.4%	0.30	9.6%	0.29
K6 (high)	21.7%	0.41	22.8%	0.42
<i>Poverty category</i>				
Income poverty D(1)=1 & D(1, 2, 3)=1	7.8%	0.27	6.9%	0.25
Time poverty D(2)=1 & D(1, 2, 3)=1	10.6%	0.31	7.6%	0.27
Social exclusion D(3)=1 & D(1, 2, 3)=1	3.0%	0.17	2.4%	0.15
Multiple poverty D(1,2,3)>=2	1.9%	0.14	1.4%	0.12
No poverty	76.7%	0.42	81.8%	0.39

Source: Authors' calculations based on J-SHINE 2010-2012.

Table 2-4: Poverty rates of each dimension by individuals' attributes (2010 and 2012)

	Poverty dimension					
	Income		Living time		Social inclusion	
	2010	2012	2010	2012	2010	2012
<b>All Persons</b>	9.1%	8.0%	12.0%	8.5%	4.3%	3.2%
<i>Sex</i>						
Male	8.2%	7.2%	14.7%	10.6%	7.5%	5.5%
Female	9.8%	8.5%	9.8%	6.9%	1.8%	1.5%
<i>partner</i>						
Yes	7.6%	6.8%	10.6%	7.1%	1.5%	1.6%
No	20.4%	20.8%	22.5%	22.8%	25.4%	20.3%
<i>Age</i>						
20s	12.7%	9.3%	14.9%	7.7%	5.6%	4.1%
30s	10.3%	9.4%	14.3%	10.7%	3.3%	2.9%
40s	6.8%	6.8%	8.7%	7.0%	4.7%	3.3%
<i>Household type</i>						
Couple with children who are all older than 6	6.0%	5.5%	4.2%	3.8%	1.4%	2.0%
Couple with one children younger than 6	7.5%	9.4%	22.6%	16.9%	2.2%	0.8%
Couple with more than two children younger than 6	14.0%	11.3%	21.3%	16.8%	0.7%	0.6%
Couple without children	4.2%	4.4%	3.7%	1.4%	1.9%	2.1%
Single-parent with children	41.1%	37.9%	37.0%	36.4%	13.7%	12.1%
One-person household	13.3%	12.3%	18.9%	18.0%	29.6%	24.6%
<i>Householders' educational level</i>						
Junior-high / High school graduates	15.1%	11.6%	10.4%	6.5%	5.7%	5.8%
Two-year college and technical school	10.1%	8.1%	10.8%	7.6%	4.7%	4.6%
Four-year college and graduate school	5.0%	5.8%	14.0%	10.5%	7.2%	6.2%
<i>Working conditions</i>						
Management executive/Operator	6.8%	4.9%	11.9%	14.8%	3.4%	3.3%
Full time employed1	4.7%	4.8%	20.8%	13.5%	5.5%	4.5%
Full time employed2	13.4%	13.5%	14.8%	10.5%	7.0%	3.8%
Part time employed	12.8%	8.7%	7.7%	6.8%	3.7%	3.3%
Self-employed	17.0%	16.2%	3.9%	6.1%	4.6%	1.4%
No work	11.6%	9.9%	0.0%	0.0%	1.4%	1.1%

Source: Authors' calculations based on J-SHINE 2010-2012.

Table 2-5: Poverty and poor health: a descriptive analysis

[2010]		Proportion (%) of					
Dimension of poverty	Definition of poverty	poor SRH			K6 $\geq$ 7		
		All	Male	Female	All	Male	Female
No poverty	D(1,2,3)=0	9.7%	8.9%	10.3%	20.6%	20.5%	20.6%
1. Household income	D(1)=1	17.7%	20.7%	15.7%	30.3%	33.3%	28.4%
2. Living time	D(2)=1	9.0%	6.4%	11.9%	18.6%	23.1%	13.4%
3. Social inclusion	D(3)=1	17.5%	16.5%	20.8%	41.8%	38.0%	54.2%
Multidimensional poverty	D(1,2,3) $\geq$ 1	12.4%	11.8%	13.0%	25.6%	28.4%	22.6%
	D(1,2,3) $\geq$ 2	28.3%	24.0%	33.3%	37.0%	40.0%	33.3%
All		10.4%	9.7%	10.9%	21.7%	22.7%	21.0%

[2012]		Proportion (%) of					
Dimension of poverty	Definition of poverty	poor SRH			K6 $\geq$ 7		
		All	Male	Female	All	Male	Female
No poverty	D(1,2,3)=0	8.3%	7.3%	9.0%	21.7%	21.1%	22.1%
1. Household income	D(1)=1	18.2%	16.4%	19.3%	32.6%	37.0%	29.8%
2. Living time	D(2)=1	10.6%	7.5%	14.1%	21.6%	18.7%	25.0%
3. Social inclusion	D(3)=1	23.7%	28.6%	10.0%	42.1%	44.6%	35.0%
Multidimensional poverty	D(1,2,3) $\geq$ 1	15.2%	14.7%	15.7%	27.8%	28.0%	27.6%
	D(1,2,3) $\geq$ 2	21.9%	17.7%	26.7%	50.0%	58.8%	40.0%
All		9.6%	8.9%	10.1%	22.8%	22.6%	22.9%

Source: Authors' calculations based on J-SHINE 2010-2012

Table 2-6: Panel logit model of poor SRH and high K6

Model	Poor SRH		High K6	
	Re Model		Re Model	
	Coefficient	z-value	Coefficient	z-value
<b>Partner</b>				
No	0.51**	2.13	0.45*	1.96
Yes (ref)				
<b>Number of children</b>				
One	-0.37*	-1.76	-0.65***	-3.27
More than two	-0.21	-1.13	-0.85***	-4.75
Zero (ref)				
<b>Working conditions</b>				
Business executive	-0.38	-0.81	-0.75	-1.57
Full time employed 1	-0.78***	-4.03	-0.46**	-2.50
Full time employed 2	-0.12	-0.37	0.06	0.21
Part time employed	-0.19	-0.89	-0.08	-0.39
Self employed	-0.94***	-2.71	-0.09	-0.30
No work (ref)				
<b>Poverty dimension</b>				
<i>Unidimensional poverty type</i>				
Income poverty	0.67***	2.95	0.44**	2.10
Time poverty	0.26	1.03	-0.12	-0.51
Social exclusion	0.91**	2.55	0.59*	1.76
<i>Multidimensional poverty type</i>				
Deprived in at least two dimensions (D(1,2,3)>=2)	1.36***	3.22	0.88**	2.06
No poverty (ref)				
Number of observations		4774		4774
Number of groups		2460		2460
Wald chi2 (12)		59.2		64.14
Prob > chi2		0.000		0.000
Log-likelihood		-1461.91		-2319.27

Note: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.



## Chapter 3: Potential impacts of income and time poverty on daily recreational activities in Japan

### 3.1 Introduction

Health benefits can be achieved by increasing one's amount of physical activity. Many empirical results of studies suggest that people who actively engage in physical activities are more likely to show better health status and well-being (Bise et al., 2007; Balboa-Castilo et al., 2011; Galan et al., 2013).

Income is also an important factor determining the level of a person's health because lower income often acts as a barrier to access to resources that enhance health. Nevertheless, some recent studies have found that not only low income, but also lack of time used for family life will engender higher risks of illness, partly because the probability of participating in physically active recreational activities such as doing sports decreases.

For instance, according to current trends in Canada, economic development has caused a decrease in the amount of leisure time of Canadians in general, presenting severe social policy implications (Spinney and Millward, 2010, p.342). Spinney and Millward (2010) report that time poverty is more important than income poverty as a barrier to regular physical activity. Kalenkoski et al. (2013) pointed out similar points. They demonstrated that time-poor individuals are less likely to engage in active travel using American Time Use Survey data.

Ishii and Urakawa (2014) found that in Japan, some household types, especially single parents with children and double-income couples with children, are now confronting a lack of time. Time poverty, a situation in which people can have only insufficient time to engage in child care and housework as well as leisure and other basic activities such as sleeping, might prevent them from participating actively in daily physical activities.

However, few researchers have examined the association of time poverty and physical activity in Japan, although prolonged work of workers has become a central issue from an international standpoint (Wada et al., 2015). The present study specifically examines relations between income and time poverty, and physical activities. Then this study estimates the effects of multiple poverty dimensions on the degree of daily

recreational activities using the household micro-dataset in Japan. By setting two dimensions of the poverty line, which consist of income and time, and by considering other socioeconomic factors, we can examine these hypotheses: (1) income poverty and time poverty are associated with physical inactivity; (2) definite correlation exists between available time and health behaviors; and (3) social-economic factors affect physical activity and health activities.

### 3.2 Literature Review

In pioneering research into time poverty, Vickery (1977) added the concept of time to the conventional measure of poverty based on money (Ishii and Urakawa, 2014). Since then, not a few researchers have defined and calculated time poverty in various countries: Harvey and Mukhopadhyay (2007) for Canada; Burchardt (2008, 2010) for the United Kingdom and Kalenkoski, et al. (2011) for the United States.

Dounthitt (2000) compared alternative approaches to defining time and income poverty and discussed their potential role in antipoverty policies. In the case of Japan, by conducting an estimation of time poverty suggested by Vickery (1977) and Harvey and Mukhopadhyay (2007), Ishii and Urakawa (2014) demonstrated that the Japanese government must increase policy support particularly for families with small children.

However, only a few reports have described investigations of the associations of time poverty and individuals' physical activity or health-related behavior. Spinney and Millward (2010) examined the associations between time and income poverty and participation in structured and unstructured physical activities, but other socioeconomic factors, such educational background and working conditions were not considered. Indeed, Kalenkoski and Hamrik (2013) estimated the correlation between time poverty and individuals' eating behavior, but the effects of multidimensional poverty were not considered in this study. In addition, longer commutes have been associated with less time spent for exercise and other health-related activities, and have been associated with substitution into lower-intensity exercise (Kalenkoski and Hamrik, 2013).

The concepts of multidimensional poverty have been applied to various fields of studies that examine health outcomes and health-related behaviors. For example, Oshio and Kan (2014) found that multiple dimensions of poverty are more useful to predict individuals' self-reported health using nationwide population survey in Japan. In addition, by application of the four dimensions of income, education, social protection and housing conditions, they suggest that multidimensional poverty affects individuals' smoking behavior.

The present study uses the household micro-datasets in Japan to examine how both income and time poverty affect engagement in physical activity. It analyzes how multidimensional poverty is associated with individuals' health-related behavior in Japan.

### 3.3 Analytical Framework: Two-dimensional Poverty Line based on Income and Time

This section explains the analytical framework used for this study with Vickery (1977) and Harvey and Mukhopadhyay (2007) as references: The framework is a two-dimensional poverty line based on income and time. Income poverty and time poverty are defined in the next paragraph.

Figure 3-1 presents a two-dimensional poverty line based on income and time. The vertical axis represents income and the horizontal axis time.  $M_0$  is the income-poverty line representing the minimum income required.  $T_1$  is the time-poverty line representing the minimum time necessary for household work.  $T_m$ , the largest value on the horizontal axis, expresses the available time, which, more specifically, is the value left after subtracting time spent for basic activities (sleeping, eating, taking personal care (excretion, bathing, getting dressed, etc.)) from the 24 hours of the day. The value left after subtracting  $T_1$  from  $T_m$  is  $T_a$ . If actual working hours  $T_w$  (including commuting time) exceed  $T_a$  near the origin and encroach on the time-poverty line  $T_1$ , then the household is regarded as time poor. Household work and market labour are assumed to be conducted by adult members of the household. Parameter values are the total time spent by the adults in the household. The values of all parameters,  $M_0$ ,  $T_m$ ,  $T_1$ , and  $T_a$  vary depending on the household type. Based on the two axes  $M_0$  and  $T_1$ , the diagram is divisible into four quadrants: the upper right area for "not poor," the lower right area for "income poor but not time poor," the upper left area for "not income poor but time poor," and the lower left area for "income poor and time poor."

Additionally, the area of "not income poor but time poor" is divisible into two types by assuming substitution of time with money such as the purchase of housework services (dining out, using childcare services, etc.). When drawing a curve with the slope of the cost of housework services from point E, at which the income-poverty line and time-poverty line intersect, the intersection  $M_1$  with the vertical axis is the minimum income necessary for outsourcing all necessary household labour. Households can be categorized into the range above the curve, in which households would not be income poor even if they purchased housework services to cover their time poverty ("not income poor after time adjustment"), and the range below the curve, in which households would be income poor if they purchased housework services ("income poor after time adjustment").

(i). Setting an income-poverty line

Poverty lines are defined generally in two ways: one is an absolute definition; the other is a relative definition. For the absolute definition, the minimum amount necessary to maintain daily life (income in this case) is measured. The poverty line is determined based on that amount.

For the relative definition, however, the poverty line is determined by comparing households against the distribution of the focused variable (income in this case) in the entire society. The study applies the method generally used to determine a relative income-poverty line and set the poverty line at 50% of the median of the distribution of equivalent disposable income that incorporates the economies of scale based on differences in the number of household members. The equivalent scale is set at 0.5.

(ii). Setting a time-poverty line

Definitions of time vary among studies (Burchardt 2010; Kalenkoski 2011). Studies reported by Vickery (1977) and by Harvey and Mukhopadhyay (2007) and other studies define a time-poverty line ( $T_1$  in Figure 3-1) as the minimum time necessary for housework. A household that is incapable of securing the minimum time required for housework because of long working hours in the market is considered time poor. The minimum time required for housework in this case means the least time needed for housework without outsourcing household chores such as cooking, washing, shopping (dining out or ordering food delivery, purchasing prepared food, using housework-related services in the market, etc.), and taking care of children, elderly people, or disabled people. Vickery (1977) used a living hour survey of time and defined the minimum time required for housework as the average time spent for housework at households with at least one full-time homemaker. Harvey and Mukhopadhyay (2007) followed this and calculated similar values from the Canadian General Social Survey. The studies used the average value of adults based on the living hour survey for time spent for basic activities (sleeping, eating, personal care (excretion, bathing, getting dressed, etc.)). More specifically, Vickery (1977) used 10.2 hours per day, the average time spent by adults for basic activities, based on the 1966 Michigan Time-use Survey of the United States. Harvey and Mukhopadhyay (2007) used 10.5 hours per day, the average time spent by adults for basic activities calculated from similar survey data of Canada. In addition, both studies considered the minimum necessary leisure time. Vickery (1977) concluded that such time is 10 hours per week. Harvey and Mukhopadhyay (2007) estimated it as 14 hours per week. Burchardt (2010) also defined time poverty from an absolute perspective. This

study determined the minimum time required for basic activities using the values in earlier studies such as those by Vickery (1997), for childcare using the childcare guidelines of the United Kingdom, and those for housework by application of the average time spent for housework by households that did not outsource their housework.

The present study defines a time-poverty line using these studies as a reference. The specific procedure is to ascertain the time spent for basic activities (sleeping, eating, taking personal care (excretion, bathing, getting dressed, etc.)) and minimum time necessary for housework ( $T_1$ ) using the 2011 Survey on Time Use and Leisure Activities of the Ministry of Internal Affairs and Communications (MIC) of Japan as a reference. The Survey on Time Use and Leisure Activities was conducted by the MIC once every five years to observe the distribution of living hours and major leisure time activities of Japanese people. The 2011 survey included participation by approximately 200,000 members aged 10 and older of approximately 83,000 households.

As the time spent for basic activities, the study used the average time spent in an entire week by men and women, separately, who were aged 20–64 years. The time for basic activities included 7.5 hours per day for men and 7.2 hours per day for women for sleeping, 1.1 hours per day for men and 1.5 hours per day for women for taking personal care, and 1.5 hours per day for men and 1.6 hours per day for women for eating. Following the example of earlier studies, this study further included the minimum leisure time required in the basic activity time. This was assumed to be one hour per day from Monday through Friday and three hours per day on Saturdays and Sundays.

Because the minimum time required for housework ( $T_1$ ) represents the least time necessary for housework without outsourcing the series of household chores such as cooking, washing, taking care of children, elderly people, or disabled people, and shopping (dining out or ordering food delivery, purchasing prepared food, using housework-related services in the market economy, etc.), for each household type to be analyzed, the study applied the average time spent for housework at households with at least one adult who did not work outside the home. More specifically, as a reference, the study used the time spent for housework at households with a husband working outside the home and wife not working outside the home for households comprising a married couple and children and households only of a married couple. For one-person households and single-parent households, the study applied the housework time of households without a member working outside the home. The housework activities include housework, nursing care, childcare, and shopping based on the Survey of Time Use and Leisure Activities. The average time spent for housework by men of one-person households is significantly shorter than in other households. Because many men living

alone are likely to outsource much of their housework by, for instance, dining outside instead of cooking at home, the minimum housework time required at female one-person households was substituted for that at male one-person households.

Table 3-1 presents the time spent for basic activities and the minimum time required for housework ( $T_1$ ) for each household type, as developed using the 2011 Survey on Time Use and Leisure Activities as a reference. As described later, the household types to be analyzed are consistent with those in the 2011 Survey on Time Use and Leisure Activities. The basic activity time and minimum time necessary for housework assumed in this study are smaller than the values used in earlier studies such as those conducted by Vickery (1977) and by Harvey and Mukhopadhyay (2007). The time-poverty line becomes lower for the difference. The likely reason is that, as revealed also by an international comparison made by the OECD (2011b), the time spent by Japanese people for leisure and personal care is less than that in other countries. It is noteworthy that this time-poverty line reflects the conditions and customs of Japanese people.

### 3.4 Data used and Hypotheses

#### 3.4.1 Data

The survey we conducted was collected from a nationwide internet survey in Japan. It was designed and implemented in 2012 for a research project that investigated the socioeconomic determinants of subjective well-being. It was sponsored by the Japanese Society for the Promotion of Science (JSPS). We sent questionnaires to 8059 randomly selected people who were registered on the members' list of an internet survey institute. We obtained 6491 responses in all (response rate: 80.5%).

The surveys elicited ample information related to individuals' subjective assessments of their own well-being, personal traits, demographic and socioeconomic status, and the frequency of several types of daily recreational activities. Many of them are useful for examination of the relation between income and time poverty and daily recreational activities.

To ensure that the sample was representative of the actual population, targeted proportions of 15 population groups were constructed, corresponding to a matrix of five age groups (20s, 30s, 40s, 50s, and 60s) and three household income classes (3 million yen or less, 3–6 million yen, and 6 million yen or more) in advance. They are based on two official statistical publications: The *Population Census* and the *Comprehensive Survey of Living Conditions of the People on Health and Welfare*. Samples were collected

until the numerical targets were obtained<sup>4</sup>.

In the analysis, we drew 20-69 aged samples, and omitted the samples who didn't answer related questions and students. As a result, we use 5872 samples.

### 3.4.2 Hypothesis

It has been demonstrated that some types of daily recreational activities such as doing sports are positively associated with personal health status. We set the following three hypotheses related to how the existence of income and time poverty affect daily recreational activities. Then we examine their validity.

- (i) Income poverty decreases the frequency and intensity of costly daily recreational activities.
- (ii) Time poverty decreases the frequency and intensity of time-consuming daily recreational activities.
- (iii) Negative effects of multiple poverty situations (income and time poverty) on daily recreational activities surpass the scale of the coefficient of each poverty situation.

### 3.4.3 Variables

#### Explained variable

To examine the validity of the hypotheses presented above, we used replies for the frequency and intensity of daily recreational activities consisting of four items as key dependent variables. We categorized these activities into two types, based mainly on the Saltin–Grimby Physical Activity Level Scale (SGPALS) originally established by Saltin and Grimby (1968). The first category is Physically Active Recreational Activity (PARA). This category mainly includes light, moderate, and vigorous physical activities such as cycling or walking to work, walking with family, gardening, fishing, playing tennis, bowling, swimming, and skiing. The second category is Physically Stationary Recreational Activity (PSRA). This category includes physically inactive and passive recreational activity. Reading, watching television, watching movie, using computers or doing other sedentary activities during leisure time are categorized into this type. This scale has good validity and reliability. It is often used by health science researchers (Aires et al., 2003).

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<sup>4</sup> Yagi et al. (2016) used the same survey for the study on the relations between happiness and employment status.

By consideration of these two categories, our analysis uses the following two variables as PARA: doing sports and visiting interesting places. Regarding the variables related to PSRA, we set the following two variables: watching movies and reading. The concrete contents of questionnaires related to daily recreational activities are the following.

[Question]

“Now we will ask you a question about your hobbies and pastimes. How often in the past year have you engaged in each of the hobbies and pastimes listed below?”

[List]

Doing sports activities, and visiting interesting places (PARA)  
Watching movie, and reading (PSRA)

[Alternatives]

(1) A few times a week, (2) Once a week, (3) Once a month,  
(4) A few times a year, (5) Only slightly ever  
(For doing sports)

(1) Almost daily, (2) A few times a week, (3) Once a week,  
(4) Once a month, (5) Only slightly ever  
(For visiting interesting places, watching movie, and reading)

We produced a dummy variable for visiting interesting places, watching movie, and reading showing inactive participation (only slightly ever). For doing sports, we set a dummy variable showing active participation (a few times a week). Additionally, we set three dummy variables showing health-related behaviors, i.e., smoking (current smoking), drinking (usually drink more than three 350 ml cans of beer a day), and lack of sleep (below 6 hours per day), as explained by variables of the econometric model set in the next section.

### Explaining Variable

Regarding key independent variables, as the preceding chapter has defined, dummy variables are made to reflect the situation of two-dimensional poverty (income and time poverty). In addition, dummy variables related to gender, age groups, and socioeconomic



factors such as academic background, job status are included in this analysis to control the effects of other important factors, based on the previous studies on socio economic factors of physical activity (Breuer, et al., 2010; Brown and Roberts, 2011).

Table 3-2 presents basic characteristics of the samples used. The characteristics of the samples in Japan are given by gender. From the poverty category of the table, one can confirm that a certain amount of difference exists related to gender gaps of poverty level. That difference might reflect differences of the labour participation rate and the employment of women in Japan. Regarding the household type, about 70% of respondents were residents of households with a spouse. In addition, age distributions do not differ much among age classes.

These descriptive statistics reflect that 15.7% of individuals in the total sample were categorized as income poor but not time poor. Actually, 17.2% of female respondents were classified as having income poverty, which is higher than that of male respondents (14.7%). However, the results of the ratio of time poor but not income poor shows that men (10.3%) were more likely to be time poor than women (5.9%), perhaps because of their greater full time labour force participation (54.6%). However, the ratio of women who has not worked outside was much higher (44%) than the ratio of unemployed men (13.6%). For mixed two-dimensional poverty, no great difference can be found between men and women, only 1.2% of men and 1% of women reported both time and income poverty. In addition, women who are doing sports had a relative frequency of 17.5%, which is lower than men (22.9%). Women with inactivity of reading (19.8%) also reported a higher relative frequency than men (12.4%). However, regarding inactivity of health related activity, ratios of men who were smoking (29.6%), drinking (20.1%) and lacking sleep (17.6%) showed a higher relative frequency than women who like smoking (14.7%), drinking (4.5%) and sleep less than 6 hours per day (16.2%).

### 3.5 Econometric Analysis

#### 3.5.1 Analytical method

The study estimates normal probit and instrumental variable (IV) probit estimations to examine whether verified hypotheses related to the relation between daily recreational activities and multi-dimensional poverty are valid or not. The IV probit estimation is applied, considering the possibility that participating in sports improves longer-term labour productivity (Hyytinen and Lahtonen, 2013). For the present study, several dummy variables were set as candidates of instrumental variables for the income poverty dummy. These variables were checked using the Wald test to ascertain whether they have

satisfactory validity.

The outline for three dummy variables showing instrument variables is the following: (1) linguistic skills, (2) communication skills, and (3) working experience. For linguistic skills and communication skills, the survey presented questions such as “from the items below, please select all things that you already have (including skills)”. We assigned one point for each answer result of linguistic skills and communication skills if respondents responded with them as “things that I already have”. For working experience, the survey presented the question of “how many years have you been working at your current place of employment?”, to which we assigned one point for respondents who answered “worked more than five years in the current workplace”.

### 3.5.2 Estimation Results

This section presents the results of empirical analysis of poverty and other socioeconomic effect on leisure daily activities and health-related activities. First, we selected four variables to describe physically active activities: doing sports, visiting interesting places, reading, and watching movies. Respondents were asked about their current condition of doing physical activities on a five-point scale (*a few times a week, once a week, once a month, a few times a year and only slightly ever*) for doing sports and, (*almost daily, a few times a week, once a week, once a month, and only slightly ever*) for visiting interesting places, watching movie, and reading. We constructed a binary variable of doing daily recreational activities less for visiting interesting places, reading, and watching movies, to which we allocated 1 if the respondent answered *only slightly ever*. In addition, we constructed a binary variable of doing sports and allocated 1 if the respondent answered *a few times a week*.

Secondly, we considered smoking, drinking, and sleeping less as indicators of health-related activities, and constructed binary variables for each. For drinking, a binary variable was allocated as 1 if an individual answered “*I usually drink three or more than three 350 ml cans of beer each day*”. For sleeping, an individual who sleeps fewer than 6 hours was regarded as sleeping less and was allocated to 1 in dummy variable for this indicator. In addition to these two unhealthy activities, we constructed binary variables for current smoking.

Table 3-3 presents results obtained from a logit model to estimate the socioeconomic effects on three daily recreational activities. Regarding the results for visiting interesting places, we noticed that one-dimensional income poverty positively affects a low frequency of visiting interesting places. Time poverty that female persons confront has the tendency of causing visiting interesting places less compared to male. In addition,

high educational background has a significant effect on the behavior of visiting interesting places. Moreover, women and people who are employed full time or employed part time show a higher probability of visiting interesting places than others. For reading behavior, lack of leisure time is associated with the less reading activity. We also observed that women, younger Japanese people, and those with low educational level tend to read less than others.

Table 3-4 presents the estimated results of the socioeconomic effects on health-related activities. We first observed that time poverty has a negative effect on sleeping, particularly for male. Regarding educational background, low educational attainment tends to predict unhealthy activities such as smoking and drinking. Men have higher probability of smoking and drinking than women. However, female who fall into income or time poverty tend to depend on drinking behavior. We also observed that people who have partners tend to do more health-related activities aside from drinking. Moreover, working conditions are associated with health-related activities. For example, full time employed workers are more likely to smoke and drink; part time employed workers tend to smoke and to sleep less.

Table 3-5(a) and Table 3-5(b) present estimation results by gender, obtained using the Probit model and IV-Probit model to estimate the socioeconomic effects on sports activities. First, we examine the estimation results obtained for all samples. Household income was found to have a positive relation with active participation in sports. One-dimensional time poverty was negatively related with active participation in sports in IV-Probit estimation (Table 3-5(b)). In addition, people who were married, people who were divorced (or widowed), full-time workers, part-time workers, and people who have low educational attainment tend to be inactive in sports participation. Secondly, by application of Probit estimation, we examined the estimation result obtained for men, observing that household income is closely associated with sports participation, but time poverty is not significantly associated. However, income and lack of free time are associated with men's activity of doing sports according to IV-Probit estimation. Finally, we examined the estimated results for women obtained using the Probit model and IV-Probit model. We first observed that low household income is associated with women's sports participation using Probit estimation, but not significantly via IV-Probit estimation. Furthermore, marriage status, full time employment, and part-time employment status hinder active participation in sports.

### 3.6 Conclusion

This analysis specifically examined the association between multidimensional poverty, participation of physical activity and participation in health related activities, by defining poverty from two dimensions of income and time in Japan using a micro dataset. Many previous studies have pointed out strong relations among the level of income, health condition, and the probability of doing physical activity. However, time, along with money, is a finite resource. It is an important factor affecting the standard of people's life (Ishii and Urakawa, 2014).

Several studies have grasped poverty from two dimensions of income and time and examined their effects on active participation in physical activity in other countries, but no report in the relevant literature has described the use of this approach in Japan. We investigated relations among time, money, and the intensities of daily activities. Furthermore, we considered the effects of other socioeconomic factors.

From the estimation results obtained using econometric models, we first clarified that income poverty is an important factor of low probability of PARA such as doing sport and visiting interesting places. For time poverty, we observed that it is highly associated with low frequency of reading and short-duration sleeping.

Indeed, we observed different results for women and men by checking the effects of cross terms. For men, who have income poverty become less likely to visit interesting places, while lack of living time might prevent them from actively reading, doing sports, while getting less sleep.

For women, individuals who are deprived on one-dimensional income poverty tend not to engage in visiting interesting places. In addition, the negative impact of low income on watching movies is larger for female than male. Time poverty is also an important determinant for women to visit interesting places and to read actively. Regarding health related activities, women whose income is very low might sleep less than others, but the effect is smaller than the case of male. These findings show that time-poor people tend to become inactive about doing physical activities, which are regarded as generally related with people's health condition.

As a second point, we confirmed that educational background can contribute to doing physically active activities as well as health related activities. Results show that people who have a low educational level are less likely to do sports, visit interesting places, or read. Furthermore, a low educational level might cause unhealthy behavior such as smoking and drinking too much.

As a third point, we observed different results among full time workers, part time workers, and self-employed people, compared to individuals who are not employed. For physical activities, full timers and part timers tend to be active in doing sports. Indeed,

full time employed workers become more likely to visit interesting places and to read. However, for health-related activities, rather, individuals who are regularly employed showed high probability of smoking and insufficient sleep time, which indicates that regular workers in Japan have a higher risk of unhealthy behaviors.

Finally, we describe several policy implications from estimate results obtained through this study. First, government must increase policy support for people who confront difficult circumstances of time poverty and income poverty, such as single parents.

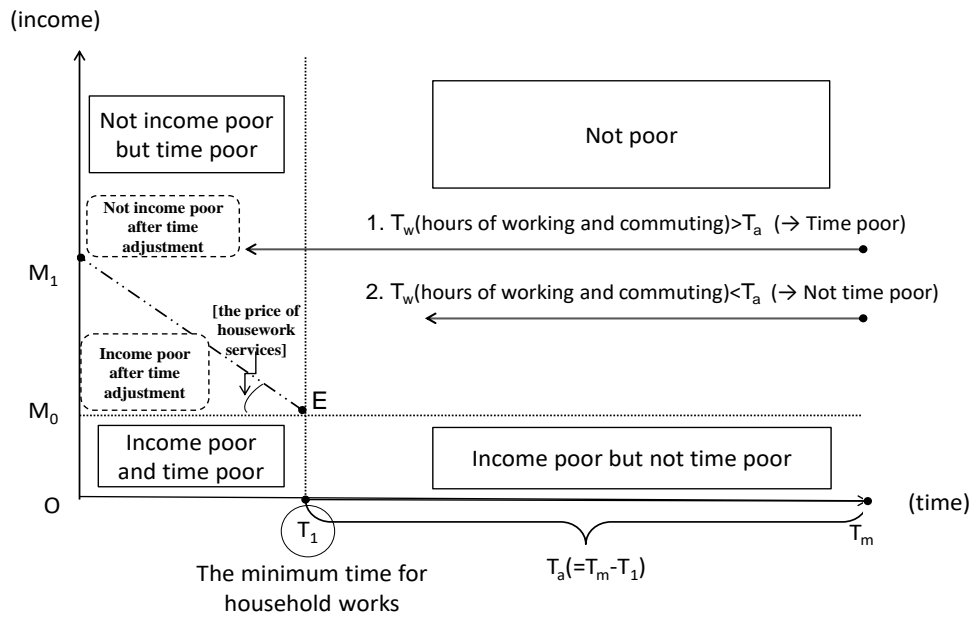
As several previous results of studies have suggested, a well-funded public child care system would help alleviate the problem of “time poverty.” In addition, policy reforms must be done with the knowledge that labour, time, and resources are all required for individuals to survive and to care for their families (Spinney and Millward, 2010). Job assistance is one important policy as a measure for income poverty.

Secondly, government should consider enhancing physical education, especially for people who have a low educational background. Kajitani and Kohara (2006) examined the demographic and socioeconomic variables that putatively affect the intensity activities for health investment, using prefectural level data (1981–2001), particularly addressing working men. Results show that high education attainment is positively correlated with the level of sports activity.

Above all, unstructured physical activities require no memberships or special facilities and might be done anytime throughout the day (e.g., walking and hiking). The prevalence of daily recreational activities that require little money and/or schedule commitments to participate should be reinforced. Some physical recreational activities are expected to help people to achieve capabilities directly and indirectly.

Thirdly, daily recreational activities such as doing sports can contribute to long and healthy lives, can provide more opportunities to participate in the life of the community, and can improve skills of teamwork, discipline, and the value of effort for people in the workplace. Consequently, enterprises also should consider providing more sport-related projects for their workers to improve their access to and participation in appropriate forms of physical activity.

Figure 3-1: Outline of income poverty and time poverty.



1

Note: Added to Ishii and Urakawa (2014).

Table 3-1: Minimum time required for basic activities and housework by household types

	7 days (V) week	Essential time (Te)		Tm (V-Te) week	Minimum time required for the housework T1				Disposal time Ta (Tm-T1) week		
		Leisure (weekday) day	Leisure (weekend) day		Housework day	Nursing/ Caring day	Childcare day	Shopping day		Total week	
											(hours)
Couple with children											
with children who are all older than 6	336	165.5	2.0	6.0	170.5	5.5	0.2	0.4	1.2	50.9	119.6
with one child younger than 6	336	165.5	2.0	6.0	170.5	4.0	0.1	5.0	1.1	71.3	99.2
with two or more children younger than 6	336	165.5	2.0	6.0	170.5	3.7	0.1	6.2	1.0	77.0	93.5
Harvery and Mukhopadhyey (2007)	336	175.0	4.0	4.0	161.0	-	-	-	-	74.6	86.4
Couple without children	336	165.5	2.0	6.0	170.5	4.3	0.1	0.1	1.1	39.4	131.1
Vickery (1977)	336	162.8	2.0	5.0	173.2	-	-	-	-	74.6	86.4
Single parent with children	168	83.2	1.0	3.0	84.8	3.5	0.1	1.1	1.0	39.3	45.5
Harvery and Mukhopadhyey (2007)	168	87.5	2.0	2.0	80.5	-	-	-	-	52.0	28.5
Male one-person household	168	82.3	1.0	3.0	85.7	2.3	0.1	0.0	0.6	21.2	64.5
Female one-person household	168	83.2	1.0	3.0	84.8	2.3	0.1	0.0	0.6	21.2	63.6
Vickery (1977)	168	81.4	1.0	2.5	86.6	-	-	-	-	31.0	55.6
Single person with parents	168	91	1.0	3.0	77	1.3	0.1	0.0	0.2	11.2	65.8

Source: Authors' calculations based on *Survey on Time Use and Leisure Activities, 2011*, Vickery (1977), Harvey and Mukhopadhyay (2007) and Ishii and Urakawa (2014).

Table 3-2: Basic statistics of the samples used

	All (n=5872)		Male (n=3447)		Female (n=2425)	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
<b>Mariage</b>						
married dummy	67.2%	0.47	68.1%	0.47	65.9%	0.47
widow/divorce dummy	6.5%	0.25	5.2%	0.22	8.4%	0.28
single dummy	26.3%	0.44	26.7%	0.44	25.7%	0.44
<b>Children</b>						
no_child dummy	40.2%	0.49	39.1%	0.49	41.7%	0.49
having children (less than 6) dummy	11.9%	0.32	10.8%	0.31	13.6%	0.34
having children (be equal to or more than 6) dummy	47.9%	0.50	47.9%	0.50	50.1%	0.50
<b>Age</b>						
20s dummy	11.7%	0.32	7.1%	0.26	18.1%	0.39
30s dummy	22.8%	0.42	22.4%	0.42	23.3%	0.42
40s dummy	21.1%	0.41	20.9%	0.41	21.2%	0.41
50s dummy	27.6%	0.45	28.0%	0.45	27.1%	0.44
60s dummy	16.8%	0.37	21.6%	0.41	10.2%	0.30
<b>Working conditions</b>						
Full time employed dummy	40.4%	0.49	54.6%	0.50	20.2%	0.41
Part time employed dummy	24.4%	0.43	19.2%	0.39	31.7%	0.47
Self employed dummy	9.0%	0.29	12.6%	0.33	4.0%	0.20
No work dummy	26.2%	0.44	13.6%	0.34	44.0%	0.50
<b>Householders' educational level</b>						
High school graduate dummy	27.5%	0.45	26.3%	0.44	29.2%	0.45
Two-year college and technical school dummy	22.1%	0.42	12.4%	0.33	35.9%	0.48
Four-year college and graduate school dummy	50.3%	0.50	61.2%	0.49	34.8%	0.48
<b>Poverty</b>						
Income poverty dummy (not time poverty)	15.7%	0.36	14.7%	0.35	17.2%	0.38
Time poverty dummy (not income poverty)	8.5%	0.28	10.3%	0.30	5.9%	0.24
Both income and time poverty dummy	1.1%	0.10	1.2%	0.11	1.0%	0.10
Non poverty dummy	74.7%	0.43	73.9%	0.44	75.9%	0.43
<b>Daily reactional activity</b>						
Doing sports dummy	20.7%	0.40	22.9%	0.42	17.5%	0.38
Inactivity of visiting intresting places dummy	65.4%	0.48	67.1%	0.47	62.9%	0.48
Inactivity of reading dummy	15.4%	0.36	12.4%	0.33	19.8%	0.40
Inactivity of watching movies dummy	33.9%	0.47	32.8%	0.47	35.4%	0.48
<b>Inactivity of health related activity</b>						
Smoking dummy	23.5%	0.42	29.6%	0.46	14.7%	0.35
Drinking dummy	13.7%	0.34	20.1%	0.4	4.5%	0.21
Lack of sleeping dummy	17.0%	0.38	17.6%	0.38	16.2%	0.37

Source: Author's calculation based on Survey on Regional Environment and Happiness, 2011

Table 3-3: Logit model: Factors on inactivity of daily reactional activity [n=5872]

Dependent variables (1= less than once a month; 0= more than once a month)	Inactivity of visiting interesting places		Inactivity of reading		Inactivity of watching movies	
	Odds ratio	z-value	Odds ratio	z-value	Odds ratio	z-value
<b>Sex</b>						
Female	0.58***	-6.81	1.34**	2.72	1.06	0.69
Male (ref)						
<b>Marriage situation</b>						
Married	1.43***	4.78	0.80**	-2.40	1.04	0.59
Divorced/Widow	1.29**	1.97	1.77***	3.83	1.05	0.35
Single (ref)						
<b>Age</b>						
30s	1.12	1.05	0.91	-0.80	1.01	0.12
40s	0.97	0.11	0.65**	-3.30	0.88	-1.17
50s	0.75**	-2.70	0.43***	-6.22	1.04	0.32
60s	0.64***	-3.49	0.35***	-6.44	1.11	0.86
20s (ref)						
<b>Working conditions</b>						
Full time employed	0.60***	-5.60	0.66***	-3.53	0.85*	-1.83
Part time employed	0.76**	-3.30	0.86	-1.41	0.94	-0.76
Self employed	0.87	-1.15	0.85	-1.05	0.97	-0.29
No work (ref)						
<b>Householders' educational level</b>						
High school graduate	1.84***	8.55	1.44***	4.04	1.05	0.74
Two-year college and technical school	1.34***	3.92	1.28**	2.54	0.94	-0.83
Four-year college and graduate school (ref)						
<b>Poverty dimension</b>						
Income poverty (one dimension)	1.55***	3.51	1.60**	3.28	1.22*	1.82
Time poverty (one dimension)	0.99	-0.05	1.42**	2.18	1.03	0.25
Income and Time poverty	1.28	0.69	1.72	1.39	1.58	1.40
No poverty (ref)						
<b>Intersection variable</b>						
Income poverty (one dimension) × Female	1.11	0.59	0.84	-0.94	1.20	1.19
Time poverty (one dimension) × Female	1.71**	2.39	0.90	-0.37	1.03	0.25
Low income and Time poverty × Female	1.21	0.68	1.13	0.21	0.42	-1.52
<b>Log likelihood</b>						
		-3670.9		-2392.1		-3736.5

Note: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.



Table 3-4: Logit model: Factors on inactivity of health related activity [n=5872]

Dependent variable	Smoking dummy (1= current smoking; 0=others)		Drinking dummy (1= drink more than 3 cans of beer a day; 0=others)		Lack of sleep dummy (1=sleep less than 6 hours a day; 0=others)	
	Odds ratio	z-value	Odds ratio	z-value	Odds ratio	z-value
<b>Sex</b>						
Female	0.41***	-9.16	0.17***	-12.27	1.18*	1.67
Male (ref)						
<b>Marriage situation</b>						
Married	0.95	-0.57	1.21*	1.71	0.90	-1.20
Divorced/Widow	1.92***	4.79	1.82**	3.44	1.23	1.34
Single (ref)						
<b>Age</b>						
30s	1.23	1.56	2.01**	2.86	0.94	-0.45
40s	1.27*	1.73	3.19***	4.76	1.19	1.25
50s	1.63***	3.63	3.89***	5.63	1.02	0.12
60s	1.19	1.10	3.88***	5.28	0.83	-1.10
20s (ref)						
<b>Working conditions</b>						
Full time employed	1.41**	3.19	1.14	0.97	1.88***	5.37
Part time employed	1.28**	2.44	1.14	0.98	1.45**	3.36
Self employed	1.73***	4.35	1.30*	1.69	0.91	-0.57
No work (ref)						
<b>Householders' educational level</b>						
High school graduate	1.78***	7.60	1.37**	3.35	0.89	-1.27
Two-year college and technical school	1.63***	5.56	1.39**	2.90	0.98	-0.18
Four-year college and graduate school (ref)						
<b>Poverty dimension</b>						
Only Low income	1.09	0.72	0.71**	-2.38	0.91	-1.74
Only Time poverty	1.19	1.40	0.91	-0.62	1.54**	3.22
Low income and Time poverty	1.33	0.84	0.46	-1.45	1.56	1.14
No poverty (ref)						
<b>Intersection variable</b>						
Income poverty (one dimension) × Female	0.92	-0.45	1.45	1.20	0.68*	-1.74
Time poverty (one dimension) × Female	0.67	-1.35	2.10*	1.92	0.60*	-2.00
Low income and Time poverty × Female	1.01	0.01	5.45*	1.81	0.47	-1.11
Log likelihood	-3025.0		-2105.5		-2619.9	

Note: \*\*\*,\*\*,and \* are statistically significant at 1%, 5% and 10% level.

Table 3-5(a): Probit estimation of socioeconomic factors on doing sports

Dependent variable : Doing sports	All		Male		Female	
	Coef	s.e	Coef	s.e	Coef	s.e
<b>Age</b>	0.193	0.017***	0.130	0.024***	0.203	0.028***
<b>Marriage situation</b>						
Married	-0.133	0.052**	-0.003	0.067	-0.249	0.092***
Divorced/Widow	-0.305	0.089***	-0.228	0.126*	-0.321	0.131**
Single (ref)						
<b>Working conditions</b>						
Full time employed	-0.174	0.052***	-0.439	0.086***	-0.174	0.098*
Part time employed	-0.172	0.056***	-0.245	0.090***	-0.198	0.075***
Self employed	-0.116	0.064*	-0.322	0.089***	-0.122	0.145
No work (ref)						
<b>Householders' educational level</b>						
High school graduate	-0.112	0.046**	-0.143	0.058**	-0.005	0.079
Two-year college and technical school	-0.136	0.050***	-0.087	0.077	-0.052	0.074
Four-year college and graduate school (ref)						
<b>Income and Time</b>						
ln (household income+1) [million yen]	0.092	0.092**	0.146	0.055***	0.132	0.066**
Time poverty (one dimension)	-0.080	0.067	-0.110	0.085	-0.001	0.110
Number of observations	5872		3447		2425	
Likelihood	-2890.40		-1792.28		-1084.58	

Table 3-5(b): IV Probit estimation of socioeconomic factors on doing sports

Dependent variable : Doing sports	All		Male		Female	
	Coef	s.e	Coef	s.e	Coef	s.e
<b>Age</b>	0.169	0.019***	0.088	0.031***	0.159	0.044***
<b>Marriage situation</b>						
Married	-0.401	0.112***	-0.170	0.100***	-0.526	0.244**
Divorced/Widow	-0.312	0.091***	-0.225	0.129*	-0.290	0.136**
Single (ref)						
<b>Working conditions</b>						
Full time employed	-0.403	0.099***	-0.912	0.223***	-0.337	0.166**
Part time employed	-0.213	0.060***	-0.414	0.118***	-0.222	0.079***
Self employed	-0.266	0.086***	-0.688	0.183***	-0.218	0.167
No work (ref)						
<b>Householders' educational level</b>						
High school graduate	-0.002	0.062	-0.019	0.080	0.101	0.118
Two-year college and technical school	-0.089	0.540	-0.027	0.093	0.005	0.089
Four-year college and graduate school (ref)						
<b>Income and Time</b>						
ln (household income+1) [million yen]	0.743	0.243***	0.845	0.307***	0.688	0.456
Time poverty (one dimension)	-0.154	0.073**	-0.149	0.089***	-0.069	0.125
Number of observations	5872		3447		2425	
Wald chi2 (10) (p<0.000)	192.59		114.54		76.68	
Wald test of exogeneity	7.68		5.58		1.52	
Wald test Prob > chi2	0.0056		0.0181		0.2177	
Instrument variable	Linguistic skills		Linguistic skills		Linguistic skills	
	Communication skills		Communication skills		Communication skills	
	Working experiences		Working experiences		Working experiences	

Note1: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.

Note2: Doing sports means 1= doing sports more than a few times a week; 0=less than once a week.

## Chapter 4: Analysis of poverty of income and living time:

### An approach from estimation of CES well-being function

#### 4.1 Introduction

Since the 1990s, empirical studies emphasizing the growth of income inequality and poverty (relative poverty) have been conducted in many developed countries. According to an international comparison done by the OECD (2016), Japan is also facing severe poverty: its relative poverty rate was high, at 16%, in 2012 after Mexico, Israel, the U.S., Turkey, and Chile. Japan's poverty rate in all age groups, including people aged 17 years or younger, those aged 18–64, and those aged 65 or older, exceeded the average of the OECD member countries (OECD 2016, p.57).

As exemplified by the OECD's international comparison, most inequality and poverty studies have used monetary measures such as income and consumption. Monetary measures are certainly the most comprehensible and manageable when assessing people's living standards. Money buys many people's necessities. Even having an adequate amount of monetary resources, however, leaves cases in which the quality of life is reduced considerably by a lack of time for personal or family life at home, which causes inadequacy in housework, childcare, nursing, or caregiving for family members, and other private activities. The reason is that housework, childcare, and other services provided at home are not completely substitutable with services available on the market or social security services provided by the national and local governments. Like money, living time that people can use freely is a finite resource and a decisively important factor affecting the quality of life.

Many earlier studies have emphasized the rising Japanese poverty level using monetary dimensions. However, time is also an important resource determining people's standard of living and access to physical activities. To clarify aspects of income-based poverty and time poverty in Japan, Ishii and Urakawa (2014) defined the time-poverty line following the method applied by Vickery (1977), which considers disposable time and the minimum time necessary for housework by household type. Using the Japan Household Panel Survey (JHPS), Ishii and Urakawa (2014) measured two-dimensional poverty and found high time poverty rates of single-parent households and double full-time employed households with children younger than six years old.

The analyses of earlier studies, however, have left some issues to be resolved. One of the more important issues is the appropriateness of the definition of poverty used for estimation. The question of whether a household that is categorized as “non-poor” based on its income but as “poor” in terms of time, for instance, is truly in a state of poverty. In fact, an adequate amount of income should allow the household to purchase alternative housework or childcare services from the market (although they are not complete), which can compensate for the lack of living time to some extent. Even if income is at a “poor” level, having “non-poor” time can be expected to help the household earn additional income in the labour market and to escape from income poverty. Yet household members have not taken such an action, which suggests that they might have adequate savings or other assets and that they do not necessarily need to earn more income. In this case, the low level of income might be a voluntary choice. There might be opposite cases in which a household is unable to get adequate employment even if the members wish to earn a higher income. In either case, poverty must be determined by incorporating consideration of the substitutability and interdependent relationship of income and living time if examined from the perspectives of both income and living time.

Considering such an issue, Merz and Rathjen (2014) proposed a poverty estimation method called the compensation approach, which specifically addresses the substitutability of income and time. This is an analytical method of determining household poverty by estimating a CES-type well-being function that includes income and spare time among its variables and which substitutes values of income and living time (spare time) of each household for the estimated function. Although measurements of poverty using the compensation approach have been accumulated in earlier studies conducted overseas, no full-scale analysis in Japan using large amounts of questionnaire data has been reported.

This study, therefore, aims to observe poverty in Japan from both income and time perspectives based on the compensation approach of Merz and Rathjen (2014) using panel data. This study examines socioeconomic factors underlying such poverty. The estimation of poverty through a compensation approach allows the extraction of “people whose poverty is caused by a lack of living time,” who have been overlooked in the past, and “non-poor people who are choosing time (spare time) over income,” who have been considered income-poor in the past. This research should offer policy implications that supplement the analytical results of existing studies on what types of policies are necessary to facilitate the achievement of the recently emphasized work-life balance of people raising children and the reduction of poverty of single-person households.

This chapter is structured by identification and estimation part as follows. Section

4.2 reviews earlier studies of time poverty. Identification sections 4.3 and 4.4 present description of the database (4.3.1), statistical variables (4.3.2), and establishment of poverty dimensions: income (4.3.3) and time (4.3.4). Section 4.4 presents discussion of the identification of interdependent multidimensional poverty based on a compensation approach provided by Merz and Rathjen (2014), and describes estimation of the time and income compensation via the CES well-being function (4.4.1), the finding of multidimensional poverty threshold as utility (4.4.2), and assignment of each to a multiple poverty regime (4.4.3). Section 4.5 presents estimation of socioeconomic determinants for interdependent multidimensional poverty conducting logit estimation (4.5.1) and panel logit estimation (4.5.2). Section 4.6 concludes this paper.

#### 4.2 Preceding Studies

This section presents a review of some earlier studies which have specifically addressed time poverty. Since the pioneer research related to time poverty by Vickery (1977), the concept of time has been added to the conventional measure of poverty based on a monetary dimension. Based on the intra-household distribution model of Becker (1965), Vickery (1977) defined that household resources consisted of “assets,” “time,” and “abilities of household members.” The model of Becker (1965) determines the optimal level of housework and balance between saving and consumption by appropriately distributing the time of each household to market labour and household labour based on household member abilities. Considering this theory, Vickery (1977) presented a two-dimensional poverty line using data of the United States. More specifically, the study estimated the minimum income required ( $M_0$ ), the minimum time required for household work ( $T_1$ ), and the minimum income required when outsourcing household work ( $M_1$ ) for each household type. The study also calculated the poverty rate for households of each type and critical wage rate at which a person can be free from poverty.

Some studies which have been made by following the concept of the two-dimensional poverty line of Vickery (1977). Douthitt (2000), for instance, used the 1985 American Time Use Survey and attempted to update the research of Vickery (1977). Harvey and Mukhopadhyay (2007) measured the two-dimensional poverty rates in the late 1990s of Canada and found high time-poverty rates of single-parent households (with two or more children). The study subsequently estimated an approximate 2% rise in income-poverty rate in consideration of the cost of outsourcing housework and childcare paid by ‘*time-poor*’ households. Similarly, Kalenkoski et al. (2011) verified variables

correlated to time poverty using data from the American Time Use Survey Data and reported that income poverty had no statistical correlation with time poverty. The study also revealed that an increase of one child would reduce approximately 35 min per day of daily discretionary time (time available for sleeping, getting dressed, doing housework and taking care of children in general, and activities other than labour) of adults. In addition, Burcahrdt (2008, 2010) used the UK Time Use Survey 2000 to investigate the relations between time poverty and personal attributes such as education, income, and race. Goodin et al. (2005) argued in detail about the definition of time poverty and examined how welfare policies can be expected to affect the amount of discretionary time of individuals.

Two-dimensional poverty based on time and money has yet to be studied in Japan. Some researchers have analyzed living hours (Ishii and Urakawa 2014; Urakawa and Oshio 2016). They primarily emphasized the work-life balance of households with small children. Many have implied the burden of time constraints, particularly by working single parents with children (Yano 1998; Tamiya and Shikata 2007; Japan Institute for Labour Policy and Training 2012; Cabinet Office 2013, etc.). For example, Tamiya and Shikata (2007) specifically examined single-mother households, analyzing the management of work and childcare in terms of international comparison, and pointed out that single mothers in Japan worked significantly longer hours and spent shorter time taking care of their children than single mothers in the United States and Europe. The Japan Institute for Labour Policy and Training (2012) conducted the Survey on Living Conditions of Households with Children and the Work Arrangement of Parents and developed various statistics based on the results. Although only 7.6% of working mothers of two-parent households had responded that they have conflict between work and family life “almost every day,” 16.8% of working single mothers and 13.8% of working single fathers had responded similarly. This fact also underscores the heavy burden of time constraints on single-parent households. These results suggest that poverty in life, particularly of households with small children, can be understood more accurately by adding time constraints to monetary conditions for the measure of poverty.

### 4.3 Data and Analytical Framework

#### 4.3.1 Data

The dataset used for this chapter is the Japan Household Panel Survey (JHPS) conducted by Panel Data Research Center at Keio University. JHPS are panel data obtained from about 4,000 adult persons in 2009, which include various fields of

questions such as household attributes, employment status, income, life hours, and residential status (Ishii and Urakawa 2014). This study used pooled samples from 2011 (JHPS2011) through 2014 (JHPS2014), including one question related to commuting time, for analyses.

The analysis is limited to households for which accurate data are available in order to measure time poverty based on the information on the living time (particularly working hours and commuting time) of adults in households. In fact, JHPS asked questions about living time only to its respondents and their spouses. No detailed information about adults, if any, other than married couples in the households were available from the survey data. The actual analysis, therefore, limits the survey respondents to those belonging to any of the following nine types of households by following the household classification of the Survey on Time Use and Leisure Activities published by the Ministry of Internal Affairs and Communications (MIC).<sup>5</sup>

- Couple with children (older than 6)
- Couple with children (one child younger than 6)
- Couple with children (two or more children younger than 6)
- Couple without children
- Single parent with children
- Single household (under 65) [Male]
- Single household (under 65) [Female]
- Single household (over 65) [Male]
- Single household (over 65) [Female]

This study excludes students and adults living with their parents from the analysis. The variables used for the analysis include sex, marital status, householder's age, job status of survey respondents (and their spouses), weekly working hours and commutation time, the number of children, householder's educational background, income, and residential area. Moreover, the analysis is limited to households providing information for all of these variables. It is noteworthy that this study limits its analysis to the specific households described above and that it uses data from the third to sixth surveys, which are affected by sample omission to a considerable degree. Furthermore, the analyzed sample is not necessarily representative of the entire society of Japan<sup>6</sup>.

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<sup>5</sup> From the JHPS, we cannot grasp the conditions of all living time of adult members of three-generation households. Therefore, we excluded the samples of three-generation households, as did Ishii and Urakawa (2014).

<sup>6</sup> Akabayashi, Shikishima and Nozaki (2013) examine the factors of attrition of the samples in the JHPS.

#### 4.3.2 Basic statistics of variables used

Table 4-1 presents the basic statistics of the variables used for analysis. Attention must be devoted to the fact that these basic statistics are a group of statistics for 2011–2014 (including respondents who had withdrawn before 2014). The data indicate three key characteristics. First, the most distinctive characteristic is that many of the respondents in this analysis are elderly people, of whom 40% are aged 60 years or older<sup>7</sup>. The reason is that adult respondents living with their parents and students are excluded from the analysis. Secondly, the respondents' residential areas do not vary markedly: 30% of respondents live in large cities such as the 23 wards of Tokyo and ordinance-designated cities. The last of the three characteristics is that both the husband and wife in 20% of the married-couple households are presented as jobless in their job status because of the inclusion of elderly people in the analysis.

#### 4.3.3 Setting an income-poverty line

Ishii and Urakawa (2014) defined an income-poverty line based on the standard of welfare benefits under Japan's public assistance system. The standard of welfare benefits on which the income-poverty relies has given rise to "the minimum standards of wholesome and cultured living" guaranteed by the Article 25 of Constitution of Japan. The study applies the generally applied method to determine a relative income-poverty line and set the poverty line at 50% of the median of the distribution of equivalent disposable income that incorporates economies of scale based on differences in the number of household members. According to calculations using those data, the poverty line was defined as JPY 1.25 million (equivalent to about USD 11,236) for each household per year.

#### 4.3.4 Setting a time-poverty line

Poverty in terms of time can be defined in various ways (Vickery 1977; Harvey and Mukhopadhyay 2007; Burchardt 2010; Kalenkoski 2011). Vickery (1977), in a pioneering study of time poverty, defined time poverty as a state in which the minimally required living time could not be retained because of working hours. The minimally required living time in this case includes time minimally required for carrying out basic activities at home (sleeping, eating, personal care, etc.) and time minimally required for housework and

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As a result, they pointed out that attributes of "experience of move during a year," "young age," "low education," "single household," and "poor health" are related to sample attrition.

<sup>7</sup> According to an estimate based on the National Census in 2010 by National Institute of Population and Social Security Research, the percentage of population over 60 years of age was 32.0% in 2014.



childcare. The latter refers to the least amount of time necessary to complete all domestic activities such as housework (cooking and washing), childcare, nursing or elderly care, and grocery shopping without outsourcing any of them.<sup>8</sup> The analysis reported by Vickery (1977) used the Time Use Survey of the U.S. of the time as a reference and defined the time minimally required for housework and childcare as the average of time spent for housework and childcare in households including at least one full-time homemaker. Harvey and Mukhopadhyay (2007) followed this and calculated the least amount of time necessary for housework and childcare based on the Canadian General Social Survey. The basic activity time (sleeping, eating, and personal care) was estimated by applying the adult average from the Time Use Survey.<sup>9</sup> Both studies considered the “minimally required spare time” separately, which was determined by Vickery (1977) to be 10 hours a week and by Harvey and Mukhopadhyay (2007) to be 14 hours a week. Furthermore, Burcahrdt (2008, 2010) examined time poverty from absolute perspectives by, for instance, using the Childcare Guidelines of the U.K. as a reference in considering the minimal amount of time necessary for childcare.

This study defines the threshold of time poverty using the techniques of these studies as references. More specifically, it uses the 2011 Survey on Time Use and Leisure Activities<sup>10</sup> of the MIC to set up “the amount of time for basic activities (sleeping, eating, and taking personal care) ( $T_e$ )” and “the minimal amount of time required for housework and childcare ( $T_1$ ),” for each type of household and subtracts these amounts of time ( $T_e$  and  $T_1$ ) and the amount of working and commuting time ( $T_w$ ) from total time  $V$  (168 hours a week for one adult and 336 hours a week for two people) to define the remaining time as the spare time of each household. Subsequently, 50% of the median of this spare time is set as the time poverty line to define time poverty as the state of respondents who are below this line.

This study defines a time-poverty line using the method provided by Ishii and Urakawa (2014), and 2011 Survey of Time Use and Leisure Activities of the Ministry of Internal Affairs and Communications (MIC) as references. The specific procedure is to determine the time spent for basic activities ( $T_e$ ) (sleeping, eating, personal care (excretion,

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<sup>8</sup> “Outsourcing” represents catering, eating out, and purchases of housework-related services and prepared foods.

<sup>9</sup> Concretely, Vickery (1977) used 10.2 hours/day which is the average value of adults’ hours on basic activities based on the United States 1966 Michigan Time-use survey. Harvey and Mukhopadhyay (2007) set 10.5 hours/day based on similar survey data from Canada’s government.

<sup>10</sup> The Survey on Time Use and Leisure Activities is conducted to clarify the allocation of living time and leisure activities every five years by the Ministry of International Affairs and Communications.

bathing, getting dressed, etc.)) and the minimum time required for housework ( $T_1$ ).

As the time spent for basic activities ( $T_e$ ), this study used the average time spent during the entire week by men and women, separately by young person (under 65) and old person (over 65). For person who were 20-64 years old, the time for basic activities included 7.5 hours per day for men and 7.2 hours per day for women for sleeping, 1.1 hours per day for men and 1.5 hours per day for personal care, and 1.5 hours per day for men and 1.6 hours per day for women for eating. For person who were over 65 years old, the time for basic activities included 8.5 hours per day for men and 8.3 hours per day for women for sleeping, 1.3 hours per day for men and 1.7 hours per day for personal care, and 1.9 hours per day for men and women for eating. Following the examples presented in reports of earlier studies, this study further included the minimum leisure time required in the basic activity time. This period was assumed to be one hour per day from Monday through Friday and three hours per day on Saturdays and Sundays.

The minimum time required for housework activities ( $T_1$ ) includes housework, nursing care, childcare, and shopping. With the same consideration provided by Ishii and Urakawa (2014), the minimum time required for housework ( $T_1$ ) represents the least time needed for housework without outsourcing the housework using strategies such as dining out, ordering food delivery, purchasing prepared food, and using housework-related services in the market economy. The study examines, for each household type to be analyzed, the average time spent for housework at households with at least one adult who does not work outside the home. More specifically, as a reference, this study used the time spent for housework at households with a husband working outside and wife not working outside for households comprising a married couple and children and households only of a married couple. For one-person households and single-parent households, the study applied the housework time of households without a member working outside the home. The average time spent for housework by men of one-person households is markedly shorter than that in other households. Because many men living alone are likely to outsource much of their housework by, for instance, dining out at a restaurant instead of cooking at home, the minimum housework time required for female one-person households was substituted for male one-person households.

Table 4-2 presents the time spent for basic activities and minimum time required for housework ( $T_1$ ) in each household type. As described later, the types of households to be analyzed are consistent with those in the Ishii and Urakawa (2014), and 2011 Survey on Time Use and Leisure Activities. In addition to the living hours of each of the nine household types used for this study, the living hours used for earlier studies (Vickery (1977) and Harvey et al. (2007)) are presented for comparison. The basic activity time

and minimum time required for housework assumed for this study are smaller than the values in earlier studies. The time-poverty line becomes lower for the difference. The likely reason is that, as revealed also by the international comparison made by the OECD (2011b), the time spent by Japanese people for leisure and personal care is shorter than that in other countries. It is noteworthy that this time-poverty line reflects the conditions and cultural customs of the Japanese people.

#### 4.4 Setting an Interdependent Multidimensional Poverty Threshold

This study proposed a new straightforward measurement approach to multidimensional poverty based on individual well-being. Because the union and intersection approaches are apparently too rigid as identification strategies for most earlier studies, a compensation approach was established by Merz and Rathjen (2014), who described in an intermediate way the identification of multiple poverty. Fundamentally, the time to earn income in a labour market competes in any time period with other non-market activities including genuine personal leisure time and housework. The more time that is spent for income earning purposes, the less time is available for leisure and vice versa (Merz and Rathjen, 2014).

This study applies a compensation approach by which a possible substitution between the poverty dimensions of income and time restricts a poverty area. As figure 4-2 shows, aside from being poor in both dimensions, a person is regarded as multidimensional poor when a person cannot compensate poverty in one dimension by the other resource above the poverty line. This kind of poverty situation is defined as interdependent multidimensional poverty (IMD poverty). To estimate IMD poverty, four main steps are used for the present study. This section presents a description of the steps according to the explanation presented by Merz and Rathjen (2009, 2014).

Step 1: Quantify the interdependence/substitution and evaluation of time and income by estimation of a CES utility function  $u = f(I, L)$ , with leisure time ( $L$ ) and income ( $I$ ) as the poverty dimensions.

Step 2: Find the multidimensional poverty threshold  $u^{poor} = f(I^{poor}, L^{poor})$ , as utility defined at the point single time and income poverty thresholds.

Step 3: Compare each household's time-income-dependent utility to the population's multidimensional poverty utility level and assign each to a multiple poverty regime

(Figure 4-2).

Step 4: Analysis of a poor individuals' socioeconomic factors for each of the multiple poverty regime by application of logit estimation and panel logit estimation.

#### 4.4.1 CES utility estimation (Step 1)

This study uses a two-input production function ( $u$ ) with income( $I$ ) and leisure time ( $L$ ) as inputs and utility as the output. To estimate the substitution between income and leisure time, this study specifies a CEC well-being function considering a constant substitution elasticity  $\sigma = \frac{1}{1+\rho}$  :

$$u = f(I, L) = \gamma \cdot (\delta \cdot I^{-\rho} + (1 - \delta) \cdot L^{-\rho})^{-\frac{v}{\rho}}$$

The substitution elasticity showing the degree of substitution is presented as  $\sigma = \frac{1}{1+\rho}$ , and  $\rho$  shows a curvature parameter.  $\gamma$  is interpreted as some basic log well-being as well as a constant.  $v$  is regarded as representing returns to scale. Input coefficients  $\delta$  will be determined using estimation methods.

The degree of substitution between two input factors is measured using Hicks' elasticity of substitution as the relative change in the proportion of the two input factors as a function of the relative change of the corresponding marginal rate of technical substitution. Usually, the degree of substitution is separated as three types: Perfect substitution ( $\rho=-1, \sigma = \infty$ ), no substitution at all ( $\rho=\infty, \sigma = 0$ ), and a certain degree of substitution, such as a Cobb–Douglas case ( $\rho=0, \sigma = 1$ ).

Regarding variables used in CES well-being function, leisure time ( $L$ ) is calculable by subtracting the essential time ( $T_e$ ), the minimum time necessary for housework ( $T_i$ ), and working and commuting time ( $T_w$ ) from total hours ( $V$ ). Income ( $I$ ) is calculated as the reported household annual income divided by the square root of the number of family members. Utility ( $u$ ) is used from the answer results on life satisfaction from the questionnaire as the alternative variable of well-being ( $u$ ). The questionnaire includes an 11-point scaled question about “general satisfaction with your life.”

To estimate the nonlinear CES function, Kmenta (1967) reported that the equation above should be approximated for the first-order and second-order terms using a Taylor Series expansion around the substitution elasticity of zero, as

$$\ln \gamma + v\delta \ln I + v(1 - \delta)L - 0.5\rho v\delta(1 - \delta)[\ln I - \ln L]^2 .$$

We can define the following classical linear regression model with alternative parameters and  $\varepsilon$  as an iid distributed error.

$$\ln u = a_0 + a_1 \ln I + a_2 \ln L + a_3[\ln I - \ln L]^2 + \varepsilon$$

The coefficients of the structural form can be computed via the following calculation:

$$\begin{aligned} a_0 &= \ln \gamma \leftrightarrow \gamma = e^{a_0} \\ a_1 &= v\delta, a_2 = v(1 - \delta) \rightarrow a_2 = v - a_1 \leftrightarrow v = a_1 + a_2 \\ a_1 &= (a_1 + a_2)\delta \leftrightarrow \delta = \frac{a_1}{a_1 + a_2} \\ a_3 &= -0.5\rho v\delta(1 - \delta) \leftrightarrow \rho = (-2) \frac{a_3}{v\delta(1 - \delta)} \\ \rightarrow \rho &= (-2) \frac{a_3}{(a_1 + a_2) \cdot \frac{a_1}{a_1 + a_2} \cdot \left(1 - \frac{a_1}{a_1 + a_2}\right)} = (-2) \frac{a_3}{a_1 - \frac{a_1^2}{a_1 + a_2}} \end{aligned}$$

According to CES well-being estimation, an indifference curve (utility poverty curve) can be graphed as a locus of combinations of income (horizontal axis) and leisure time (vertical axis), which produce equal levels of life satisfaction (Figure 4-1).

#### 4.4.2 Finding the multidimensional poverty threshold (Step 2)

The step 2 task is to ascertain the multidimensional poverty threshold as utility defined at the point single time and income poverty thresholds. The interdependent multidimensional poverty line  $u^{poor}$  is given by the estimated CES utility isoquant which runs through the intersection of both single poverty lines ( $I^{poor}, L^{poor}$ ). Based on the definitions for income and time presented in previous sections, the income poverty line (50% median net equivalence annual income) is JPY 1.25 million for each household per year. However, the time poverty definitions typically based on the household types, and thereby leisure time poverty lines and multidimensional poverty lines, differ among household types (Table 4-3).

#### 4.4.3 Identifying the multiple poverty regime (Step 3)

Step 3 shows examination of each of the various situations related to time, income

and interdependent multiple poverty, and assigns each to one of the multiple poverty regimes, based on estimation of the multiple poverty threshold:  $u^{poor} = f(I^{poor}, L^{poor})$ . Importantly, each is assigned not only to be poor or not, but also to one of six regimes under the multidimensional poverty line (Figure 4-2).

Individuals below the multidimensional poverty line are called IMD poor (Regime 1, Regime 2, and Regime 3). Regime 1 is the strict multidimensional poor situation. People in this regime are poor by income and lacking leisure time. They are also regarded as IMD poor. The traditional one-dimensional income poverty threshold concludes Regime 1, Regime 2, and Regime 4. However, individuals in Regime 4 can compensate for their insufficient income by spending more time on labour behavior, although people in Regime 2, cannot substitute time for a low income. Consequently, Regime 4 is regarded as non-multiple poverty if considering a compensation approach. Time poor persons exist in Regime 1, Regime 3 and Regime 5. In Regime 3, people are unable to or do substitute their time deficit by earning additional income, whereas in Regime 5, people can trade off less leisure time for more income.

The most important areas are Regime 3 and Regime 4. The conventional definition of poverty based on income recognized people positioned below the income poverty line, i.e., those in Regimes 1, 2, and 4, as being poor. The definition of IMD poverty that incorporates the substitutability with living time, however, recognizes Regimes 1, 2, and 3 as poverty zones. In other words, it is noteworthy that IMD poverty identifies Regime 4 recognized as a poverty zone in the conventional concept of income poverty as a non-poverty zone and newly acknowledges people in Regime 3 as being poor. Consequently, IMD poverty regards those in Regime 3 as people who lack living time and who are unable to provide minimally required housework and childcare services even by using their household income. Those in Regime 4 are considered non-poor opting for time (spare time) over income, who are capable of escaping from income poverty if necessary, while having adequate living time despite being below the income poverty line.

Table 4-4 presents details of the relations between such poverty areas (regimes) and the respondents' household and socioeconomic attributes. The following describes the characteristic tendencies found in Table 4-4. First, although income poverty rate is 10.3% of the entire sample, the IMD poverty rate based on interdependent income and time defined from the estimation of the well-being function is slightly lower, at 8.7%. This result derives from the fact that, although people in Regime 3 comprised 2.0% of the total sample population, slightly more people, or 3.6% of all, were situated in Regime 4. Secondly, people who are not considered poor based on any income-based, time-based, or IMD-based definition comprise approximately 70% of the total population; those

recognized as being time-poor (Regime 1, Regime 3, and Regime 5) exceeded 20%. This difference suggests that the inclusion of the perspective of living time in poverty results in a larger population of people who are considered poor. The third characteristic is that the households confronted by poverty of income and time simultaneously make up approximately 1.6% of all, which is not a large percentage. Among the single-parent households, however, the cases of simultaneous income and time poverty climb to a substantially high percentage of approximately 18%. This percentage among single-woman (over 65) households reaches approximately 6%, which is not negligible. The fourth characteristic is that the households in Regime 4, which are deemed income-poor but non-poor based on IMD poverty, i.e., the households likely to be capable of escaping from income poverty by shifting the use of time from private life to labour, are more commonly single-parent households and single-person households, comprising 15.5% of the single-parent households and 14.1% of the single-woman (under 65) households. Finally, households considered IMD-poor because of a lack of living time despite not being poor in terms of income (Regime 3) are more common among two-parent households having two or more children younger than six years and single-person households. By taking these findings into account, the next section presents an econometric analysis of the socioeconomic factors of various types of poverty.

## 4.5 Econometric Analysis

### 4.5.1. Logit model

Based on the descriptive analysis presented up to this point, this section builds an econometric model and examines the socioeconomic factors of multidimensional poverty that incorporates consideration of both income and time. This corresponds to Step 4 of the IMD poverty analysis mentioned in the previous section. As exhibited in Figure 4-2, the regimes determined as a state of poverty can be categorized into five regimes from Regime 1 to Regime 5 by defining three poverty lines, including an income poverty line, a time poverty line, and an IMD poverty line. Because the characteristics and situations of these poverty conditions vary, a dummy variable is used. A value of one is assigned to respondents determined as being poor in each regime. A value of zero is assigned to those who are not. The dummy variable identifies, through logit analysis, the socioeconomic attributes having strong relations with each poverty regime.

Table 4-5 presents results of logistic estimation for the socioeconomic factors of the respective regimes of multiple poverty. The sample size of pooling data is 4,856. In logistic estimation, independent variables (five regimes of multiple poverty) and

dependent variables (socio-economic factors) are assigned as dummy variables. Some observations are deleted if it is difficult to predict results. Therefore, for example, regarding the econometric model of Regime 1, we excluded respondents for whom the labour status was non-work (homemakers, retired people, etc.). Similar treatment was given to the remaining econometric models.

Taking into account the above, the following describes the key characteristics of the estimation results of the logit model. First, the analytical results of Regime 1 determined as a state of poverty indicate that the poverty risk is lower for married respondents than for unmarried respondents, lower for those in their 60s than those in their 40s, and lower for full time employees than part-time employees in all three cases of income, time, and IMD. In terms of residential areas, the fact that poverty risk is higher in large cities than in other cities (medium-sized and small cities) is notable. As for the simultaneous poverty of income and time, no statistical difference in poverty risk is found between elderly people and the working generation. Secondly, in Regime 2, recognized as a state of poverty in the two cases of income and IMD, the poverty risk of groups such as people in their 30s, those without the background of higher education, and jobless or unemployed people is high. Considering that low-income groups comprise young people, people with a low level of education, and those with unstable employment, this analytical result is comprehensible. Another trait is that the characteristics and differences in the socioeconomic attributes of people belonging to Regime 3 (not income poor, but time-poor and IMD-poor) and Regime 4 (income-poor, but not time-poor and IMD-poor), which draw the greatest interest in this study, indicate that the odds ratios of people without a high educational background and self-employed people are significantly high in Regime 3. The odds ratios of women, jobless people (full-time homemakers, retirees, etc.), unemployed people, and residents of small towns are significant and positive in Regime 4. In both regimes, although the odds ratios of young people such as those in their 30s are significantly high, an interesting tendency is that the odds ratios of people in their 50s and 60s are significantly low in Regime 4. Finally, in Regime 5 (time-poor, but not income-poor and IMD-poor), the odds ratios of people employed full time, self-employed, those in their 20s, those in their 50s, and those with a strong sense of subjective health are significant and positive. While working full time generally raises the risk of time poverty, this analytical result suggests that the deficient living time in many cases can be compensated by using income.

Conventional studies that have considered poverty only based on income did not recognize people in Regime 3 as being poor. Analysis based on IMD poverty newly recognizes Regime 3 as a state of poverty and does not perceive Regime 4, in which a



lack of income can be offset by shifting the use of time from private life, as poverty. Assessment of IMD poverty corresponding to Regimes 1, 2, and 3 reveals that poverty risk is high among young people in their 30s and people without a high level of education. Specifically with regard to Regime 3, one finds that the poverty risk of self-employed people and those in other forms of employment (contract workers, etc.) is high. The high poverty risk of self-employed people, who are likely to be able to adjust their working hours at their own discretion, in Regime 3 is a somewhat unexpected result. In this case, however, both the husband and wife might tend to work excessively without having an employer limiting their working hours.

#### 4.5.2 Panel logit analysis

The Japan Household Panel Survey (JHPS) used in the analysis of this study provides panel data of certain households experiencing important life events such as changes in jobs, relocation of residence, and childbirth. The panel data analysis, therefore, allows an analysis of how a change in a life event affects the risk of interdependent poverty (IMD poverty) that considers income and time.<sup>11</sup> Panel data analysis in this study specifically examines married-couple households to assess how the job status of the married couples affects various poverty regimes. The estimation excluded Regime 1 because of the small sample size and excluded Regime 6 for being a non-poor regime. Therefore, econometric analyses of the poverty in Regimes 2–5 were performed.

The results of the analyses are presented in Tables 4–6. As also for the logit analysis, estimation was performed by setting up a dummy variable, with assignment of a value of one to respondents positioned in Regimes 2–5 and assignment of a value of zero to the remaining respondents, as the explained variable and by selecting either a random effects model or fixed effects model according to the result of the Hausman test. When the fixed effects model was selected, the variable of highest education received, which was constant through time, would be excluded from the explanatory variables.

The following reflects particular attention to the estimation results of Regimes 3 and 4 and describes the major findings. First, in Regime 3, the poverty risk of young people (in this case, those in their 20s and 30s) is higher than that of people in their 40s, which is also indicated by the panel analysis results. Comparison with households in which the husband works at a job and the wife does not reveals that poverty risk is higher for many

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<sup>11</sup> As representative prior studies, Ishii and Yamada (2007), Ishii, Sato and Higuchi (2010), and Abe (2011) specifically examined poverty dynamics. Ishii, Sato and Higuchi (2010) clarified whether policy support for personal development is effective for escape from working poverty.

variables such as households in which both the husband and wife work full time, those in which the husband works full time and the wife works part time, those in which both the husband and wife are self-employed, and those in which both the husband and wife work at jobs of other types. Because the number of children is significant and negative when the job statuses of the husband and wife are controlled, this finding suggests that changes in the risk of time poverty and IMD poverty are more likely to be caused by changes in how the couple work at a job than changes in time spent for housework or childcare because of the presence or absence of children.

Concretely speaking, working of a wife and working of a parent in a single parent household are connected directly to increases in IMD poverty risk because the lengths of working and commuting hours are internationally very long for full-time employment. However, examining results of Regime 4, young households (20s and 30s) confront higher poverty risks than people in their 40s, just as in the situation of Regime 3. However, the poverty risk of the type of husband (full-time) – wife (part-time) is lower than for the type of husband (working) – wife (non-work), and that of a husband (non-work) - wife (non-work) is much higher. The coefficient of persons living in large cities is statistically significantly negative. The poverty risk is low.

How do we interpret the coefficient of husband (non-work) – wife (non-work) as significantly positive in the model of Regime 4? It indicates that the rate of respondents who belong to the type of husband (non-work) – wife (non-work) and who belong to the regime of income poverty, but not time and IMD poverty, is quite large. Some fraction of this type of household group are recipients of public pensions and have already accrued assets to some extent. Therefore, it is possible that they voluntarily choose non-work as Merz and Rathjen (2014) pointed out. However, no questions address the time used for job seeking activities of non-voluntarily unemployed people in the questionnaire we used. For that reason, the problem remains that we cannot exactly ascertain the effects of their job search on living time. If respondents take sufficient time for job searching, and if household members also cooperate in their activities, as a matter of course, then the living time of such households naturally decreases. The percentage of time poor households will increase further. This point is extremely important, but we cannot conduct more sufficient analyses. Therefore, detailed examinations will be our future task. Summarizing the results of descriptive statistics and econometric analyses, comparing original poverty emphasizing only income for IMD poverty calculated by estimating well-being function, then the results would clarify that the original income poverty slightly overestimates the poverty of a single household, a single parent household, and a household with retired people. However, such calculation tends to underestimate the poverty of a households

with children under six years old, households in which the householder's academic background is junior high-school or high school, and households with self-employed persons.

#### 4.6 Conclusion

This study used panel data from the Japan Household Panel Survey (JHPS) (2011–2014) and performed poverty analysis with attention to both dimensions of income and living time. More specifically, it identified “people whose poverty was caused by a lack of living time” (corresponding to Regime 3 in Figure 4-2), who had been overlooked in the past, and “non-poor people who were choosing time (spare time) over income” (Regime 4) based on poverty estimation that used the CES well-being function proposed by Merz and Rathjen (2014).

The estimation result indicated that a small fraction, or about 1.6%, of all households analyzed (excluding households having a student and three-generation households) were simultaneously confronting poverty of income and time. Among single-parent households, however, a high percentage, or approximately 18%, of them were adversely affected simultaneously by income and time poverty, and approximately 5.5% of single-woman households faced such a poverty condition. Additionally, approximately 20% of all households were deemed poor because of a lack of living time despite not being poor based solely on their income (Regimes 1, 3, and 5), which revealed the deficient living time faced by a wide-ranging groups of respondents. A particularly important finding from the analysis is the case in which the households are deemed poor based on IMD poverty (Regime 3) defined through the estimation of well-being function, despite not being considered poor in the conventional income-based measurement. Such cases comprised only a small proportion, or approximately 2%, of all households, but they included 5.5% of two-parent households having two or more children aged below six years and 4.0% of single-person (male over 65) households, suggesting the possibility that the conventional income-based poverty indicator had underestimated the true poverty risk of households with small children. Furthermore, the result of the econometric analysis indicated a tendency by which the poverty of households with householders without high educational background and households with self-employed members was estimated as somewhat low by conventional poverty standards based solely on income.

As for households with children younger than school age, studies both in Japan and abroad have pointed out, particularly in recent years, the high poverty rate of children in Japan and large income disparities of households with small children, which reveal an

increasing necessity for further policy support.<sup>12</sup> The result of the analysis in this study reconfirms the importance of such policies as employment support for single parents and childcare support for households in which both parents work outside. Considering that the working hours of single mothers in Japan are exceptionally longer than those in the U.S. and Europe and that single parents more often face a conflict between work and family life than two-parent households do, the policy of supporting the employment of single parents must improve assistance designed to reduce the work load and burden of childcare outside of working hours.

Finally, an issue remaining in this study is the necessity for poverty analysis that takes into account assets. The estimation result indicates that a percentage of households that are likely to be able to escape from income poverty by shifting the use of time from private life to labour (Regime 4) is high among single-parent households and single-person (woman over 65) households, at approximately 16% and 23%, respectively (Table 4-4). These percentages are not negligible. They demand further examination to determine whether the act of not engaging in labour activities or working short hours is a voluntary choice or an involuntary act because of very limited choice. In doing this, poverty research that considers the asset holding conditions of households will be extremely important. Currently, poverty studies in Japan that include such considerations are few, including Yamada et al. (2011), who examines the degree of change in the effective rate of protection when the asset holding requirements of protected households are relaxed.<sup>13</sup>

In Japan, the spread of long working hours has posed a severe social problem in recent years. The entire nation is working to solve the problem. Multiple studies have verified the possibility that long hours of labour not only reduce spare time, but cause a lack of sleep and exercise, leading to reduced connection with family and society and engendering health damage (Kalenkoski and Karmrick 2013; Ohtsu et al., 2013). Measures of poverty that specifically address various aspects are likely to allow a more appropriate policy approach to the reduction of poverty.

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<sup>12</sup> According to a UNICEF Report (UN Children's Fund) published in 2016/4, the relative income gap of Japan amounted to about 60%. The bottom 10% child's income (child's equivalent household income) is less than 40% of the median child's income. This gap is ranked eighth among 41 economically developed countries. Therefore, Japan is a representative country for which inequality between middle-income and low-income classes is high (Office of Research-Innocenti, UNICEF, 2016).

<sup>13</sup> According to *Result on Household Asset – National Survey of Family Income and Expenditure in 2014*, regarding two-person household, the average financial asset of the first quintile on annual income is 9.17 million yen.

Table 4-1: Basic statistics of variables

	All samples		Samples with spouse	
	mean	S.D.	mean	S.D.
<i>Gender</i>				
Female	0.49	0.50	0.48	0.50
Male	0.51	0.50	0.52	0.50
<i>Partner</i>				
Yes	0.83	0.37		
No	0.17	0.37		
<i>Householder's age</i>				
20s	0.04	0.19	0.03	0.18
30s	0.19	0.39	0.20	0.40
40s	0.24	0.43	0.26	0.44
50s	0.12	0.33	0.12	0.32
60s	0.20	0.40	0.19	0.40
70s	0.20	0.40	0.20	0.40
<i>Householders' educational level</i>				
High school graduate	0.48	0.50	0.46	0.50
Two-year college and technical school	0.07	0.26	0.07	0.25
Four-year college and graduate school	0.38	0.48	0.40	0.49
<i>Working conditions</i>				
Full time employed	0.49	0.50		
Part time employed	0.09	0.28		
Self-employed	0.10	0.30		
Other work	0.04	0.21		
Full-time homemakers and retirees	0.24	0.43		
Unemployment	0.01	0.12		
<i>Number of children</i>				
Zero			0.41	0.49
One			0.17	0.37
Two or more			0.43	0.49
<i>Husband's working conditions + Wife's working conditions</i>				
Full time employed + Full time employed			0.10	0.30
Full time employed + Part time employed			0.21	0.41
Full time employed + Self employed			0.01	0.09
Other employed condition + Other employed conditions			0.16	0.37
Unemployed + Unemployed			0.20	0.40
Employed + Unemployed			0.30	0.46
<i>Health</i>	0.87	0.33	0.88	0.32
<i>Region scale</i>				
Large city	0.30	0.46	0.30	0.46
Middle city	0.61	0.49	0.62	0.48
Small city	0.08	0.28	0.08	0.27
<i>Year</i>				
2011	0.28	0.45	0.29	0.45
2012	0.25	0.43	0.25	0.44
2013	0.24	0.43	0.24	0.43
2014	0.22	0.42	0.22	0.41

Source: Authors' calculations based on the JHPS2011-2014.

Table 4-2: Amount of time for basic activities and time minimally required for housework, childcare, etc. by type of household

(hours)	7 days (V) week	Essential time (Te)		Tm (V-Te) week	Minimum time required for the housework T1				Total week	Disposal time Ta (Tm-T1) week	
		Leisure (weekday) day	Leisure (weekend) day		House work day	Nursing/ Caring day	Childcare day	Shopping day			
											week
<b>Couple with children</b>											
with children who are all older than 6	336	165.5	2.0	6.0	170.5	5.5	0.2	0.4	1.2	50.9	119.6
with one child younger than 6	336	165.5	2.0	6.0	170.5	4.0	0.1	5.0	1.1	71.3	99.2
with two or more children younger than 6	336	165.5	2.0	6.0	170.5	3.7	0.1	6.2	1.0	77.0	93.5
Harvery and Mukhopadhyey (2007)	336	175	4.0	4.0	161.0	-	-	-	-	74.6	86.4
<b>Couple without children</b>											
Vickery (1977)	336	162.8	2.0	5.0	173.2	-	-	-	-	74.6	86.4
<b>single parent with children</b>											
Harvery and Mukhopadhyey (2007)	168	87.5	2.0	2.0	80.5	-	-	-	-	52.0	28.5
<b>Male one-person household (under 65)</b>											
Female one-person household (under 65)	168	83.2	1.0	3.0	84.8	3.5	0.1	1.1	1.0	39.3	45.5
Harvery and Mukhopadhyey (2007)	168	87.5	2.0	2.0	80.5	-	-	-	-	52.0	28.5
<b>Male one-person household (over 65)</b>											
Female one-person household (over 65)	168	82.4	1.0	3.0	85.6	2.1	0.2	0.0	0.7	21.0	64.6
Vickery (1977)	168	81.4	1.0	2.5	86.6	-	-	-	-	31.0	55.6

Source: Authors' calculations based on 2011 Survey on Time Use and Leisure Activities.

Table 4-3: Income, time, and IMD Poverty lines by type of household (2011–2014)

	Income poverty line (=50% median net equivalence income) <i>I_poor</i>	Time poverty line (=50% median leisure time) <i>L_poor</i>	Interdependent Multidimensional Poverty line <i>u_poor</i>
<b>Couple with children</b>			
with children who are all older than 6	125	24.4	5.123
with one child younger than 6	125	16.5	4.986
with two or more children younger than 6	125	16.6	4.988
<b>Couple without children</b>			
	125	52.9	5.469
<b>Single parent with children</b>			
	125	2.3	4.578
<b>Male one-person household (under 65)</b>			
Female one-person household (under 65)	125	6.6	4.748
Male one-person household (over 65)	125	10.7	4.861
Female one-person household (over 65)	125	26.8	5.158
Female one-person household (over 65)	125	26.0	5.147

Note 1: Data for four years of 2011–2014 were collected to calculate the parameters.

Note 2: The estimated utility function was  $u = 2.971(0.426I^{0.563} + 0.574L^{0.563})^{-0.563}$ .

Figure 4-1: Well-being function of income and time

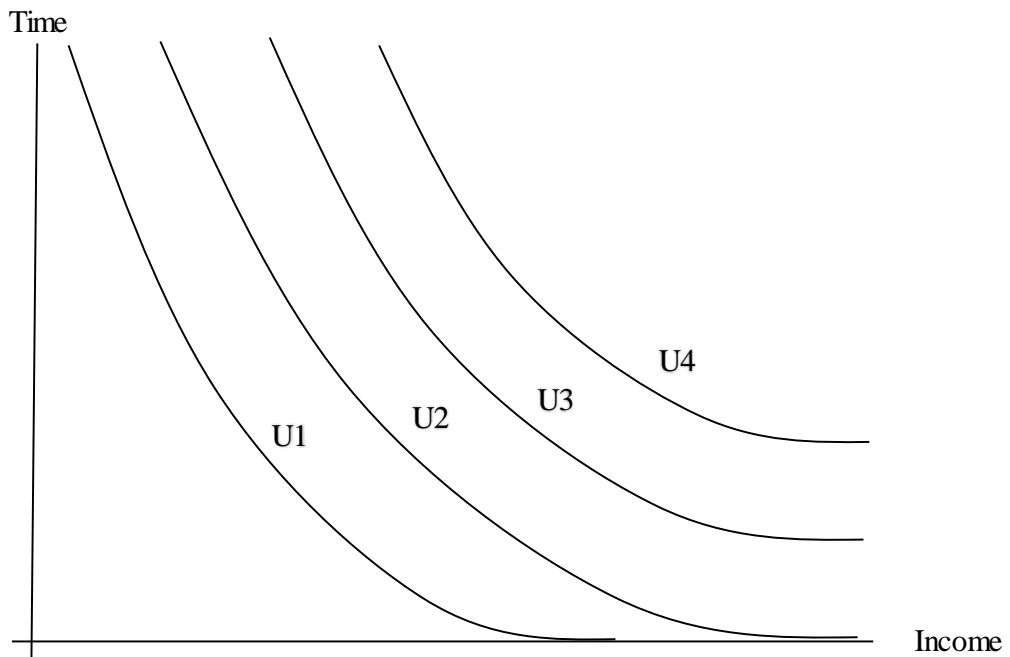


Figure 4-2: Multidimensional poverty based on IMD curve and its regimes

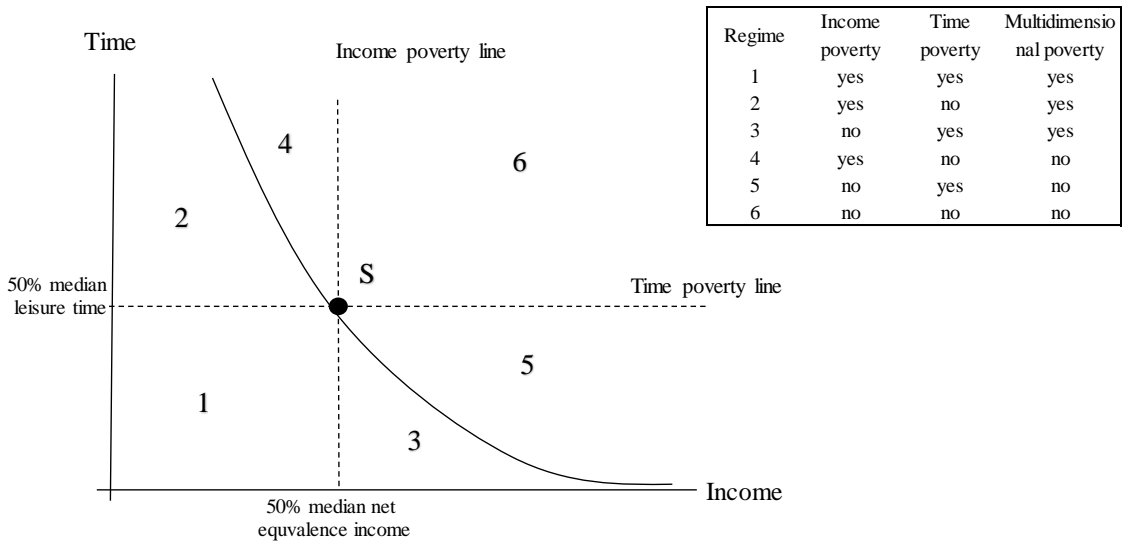


Table 4-4: Relation between multidimensional poverty and socioeconomic attributes

	Poverty Regime						Income Poverty	IMD Poverty
	1	2	3	4	5	6		
<b>All Persons</b>	1.6%	5.1%	2.0%	3.6%	17.8%	69.9%	10.3%	8.7%
<i>Gender</i>								
Male	1.5%	4.5%	2.5%	2.3%	20.5%	68.7%	8.3%	8.5%
Female	1.8%	5.7%	1.5%	5.0%	14.9%	71.1%	12.5%	9.0%
<i>Partner</i>								
Yes	1.0%	4.5%	2.3%	1.5%	17.3%	73.4%	7.1%	7.8%
No	4.7%	7.9%	0.9%	14.3%	20.2%	52.1%	26.9%	13.5%
<i>Householder's age</i>								
20s	1.1%	2.7%	3.8%	2.7%	32.8%	57.0%	6.5%	7.5%
30s	2.0%	7.0%	3.5%	3.9%	23.2%	60.4%	12.9%	12.6%
40s	2.0%	3.7%	1.5%	1.9%	21.8%	69.3%	7.5%	7.1%
50s	1.7%	4.3%	2.7%	1.7%	28.1%	61.5%	7.7%	8.7%
60s	1.1%	5.8%	1.7%	4.6%	11.9%	75.0%	11.5%	8.6%
70s	1.4%	5.2%	0.8%	6.0%	4.8%	81.8%	12.5%	7.4%
<i>Household type</i>								
Couple with children who are all older than 6	0.7%	4.2%	1.5%	1.1%	14.2%	78.4%	6.0%	6.3%
Couple with one children younger than 6	1.7%	3.6%	2.6%	1.9%	25.6%	64.6%	7.2%	7.9%
Couple with more than two children younger than 6	2.3%	9.7%	5.5%	4.3%	21.4%	56.8%	16.3%	17.5%
Couple without children	0.9%	4.3%	2.2%	1.3%	16.4%	74.9%	6.5%	7.4%
Single-parent with children	18.2%	17.3%	0.0%	15.5%	23.6%	25.5%	50.9%	35.5%
Single male (under 65)	0.8%	4.9%	0.8%	8.6%	23.8%	61.1%	14.4%	6.6%
Single female (under 65)	1.3%	5.4%	0.0%	14.1%	22.8%	56.4%	20.8%	6.7%
Single male (over 65)	3.0%	6.0%	4.0%	11.0%	25.0%	51.0%	20.0%	13.0%
Single female (over 65)	5.5%	9.0%	0.5%	22.5%	9.5%	53.0%	37.0%	15.0%
<i>Householders' educational level</i>								
High school graduate	1.7%	6.1%	2.3%	5.3%	15.8%	68.9%	13.0%	10.1%
Two-year college and technical school	2.6%	7.3%	1.7%	3.2%	15.7%	69.6%	13.1%	11.6%
Four-year college and graduate school	1.0%	3.4%	1.6%	1.2%	19.4%	73.4%	5.6%	6.0%
<i>Working conditions</i>								
Full time employed	0.9%	3.0%	2.0%	0.8%	25.3%	68.0%	4.7%	5.9%
Part time employed	5.6%	12.3%	2.1%	8.6%	10.9%	60.7%	26.4%	19.9%
Self-employed	5.2%	5.8%	5.6%	3.0%	29.5%	50.9%	14.0%	16.6%
Other work	2.8%	10.1%	5.5%	3.7%	22.1%	55.8%	16.6%	18.4%
No work1 (Voluntary unemployed)	0.1%	4.0%	0.0%	7.0%	0.3%	88.6%	11.2%	4.1%
No work2 (Involuntary unemployment)	0.0%	27.8%	0.0%	16.7%	0.0%	55.6%	44.5%	27.8%
<i>Region scale</i>								
Large city	2.5%	4.6%	1.6%	2.5%	19.6%	69.3%	9.6%	4.6%
Middle city	1.2%	5.0%	2.2%	3.8%	16.7%	71.0%	10.1%	5.0%
Small city	1.2%	7.1%	2.2%	6.4%	18.9%	64.1%	14.8%	7.1%

Source: Calculated by the author based on the Japan Household Panel Survey (JHPS2011-2014).



Table 4-5: Logit analysis of factors of multidimensional poverty (Odds ratios)

	Poverty Regime				
	Regime 1	Regime 2	Regime 3	Regime 4	Regime5
<i>Gender</i>					
Female	1.042	1.195	0.559***	1.711***	0.712***
Male (ref)					
<i>Partner</i>					
Yes	0.226***	0.849	2.651**	0.139***	0.596***
No (ref)					
<i>Householder's age</i>					
20s	0.586	1.066	3.342**	2.077	1.532**
30s	1.024	2.155***	2.861***	1.977**	1.111
50s	0.582	1.025	1.823*	0.595	1.400***
60s	0.349**	0.884	1.202	0.572*	0.987
70s	1.293	0.976	1.425	0.547*	1.134
40s (ref)					
<i>Householders' educational level</i>					
High school graduate	1.023	1.498***	1.398	1.432*	0.943
Two-year college and technical school	1.321	1.744**	0.889	0.799	0.817
Four-year college and graduate school (ref)					
<i>Householders' working conditions</i>					
Full time employed	0.235***	0.229***	0.767	0.149***	2.717***
Self-employed	1.395	0.504***	2.958***	0.683	3.446***
Other work	0.738	0.979	2.915**	0.835	2.359***
Full-time homemakers and retirees	omitted	0.362***	omitted	1.788**	0.021***
Unemployment	omitted	3.291***	omitted	3.453***	omitted
Part time employed (ref)					
<i>Health</i>	0.719	0.562***	0.990	0.809	1.224
<i>Region scale</i>					
Large city	1.716**	0.876	0.609**	0.561***	1.070
Small city	0.947	1.435*	1.062	1.544*	1.201
Middle city (ref)					
<i>Year</i>					
2012	0.626	1.157	1.378	0.885	0.888
2013	0.947	1.313	1.119	0.829	0.881
2014	0.845	1.498**	0.971	0.927	0.827
2011 (ref)					
n (observations)	3606	4839	3606	4839	4767
Likelihood ratio	-320.02	-887.44	-419.23	-577.89	-1934.25

Note: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.

Table 4-6: Panel logit analysis of factors affecting falling into and escaping from multidimensional poverty (Married-couple households)

Model	Regime 2		Regime 3	
	Re Model		Re Model	
	Coef	z-value	Coef	z-value
<b>Constant</b>	-5.61***	-9.12	-6.84***	-8.77
<i>Number of children</i>				
One	0.42	1.08	-0.83**	-1.97
Two or more	0.66*	1.88	-0.75**	-2.13
Zero (ref)				
<i>Householder's age</i>				
20s	0.35	0.49	1.57***	2.65
30s	0.46	1.25	1.19***	3.18
50s	-0.04	-0.09	0.54	1.22
60s	0.75*	1.69	-0.26	-0.49
70s	0.45	0.88	-0.19	-0.27
40s (ref)				
<i>Householders' educational level</i>				
High school graduate	0.66**	2.31	0.39	1.33
Two-year college and technical school	0.74	1.42	0.10	0.18
Four-year college and graduate school (ref)				
<i>Husband's working conditions + Wife's working conditions</i>				
Full time employed + Full time employed	-2.31***	-3.35	2.73***	4.39
Full time employed + Part time employed	-1.08***	-2.98	2.21***	3.77
Full time employed + Self employed	0.48	0.45	2.34**	1.82
Other employed condition + Other employed conditions	-0.29	-0.92	3.52***	6.15
Unemployed + Unemployed	-0.87**	-2.12	omitted	
Employed + Unemployed (ref)				
<i>Region scale</i>				
Large city	0.13	0.45	-0.44	-1.38
Small city	0.61	1.36	-0.20	-0.39
Middle city (ref)				
Number of observations	4053		3253	
Number of groups	1448		1203	
Log-likelihood	-651.81		-351.53	
Prob > chi2 (Hausman test)	0.853		0.531	

Note1: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.

Note2: Table shows the results of un-balanced panel data during four years.

Table 4-6: Panel logit analysis of factors affecting falling into and escaping from multidimensional poverty (Married-couple households) [cont.]

Model	Regime 4		Regime 5	
	Re Model		Fe Model	
	Coef	z-value	Coef	z-value
<b>Constant</b>	-9.34***	-6.02		
<i>Number of children</i>				
One	1.88**	2.52	-0.48	-0.94
Two or more	2.02***	2.83	-0.03	-0.04
Zero (ref)				
<i>Householder's age</i>				
20s	2.55**	2.31	0.72	0.89
30s	2.00***	2.75	0.68	1.55
50s	-0.37	-0.31	-0.16	-0.25
60s	0.60	0.65	-0.29	-0.29
70s	0.94	0.93	0.49	0.36
40s (ref)				
<i>Householders' educational level</i>				
High school graduate	0.51	1.04	omitted	
Two-year college and technical school	-1.07	-0.90	omitted	
Four-year college and graduate school (ref)				
<i>Husband's working conditions + Wife's working conditions</i>				
Full time employed + Full time employed	omitted		2.48***	4.87
Full time employed + Part time employed	-2.30***	-2.84	2.46***	6.27
Full time employed + Self employed	omitted		1.05	1.03
Other employed condition + Other employed conditions	-0.71	-1.06	2.10***	4.54
Unemployed + Unemployed	1.39*	1.88	-15.34	-0.03
Employed + Unemployed (ref)				
<i>Region scale</i>				
Large city	-0.92	-1.56	2.41*	1.96
Small city	-0.22	-0.26	-0.27	-0.09
Middle city (ref)				
Number of observations	3624		937	
Number of groups	1323		275	
Log-likelihood	-258.19		-300.96	
Prob > chi2 (Hausman test)	1.000		0.000	

Note 1: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.

Note 2: Table shows the results of un-balanced panel data during four years.

## Chapter 5: Enrollment and graduation effects of university on poverty risk

– Empirical analysis based on propensity score matching –

### 5.1 Introduction

In Japan, the percentage of high school graduates who continue their education at institutions for higher education reached 71.2% in 2015 (2015 School Basic Survey). Ongoing economic globalization increasingly requires human resources capable of communicating and negotiating with people from various countries and regions. Employers have growing expectations for the development of specialized human resources and improvement of the quality of education and research at institutions of higher education. How such institutions can ensure the quality of higher education and improve the skills of their students is a question that has arisen in recent years while numerous issues such as an increase in dropouts and a lack of expertise and communication skills of graduates when starting working for companies has become more severe.<sup>14</sup>

During the quarter of a century between the beginning of 1990 and the first half of the 2010s, the percentage of high school graduates advancing to college increased, although the incidence of poverty among the working generation expanded, particularly among young people. According to the National Survey of Public Assistance Recipients conducted by the Ministry of Health, Labour, and Welfare, approximately 2.17 million people (approx. 1.62 million households) in Japan were receiving welfare benefits as of December 2014. A distinct difference from past results is that the amount received by “other general households,” which were not households such as “elderly households,” “single-mother households,” and “households with an ill, injured, or disabled householder or member,” had increased significantly from the latter half of the 1990s. The number of

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<sup>14</sup> UNESCO and OECD jointly developed *New Guidelines on Quality Provision in Cross-border Higher Education* in 2005, reflecting a growing need for safeguards against low-quality services. Although they are not binding, their endorsement by two international organizations grouping more than 190 countries is expected to give them some force (OECD, 2015).

households receiving welfare benefits increased from approximately 42,000 in 2000 to 294,000 by 2012, suggesting the extension of welfare recipients to households of the working generation. One contributing factor is an increase of low-income jobs held particularly by young people and those of various generations.

Conventionally, receiving a high level of education has been thought to improve employment opportunities after college graduation, help earn a high income, and be closely related to the improvement of social status. In fact, many earlier studies have demonstrated that high academic achievement is relevant to subsequent climbing of the social ladder (high income, job promotion, etc.) (Tachibanaki and Yagi, 2009).

In recent years, however, some enlightening books have presented specific cases in which a high educational background does not necessarily help raise one's socioeconomic position. During the 30 years of 1975–2005, tuition at national universities was raised to 535,800 yen, nearly 15 times the amount of tuition in 1975: 36,000 yen. Tuition at private universities showed a nearly 4.5-fold rise from 182,700 yen to 818,000 yen, demonstrating a sharp increase in both cases (see “Changes in Tuition and Fees at National and Private Universities” (Japanese) on the website of the Ministry of Education, Culture, Sports, Science and Technology). Even if students graduated from college after paying high tuitions, some would subsequently face poverty attributable to illness, employment separation, or other reasons. In particular, those who received student loans during college years or scholarship funds that must be repaid are exposed to higher risk of poverty because of their repayment obligations. In Japan, the number of college students using the scholarship programs of the Japan Student Services Organization (JASSO) reached 1.41 million in 2014. Generally, most such scholarships are provided as interest-bearing loans and not as a benefit free of repayment obligations. Unlike in the UK, no system of income-linked loans, for which repayment amounts are determined by the amount of income after college graduation, has been introduced in Japan. Graduates cannot be exempt from repayment even if their living standard falls (Kobayashi, 2012). The Student Life Survey conducted by JASSO in 2012 revealed that approximately 30% of the students worked a part-time job to pay their tuition.

The fact that people who have made a considerable investment in college education are unable to achieve their full potential and, in some cases, fall into a condition where it is difficult even to maintain minimum living standards, suggests that serious shortcomings exist for Japan's college education system.

As demonstrated by earlier studies, significant differences were found in the income or wages and the possibility of promotion in a company between workers with a college degree and those without. Even if there is a simple positive correlation between entrance

and graduation from college and the subsequent income, however, whether it is a true effect of college education or a spurious correlation reflecting other preceding factors that affect the advancement to college must be determined. Conventional studies have approached the issue above by applying control with variables that reflect social origin using econometric models such as regression analysis. The issue of selection bias between going and not going to college caused by individuals' heterogeneity has been addressed using such analytical methods as the instrumental variable method. An important factor, however, is that these analyses are based on the strong assumption that explanatory variables affect the entire sample equally; the effect of earning a college degree varies among individuals. Heterogeneity of the effect is expected to exist. This bias is known as treatment-effect heterogeneity bias (Brand and Xie, 2010; Nakazawa, 2013).

To address this issue, this study uses an analytical method called propensity score matching, which estimates the effect based on counterfactual assumptions for quantitative identification of the effect of college entrance and graduation on the risk of poverty. This technique finds individuals with similar attributes as college graduates (but not college graduates) and matches them with college graduates to compare the percentages of those who fall into poverty in the two groups. If the study proves that college education and degree do not, in effect, facilitate an increase in opportunities for higher income or reduction of poverty risk, then the validity of "vocational capability development" in college education can be questioned.

## 5.2 Data

The individual data this study used for our empirical analysis were obtained from a *survey of regional life environment and happiness*, funded by MEXT and Japan Society for the Promotion of Science. The nationwide internet survey was administered in Japan in February 2011. This questionnaire asked the respondents to report details of their subjective well-being (sense of happiness, life satisfaction, etc.) and social and economic factors such as income, educational background, occupation, and so on. The second survey included numerous questions asking about the knowledge and experience gained from respondents' childhood. More specifically, some questions related to cultural capital such as parents' educational background are included as well.

Considering the educational level for respondents who are older than age of 50, this study selected respondents based on age (20s, 30s, and 40s). In addition, students, those who do not answer questions that are important for analysis, those who graduated from middle school and graduate school (the sample is too small), and those who are living

with their parents are excluded from analysis. As a result, the eventual sample size became 2,571 respondents (1,231 men, 1,340 women).

It is noteworthy that data collected from this internet survey had three important biases. First, the gender proportion was skewed somewhat toward men, who were 55.4% of respondents. Second, the respondents were more educated than the actual population; approximately 51% had graduated from college or had some higher education, which was well above the 28% of the actual population aged 20–69 years (*Employment Status Survey* of 2012). Third, 35% of respondents lived in the Tokyo Metropolitan Area, which is higher than the 28% of the population of Japan who actually live there (according to the *Comprehensive Survey of Living Conditions of the People on Health and Welfare* of 2011). Because of these biases, caution is necessary when interpreting the estimated results. However, the distributions of age and household income did not differ significantly from the actual distributions. In this analysis, this study specifically focus on the younger generation (20s-40s).

Regarding the measurement of poverty, we employ two poverty indexes consisting of income poverty ratio and interdependent multidimensional (IMD) poverty ratio in the later analysis. The poverty line of income poverty is set as 50% of median of adjusted household income. Adjusted household income represents the household income divided by the square root of household number. How to measure IMD poverty is explained in more detail in the later section.

Table 5-1 presents simple descriptive statistics for later quantitative analysis. First, the percentage of male respondents who have completed higher education is 63%, while that is for female is 38%. Second, regarding working situation, 82% of men are employed as regular worker, only 25% of female are regular employees while almost half of women (46%) in this analysis are jobless. Third, regarding percentage of persons who participated in cultural lessons, 13% of men are presented as participated in sports lessons and 37% of women are found participated in instrument lessons. Fourth, regarding percentage of persons who fall into poverty, 11% of men are presented as income poor and 7% of them are interdependent multidimensional poor, and 16% of women are found as income poor and 13% of women fall into interdependent multidimensional poor.

### 5.3 Factors of College Graduates

Firstly, the study examines the factors of college graduates by conducting logistic estimation by sex. The explained variable of higher education assigns to 1 if respondents who have graduated from university and assigns to 0 if those who did not.

For key independent variables, this study set three types: (1) Cultural capital (1. Early childhood cultural experiences at home [Embodied cultural capital], 2. Cultural goods at home in early childhood [Objectified cultural capital], and 3. Parental academic backgrounds [Institutionalized cultural capital]), (2) Other parents' and teachers' influence, and (3) Extracurricular activities (Music, Sports, Calligraphy and Cram school).

#### (1) Cultural capital

Based on the Bourdieu's concept of three types of cultural capital (1986), Kataoka (2001) constructed the path-analysis model to analyze the relations between the family background and the children's educational attainments during junior high school, particularly addressing the differences of the family's educational strategies. This study also used the same three variables as indicators of cultural capital: 1. Early childhood cultural experiences at home, 2. Cultural goods at home in early childhood, and 3. Parental academic background status<sup>15</sup>.

The variables of the embodied cultural capital representing the cultural experiences in early childhood were constructed by two answer results on whether parents often took respondents to art museums/art galleries, theater, and classical music in early childhood (Cultural experiences), and whether family members often read books to respondents in childhood or not (Reading experiences). The dummy variable according to the reply to the question values one when a respondent had cultural and reading experiences better than average.

Concerned the variable of cultural goods at home in early childhood which shows the objectified cultural capital, the principal component score was calculated, using the answer results regarding items on cultural resources in the home when the respondent grew up (piano/ the collections of literature, encyclopedia, and pictorial books / the complete series of art works when the respondent was aged 15).

Third, the dummy variables of academic backgrounds of each parent representing institutionalized cultural capital are set to one if a parent graduated from undergraduate or graduate school.

#### (2) Other parents' and teachers' influence

As a second key variable, this study used household income when a respondent was aged 15. However, collecting the exact numerical value from the survey is difficult, so

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<sup>15</sup> Each indicator is based on Bourdieu's theory of cultural capital. Cultural experiences applies to 'Embodied' capital, cultural goods apply to 'Objectified' capital, and parents' academic background corresponds to 'Institutionalized' capital.



this study used the answer results, which show evaluations for respondents' standard of living at home at 15 years old. Three dummy variables (high, middle, and low) were made according to the living standard level. Furthermore, as a key difference from previous research, a dummy variable was produced which is related to parents' educational attitude: "Whether parents were helpful to extracurricular activities."

Additionally, this study used variables representing the degree of communication with teachers at several stages of education. In the survey, a respondent was asked whether he/she had experience of meeting a teacher who left a deep impression on their life at each stage of school: elementary school, junior high school, high school, and college. Two dummy variables were set for inspirational teachers during compulsory education (at elementary and junior high school) and for those at high school and college. These variables are regarded as playing vital roles in connecting the childhood cultural experience and extracurricular activities with later learning motivation at university.

### (3) Extracurricular activities

Regarding extracurricular activities, this study used responses to questions asking about activities that respondents engaged in for more than 6 months before compulsory education. The survey asked about 10 items for extracurricular activities: 1. Cram school, 2. Private tutor, 3. Sports training (e.g. swimming, baseball, soccer), 4. Music school/Painting/Ballet lessons, 5. Sado (Japanese traditional tea ceremony)/Kado (Japanese traditional flower arrangement), 6. English or other language school, 7. Calligraphy/Abacus, 8. Boy scouts/Girl scouts, 9. Others, and 10. Nothing. The selected answer results were items of 1, 3, 4, and 7 in the multivariate analysis, producing dummy variables for each category. The dummy variables were set to one if the respondent engaged in the activity around that time for more than 6 months.

Table 5-2 presents results of logistic estimation for the factors of college graduates. According to the results, regarding male, 'Had cultural asset (dummy)' 'which can be interpreted as 'objectified cultural capital' and 'Father: graduated from university (dummy)' regarded as 'embodied cultural capital' significantly positively affected the achievement of academic background of college graduates. On the other hand, regarding female, 'Mother: graduated from university (dummy)' and 'Meeting with teachers' had positive impacts in addition to the above variables.

In addition, focusing on at the effects of extracurricular activities which represent education investments other than school, 'participation in correspondence education lessons' had a positive impact for male, and 'participation in instrumental lessons' had a positive impact for female. Namely, extracurricular activities during childhood also had

statistically significant impacts to enrollment and graduation of university even after controlling other important variables related to cultural capital.

## 5.4 IMD Poverty Estimation

### 5.4.1 IMD poverty approach

In the analysis, we use multidimensional poverty index considering the shortage of leisure in addition to the standard income poverty ratio. The measurement of multidimensional poverty is based on compensation approach, which was established by Merz and Rathjen (2014). Basically, time to earn income in a labour market competes in any time period with other non-market activities including genuine personal leisure time and housework time. The more is spent for income gaining purposes, the less is available for leisure and vice versa (Merz and Rathjen, 2014).

In the compensation approach, a possible substitution between the poverty dimensions of income and time restricts a poverty area. As figure 5-1 shows, besides being poor in both dimensions, a person is regarded as multidimensional poor when he/she cannot compensate poverty in one dimension by the other resource above poverty line. This kind of poverty situation is described as interdependent multidimensional poverty (IMD poverty) by Merz and Rathjen (2014). To estimate IMD poverty, three main steps are conducted in this study. We mainly describe the steps according to the explanation by Merz and Rathjen (2009):

Step 1: Quantify the interdependence/substitution and evaluation of time and income by the estimation of a CES utility function  $= f(I, L)$  , with leisure time ( $L$ ) and income ( $I$ ) as the poverty dimensions.

Step 2: Find the multidimensional poverty threshold  $u^{poor} = f(I^{poor}, L^{poor})$  , as utility defined at the point single time and income poverty thresholds.

Step 3: Compare each individual's time income dependent utility to the population's multidimensional poverty utility level and assign each individual to one of the multiple poverty regimes.

### 5.4.2 Empirical Estimation of CES well-being function

As Step1, we will use a multidimensional CES well-being ( $u$ ) function in order to specify the substitution/compensation of the poverty dimensions with income ( $I$ ) and

genuine leisure time (L), and to analyze the interdependence of multidimensional poverty. It allows compensation above the single poverty thresholds we will concentrate our empirical application under the weak focus axiom (Merz and Rathjen, 2014, p461).

$$u = f(I, L) = \gamma \cdot (\delta \cdot I^{-\rho} + (1 - \delta) \cdot L^{-\rho})^{-\frac{v}{\rho}}$$

The substitution elasticity showing the degree of substitution is shown as  $\sigma = \frac{1}{1+\rho}$ , and  $\rho$  shows a curvature parameter.  $\gamma$  is interpreted as some basic log well-being as well as constant.  $v$  is regarded as returns to scale, and the input coefficients  $\delta$  will be determined by some estimation methods.

In order to estimate the non-linear CES function, Kmenta (1967) suggested the above equation should be approximated for the first and second order terms by using a Taylor Series expansion around the substitution elasticity of zero:

$$\ln \gamma + v\delta \ln I + v(1 - \delta)L - 0.5\rho v\delta(1 - \delta)[\ln I - \ln L]^2$$

We can define the following classical linear regression model with alternative parameters and  $\varepsilon$  as an iid distributed error.

$$\ln u = a_0 + a_1 \ln I + a_2 \ln L + a_3 [\ln I - \ln L]^2 + \varepsilon$$

This study uses answer results on life satisfaction from the questionnaire as the alternative variable of well-being (u). The questionnaire includes an 11 point scaled question about “satisfaction with your life in general”. The coefficients of the structural form can be computed via the following calculation:

$$\begin{aligned} a_0 &= \ln \gamma \leftrightarrow \gamma = e^{a_0} \\ a_1 &= v\delta, a_2 = v(1 - \delta) \rightarrow a_2 = v - a_1 \leftrightarrow v = a_1 + a_2 \\ a_1 &= (a_1 + a_2)\delta \leftrightarrow \delta = \frac{a_1}{a_1 + a_2} \\ a_3 &= -0.5\rho v\delta(1 - \delta) \leftrightarrow \rho = (-2) \frac{a_3}{v\delta(1 - \delta)} \\ \rightarrow \rho &= (-2) \frac{a_3}{(a_1 + a_2) \cdot \frac{a_1}{a_1 + a_2} \cdot \left(1 - \frac{a_1}{a_1 + a_2}\right)} = (-2) \frac{a_3}{a_1 - \frac{a_1^2}{a_1 + a_2}} \end{aligned}$$

### 5.4.3 Finding the Multidimensional Poverty Threshold

In step 2, we'll find the multidimensional poverty threshold as utility defined at the point single time and income poverty thresholds. Therefore, we need to set poverty lines of income and leisure time in advance.

#### (i) Income poverty line

As previously described, the income poverty line was set as half of the median of equivalent household income of the total respondents based on the definition given by OECD. For the study, the reported household annual income was divided by the square root of the number of family members, to adjust for household size. According to the calculation of the data, the poverty line was defined as JPY 1.59 million for each household per year.

#### (ii) Leisure time poverty line

This study defined the time-poverty line which follows the method applied by Ishii and Urakawa (2014), which considered the disposable time and minimum time necessary for housework.

The estimation procedure was summed in four main steps: First, the essential time ( $T_e$ ) spent for basic activities (sleeping, eating, personal care (excretion, bathing, getting dressed, etc.)) was defined. It includes the minimum leisure time required (one hour per day during Monday–Friday and three hours per day on Saturday and Sunday) for basic activities. Second, it defined the minimum time necessary for housework ( $T_1$ ), consisting of housework, nursing care, child care, and shopping, based on a 2011 Survey on Time Use and Leisure Activities conducted by the Ministry of Internal Affairs and Communications (MIC). Third, the working and commuting time ( $T_w$ ) were calculated from the data for each responded household. The disposal week time ( $T_a$ ) is calculable by subtracting the essential time ( $T_e$ ) and the minimum time necessary for housework ( $T_1$ ) from total hours ( $V$ ). Fourth, the leisure time ( $L$ ) is regarded as disposal week time ( $T_a$ ) minus working and commuting time ( $T_w$ ). According to these procedures, an individual is regarded as suffering from time-poverty if his or her leisure time is less than 50% of median leisure time.

Based on poverty lines for income and time dimension, the respective interdependent multiple poverty threshold is estimated.

#### 5.4.4 Identifying the poverty regime

Step 3 examines each individual's various situations regarding time, income and IMD poverty, and assign each individual to one of the multiple poverty regimes, based on the estimation result. Importantly, each individual is assigned not only to be poor or not but also to one of six regimes under the multiple poverty line (Figure 5-1). The traditional income poverty is identified as the areas of regime 1, regime 2 and regime 4. On the other hand, interdependent multidimensional (IMD) poverty is defined as the areas of regime 1, regime 2 and regime 3.

#### 5.5 Estimation of Poverty Risk through Propensity Score Matching

Subsequently, we used propensity score matching to verify the relation between a college degree and poverty risk. The method was to, first, measure the propensity score (for earning a college degree) of each sample based on logit model estimation in the previous section. As the matching method based on propensity scores, we used the technique of nearest neighbor caliper matching (Guo and Fraser 2010) with quantitative analysis software (Stata).

Figure 5-2 depicts graphs representing the effect of a college degree by sex in a logit model that estimates poverty using the sample after matching. The treatment group represents the actual college graduates. The control group comprises individuals who are considered to have similar attributes to college graduates through matching. ATT stands for the average treatment effect on the people treated, which is an indicator of the difference in the poverty rate between the treatment group and the control group when the other control variables are controlled. As explanatory variables, this study uses an educational background dummy, an age group dummy, an employment form dummy, a spouse dummy, and the cross term of the spouse dummy and the high-income spouse dummy. The high-income spouse dummy is a dummy variable that takes 1 when the income of spouse is above average and zero when it is below average.

As presented in Figure 5-2, the poverty risk of men is lower for college graduates in terms of both income poverty and interdependent multidimensional poverty. In other words, the result exhibits a significant effect of educational experience at college, earning college degrees, and development of people networks on the reduction of poverty risk. Women also exhibited a significant decrease in poverty risk of college graduates in income poverty at the 1% level. However, for interdependent multidimensional poverty, no statistically significant difference was found from the result. Judging from the

estimation results, therefore, college education and degrees earned by male students have a strong effect of reducing poverty risk even when the hometown environment and past educational experience are considered. For women, however, such an effect proved to be a little bit weaker than in the case of men.

Although the presentation of detailed estimation results is omitted because of space restrictions, regarding the effects of control variables of the age 20–29 dummy representing young people (age 40–49 dummy is the reference group), significant positive effects on income poverty and IMD poverty were found for both men and women. The cross term of the with-spouse dummy and high-income spouse dummy indicated a significant negative effect on income poverty for both men and women.

## 5.6 Conclusion

This study used propensity score matching to examine the extent of substantial reduction of poverty risk of individuals who attended college and graduated from college in comparison to those without any college education, taking into account the recent increase in college education recipients and the spread of youth poverty. The results suggest that men enjoyed an adequate effect (reduction of poverty risk) of a college degree on household income (equivalent household income) poverty and interdependent multidimensional (IMD) poverty measured based on the compensation approach. For women, however, the effect of a college degree on the reduction of risk of falling into income poverty was evident to some degree, but no effect on their IMD poverty was observed in the study. Although the effect of educational experience in college on subsequent employment and family development is regarded as significant, the specialized learning acquired in college by women might not be applied adequately to the labour market.

Furthermore, in Japan, difficulties often arise with labour, particularly of irregular employees, related to the number of working days, overtime hours, and social insurance coverage provided by their employers, and the fact that higher education is not providing effective solutions to such labour issues can be pointed out. Much of “the working poor,” who can still only earn an income below the poverty line even while working long hours, must assess whether their poverty is attributable to their own low productivity or attributable to their confrontation of so-called labour difficulties. As pointed out by Honda (2009), knowledge of labour laws and social security is fundamentally important as a means of reporting and correcting illegal acts in the workplace. The fact, however, that higher education scarcely provides vocational knowledge that supports the rightful

“resistance” of such workers can be regarded as an important issue in Japan. A report submitted by a Ministry of Health, Labour, and Welfare study group in 2008 positioned high schools and universities as the first places for education for the labour-related legal system. Whether such educational opportunities are provided adequately in general education courses of today’s universities, or not, should also be examined.

Table 5-1: Descriptive Statistics of Variables Used

	Male (n=1,231)		Female (n=1,340)	
	Mean	Std. Dev	Mean	Std. Dev
20s	12.4%	0.33	26.5%	0.44
30s	43.9%	0.50	38.4%	0.49
40s	43.6%	0.50	35.1%	0.48
Have spouse	70.5%	0.46	74.8%	0.43
Had cultural asset (as a child)	56.9%	0.50	71.2%	0.45
Father: graduated from university	25.9%	0.44	29.0%	0.45
Mother: graduated from university	7.1%	0.26	8.7%	0.28
Participated in instrument lessons	9.7%	0.30	36.7%	0.48
Participated in sports lessons	13.4%	0.34	12.1%	0.33
Participated in calligraphy lessons	9.1%	0.29	9.2%	0.29
Participated in correspondence education lessons	28.3%	0.45	25.4%	0.44
Meeting with teachers (elementary, junior-high, and high schools)	40.9%	0.49	42.6%	0.49
Graduated from university	62.6%	0.48	37.5%	0.48
Graduated from junior college, technical college	16.2%	0.37	37.9%	0.49
Graduated from high school	21.2%	0.41	24.6%	0.43
Regular employment	81.9%	0.39	24.7%	0.43
Irregular employment	7.1%	0.26	26.5%	0.44
Self-employed	7.7%	0.27	2.4%	0.15
Jobless	3.2%	0.18	46.4%	0.50
Income poverty	10.9%	0.31	15.5%	0.36
Interdependent multidimensional poverty	7.1%	0.26	13.0%	0.34

Source: Survey on Regional Living Environment and Sense of Happiness (2011).



Table 5-2 Estimation Results of Logit Model for Advancement and Graduation from University

	Male (n=1231)		Female (n=1340)	
	Odds ratio	z-value	Odds ratio	z-value
<b>Age</b>				
20s	1.00	-0.01	2.10***	4.47
30s	0.89	-0.86	1.72***	3.57
40s (ref)				
<b>Cultural capital</b>				
Had cultural asset (as a child)	1.43***	2.78	1.61***	3.09
Father: graduated from university	2.15***	4.52	2.54**	6.47
Mother: graduated from university	1.01	0.05	2.42**	3.62
<b>Cultural lessons</b>				
Participated in instrument lessons	0.92	-0.34	1.34**	2.22
Participated in sports lessons	1.16	0.73	1.23	1.12
Participated in calligraphy lessons	1.14	0.58	1.14	0.63
Participated in correspondence education lessons	1.71***	3.62	1.18	1.17
<b>Parents' attitudes about education</b>	1.27*	1.75	1.36**	2.33
<b>Meeting with teachers (elementary, junior-high, and high schools)</b>	1.02	0.18	1.29**	2.03
Log likelihood	-759.2		-776.4	

Note: \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.

Figure 5-1: Multidimensional poverty and poverty regimes

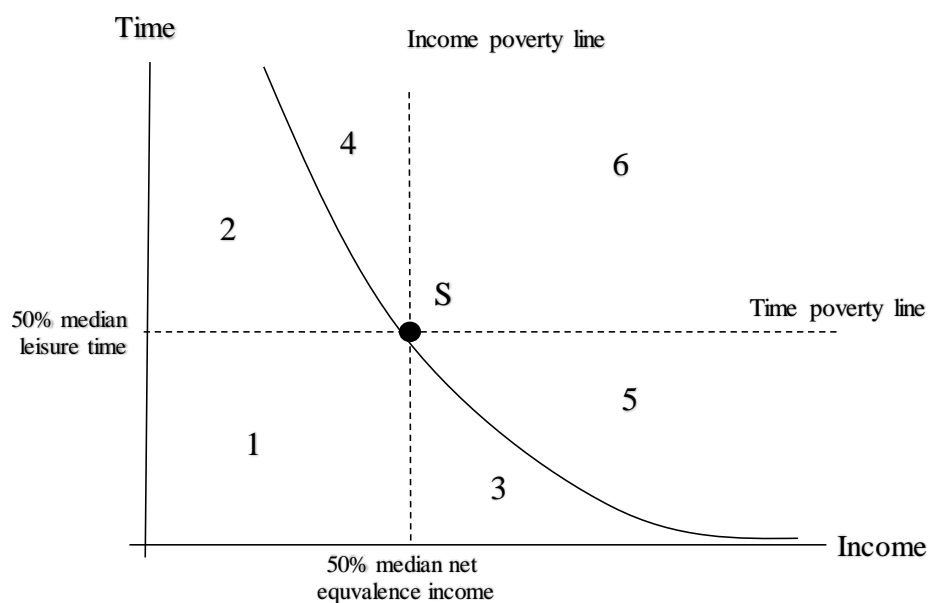
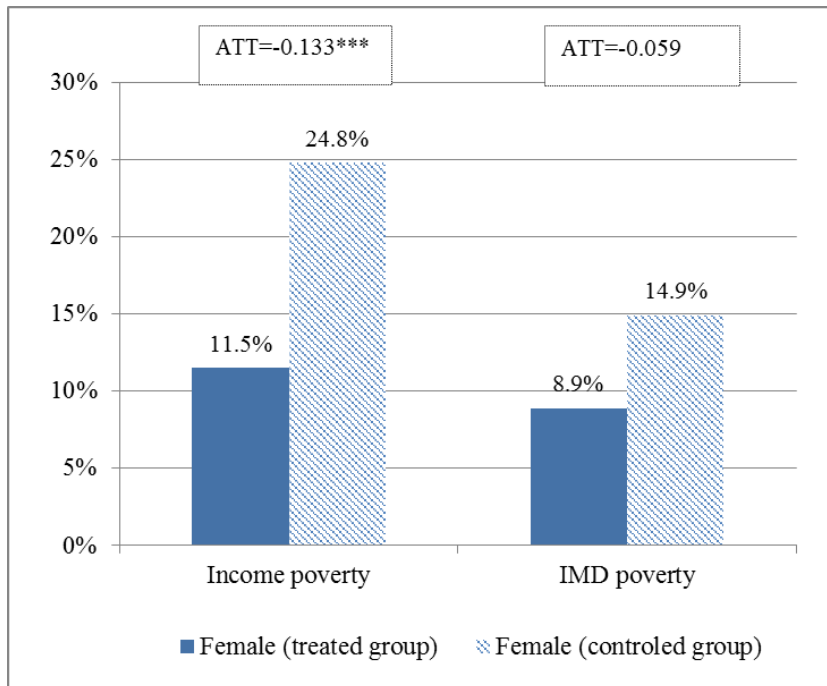
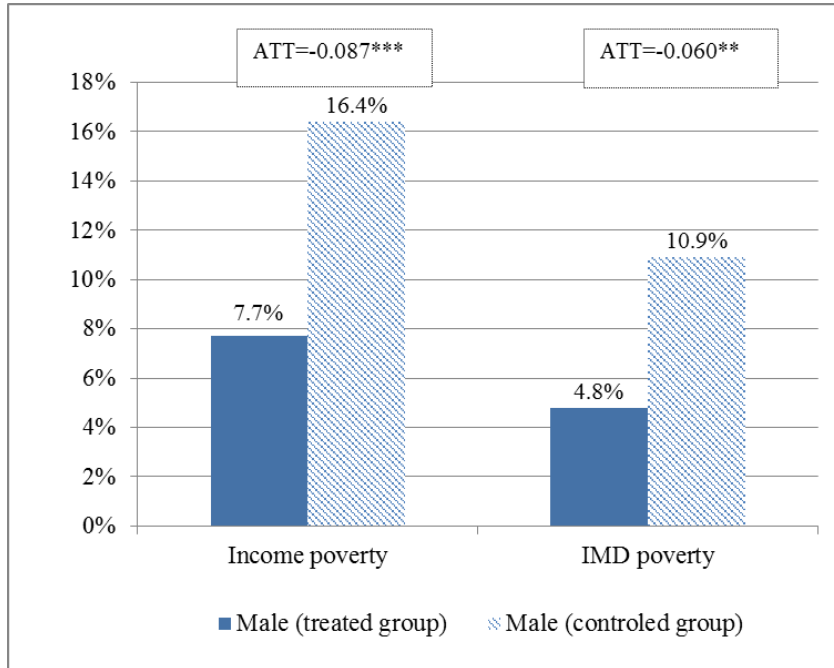


Figure 5-2: Effect of College Degree on Poverty Risk (after Matching).



Note: ATT stands for the average treatment effect on treated people. Symbols \*\*\*, \*\*, and \* are statistically significant at 1%, 5% and 10% level.

## Chapter 6: Conclusion

This dissertation has presented an investigation of multidimensional poverty and well-being in Japan. Specifically, this dissertation presents analyses using the following assessments: (1) what multiple poverty situations people are facing, along with socioeconomic factors, influence people's well-being and daily activities; (2) what socioeconomic factors affect multidimensional poverty including the time dimension; and (3) whether higher education can truly reduce the risk of multidimensional poverty.

Many scholars have remained concerned that income inequality in most developed countries has increased in the past three decades. This dissertation starts with introduction of recent trends of inequality and poverty around world and presents discussion of the impact of globalization on inequality in Japan in Chapter 1. In addition, Chapter 1 reviews previous reports of the literature related to multidimensional poverty and explains the analytical framework based on the economics of poverty. Chapter 2 presents an investigation of the effects of multidimensional poverty including income poverty, time poverty, and social exclusion, on key health indicators (self-rated health (SRH) and psychological distress (K6)) in Japan, based on the multidimensional poverty approach presented by Alkire and Foster (2011a). Because many empirical studies have examined the association between physical activities and health status and well-being, Chapter 3 describes examination of the relations between income and time poverty, and physical activity using the household micro-dataset in Japan. To some degree, estimation results presented in Chapter 3 support the conclusions from Chapter 2, indicating that multiple poverty is highly associated with people's well-being. In addition, Chapter 2 and Chapter 3 not only suggest that multiple dimensions of poverty are more useful to predict people's well-being; they particularly emphasize the importance of the time dimension, which has been discussed only insufficiently in Japan.

To clarify aspects of income-based poverty and time poverty, Ishii and Urakawa (2014) reported that time poverty can be reduced by payment for household services, while the ratio of income poverty increased. In Chapter 4, by considering substitution between income and leisure time via the estimation of a CES well-being function, it is apparent that there are 'hidden poor', who have been ignored in studies of traditional monetary poverty and who have been discussed insufficiently in many earlier studies. For example, an important fraction of time poor individuals are not compensated for their time deficit even by the income poverty threshold above. Chapter 4 estimates the socioeconomic factors of interdependent multidimensional poverty, such as age,

educational background, and working status. Based on results obtained from Chapter 4, the study explained in Chapter 5 provides some solutions for multidimensional poverty. Chapter 5 examines the potential impact of higher education on interdependent multiple poverty using analytical methods called propensity score matching.

Contributions of this dissertation are summarized as follows: First, these studies provide a multidimensional perspective to analyze social issues such as poverty. By considering combinations of more complex dimensions of poverty, the studies described herein also suggest a multiple perspective for social policy making. In general, it is difficult to seek some indicators or dimensions that are both relevant for identifying deprivation and which are useful as a basis for policy making. The central motivation for empirical analysis for multiple dimensions of poverty is to inform social policy, and thereby to improve the standard of living. The AF methodology applied in Chapter 2 and Chapter 3 and the compensation approach used in Chapter 4 and Chapter 5 in this dissertation might open a window onto policy. Such approaches will require Japanese government officials to change their way of thinking and expand their knowledge and capacities to encompass the influences of broader socioeconomic factors. In contemporary Japan, poverty reduction policies have centered on income. For instance, to protect the living conditions of working generation, the Ministry of Health, Labour and Welfare decided to adopt a local minimum wage level in year of 2016. However, other entitlements or capabilities, for example, time and the condition of higher education, have been neglected to some degree.

Second, in the field of multiple poverty studies, it examines time specifically, and to emphasize the impact of multidimensional poverty, including the time dimension, on an individual's health. Although some earlier studies have applied multiple dimensions by consideration of both monetary resources (e.g., income, consumption, assets, wealth, housing conditions) and non-money resources (e.g., food, water, educational attainment, skills, well-being, security, social inclusion), few of them have considered the time dimension. Taking Sen's perspective, time is a fundamentally important resource because it enables and restricts many activities. Thereby, individuals who are deprived in time lack the basic capability to function and to live a valued life. Consequently, it is necessary to expand the income poverty dimension or non-monetary poverty dimensions with the time dimension.

Third, this dissertation highlights the role of higher education, not just because it assists people in escaping from income poverty, but because it will prevent the young generation from deprivation on multiple poverty dimensions. Monetary measures of poverty engender policies particularly addressing income generation and infrastructure

development. However, without overall improvement of environment of education, health and other conditions, low-income assistance programs are just a short-term strategy. Chapter 1 presents discussion of the causes of income poverty. Inequality in Japan can be explained partly by a demand shift towards skilled labour. Nevertheless, Atkinson (2015) provided an optimistic perspective by which advanced countries can benefit from globalization with increase of the highly skilled and highly educated labour force. Countries with a highly skilled force might indeed be fully specialized in the production of some advanced product or service. Atkinson's concern appears to be fully in line with the strategy adopted by the European Union, and other advanced countries, of prioritizing investment in education: 'equipping people with the right skills for the jobs of today and tomorrow' being one of the Europe 2020 initiatives. It is important to note, however, that we have elided 'skill' and 'education' (Atkinson, 2015). Empirical results from Chapter 5 demonstrate the link between higher education and poverty reduction for Japanese people of younger generations. More importantly, as many earlier studies have emphasized, low education can trap poor people in a vicious cycle of poverty, and even pass poverty on to later generations. Consequently, the Japanese government must shift its policy on higher education investigation. A shift is needed in poverty reduction strategies from the present low-income assistance and short-term strategies to broad combinations of short-term and long-term efforts.

To decrease income inequality between regularly employed workers and non-regularly employed workers the Japanese government has undertaken action on a reform plan named "work-style reform." The action plan for work-style reform contains three main parts: (1) raising the average minimum hourly wage; (2) equal pay for equal work; and (3) restrictions on overtime work hours.

Public policies for 'Raising the minimum hourly wage' and 'equal pay for equal work' are mainly intended to narrow wage gaps between regular and non-regular workers. It was an effective action to increase the minimum hourly wage legally guaranteed for workers in 2016. However, widening regional gaps of minimum wages are apparent in Japan. For example, the minimum hourly wage in Tokyo, which is the highest among all prefectures in Japan, was ¥907 in 2016. That figure much higher than some lowest-rank prefectures such as Okinawa. In addition, although the minimum level of hourly wage was improved in most of prefecture, it is still very low compared to wages of regular workers. "Equal pay for equal work" has been regarded as a key component of the "work-style reform" policy agenda because the ratio for non-regular workers has increased continually in recent years and because it consists of almost 40% of the labour market. Consequently, "equal pay for equal work" might elicit more effective results for reducing

inequality between regular and irregular workers than “raising the average minimum hourly wage.” However, attention must be devoted to the various constraints of “equal pay for equal work” policy: first, to narrow disparities between women and men in earnings. World Bank (2012) reported that providing more opportunities for women’s access to education will decrease gender inequality and improve development outcomes for the next generation. However, increased female education participation has been insufficient for wage equality between men and women in the labour market in many OECD countries. In Japan, regarding women who have college educational background and who are employed as full-time workers, their income tends to be smaller than men who have similar socioeconomic status (Sano, 2005). Consequently, narrowing the gender gap must be regarded as an important component of an “equal pay for equal work” policy. Second, irregular workers have much less income than regular workers, and often have almost no stability in their employment, particularly in Japan. Unstable employment can result in a large share of irregular workers lacking proper social security protection. Consequently, government should undertake great efforts to improve pay as well and employment conditions of irregular workers. Third, a long-term means of enhancing equality between irregular and regular workers is the creation of more opportunities for training and education for irregular workers, and help for these workers to find better paying or full-time jobs in the labour market.

‘Restrictions on overtime work hours’, which play a key role in “work-style reform” is a good solution for the ‘karoshi’ problem. In principle, Japan’s government limits overtime work to 45 hours per month and 360 hours per year. However, during busy times, the maximum overtime work can be increased up to 100 hours per month. Under the government’s current plan for regulation of overtime, some Japanese enterprises have decreased overtime work and have attached an allowance for overtime work as a fund to improve the work environment or as bonus for their employees. Kivimäki et al. (2010) emphasized that a psychosocial work environment will affect worker health. In addition, empirical results from Chapter 2 suggest that health situation cannot be improved solely by “restrictions on overtime work hours” policy or economic policy. Therefore, it is necessary that more enterprises act in more effective ways, including support for social exclusion and limitations of overtime work.

In addition, insights from this dissertation can help speed up the process of poverty reduction in three policy actions:

First, policymakers should reconsider tightening regulations on overtime work, reflecting the widening trend of long working hours at many firms. High ratios of persons in time poverty are often observed in cases of full time employees and full time couples

with preschool children. Based on time allocation in this dissertation, lack of leisure time reveals overtime work as well as long commuting times. Thereby time poverty ratios might vary from the city scale. For example, in chapter 2, a large share of JSHINE data's respondents consist of young generations in Tokyo. The estimated results clarify the severe situations of working and commuting times of workers in Tokyo. Consequently, corporations in large cities must increasingly be governed more by overtime rules than companies in small cities are. Recently, the Japanese government is toughening rules to change the status quo in a country where working overtime is the norm. Under the proposed legislation, a special rule that is being promulgated limits overtime to 60 hours a month to rein in overwork among corporate employees. However, the limitations of overtime work should be reconsidered according to family structure. Main results reported by this dissertation give evidence that single-parent households and double full-time employed couple with preschool children households need more time to care for children. Regarding these situations, many corporations can establish a flexible working style by which employees are not only allowed work in offices but can work instead in their own houses.

Second, as Tachibanaki (2010) has highlighted, the Japanese government must strengthen childcare assistance so that single mothers can work with working hours stipulated by law or, if they so desire, work overtime hours. It has been difficult for single mothers to work full working hours. Japan should eliminate that barrier. Although the Japanese government provides "*kodomo teate*" of ¥15,000 per month for each child under age three for both Japanese and foreign parents who are living with their children in Japan, based on a compensation approach, Chapter 4 reveals that double full-time employed couples and couples who have small children are unable to spend adequate time with their children or substitute their time deficit by earning additional income. Therefore, it might be more useful to some firms to provide daycare centers to help their employees to rear children. For instance, online mall operator Rakuten and a portal site operator Yahoo! Japan recently planned to expand daycare childcare. Moreover, support for single-parent households remains insufficient because the income and time-based dimensional poverty ratio of single-parent households is particularly high as reported in this dissertation.

Third, the study in Chapter 5 undertakes consideration of how to overcome poverty, and examines the potential impact of higher education on multidimensional poverty. Consequently, it is more appropriate for governments and policymakers to decide to invest in human capital to reduce poverty in Japan. Universities should establish more scholarship programs for students who are distinguished but who need financial aid. Child care assistance is a short-term solution for children escaping from poverty. However,

education assistance is a long-term solution for teenagers to reduce the risk of a fall into poverty in the future. The Japanese government must invest more in education because it will equip young people with the right skills for the jobs of tomorrow. Furthermore, a change of attitude related to poverty reduction policies must be undertaken by policymakers, government officials, and donors, as well as NGOs. A shift must be undertaken in poverty reduction strategies from the present income generation activities and short-term strategies to broad combinations of short-term and long-term efforts.

As Atkinson (2015) stated, reducing inequality and poverty, and promoting social inclusion will be greatly helpful for creating a society that is safer and more stable, which should be regarded as fundamentally important conditions for sustainable economic growth and development. This dissertation has provided a mixed perspective for reducing poverty and for improving human well-being in the society. Particularly, coordinated public policy actions for reinforcement of work-life balance are regarded as important to form a better society by reducing the number of people facing multiple poverty situations.



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