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(所得格差の決定要因に関する三つの実証研究)

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Chapter 1
Introduction

There have been frequent discussions in many countries on the issue of domestic income inequality. Since the late 1970s, the income inequality level in many developed countries has increased (Piketty and Saez, 2003; OECD, 2014; OECD, 2018). On top of this, the citizens of low and middle income and non-OECD member countries tend to regard themselves as members of unequal societies (Murata and Aramaki, 2013). Low and middle income countries tend to have higher income inequality than high-income countries (World Bank, 2020). Those in developing countries are more aware of inequality and so people in developing countries may be more dissatisfied with their governments. Increasing inequality may not only produce relative poverty but cause many negative effects such as a decline in the economic growth rate of the country and the deterioration of public order (OECD, 2014). Therefore, there is an urgent need to resolve social issues that accompany an increase in inequality.

One thing to keep in mind here is that the market economy is not completely at fault. In addition, we are not denying that competition between companies under capitalism has some benefits. This study explains our position in regards to the best economic system after explaining the concepts of the three current major economic systems, the market economy, the planned economy, and a mixed economy. The market economy refers to an economic system in which most services and goods are produced, invested in, and distributed through the market under a pricing system (Merriam-Webster, 1993; Stepykina, 2004). As a general rule, a market economy assumes the right of private property and private ownership of the means of production. Additionally, economic agents such as companies can produce and invest with little restraint from the public sector, such as the government. In a market economy, prices and supplies are adjusted through market mechanisms, improving production efficiency and achieving efficient resource allocation. However, the market mechanism is not perfect, and there is a phenomenon called “market failure” in which economically efficient allocation is not achieved. Increasing inequality and poverty are negative effects caused by “market failure”. Increasing inequality adversely affects the country's economic growth rate (OECD, 2014). Therefore, although a market economy is likely to achieve efficient resource allocation, it is not perfect, and increases in inequality caused under the market economy hinder not only fairness but economic growth. Therefore, this study is skeptical of a complete market economy with minimal government involvement.

A planned economy is an economic system in which services and goods are produced, invested in, and distributed through the public sector. Under this system the government is instrumental in planning and overseeing production in the economy. As a general rule, a planned economy assumes public ownership of the means of production. A planned economy does not depend on market mechanisms, so it has the advantage of not being affected by market failure. For example, in the early 1930s, the Soviet Union achieved high economic growth rates since it was not affected by the Great Depression of 1929. Additionally, at least in principle, there is no inequality in distribution and ownership, so there is little concern about problems of inequality. However, farmers, factory workers, and service workers under a planned economy are likely to lose their motivation because their overall income is not tied to their production capacity. Under these conditions, economic efficiency is extremely low and economic growth is likely to stagnate. Therefore, this study is also skeptical of a planned economy overseen by government involvement.

A mixed economy is an economic system that combines concepts of both the market economy and the planned economy. Specifically, a mixed economy is a system in which the government intervenes in the market economy to avoid the risk of market failure. The mixed economy has the merit of promoting economic growth that cannot be achieved by a market economy by utilizing aggressive fiscal policies represented by public investment in infrastructure. Therefore, higher economic growth can be expected than in those countries under a perfect market economy, and the gross national income is also likely to increase. Government intervention makes it possible to fairly redistribute the wealth gained from economic growth. In this way, the mixed economy is a system that can achieve both economic growth and more equitable redistribution. In addition, reducing income inequality promotes economic growth (OECD, 2014). This active government intervention in a market economy would enable a virtuous cycle of growth and distribution to be achieved. Although this study raises the issue of correcting income inequality, it also looks to do this by expanding national wealth through economic growth under capitalism. Unless the gross national income increases, the income available for redistribution will decrease. In other words, this study is based on the proposition that a satisfactory redistribution of wealth cannot be achieved without economic growth.

However, at present, few countries or regions have achieved this virtuous cycle of growth and redistribution. The citizens of many countries have become increasingly dissatisfied with their income inequality these days (Murata and Aramaki, 2013). Moreover, the citizens of some countries are dissatisfied with their government's

redistribution policies, saying that certain minorities are treated with more favor (Sanders, 2003; Orife, 2016; Schmidt et al., 2020). Since increasing income inequality is a problem directly linked to daily life, the negative emotions of individuals produced by dissatisfaction may lead to a deterioration of public security and eventually social and economic stagnation. The ultimate goal of this study is to address problems of income inequality by suggesting ways to reduce dissatisfaction among individuals, improve motivation, and as a result build a virtuous cycle of improving economic conditions and public order. The aim of this study is to identify optimal policies that can be effected in environments of increasing income inequality to alleviate them and transition to a better social order, to achieve this ultimate goal.

However, this is a difficult problem since there is not just one factor but many factors that affect income inequality. Additionally, each factor has differences in spread of period and spatial expanse. Specifically, factors differ in the spatial range of same effect on inequality and in the period in which the influence on inequality changes (circulates). By conducting a multifaceted analysis under various conditions according to the factors that are thought to affect income inequality, it is possible to make flexible policy proposals that meet the conditions. Additionally, each factor is complementary and can be combined to provide a concrete solution to income inequality. Based on these, this study analyzes the impact of each factor on income inequality from different perspectives in Chapters 2, 3 and 4.

In Chapter 2, we focus on the influence of industrial structure changes, which is the fundamental idea of the Kuznets hypothesis (Kuznets, 1955), on inequality. Specifically, we show the transition of each industrial structure change of agriculture-manufacturing, manufacturing-service, and service-knowledge in OECD countries and the impact of these changes on income inequality. In other words, we indicate that the industrial structure, which has changed over the medium term span of about 30 years, has had a similar effect on the inequalities of OECD countries at similar economic development stages.

The industrial structure change from agriculture to manufacturing, service sector, and the knowledge sector is considered to indicate the stage of economic development. Simultaneously, based on the Kuznets hypothesis, the income inequality would change with the structure change from the traditional sector to the modern sector (Kuznets, 1955; Kwon, 2016). Therefore, industrial structure change would indicate the process of economic growth and be a fundamental factor in creating or converging inequality. The Chapter further considers that industrial structure change is the trajectory of economic

development and the radical factor of the change of inequality, we show the medium- to long-term transition of the industrial structure change in developed countries and the effect on income inequality at each stage.

However, it is difficult to present a concrete redistribution policy to correct income inequality only by showing the relationship between the stage of economic development and income inequality. Therefore, it is necessary to actually show the relationship between major policies and income inequality. The ideology of the government that actually formulates and implements policies is also important. In Chapter 3, we capture the policies of successive governments in postwar Japan comprehensively and individually, and we conduct empirical analysis on the side and adverse effects of policies on changes in income inequality, using long-term time-series data. In addition, we regard how the ideology of diplomatic, defense, and national finance and the way of thinking about income inequality of each cabinet and the ruling party affect the fluctuation of inequality. This chapter analyzes and considers the domestic effect of the policies and ideologies of each cabinet in postwar Japan that change in the short term span of about 5 years, on inequality. Additionally, we suggest policies necessary to correct the inequality.

However, even if redistribution policy is carried out, the major issue is whether appropriate distribution reaches the vulnerable people who really need support. Actually, especially in Western countries, white people have raised the issue of so-called “reverse discrimination” that may have occurred due to the influence of affirmative action policies that give preferential treatment to specific minorities in recent years (Sanders, 2003; Orife, 2016; Schmidt et al., 2020).

Therefore, in Chapter 4, we focus on the world as a whole and indicate the relationships between diversities of human heterogeneities such as race, religion, language, educational background and fluctuations in income inequality through econometric analysis. Social diversity may induce differences in social environments within and between each attribute, and have an effect on inequality over the long term. In this chapter, we eliminate regional influences and indicate how such diversities have common impacts on income inequality throughout the world. Moreover, we add interdisciplinary considerations based on previous studies of cultural anthropology, sociology, and religious studies, as well as that of socioeconomics. Based on these considerations, we make policy recommendations to deal with income inequality around the world. In particular, this chapter suggests a policy to alleviate income inequality by identifying “socially vulnerable people,” who should receive specific redistribution. In Chapter 5, we summarize our findings from Chapters 2, 3 and 4 and explain their policy

implications based on the results.

Chapter 2
Industrial Structure and Inequality in Developed Countries

2.1 Introduction

In recent years, increasing trend of inequality are argued in many industrialized countries. The Gini coefficient, which is an indicator of the income inequality level, tends to rise. According to OECD (2018), the Gini coefficient had risen in almost all countries from the 1980s to 1990s. Meanwhile, in the 2000s, the Gini coefficient either stagnated or trended downward except in some countries, for example, the US, Sweden, and Denmark. However, inequality has not disappeared clearly, and continues to remain high today. The widening inequality may not only produce poverty but cause many negative effects such as slowing the economic growth and the deterioration of public order (OECD, 2014). Therefore, the transition of income inequalities is a matter of growing social interest in each country.

According to Piketty and Saez (2003), the long-term income inequality trend in industrialized countries since 1913, is roughly depicted in a U-shaped curve. Although income inequality tended to rise by the 1920s, following the Great Depression in 1929, inequality gradually declined from around 1930. Since then, inequality continued to decline, but it stagnated in the 1970s and rose again around 1980.

Kuznets' (1955) inverted U-curve is one of the most fundamental arguments related to the relationship between income inequality and economic development. However, income inequality in developed countries started to rise from the late 1970s, although such countries were industrialized. This trend is inconsistent with the Kuznets curve. Therefore, many economists (e.g., Harrison and Bluestone, 1988; Tribble, 1996) raised the necessity of a new theory. "The Great U-Turn" hypothesis states that the transition of inequality assumes a U-shaped quadratic curve in the United States (Harrison and Bluestone, 1988). Tribble (1996) analyzed US data and demonstrated that the relationship between GNP and income inequality could depicted by an S-shaped cubic curve model. Similarly, Amos (1988) and Tachibanaki (2009) argued that income inequality draws a cubic curve in some developed countries. Furthermore, Piketty and Saez (2003) denied to attribute the cause of the change in inequality to the industrial structure change. However, Kwon (2016) argued that the idea of the Kuznets hypothesis explains the relationship between the structural change in the service–knowledge sectors and inequality change in the US in recent years. Kwon (2016) was an epoch-making study in

that it divided the service sector into (low-skill) service and knowledge sectors, overturning the criticism of the Kuznets hypothesis.

In addition, Madsen et al. (2018) compiled a panel data set for 21 OECD countries over the period 1870–2011. They sought to gain greater clarity on the consequences of inequality on growth and the transmission channels through which inequality affects growth. Therefore, the authors empirically examined the extent to which income inequality transmits to growth through savings, investment, education, and knowledge production. However, their results were inconclusive.[1]

The main contributions of this study are threefold. First, this study shows the correspondence between the change of inequality and each industrial structure change in developed countries which is not clearly described in previous studies. Second, this study is depicted finely the transition of industrial structure changes across the OECD by analyzing the impact of industrial structure changes of agriculture-manufacturing, manufacturing-service, and service-knowledge on inequality throughout the OECD countries in every decade from the 1970s to the 2010s. Third, this study verifies whether the argument that denies the Kuznets hypothesis is valid throughout the OECD countries by showing whether the inverted U-shaped curve could be applied between the service-knowledge structure change that has been progressing in recent years and income inequality.

The rest of this paper is structured as follows. Section 2.2 presents theoretical studies on inequality and socioeconomic conditions. Section 2.3 outlines the model constructed to clarify the determinants of inequality, the empirical analysis method employed and the variables used. Section 2.4 reports our analysis results and discusses the relationship between industrial structure changes and our results. Section 2.5 presents the conclusions and the contributions.

2.2 Kuznets Hypothesis and its Re-Evaluation

Kuznets Hypothesis and Criticism

One of the most fundamental arguments related to the relationship between income inequality and economic development is the Kuznets hypothesis. Kuznets (1955) proposed that a graph with the income inequality level on the vertical axis and the income

[1] Specifically, underdeveloped financial markets constrained market size, entrepreneurship, and innovation. However, in economies with highly developed and sophisticated credit facilities, inequality had little effect on the four outcome variables.

level on the horizontal axis presents an inverse U-shaped quadratic curve. According to Kuznets (1955), the main factor that causes change in inequality is industrial structure change due to economic development, that is, industrialization. In the early stages of economic development, most inhabitants work in the agricultural sector, with low productivity and wages, and income inequality is low, with all workers receiving the same payment. Over time, the manufacturing sector develops with economic development, and the rural labor force moves to the cities, resulting in a structural change from an agriculture-based to a manufacture-oriented regional economy. Economic inequality expands with an increase in the income disparity between workers in the manufacturing sector with high productivity and wages and workers in the agricultural sector with low productivity and wages. However, when the regional economy develops beyond this stage, the agricultural sector shrinks, and almost all workers are absorbed into the manufacturing sector, thereby reducing the disparity. Therefore, the above hypothesis is established.[2]

However, the late 1970s witnessed a tendency that contradicts the Kuznets curve relationship in many countries and regions, mainly in developed countries, where income inequality started to rise despite near completion of industrialization. This contradiction has raised the necessity of a new theory, and many economists have actually initiated discussions on the question.

The Great U-Turn hypothesis proposed by Harrison and Bluestone (1988) is one of the main arguments. This hypothesis rejects Kuznets (1955), based on the income distribution changes in the United States. The income and wage inequality levels in the US had trended downward since the Great Depression. However, they have been on the rise again since 1969 and 1976, respectively. Consequently, inequality levels in the US represent U-shaped quadratic curves. It suggests that the Kuznets curve reached the end in the US. Harrison and Bluestone (1988) used the de-industrialization in the US to explain this hypothesis. Specifically, due to the hollowing out of industry, which in turn led to an increase in the unemployment rate and an employment shift to service sector. Consequently, economic inequality increased as the number of workers in the

[2] Hereafter, we define the Kuznets hypothesis as follows; the relationship between industrial structure change from the agricultural sector to manufacturing sector and inverse U-shaped quadratic curve between economic development level and income inequality level.

manufacturing sector, the former middle class, decreased. The same phenomenon is observed worldwide, especially among developed countries, along with its social impact.[3]

Also, these days, hypotheses and theories have been proposed that apply the Kuznets hypothesis and that the relationship between income distribution and economic development is represented by a cubic curve or a more multidimensional graph. Tribble (1996) examined the per capita GNP and Gini coefficient in the United States from 1947 to 1990. Consequently, the relationship between GNP per capita and income inequality was defined by an S-shaped cubic curve model, represented by equation (2.1):

$$Y = \beta_0 + \beta_1 lnPGNP + \beta_2 lnPGNP^2 + \beta_3 lnPGNP^3 + \varepsilon \quad (2.1)$$

However, $\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 > 0$ and $|\beta_1| > |\beta_2| > |\beta_3|$. Y is the income inequality level, *lnPGNP* is the logarithm of GNP per capita. According to Tribble (1996, 1999), in high-income countries, the Kuznets curve is essentially composed of agriculture–manufacturing (primary) structural transition and manufacturing–service (secondary) structural transition. Tribble's hypothesis is therefore an extended model obtained by synthesizing the quadratic curves of the above-mentioned Kuznets curve and the Great U-Turn. This curve is essentially a transition in the economic development process, and is a recurring quadratic curve that inevitably arises with each structural transition (namely, Kuznets (1955) cut out only the agriculture–manufacturing structural change out of this process and explained as an inverted U-curve hypothesis). Therefore, when the industrial structure changes with the emergence of a new sector in place of the service sector, the curve is iterated not only in the S-shaped cubic curve but repetitively, thus becoming a multi-order (higher than quartic) curve as that shown in Figure 2.2. Similarly, Amos (1988) and Tachibanaki (2009) apply the Kuznets hypothesis using income data of the United States and Japan, respectively, and proposed the hypothesis that income inequality in some developed countries draws a cubic curve.[4]

Re-evaluation of the Kuznets Hypothesis

Due to the rise and bipolar structure of the service sector, inequality seeped into and

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[3] Hereafter, we define "the Great U-Turn" as follows; the relationship between industrial structure change from the manufacturing sector to services sector and U-shaped quadratic curve between economic development level and income inequality level.

[4] In addition, Piketty and Saez (2003) is one of the representative studies critical of the Kuznets hypothesis. However, unlike the other hypotheses mentioned in this section, Piketty and Saez (2003) refused to attribute the cause of the change in income inequality to the industrial structure change.

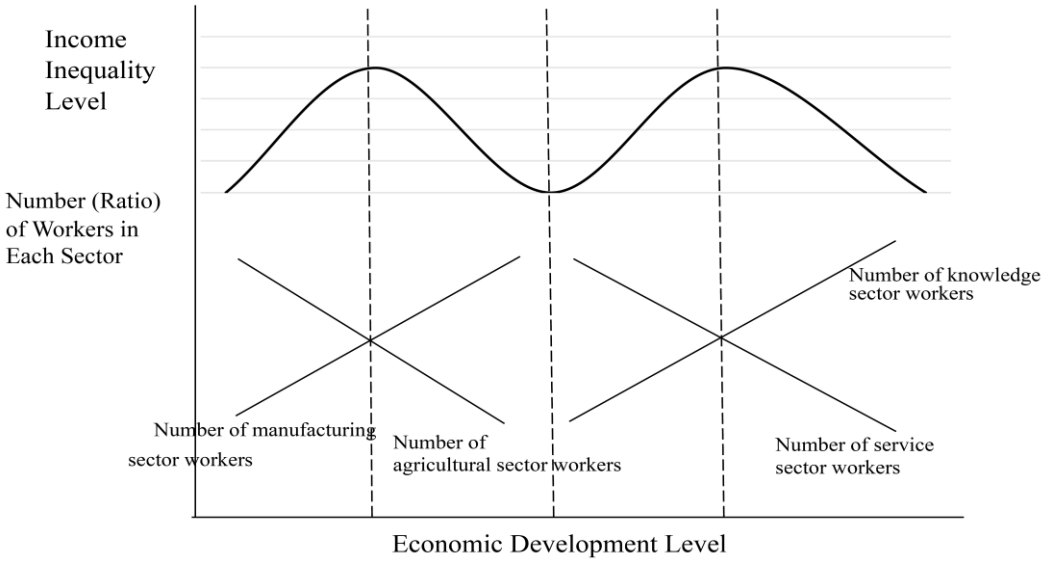
expanded within the sector, raising more questions about Kuznets' inverted U-curve. The critics debated alternative theories to the Kuznets hypothesis, such as the Great U-Turn. However, Kwon (2016) refuted the criticism as follows. The Kuznets hypothesis not only positions industrial structure change as a determinant of inequality but focuses on the transition of a proportion of workers between the traditional and modern sectors of the regional economy. Specifically, inequality first expands as a result of the shift in employment to the modern sector, and then shrinks. Moreover, because the service sector includes a wide range of services, employment in some services needs to be separated.

Accordingly, Kwon (2016) divided the service sector into a (low-skill) service sector and a knowledge sector based on Florida (2002).[5] The Kuznets curve was then validated by Kwon with a US data set of economic and social variables from 1917 to 2008. In conducting the analysis, Kwon (2016) set forth the following hypotheses. The recent service–knowledge structural change in the United States affects the transition of income inequality in the same way as the past agriculture–manufacturing (primary) structural change did. Based on this hypothesis, Kwon (2016) predicted that the influence of the primary structural change will gradually have lower influence whereas the service–knowledge structural change will gradually exert greater influence, because of the industrial structure change. The most innovative point in this analysis is the use the absolute difference between the ratios of industrial workers in the traditional and modern sectors as an independent variable representing the change proposed in the Kuznets hypothesis. According to Figure 2.1, the Kuznets curve relationship would be established if the absolute difference between the numbers of industrial workers (ratios) in the traditional and the modern sectors and the transition in income inequality level in the target area represents a negative relationship. Therefore, the Kuznets curve holds if the absolute difference has a negative impact on inequality.

According to Kwon's empirical analysis, the absolute differences between the ratios of primary and secondary sector workers and between the ratios of services sector and knowledge sector workers show significant negative effects on inequality. In addition, the influence of the employment shift from agriculture to manufacturing decreases over time.

[5] Service jobs are low-skill, low-wage, and low-discretion occupations such as food-service workers and janitors. Creative jobs are occupations that required high knowledge and imagination such as lawyers, researchers (Florida 2002). Based on this classification, Kwon (2016) calculated the proportions of workers in the primary industry, secondary industry, (low-skill) service sector, and knowledge sector in the United States since 1900 as that shown in Appendix A.

Figure 2.1 The Kuznets Hypothesis and Industrial Structure Change.



Meanwhile, the influence of the employment shift from the service to the knowledge sector expands with the passage of time. These results are consistent with Kwon's hypothesis. Hence, Kwon (2016) showed that his hypotheses were all supported in the United States; he also showed that the Kuznets curve held in service–knowledge structural change in the US.

2.3 Empirical Model and Data

This section outlines the model constructed to clarify the determinants of income inequality in OECD countries, the empirical analysis method employed, and the variables used in the analysis. First, this study explains data used in the analysis. We use cross-country panel data for 13 countries (Australia, Canada, Denmark, France, Ireland, Italy, Japan, New Zealand, Norway, Spain, Sweden, the United Kingdom, and the United States) from 1970 to 2014 based on the World Bank (2020), OECD (2018), and ILO (2018). The reason for limiting the analysis subject to OECD countries instead of all over the world and setting it after 1970 is as follows. First, the development of the industrial structure and that of the labor market are different between developed countries and developing countries, therefore, it is not easy to analyze using the same model. In particular, the knowledge industry is likely to be underdeveloped in developing countries. Second, there is a lack of data, and there is a difference in the development of industrial structure between developed countries before 1970.

Panel data refers to data sets consisting of multiple observations on each sampling unit. This could be generated by pooling time-series observations across a variety of cross-sectional units including countries, states, regions, firms, or randomly sampled individuals or households (Baltagi and Giles, 1998). Obvious benefits of panel data sets are a much larger data set with more variability and less collinearity among the variables than is typical of cross-section or time-series data. Another advantage is their ability to control for individual heterogeneity. Panel data sets are also better able to identify and estimate effects such as complex issues of dynamic behavior that are simply not detectable in pure cross-sections or pure time-series data (Baltagi and Giles, 1998).

In time series data and panel data, the stationarity of each variable becomes a problem. About this, Murray (2006) examined all cases in which regression equations have variable that including the unit root process, only the independent variables are present; only the dependent variable is present; and both variables are present. According to Murray (2006), time series analysis could involve spurious regressions and therefore yield inappropriate results, if both independent and dependent variables are unsteady and take unit roots. Besides, even if only the dependent variable takes a unit root, the consistency of the estimated values is lost. When only independent variables take unit roots, they do not satisfy the asymptotic property although they satisfy the consistency requirement. However, this study uses panel data for 47 years and the sample size exceeds 300, so its influence is slight compared with the consistency. Therefore, when the dependent variable includes a unit root process, the general method described below cannot be used exactly as mentioned. Here, we need to use finite differences within dependent and independent variables, then use a model corresponding to the unsteady process.

Therefore, the panel unit root test is performed on the dependent variable used in this analysis. This study uses the Fisher-ADF test (Maddala and Wu, 1999; Choi, 2001) and the IPS test (Im et al., 2003). We use the null hypothesis that “a unit root exists.” First, we estimate objective variables at the level using two models, one with both a constant term and a time trend term and another with only a constant term. If the former yields a significant result, it is the result of the unit root test. If the former is not significant, the latter estimation is used as the test result. If this is not significant, either, we also do a unit root test after taking the first-order difference for each variable. If this, again, is not significant, we take the logarithm and repeat the same process. Appendix B shows the test result based on this method. According to the result, the null hypothesis was rejected

at the 1% level in the model with both the constant term and the time trend term, and we judged that dependent variable has stationarity. Therefore, we use this as the test result.

Even if the transformation of the industrial structure is at almost the same stage, the effect of industrial structure changes on income inequality may differ from country to country. Therefore, this study uses a random effect model (REM) and a fixed effect model (FEM), because it corresponds to the case where there is an individual effect. The regression equations are defined based on the data, and each equation is analyzed by multiple methods, such as an FEM and an REM. Then, the Hausman test is used to select the most appropriate method. If the REM is not rejected, almost all the data used are homogeneous, and it is not necessary to consider the effects for individual data. However, if the REM is rejected (i.e., the FEM is used), the individual-specific effects are correlated with the independent variables.

This study verifies the influence of income level, labor, industrial structure, and other variables on income inequality using equation (2.2), which is based on the variables used in the discussions on the Kuznets hypothesis, the Kwon (2016) approach, and the Great U-Turn.

$$Y_{it} = \alpha_i + \sum_j \beta_j X_{(it)j} + \sum_t T_t + \sum_t \sum_j \gamma_{tj} T_t X_{(it)j} + \varepsilon_{it} \quad (2.2)$$

In equation (2), i is the country, and t is the observation year. Y is the income inequality level, X_j is each social variable for income inequality, and ε_{it} is the error term. The period dummy T_t (1970s, 1980s, 1990s, 2000s, 2010s; the reference period is the 1970s) is used as a control variable. In addition, α_i shows individual effects, unique to the country. In the FEM, α_i is regarded as an individual-specific constant term, and in the REM, α_i is regarded as an error term similar to ε_{it}. $T_t X_{(it)j}$ represents the interaction term of the dependent variable and period dummy. By using this interaction term, this study can be shown the transition of structural change for each period clearly. Therefore, the change with time of the influence of industrial structure changes on inequality becomes clear.

The dependent variable is the income ratio of the richest 10 percent (*P90P100*) of each country.[6] Appendix C shows the definition of the dependent variable. This study mainly uses the independent variables related to labor and industrial structure based on

[6] Initially, we used the Gini coefficient as the dependent variable, we changed it because sufficient results were not obtained.

the Kuznets hypothesis, the Kwon (2016) approach, and the Great U-Turn.[7] Appendix C shows the definition of independent variables. Below, we explain independent variables using in the analysis in detail.

First, we explain the variables related to the Great U-Turn. We apply the core model of inequality and development proposed by Nielsen (1994) to explain the Great U-Turn. Further, we select its social factors following Harrison and Bluestone (1988), Alderson and Nielsen (2002), and Kwon (2016). In the regression analysis, this model is represented by equation (2.3). However, *Y* is a variable showing income inequality.

$$Y = f(IMPORTGDP, UNIONDENSITY, FEMALELABOR, 2NDSCHOOLENROLL) \quad (2.3)$$

Second, we explain the following variables related to Kwon (2016); the absolute difference between the ratios of the primary and secondary sector workers (*INDAGRI*), the absolute difference between the ratios of the secondary sector and service sector workers (*SERIND*), and he absolute difference between the ratios of the service sector and knowledge sector workers (*KNOWSER*).

According to Kwon (2016), the service to knowledge structural change and the conversion from agriculture to manufacturing, in the United States, are almost consistent with the Kuznets curve relationship. Therefore, he concluded that the service–knowledge structural change should be discussed according to the Kuznets hypothesis. We support the Kuznets curve when these variables are expected to have a significantly negative influence on inequality. Conversely, if these significantly positive affect on inequality, we do not support the Kuznets curve. Moreover, if we analyze through the interaction terms multiplied by each of the above variables and the period dummies (1970s, 1980s, 1990s, 2000s, 2010s), *INDAGRI* exerts a lower influence with the passage of time whereas *KNOWSER* is expected to have a rising influence over time. In the calculation, ILO (2018) is used as the percentage of workers in each sector. Thereby, the unit of measurement of the variable is percentage points.

Finally, we summarize the details of the expected impacts of each variable in the case of both the Kuznets hypothesis and the Great U-Turn in Table 2.1. However, in Table 2.1, it should be noted that we predict the industrial structure change shifts in the order of agriculture-manufacturing change, manufacturing-service change, and service-knowledge change in OECD countries.

[7] In addition, contrary to the purpose of this study, there is also the possibility that income inequality is affecting the industrial structure change, that is, endogeneity.

Table 2.1 Expected Effects of Independent Variables in the case of each Industrial Structure Change.

Industrial Structure Change	Agriculture-Manufacturing	Manufacturing-Service	Service-Knowledge
Hypothesis (Expected to be Applied)	Kuznets	The Great U-Turn	Kuznets
The Great U-Turn			
IMPORTGDP		+	
UNIONDENSITY		−	
FEMALELABOR		+	
2NDSCHOOLENROLL		−	
Industrial Structure Changes			
INDAGRI + INDAGRIyear	−		
SERIND + SERINDyear		+	
KNOWSER + KNOWSERyear			−

Notes: 1. This study predicts that industrial structure change shifts in the order of agriculture-manufacturing change, manufacturing-service change, and service-knowledge change in OECD countries. Agriculture-manufacturing change, manufacturing-service change, and service-knowledge change are corresponded to Table 2.2 (1), (2), and (3), respectively.

2. *INDAGRI* + *INDAGRIyear*, *SERIND* + *SERINDyear*, and *KNOWSER* + *KNOWSERyear* mean the sum of the coefficients of industrial strucure changes (*INDAGRI*, *SERIND*, and *KNOWSER*) and the coefficients of each interaction terms from the 1980s to the 2010s, respectively.

3. *INDAGRIyear*, *SERINDyear*, and *KNOWSERyear* mean the coefficient of the interaction terms of *INDAGRI*, *SERIND*, and *KNOWSER*, respectively.

2.4 Empirical Result on the Effect of Industrial Structure

Table 2.2 reports the result of the empirical analysis based on the relationship between industrial structure changes and income inequality in developed countries. In these models, the Hausman test does not reject the REM. Hence, we explain the results without taking the differences in the industrial structures of each country into account.

Table 2.2 (1) is based on the hypothesis that the agriculture to manufacturing structural change is the main determinant of income inequality transition in each country. First, regarding the variables of the Great U-Turn, *UNIONDENSITY* and *2NDSCHOOLENROLL* are significantly negative, *FEMALELABOR* is significantly positive. Although *IMPORTGDP* does not exert a significant influence, it tends to have a

Table 2.2 Industrial Structure Change and the Kuznets Curve.

	P90P100 (1)	P90P100 (2)	P90P100 (3)
IMPORTGDP	0.0002	-0.0003	0.0001
	[1.42]	[-1.36]	[0.56]
UNIONDENSITY	-0.0017***	-0.0012***	-0.0015***
	[-13.28]	[-8.55]	[-11.06]
FEMALELABOR	0.0012***	0.0003	0.0011***
	[4.67]	[0.86]	[4.01]
2NDSCHOOLENROLL	-0.0012***	-0.0017***	-0.0016***
	[-7.92]	[-10.26]	[-10.19]
INDAGRI	-0.0035***		
	[-2.73]		
SERIND		-0.0022	
		[-1.34]	
KNOWSER			0.0029**
			[2.00]
INDAGRI1980s	0.0018		
	[1.25]		
INDAGRI1990s	0.0039***		
	[2.57]		
INDAGRI2000s	0.0078***		
	[4.50]		
INDAGRI2010s	0.0133***		
	[3.37]		
SERIND1980s		0.0043**	
		[2.05]	
SERIND1990s		0.0047**	
		[2.55]	
SERIND2000s		0.0033*	
		[1.82]	
SERIND2010s		0.0025	
		[0.97]	
KNOWSER1980s			0.0014
			[0.82]
KNOWSER1990s			-0.0014
			[-0.89]
KNOWSER2000s			-0.0025
			[-1.59]
KNOWSER2010s			-0.0033*
			[-1.76]
D1980s	-0.0547	-0.0272*	-0.0178
	[-1.55]	[-1.84]	[-1.34]
D1990s	-0.0678**	0.0143	0.0476***
	[-1.82]	[0.98]	[3.58]
D2000s	-0.1400***	0.0388**	0.0657***
	[-3.32]	[2.39]	[4.88]
D2010s	-0.2324***	0.0469	0.0656***
	[-3.13]	[1.11]	[3.87]
Constant	0.4983***	0.5093***	0.4309***
	[14.36]	[20.93]	[22.56]
N	434	374	374
Adjusted R-squared	0.4113	0.3229	0.2819
Hausman	REM	REM	REM

Notes: *, **, *** indicate that they are significant at 10%, 5% and 1% level, respectively. Numbers above parentheses are regression coefficients, and numbers in parentheses are z-values.

positive influence. Therefore, this model supports the Great U-Turn with the high probability. Hence, if we ignore period dummies, at first glance, the Great U-Turn has held. Second, the coefficient of the absolute difference itself (*INDAGRI*) is significantly negative influence on inequality. This result is suggested that *INDAGRI* had a negative effect on inequality in the 1970s.

However, the coefficients of the interaction terms (*INDAGRI1980s*, *INDAGRI1990s*, *INDAGRI2000s*, *INDAGRI2010s*) have been gradually increasing each decade, and the coefficients of the interaction terms since the 1990s are significantly positive. Thereby, the recent increase in the absolute difference between the ratios of primary and secondary sector workers seems, on the surface, to drive an expansion in income inequality after the 1990s. This is due to the reduced impact of the agriculture–manufacturing structural change, because this structural change has completed in the sample countries. Even if the coefficients of absolute difference themselves (*INDAGRI*) are added to the coefficients of the interaction term, the sign does not change after the 1990s. Therefore, the agriculture–manufacturing structural change in OECD countries was still under way by the 1970s. This indicates a high possibility that the Kuznets curve relationship held at the time. In the 1980s, the agriculture–manufacturing structural change came to an end, and its influence gradually declined. This result is also consistent with the hypothesis in the previous section.

The analysis presented in Table 2.2 (2)[8] assumes that the structural change from manufacturing to service is the main determinant of income inequality transition in every country. First, regarding the variables of the Great U-Turn as shown in Table 2.2 (1), *IMPORTGDP* and *FEMALELABOR* do not have a significant influence. However, *UNIONDENSITY* and *2NDSCHOOLENROLL* are significantly negative. Therefore, this model analysis supports the Great U-Turn to some extent. Second, the coefficient of the absolute difference itself (*SERIND*) is negative (not significant). In addition, each of the interaction terms (*SERIND1980s, SERIND1990s, SERIND2000s, SERIND2010s*), was significantly positive correlated with income inequality in the 1980s, 1990s, and 2000s. Moreover, if the coefficients of the absolute differences themselves (*SERIND*) are added to the coefficients of the interaction term, the sign does not change. Therefore, the sum of

[8] The number of observations of *SERIND* and *KNOWSER* is smaller than *INDAGRI*, because it is not possible to distinguish between the service and knowledge sectors in some of the observations in Table 2.2 as that shown in Table 2.4. Therefore, the number of observations is different between 434 in Table 2.2 (1) and 374 in Table 2.2 (2), (3).

the coefficients of *SERIND* and them of each interaction terms is positively trend from the 1980s to the 2000s.

From the above, as well as the results presented in Table 2.2 (1) and (3), a structural change from manufacturing to services during the 1980s to 2000s is highly likely, and some variables are consistent with the Great U-Turn. Considering the sum of the coefficients of the 1980s to the 2010s are positive, the manufacturing–service structural change does not support the Kuznets curve relationship. Moreover, the coefficients of the interaction terms from the 1980s to the 2000s are significantly positive. On the contrary, we can insist that the reverse correlation is occurring. Therefore, we may conclude that this change does not support the Kuznets curve, but supports the Great U-Turn in the 1980s to the 2000s.

The analysis in Table 2.2 (3) assumes that the structural change from a service to a knowledge economy is the main determinant of income inequality transition in every country. As for the variables of the Great U-Turn, *UNIONDENSITY* and *2NDSCHOOLENROLL* are significantly negative, *FEMALELABOR* is significantly positive, as in Table 2.2 (1). In addition, *IMPORTGDP* does not exert a significant influence. Therefore, if we ignore period dummies, at first glance, the Great U-Turn seem to apply in this model as well. The coefficient of the absolute difference itself (*KNOWSER*) is significantly positive influence on inequality. This result is suggested that this absolute difference had a positive effect on income inequality in the 1970s.

In addition, the sum of the coefficients of the absolute difference (*KNOWSER*) and them of each interaction terms (*KNOWSER1980s*, *KNOWSER1990s*, *KNOWSER2000s*, *KNOWSER2010s*) seemed, at least on the surface, an increasing trend on income inequality in the 1970s and 1980s. Considering that services to knowledge structural change had not yet occurred at that time,[9] this result implies that there was almost no influence.[10] However, the coefficient gradually switched to a decreasing trend, and had a significantly negative impact on inequality in the 2010s. This is related to the Kuznets curve relationship, as it is due to the service–knowledge structural change.[11] Therefore,

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[9] The ratio of workers in the knowledge sector did not largely increase in the developed countries of the 1970s and the 1980s. For example, in the United States, it is shown in Appendix A.

[10] Assuming that the Kuznets curve holds in the service–knowledge structural change, this result is interpreted as having a smaller effect of the structural change than in the insignificant case.

[11] Since about the 1990s, the ratio of workers in the service sector has been flat to slightly decreasing, and that in the knowledge sector has been increasing in developed countries. For example, in the US, it is shown

the OECD countries had not experienced the service–knowledge structural change by the 2000s, but has experienced only since the 2010s—and it is still under way. Hence, it is highly possible that the Kuznets curve has held since the 2010s. In addition, we can conclude that the impact of the service to knowledge conversion on inequality is increasing every year. This result is also consistent with the hypothesis in the previous section.

From the variables of the Great U-Turn of Table 2.2, the analysis would show a high possibility that the Great U-Turn has held in OECD countries since 1970 if it is ignored period dummies. Therefore, it seems at first glance that the Kuznets hypothesis has reached the end. However, Table 2.2 (1) suggests that the Kuznets curve applies to the agriculture–manufacturing structural change by the 1970s. Table 2.2 (3) suggests that the Kuznets curve has also held in the service–knowledge structural change since the 2010s. Therefore, when analyzing in consideration of the industrial structure change, the Kuznets curve, in which the service sector is a traditional sector and the knowledge sector is a new industry sector, is held at present. However, according to Table 2.2, the manufacturing–service structural change from the 1980s to the 2000s was contrary to the Kuznets curve relationship.

Therefore, all the arguments of Kwon (2016) discussed previously hold in this analysis. Moreover, the manufacturing–service structural change, which is the only transformation that the Kuznets curve does not explain, can be described as the Great U-Turn. Hence, we suggest that Kuznets' inverted U-shaped curve defines the agriculture–manufacturing structural change by the 1970s, whereas the Great U-Turn describes the manufacturing–service structural change from the 1980s to the 2000s. We also suggest that Kuznets' inverted U-shaped curve holds again in the service–knowledge structural change since the 2010s. From the above, these results indicate that the industrial structure change caused a change in income inequality in OECD countries from the 1970s to the 2010s as the industrial structure gradually evolved from agriculture to the knowledge industry.

Discussion

We now explore the relationship between the S-curve hypothesis and our analysis results. From the results, the Kuznets curve holds in the primary structural change by the 1970s, the Great U-Turn appears in the secondary shift from the 1980s to the 2000s, and the Kuznets curve manifests again in the service–knowledge change in the 2010s.

in Appendix A.

Moreover, the income inequality decreases in developed countries before 1970 and has stagnated in recent years. Therefore, a pseudo recurring quadratic curve can be drawn (it is shown in the lower part of Figure 2.2).

Although, Tribble (1996, 1999) insisted that the primary structural change was defined from the starting point to the inflection point (between the local maximum and the local minimum). Similarly, the secondary structural change was defined from this inflection point to another point two inflections ahead (via the minimum value, the next inflection point, and the next maximum value; it is shown in the upper part of Figure 2.2). However, in our analysis, although the part of the curve reflecting the influence of the primary structural change follows Tribble (1996, 1999), the part corresponding to the second conversion changes from the inflection point to the next inflection point (via the minimum value). The service–knowledge conversion occurs from that inflection point (between the local minimum and the local maximum value) through the maximum value to another inflection point between the local maximum value and the local minimum value. In other words, the portion of the curve reflecting the change in income inequality due to the influence of the secondary conversion, which is defined by Tribble (1996, 1999), is divided into two parts: one reflecting the secondary conversion and the other representing the service–knowledge transformation as that shown in Figure 2.2. This means that despite the high possibility that an S-shaped curve could be applied, however, the S-curve hypothesis itself is incomplete. Tribble (1996, 1999) does not divide the service sector into lower-skill service and knowledge, but regards the service sector as a single industry sector. Therefore, such a difference seems to have occurred.

Next, we estimate the impact of industrial structure changes on inequality every 5 years using the results of the empirical analysis in the previous section. Specifically, we measure how much the mean values in OECD countries of *INDAGRI*, *SERIND*, and *KNOWSER* are changed in 1971-74, 1975-79, 1980-84, 1985-89, 1990-94, 1995-99, 2000-04, 2005-09, and 2010-13 (Table 2.3 shows these mean values in detail). By multiplying these differences by the sum of the coefficient of each variable (*INDAGRI*, *SERIND*, *KNOWSER*) and the coefficient of the interaction terms obtained in the analysis, we estimate the effect of industrial structure changes on inequality.

Figure 2.3 (a) indicates estimated values of the effect of industrial structure changes every 5 years and Figure 2.3 (b) indicates transition of the absolute difference. Estimated value of *INDAGRI* may have had the effect of decreasing inequality in the early 1970s, but it may have reversed in the late 1970s. After that, estimated value of *INDAGRI* has remained almost flat, and since the late 2000s, at first glance, estimated value of *INDAGRI*

Figure 2.2 Differences between Tribble's S-curve Hypothesis and our Analysis Results.

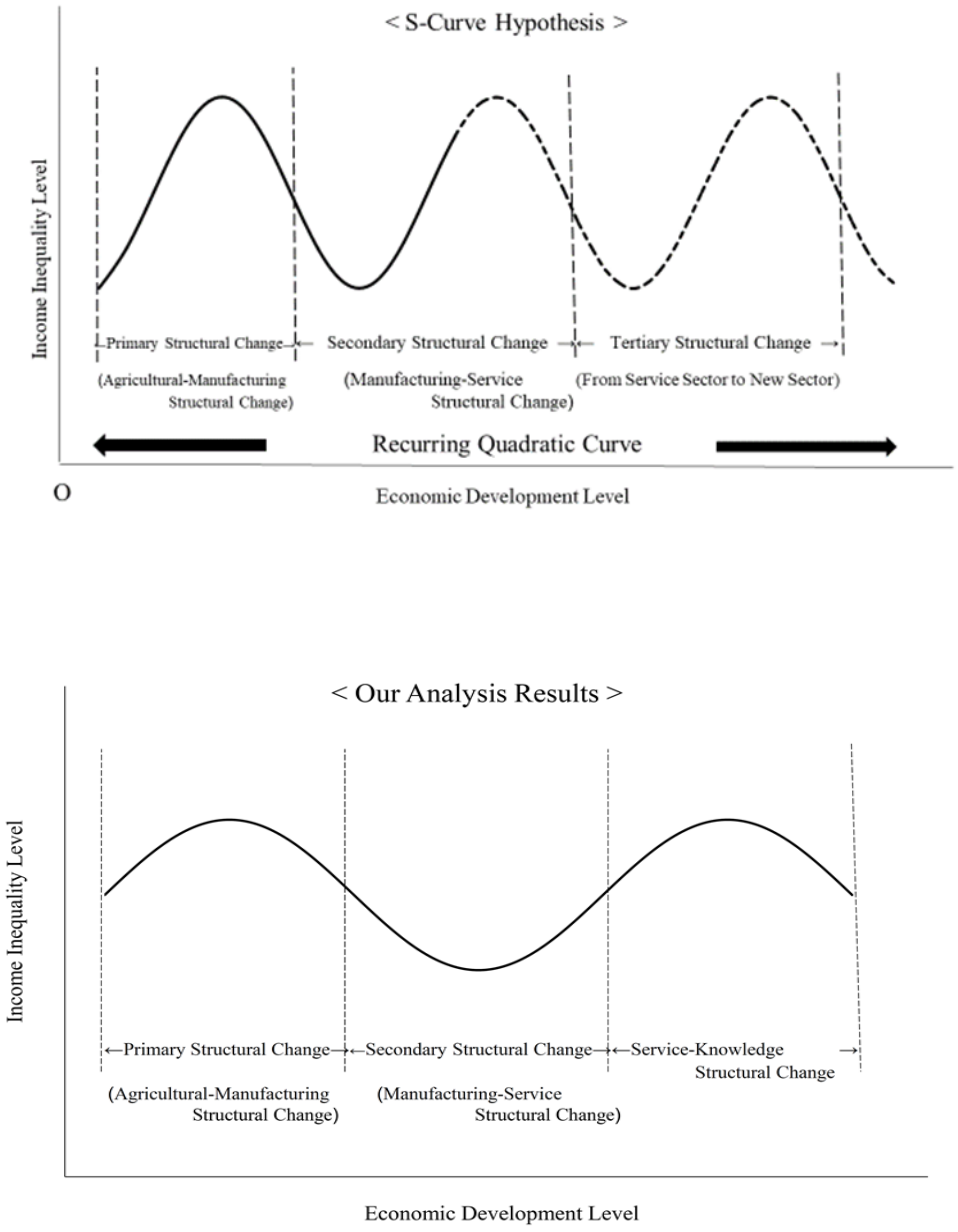
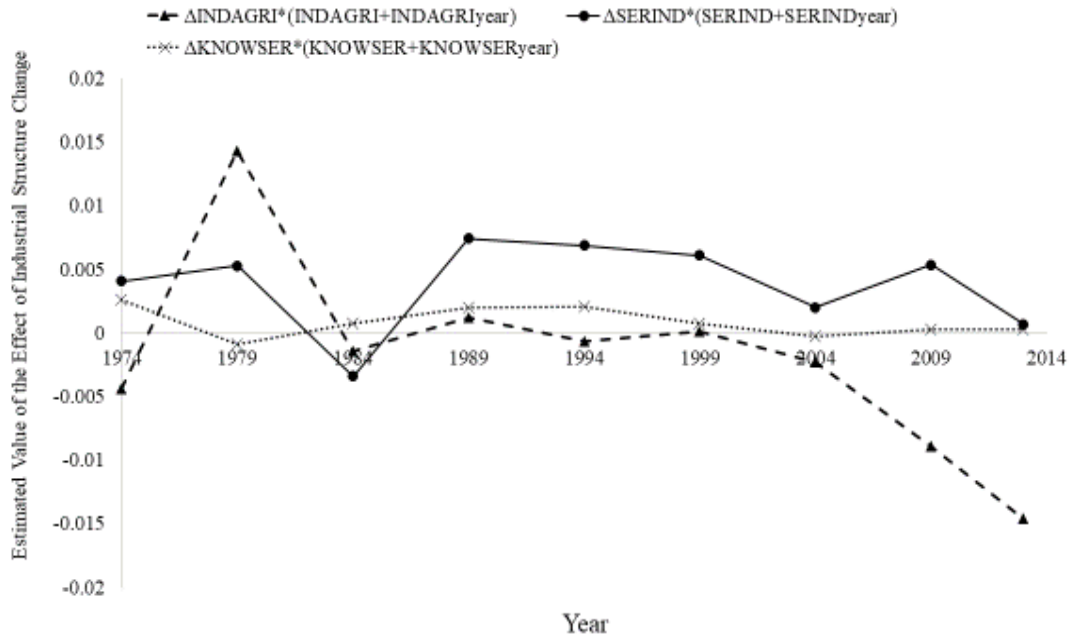
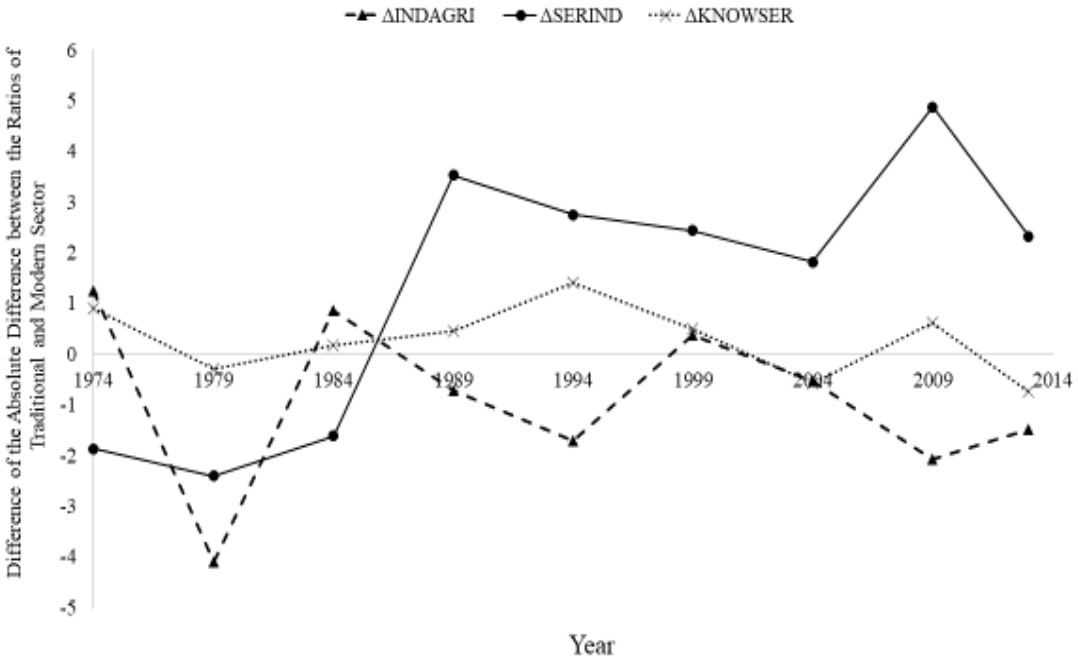


Figure 2.3 The Effect of Industrial Structure Changes on Inequality.

(a) Estimated Value of the Effect of Industrial Structure Change on Inequality.



(b) Difference of the Absolute Difference between the Ratios of Traditional and Modern Sector.



Notes: As the definition of *INDAGRIyear*, *SERINDyear*, and *KNOWSERyear*, it is shown the note of Table 2.1.

Table 2.3 Mean and Standard Deviation of Variables Related to Industrial Structure Change (every 5 Years).

Year	1971		1974		1979		1984		1989	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
INDAGRI	25.286	4.8054	26.532	3.1492	22.442	5.1311	23.302	4.9062	22.594	4.8644
SERIND	9.6469	2.9427	7.7856	3.4714	5.3878	3.8080	3.7799	3.0837	7.3090	5.1042
KNOWSER	5.3522	5.3101	6.2599	3.3401	5.9615	4.8635	6.1402	4.7334	6.5998	5.4821

Year	1994		1999		2004		2009		2013	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
INDAGRI	20.890	4.2534	21.277	3.8511	20.737	3.2405	18.665	2.9129	17.174	1.7408
SERIND	10.061	5.8573	12.497	6.2503	14.318	4.8146	19.199	4.4309	21.525	3.7372
KNOWSER	8.0082	5.7992	8.5161	6.7798	7.9513	6.1316	8.5744	5.7164	7.8304	5.4621

seem to have the effect of decreasing. Considering that *INDAGRI* begin to decline in the late 1970s, this is thought to the decrease in the ratio of manufacturing workers at the transition stage of agriculture-manufacturing structural change to manufacturing–service structural change. At first glance, the trend since the late 2000s seems to have a negative effect on inequality despite the shrinking trend of agriculture-manufacturing structural change. However, when applying the extension of the Kuznets hypothesis, the effect of absolute difference on inequality is negative. Thereby, it cannot be explained by the extension of the Kuznets hypothesis. Therefore, the estimated value may suggest that the effect of agriculture-manufacturing structural change on inequality is extremely weak in 21st century.

Next, we consider the impact of manufacturing–service structural change on inequality. From Figure 2.3, the estimated value and *SERIND* have a positive relationship from 1980s to the 2000s, and manufacturing–service structural change has affected the inequality in the 1980s, 1990s, and 2000s. This is consistent with the Great U-turn. However, in the 2010s, the expansion trend of *SERIND* has settled down, and the impact of manufacturing–service structural change is rapidly shrinking. Therefore, manufacturing–service structural change may have ended in the 2000s.

The absolute difference of *KNOWSER* is almost consistently expanding until the 2000s, but the coefficient is not significant in Table 2.2 (3) from the 1980s to the 2000s. However, *KNOWSER* begin to shrink in the 2010s, and the coefficient of *KNOWSER2010* become significantly negative. This is consistent with the initial stage of the Kuznets inverted U-curve, where income inequality increases as the absolute difference shrinks, and it may be explained by expanding the Kuznets hypothesis as that shown in Figure 2.1. In addition, it is thought that service–knowledge structural change has affected income inequality since the 2010s.

2.5 Conclusion

From our empirical results, if the time series is ignored, the Great U-Turn has held in OECD countries since 1970. Therefore, at first glance, the Kuznets hypothesis has reached the end. However, Kuznets' inverted U-curve is held between variations in the income inequality level and agriculture-manufacturing (primary) structural change by the 1970s. Moreover, the Great U-Turn occurs between variations in the inequality level and manufacturing-service (secondary) structural change from the 1980s to the 2000s. The Kuznets curve could be applied between variations in the inequality level and service-knowledge structural change (under way since the 2010s). In this way, the gradual industrial structure change from agriculture to the knowledge industry can be said to have caused the income inequality change in OECD countries over a long period. In addition, although the S-shaped curve itself could be applied by our analysis results and the subsequent considerations, Tribble's (1996) S-curve hypothesis is shown to be incomplete because the secondary structural change and the service–knowledge structural change were not separated. Furthermore, by applying the S-curve hypothesis, we conclude that income inequality expanded in OECD countries until recent years because the service–knowledge structural change (that can be explained by the Kuznets hypothesis) occurred after inequality expanded as a result of the manufacturing–service structural change.

The characteristics of this study are as follows. First, Kwon (2016) asserted that the Kuznets curve holds in the structural change from the low-skill service sector to the knowledge sector. However, Kwon (2016) was conducted only in the United States. Therefore, by expanding the analysis to OECD countries and incorporating a fixed effect model into the analysis, we confirmed whether Kwon (2016)'s conclusions apply in other developed countries. Second, the transition of inequality in recent years was somewhat ambiguous in Kwon's (2016) analysis with dummy variables for three periods (before 1950, 1950-1980, after 1980). However, our analysis, which was limited to the post-1970 period and set period dummy variables for every decade, is more detailed. In addition, Kwon (2016) regressed the interaction term between industrial structure and dummy for each period separately. However, in this case, there is a possibility that the industrial structure dummy represents different meanings among different specifications. Therefore, in our empirical analysis, interaction terms using same industrial structure are regressed same model regardless of the period dummy. Finally, this study concludes why income inequality expanded in OECD countries till recent years by applying Tribble's (1996) S-curve hypothesis.

Finally, we discuss future research problems. The level of income inequality,

especially its maximum value, could be different because of likely differences between the primary structural change and the service–knowledge structural change. However, this issue was not analyzed in this study. Therefore, caution is required when conducting the same analysis in the future. Furthermore, it is possible that the shapes themselves may be different in the two structural changes mentioned above. As can be inferred from the fact that the income inequality level has remained high since the beginning of the 21st century, the income inequality level will continue to remain high. At the moment the conversion from the services to knowledge sector has not been completed. Although income inequality has expanded and remains stagnant and the Kuznets curve holds at present, the inequality level may not show a clear contraction tendency in the near future.

Table 2.4 Descriptive Statistics.

	N	Mean	Var.	Std. Dev.	Minimum	Maximum
P90P100	434	0.3242	0.0030	0.0544	0.2183	0.4781
IMPORTGDP	434	26.9800	170.8845	13.0723	5.3386	80.6501
UNIONDENSITY	434	36.6161	452.9529	21.2827	7.5	83.1
FEMALELABOR	434	62.1652	130.7034	11.4326	32.5	82.0
2NDSCHOOLENROLL	434	102.7842	279.0640	16.7052	71.7856	162.61
INDAGRI	434	21.2541	17.8538	4.2254	9.8189	30.0101
SERIND	374	11.6885	46.2409	6.8001	0.1067	25.7913
KNOWSER	374	7.5592	31.7500	5.6347	0.0230	20.5849

Chapter 3

Government Policies and Inequality in Postwar Japan

3.1 Introduction

Since the late 1990s, it has been argued that domestic income inequality has been increasing in Japan (e.g., Sato, 1998; Tachibanaki, 1998; Tachibanaki, 2006). Income inequality in postwar Japan was relatively high before the 1960s, but declined sharply in the early 1960s and tended to decline slightly until the 1970s (Figure 3.1 (a)). However, the Gini coefficient (initial income), which is an indicator of income inequality level, has increased since the 1980s (Ministry of Health, Labour, and Welfare of Japan, various years). Additionally, the increase in income inequality in Japan has been criticized for resulting from government policies such as deregulation, which has been pursued since the mid-1990s; this is also discussed in the Japanese National Diet (Ohtake and Kohara, 2010). Anxiety about domestic inequality based on the above discussions is called the "disparity society" in Japan. Increasing inequality may cause many negative effects, including reduced economic growth and deterioration of public order (OECD, 2014). Therefore, this study focuses on the side and adverse effects of successive government policies on income inequality in postwar Japan, to identify policy factors that increase economic inequality and an optimal policy for the "disparity society" in Japan.

Since the 1990s, research analyzing the long-term trend of income inequality and its factors has increased. Based on United States income data, Piketty and Saez (2003) found that one of the key factors in the decline in the income ratio of the richest during World War II was the strengthening of the progressive tax system. They also suggested that the progressive tax easing of the 1986 tax reform (TRA86) in the US would restore the capital income of the richest people. Additionally, Bartels (2008) showed that the US administration's partisanship, and their policies, could influence income inequality. He found that the party to which the president belongs to made policy differences, which affected economic growth rate and income inequality.

Ihori and Kawade (2001) and Inui et al. (2017) analyzed the effects of postwar Japan's fiscal and monetary policies on economic growth and income inequality. Regarding fiscal policy in postwar Japan, we followed Asako et al. (1994) and Mitsui and Ota (1995) and concluded the following: First, the productivity of social capital is high in urban areas. Second, in urban areas, the productivity of capital that contributes to the productivity of industrial sectors is high, but in rural areas, it is low. Third, the

productivity of social capital for agricultural sectors was low nationwide, and the productivity of tertiary industries was almost equal nationwide. Regarding monetary policy in Japan, Inui et al. (2017) concluded that the economic stimulus effect of monetary easing has declined since the 2000s.

Previous studies have only partially captured the secondary effects of successive government policies on changes in domestic income inequality, and no study has clarified the overall picture. Additionally, to overcome the "disparity society" in Japan, it is important to clarify the policies that correct income inequality and do not impair economic growth by covering each policy adopted by successive Japanese administrations and secondary effects of these policies on inequality. The greatest contribution of this study is that it visualizes the effect of each policy for each successive administration by using the interaction term between the cabinet (ruling party) period dummy and each policy variable. Thus, our analysis is realized in two ways, namely, the transversal impact of each policy on fluctuations in income inequality, and the impact of each cabinet's policies individually on fluctuations in income inequality. Therefore, this study comprehensively and individually captures the policies of successive governments in postwar Japan and conducts an empirical analysis using long-term time-series data on the effects of these policies on fluctuations in inequality. Additionally, we examine the policy speeches of successive cabinets and determine how the ideology and the cabinet's attitude toward income inequality, which cannot be grasped by the secondary influence on policy, affect inequality. Moreover, we make policy recommendations based on these results.

3.2 Literature Reviews on Government Policies and Inequality

Bartels (2008) conducted an econometric analysis using data classified by each income class in the United States from 1948 to 2005. Based on the results, Bartels (2008) concluded that in the US, policies differed depending on whether the head of the government was a member of the Republican or Democratic Party, as well as the subsequent economic growth rate and income inequality. In Japan, the Liberal Democratic Party (LDP) was the ruling party for most of the period since the formation of the LDP in 1955. The period during which the LDP was an opposition party was limited to the period during which the coalition government of minority parties was formed (August 1993 to June 1994) and the period during which the Democratic Party of Japan took power

(September 2009 to December 2012).[12] Therefore, it is considered that the policies of successive Japanese governments have had a significant impact on changes in inequality in postwar Japan. This study describes previous research and analyzes the effects of successive government policies on inequality based on the following research, and thoroughly clarifies the policy effects of each cabinet and ruling party.

First, we discuss previous studies that describe the relationship between monetary policy and income inequality. According to Greenwood and Jovanovic (1990), there is an inverted U-shaped relationship between financial sector development and income inequality. The central bank's monetary easing policy makes it easier for financial institutions to raise funds at lower interest rates. However, the benefits are mainly enjoyed by large companies, and the increase in bond prices due to lower interest rates also benefits capitalists. Therefore, income inequality is temporarily increased; however, because of the trickle-down effect[13], the benefits of wealth spread to the poor through the activation of economic activities such as consumption— inequality is decreased. The study by Greenwood and Jovanovic (1990) is similar to this effect. This study predicts that monetary easing increases the income gap in the short term, and monetary tightening temporarily reduces the gap.

Additionally, Inui et al. (2017) used micro data (quarterly data) of Japanese households from 1981 to 2008 to construct indicators of income and consumption inequality, and then analyzed the effect of monetary policy on income and consumption distributions in Japan. As a result, in the analysis of 1981–1998 worker households, although monetary easing policy had a significant positive effect on income inequality, in the analysis of 1981–2008, it did not. This shows that the unconventional monetary easing policy, represented by the zero interest rate policy[14] implemented for the purpose of economic recovery in Japan, where the economy was sluggish after the collapse of the bubble economy in 1991, had little effect. Therefore, monetary easing may increase short-term inequality, and monetary tightening may temporarily reduce this gap.

Second, we explain previous studies that describe the relationship between public investment and income inequality. Brenneman and Kerf (2002) and Calderón and Servén (2004) note that inequality is expected to decrease when public work expenditure

[12] Appendix D presents all the Cabinets since the LDP was formed in 1955.

[13] However, OECD (2014) denied the trickle-down effect because increasing income inequality was slowing growth in many OECD countries.

[14] The zero interest rate policy started in 1999 in Japan (Figure 3.1 (c)).

increases. In Japan, Asako et al. (1994) and Mitsui and Ota (1995) analyzed differences in the productivity of social capital by region and industrial sector, and concluded the following: First, the productivity of social capital is high in urban areas. Second, in urban areas, the productivity of capital that contributes to the productivity of industrial sectors was high, but in other regions, it was low.

Third, the productivity of social capital for primary industries was low nationwide, and the productivity of tertiary industries was almost equal regardless of the area. Additionally, Yoshino and Nakajima (1999) estimated the productivity of public investment by region and sector. The productivity of public investment in depopulated areas and agriculture was low, but productivity in urban areas, telecommunications, and the environment was high. According to Ihori and Kondo (2001), the allocation of public investment by the Japanese government was not optimal; the productivity of public investment in agriculture was particularly low. These results suggest that the allocation of public investment by the Japanese government may have triggered increased inequality between urban areas (especially in areas with industrial sectors) and rural areas.

Moreover, according to Yamada (1994), there was a strong long-term positive correlation between the "employee income gap per capita between the three metropolitan areas in Japan (Tokyo, Nagoya, and Osaka) and local areas in Japan" and "net-migration of the three metropolitan areas in Japan." This means that the greater the income gap between metropolitan and rural areas, the greater the population migration from rural to metropolitan areas in search of higher income. These values were positively correlated with the economic growth rate in Japan. Therefore, the effects of the allocation of public investment were prominent during the high growth period (1955–1973) and are also assumed to have been relatively large during the Japanese asset price bubble period (1986–1991).Therefore, increasing inequality because of the allocation of public investment may have particularly strong effect during boom periods, as seen during the period of high economic growth in Japan (1955–1973) and Japanese asset price bubble (1986–1991).

3.3 Prime Minister's Policy and Inequality in Japan

In this section, we explain the effects of the policies of each cabinet or ruling party on income inequality based on the analysis results and transition of each variable used in the analysis. Based on transitions in the Gini coefficient and each policy before and after taking office of each cabinet and ruling party (Table 3.6), we confirm the major economic policies adopted by successive cabinets (ruling parties). Below, we detail the policies of

each cabinet and the ruling party.

We explain the policies of the Kishi Cabinet (*d_Kishi*,[15] February 25, 1957–July 19, 1960). In their speech, the Kishi Cabinet commended the Japan-US alliance and liberalism and emphasized its position as a Western Bloc. Hence, they signed the US–Japan Security Treaty in 1960. Additionally, they focused on Asian diplomacy, mainly in Western countries. Moreover, he strongly criticized the communist-led labor movement in Japan and communist-friendly political parties represented by Japan Socialist Party. Conversely, the Kishi Cabinet has emphasized the social security and welfare policies represented by universal health insurance (medical care) and pension. Moreover, they enacted the minimum wage law.[16] Hence, while the Kishi Cabinet is considered pro-American and anti-communist, it emphasizes welfare and redistribution. The Kishi Cabinet increased public works projects and raised tariff ratios (Table 3.6). Rising tariffs indicate that the Kishi Cabinet had protectionist tendencies. However, they eased progressive taxation and capacity burden.

Policy speeches under the Ikeda Cabinet (*d_Ikeda*, July 19, 1960–November 9, 1964), on the premise of maintaining the position of Western Bloc and the Japan-US alliance, emphasized peaceful coexistence with communist countries and alleviation of conflicts with communist countries, unlike the Kishi Cabinet. The Ikeda Cabinet aimed to double national income (Income Doubling Plan). The social security policy for reducing income inequality was continued based on wealth by economic growth. Additionally, for economic growth, the government raised the enhancement of infrastructure through public works projects and increased public investment (Table 3.6). While they were positive about a free trade policy, tariff reductions began after the Sato Cabinet immediately after Ikeda resigned (Table 3.6).

Policy speeches under the Sato Cabinet (*d_Sato*, November 9, 1964–July 7, 1972) showed that they adhered to the Japan–US alliance and, clarifying its position as a Western Bloc, advocated diplomacy with emphasis on Asian countries centered on allies such as South Korea, Republic of China (Taiwan), and the Third World. In 1965, they realized diplomatic relations with South Korea. Conversely, the Sato Cabinet promoted trade liberalization and reduced tariffs (the tariff burden ratio is also declining in Table 3.6), while adopting a policy of expanding exports. They improved infrastructure and

[15] Text set in italics is the cabinet (ruling party) dummy. Please see Section 3.4.

[16] The content of the policy speech is from the National Diet Library (2020). The same source is used for each cabinet other than the Kishi Cabinet.

reduced income tax.[17] Monetary policy initially tightened but eased after a few years.[18]

The Tanaka Cabinet's (*d_Tanaka*, July 7, 1972–December 9, 1974) policy speech emphasized the Peace Constitution and the Three Non-Nuclear Principles. Moreover, it and emphasized cooperation with communist countries such as China and the Soviet Union. The Japan–China Joint Communique, inherited from the Sato Cabinet, was realized. Conversely, although they maintained the Japan–US alliance, negotiations were held for reducing the US military's bases. Therefore, the Tanaka Cabinet aimed to make strong concessions with communist countries.

However, on the economic side, trade friction with the United States and other countries rose because of the expansion of exports. Hence, the Tanaka Cabinet decided to implement policies for significantly reducing tariffs and increasing imports. They compromised with the US on such policies. Moreover, they expanded the benefits of social security and pensions. Additionally, as a measure against rising prices, they tightened monetary policy to absorb excess liquidity. While they insisted on a plan for remodeling the Japanese archipelago, public works spending started declining, unlike the previous cabinets. This may be attributable to the Tanaka Cabinet's emphasis on reducing environmental pollution. The background of policies emphasizing the enrichment of life and the environment rather than such growth was that the economy had grown sufficiently because of the Japanese high economic growth that had continued since the mid-1950s. Therefore, people required the next stage of quality of life. In 1973, high economic growth in Japan ended because of the soaring crude oil prices caused by the Fourth Arab–Israeli War.

The Miki Cabinet's (*d_Miki*, December 9, 1974–December 24, 1976) policy speech discussed the Middle Eastern countries as the Japanese economy was hit by high crude oil prices. Based on the Japan-US alliance, the Miki Cabinet maintained the JSDF (Japan Self-Defense Forces) while denying them nuclear weapons. Moreover, diplomacy with China, the Soviet Union, and other Western nations was emphasized. Regarding diplomacy, while inheriting the policy of the Tanaka Cabinet, consideration for Western countries was strengthened. Additionally, with the end of high economic growth and transition to stable growth, the previous quantitative expansion route was changed to qualitative improvement. Thus, they attempted to improve welfare; however, unlike the Tanaka Cabinet, they demanded a high burden as a price for high welfare. Therefore, the

[17] These policies are consistent with actual transitions in Table 3.6.

[18] Figure 3.1 shows the transition of the policy interest rate in the Sato Cabinet.

response burden on social security was strengthened. According to Figure 3.1, the tariff burden ratio rose as a recoil to the rapid decline of the tariffs by the Tanaka Cabinet.

The Suzuki Cabinet's (*d_Suzuki*, July 17, 1980–November 27, 1982) policy speech emphasized the Japan-US alliance and cooperation with Western bloc countries, partly because of the influence of the Soviet invasion of Afghanistan in 1980 on the diplomatic side. The defense policy was not much different from that of the Miki Cabinet. Additionally, while they continued to address the economic impact of resource depletion and trade friction, they also worked on the aging population problem and the elimination of the budget deficit. As a result of this emphasis on fiscal equilibrium, public work projects began to decrease, while the progressive burden of social security increased. As shown in Figure 3.1, they maintained a low tariff burden ratio. On the other hand, the Suzuki Cabinet applied flexible monetary policy to boost the economy and ease monetary policy.

The Nakasone Cabinet (*d_Nakasone*, November 27, 1982–November 6, 1987) focused on policies dealing with trade friction and budget deficit, which were the primary concerns then. Specifically, because of pressure from Western countries, tariffs were reduced.[19] Moreover, the yen depreciation was corrected by the Plaza Accord in 1985 to deal with criticism of the large trade surplus caused by exports of mechanical products such as automobiles. Thus, free trade is promoted by external pressure. Additionally, Nakasone adopted a "small government" policy represented by privatization of the three public corporations, the Japanese National Railways, Nippon Telegraph and Telephone Public Corporation, and Japan Tobacco and Salt Public Corporation to deal with the huge budget deficit. They also reviewed the public pension system. Therefore, Nakasone was considered neoliberalist.

The Takeshita Cabinet (*d_Takeshita*, November 6, 1987–June 3, 1989) emphasized the Japan-US alliance but aimed to adhere to the Three Non-Nuclear Principles and concentrate on exclusive defense. The Takeshita Cabinet adopted the policy of the Nakasone Cabinet and adopted a small government policy; therefore, they reduced public work. Additionally, a monetary tightening policy was adopted to curb the soaring land prices in large cities because of the Japanese bubble economy that developed after the Plaza Accord. Additionally, while reforming the tax system and reducing the progressive taxation of direct tax, the consumption tax (an indirect tax) was adopted in April 1989.[20]

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[19] However, the tariff burden ratio was increased since the Plaza Accord in 1985 (Table 3.6 and Figure 3.1).

[20] Before 1989, the excise tax (indirect tax)—a system based on the political idea of only taxing luxury

They also reduced tariffs to manage trade conflicts.

Under the Kaifu Cabinet (*d_Kaifu*, August 10, 1989–November 5, 1991), on diplomatic and defense issues, upon assuming the policy of the Takeshita Cabinet, they emphasized working on building a new world order following the end of the Cold War. In Kaifu Cabinet's policy speech, Kaifu said they would like to continue tackling the issue of budget deficits. Hence, they reduced public works (Table 3.6). Moreover, they reviewed the insurance system, restrengthened the social security burden and progressive taxation, and implemented a monetary tightening policy to stop the rising land prices during the bubble economy. After 1991, although the bubble economy collapsed, this event marked the beginning of a long-term recession that followed.

Therefore, the political world in Japan was confused and after the general election in 1993, the Hosokawa Cabinet was established by an eight-party coalition. Therefore, the LDP lost its ruling party position for the first time in 38 years. After that, the LDP and SDPJ united, and the coalition government of the LDP, the Social Democratic Party of Japan (SDPJ), and the New Party Sakigake (NPS) (*d_LDPSDPJ*, June 30, 1994–May 31, 1998) was launched. Since the Murayama Cabinet was led by the chairman of the SDPJ, which was partial to communist countries during the Cold War, the Japan-US alliance was barely mentioned in the policy speech. Moreover, although the alliance was maintained, a difference from the past LDP administration was found. However, despite the occurrence of the Great Hanshin-Awaji Earthquake, public works projects were strongly reduced to eliminate budget deficits. Additionally, since the economy was in a severe recession then, the Murayama Cabinet implemented bold monetary easing as a measure for boosting the economy. This is consistent with many LDP administrations in that they continued their free trade policy and reduced tariffs. Under the Hashimoto Cabinet (*d_Hashimoto*, January 11, 1996–July 30, 1998),[21] their policy was implemented to a certain extent. The Hashimoto Cabinet made particular efforts to streamline administration, such as reorganizing ministries and agencies.

The Koizumi Cabinet (*d_Koizumi*, April 26, 2001–September 26, 2006)

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goods was granted under the principle of ability to pay—was introduced in Japan. However, because of improvements in living standards after rapid economic growth, the general public began consuming goods that were considered luxury goods, which were subject to excise tax, and excise tax was not imposed on some of the more expensive goods. Therefore, the Cabinet abolished excise tax and introduced a consumption tax that can be levied uniformly on all products.

[21] Since June 1998, the cabinet was the single-party government of the LDP.

implemented small government policies similar to those of the Nakasone Cabinet, such as privatization of postal service, privatization of road public corporations, and reduction of public works projects. Diplomacy was based on the Japan-US alliance, and the JSDF were dispatched to Iraq to cooperate with the Iraq War. The Koizumi Cabinet also promoted free trade by drastically reducing tariffs. However, owing to temporary economic recovery, monetary tightening was conducted. However, interest rates rose because of the cancellation of the extreme monetary easing policy (zero interest rate policy) that had since continued from February 2002 to March 2006, and the policy interest rate itself was at a low level.

Under the Democratic Party of Japan (DPJ) administration (*d_DPJ*, September 16, 2009–December 26, 2012), public work expenditures fell sharply after the inauguration of the Yukio Hatoyama Cabinet. However, it began rising after the Great East Japan Earthquake that occurred under the Kan Cabinet. However, overall, public works projects shrunk, similar to that in the ruling era of the SDPJ, and one of the predecessor parties of the DPJ. The Hatoyama Cabinet emphasized Asian countries, especially East Asian countries, in their policy speech, and announced a policy of significantly overturning the diplomacy that emphasized the US and the former Western countries. However, this diplomatic policy was replaced by a moderate policy in the Kan Cabinet. The Noda Cabinet raised the maximum income tax rate to restore income redistribution in taxation.

In the 2012 general election, LDP returned as the ruling party and the (Second to Third) Shinzo Abe Cabinet (*d_Abe2,* December 26, 2012–September 16, 2020)[22] was inaugurated. In the policy speech, Abe emphasized strategic diplomacy, diplomacy emphasizing universal values, and the protection and assertion of national interests. The Abe Cabinet also decided to collaborate with Asian countries and other allies, centering on the Japan-US alliance. On the other hand, they blamed China's demonstrations in the Senkaku Islands[23] and North Korea's nuclear tests. Additionally, the Abe Cabinet increased defense-related expenses in 2013 for the first time in 11 years. The Abe Cabinet announced a so-called "Abenomics"[24] economic policy comprises bold monetary easing, agile fiscal policy, and a growth strategy encouraging private investment. Adhering to this policy, the Abe Cabinet conducted bold monetary easing, aggressive fiscal policy, and

[22] This analysis covers the period until September 2017.

[23] The Senkaku Islands are territorial disputes between Japan, China, and Taiwan.

[24] The name follows Reaganomics, an economic policy implemented by US President Ronald Reagan in the 1980s.

increased public works that had been on an extended downward trend.

The LDP has been forming a coalition with the New Komeito (NKP) since 1999. Under the coalition government of the LDP and the NKP (*d_NKP*, October 5, 1999–September 16, 2009, December 26, 2012–present)[25], the tariff burden rate almost falls, the direct tax and social insurance contribution rate is almost increased, and the policy interest rate almost falls. Therefore, the NKP supported free trade and monetary easing through the administration while strengthening the progressive tax system and burden of social security. Additionally, NKP is thought to reduce public work.

Finally, in Table 3.6 and Figure 3.1, we confirm the long-term changes in each policy. Public investment has been on a downward trend since the end of Japanese high economic growth (Tanaka Cabinet), especially in small government-oriented cabinets (e.g., the Nakasone and Koizumi Cabinets). Although monetary policy is aimed at monetary easing as a whole, it is applied to tighten the economy during the bubble economy period (Takeshita and Kaifu Cabinets). Surprisingly, many cabinets have an increasing tariff burden. The direct tax and social insurance contribution rose since the end of high economic growth (Tanaka Cabinet), and the progressive system according to the burden capacity has been strengthened.

3.4 Empirical Result on Time-Series Analysis

Methods

We conducted empirical analyses on the effects of successive government policies on inequality based on our hypotheses. In these analyses, since the volatility of each variable can be predicted to be high and time-dependent, it is desirable to use a model that corresponds to heteroskedasticity. Therefore, this study uses autoregressive conditional heteroskedasticity (ARCH) regressions.

Specifically, the analysis was performed using two regression equations (3.1) and (3.2). Here, $T_l \Delta X_k$ represents an interaction term multiplied by the one-by-one cabinet (ruling party) period dummy *T* and the explanatory variable X_j (However, $k \in j$, $l \in m$). Additionally, this analysis includes the distributed lag model (DLM) in equation (3.2), considering that a lag is likely to occur in the policy effect. Here, we consider the lag period from lag 0 to lag 12. In equation (3.2), z represents the number of lag periods, and $0 \leq z \leq 12$.

$$\Delta Y = \Sigma \beta_j \Delta X_j + \Sigma T_m + \varepsilon_t \tag{3.1}$$

[25] This analysis covers the period until September 2017.

$$\Delta Y = \Sigma\beta_j \Delta X_j + T_l + \sum_{z=0}^{n} \gamma_{lkz} T_{lz} \Delta X_{kz} + \varepsilon_t \quad (3.2)$$

In the following section, we describe our analysis methods. First, we estimated regression equations (3.1) and (3.2) using ordinary least squares (OLS) to measure the ARCH effect and performed Engle's ARCH test using Lagrange multipliers. If the ARCH effect was present, we analyzed the ARCH (q) models (where q = 1, 2, 3, 4) using the appropriate model measured by the Wald test (Wald statistics). However, currently, 13 models with lags 0 to 12 correspond to one cabinet or political party (dummy). Subsequently, we perform the Wald test again and select the model with the best lag order from 0 to 12 for each cabinet (ruling party). Therefore, we can measure the effect of each policy on income inequality for each cabinet (ruling party).

Dependent Variable

Since the objective of the analysis was to clarify the policy factors of income inequality in postwar Japan, we used the Gini coefficient of the redistributed income (*D. GINID*) as the dependent variable. We calculated monthly data based on the "actual income" item of the annual income data of each quintile for households of two or more persons published by the Ministry of Internal Affairs and Communications of Japan (various years). Specifically, the Gini coefficient for each month was calculated after the income of each quantile in each year was converted into a real value by the Japanese consumer price index (comprehensive index excluding imputed rent of owned homes; base year, 2015). Thereafter, seasonal adjustments were made using a 12-month moving average.[26]

Below, this study uses the unit root test on the dependent variable and all the independent variables in this analysis under the null hypothesis that "unit roots exists." We used the Augment Dickey-Fuller (Dickey and Fuller, 1979; Said and Dickey, 1984) test and the Phillips and Perron (1988) test, which are relatively popular. Using the above method, we first performed a test on the level value; however, the null hypothesis could not be rejected at the 5% level and was assumed to be a non-stationary process. Second, when tested with first-order difference, the null hypothesis was rejected at the 5% level, as shown in Appendix E. Therefore, we used the first-order difference on the dependent variable and all the independent variables.

Next, we used a co-integration test to examine the long-run equilibrium relationship between the variables. Engle and Granger (1987) and Johansen (1988) were mainly used as co-integration tests. The former can be applied between two variables, but cannot be

[26] For the method of calculating monthly data, see Miyazaki (2006).

applied when there are multiple co-integration relationships in the model. Therefore, we first conducted the Johansen (1988) test. If the co-integration vector was one or zero, Engle and Granger's (1987) test was performed. At that time, all the independent variables and dependent variables[27] used in the analysis were collectively tested. When the Johansen (1988) test was performed, both the trace test and the maximum eigenvalue test rejected the null hypothesis that the number of co-integration vectors was zero. However, because the null hypothesis that the number of co-integration vectors is one cannot be rejected, the co-integration vector was one according to the same test (see Appendix E for details). Because there are no multiple co-integration relationships in the model, we performed the Engle and Granger (1987) test. Since the test statistic was -1.648, which was below the 5% critical value (-2.860), the null hypothesis, "there is no co-integration relationship," could not be rejected at the 5% level. From the above, we conclude that there is no co-integration relationship in this analysis.

Independent Variables[28]

For each of the independent variables, monthly data was obtained from statistical books, as described in Table 3.7. In addition, because of the results of the unit root test, the first-order difference was also used for each independent variable. Thereafter, seasonal adjustments were made using a 12-month moving average about all independent variables, which was the same as the dependent variable. Below, the outline of each variable and previous research on the variables are described.

First, we describe the variables related to the fiscal policy (expenditure side). *D. PUBLICGDP* indicates public work expenditure (% of GDP) From previous research in Section 3.2, when public works expenditure increases, inequality is expected to increase, especially during a boom period. Second, we describe the variables related to the monetary policy. *D. INTERESTRATE*: The policy interest rate. According to Greenwood and Jovanovic (1990), there is an inverted U-shaped relationship between financial sector development and income inequality. We hypothesize that monetary easing has increased the income gap in the short term, and monetary tightening temporarily reduced the gap from previous research in Section 3.2. We used the Japanese official discount rate as the policy interest rate before June 1995. However, because of changes in the main

[27] For *D. GINID*, *D.PUBLICGDP*, *D.INTERESTRATE*, *D.TARIFFRATIO*, *D.DIRECTTAXP80P100*, and *D.PEDUCPI*, each test was performed collectively without taking a difference.

[28] This analysis does not use variables such as public assistance expenditure, unemployment allowances, or employment policy spending as their monthly data are difficult to obtain.

operational targets of the Bank of Japan's financial market regulation, after July 1995, we used the uncollateralized overnight call rate in Japan.

Third, we describe the variables related to the trade policy. The tariff burden ratio (*D. TARIFFRATIO*) represents the tariff revenue divided by total imports. It is considered that countries and regions with low tariff rates adopt a free trade policy, while those with high tariff rates adopt protectionism. This study predicts that an increase in *D. TARIFFRATIO* has a negative effect on inequality. Fourth, we describe the variables related to the fiscal policy (revenue side). *D. DIRECTTAXP80P100* indicates direct tax and social insurance contribution rate for upper-income groups. According to Muinelo-Gallo and Roca-Sagalés (2011), an increase in direct taxes in middle-and high-income countries has a significant negative impact on income inequality. Therefore, we predict that an increase in *D. DIRECTTAXP80P100* has a significant negative effect on inequality. Finally, we introduce the control variables. We use *D. PEDUCPI* to indicate the National Treasury contribution of compulsory educational expenditure per population aged 6 to 15 in Japan.

Dummy Variables and Interaction Terms[29]

Next, we describe the period dummy variables, namely the cabinet (ruling party) dummies. As a rule, the cabinet dummy is adopted for a cabinet in which the prime minister has been in office for at least two years.[30] However, the Ichiro Hatoyama Cabinet was excluded because the Cabinet had been working for less than two years during the analysis period. Although the Takeshita Cabinet (*d_Takeshita*) had less than two years of employment, it was adopted as an exception because it may be important in the discussion of consumption tax and other matters. Additionally, the dummy of the coalition government of the LDP, the SDPJ, and the NPS (*d_LDPSDPJ)*, the DPJ government dummy (*d_DPJ*), and the dummy of the coalition government of the LDP and the NKP (*d_NKP*) are ruling party dummies. Here, the cabinet dummy set the term of the prime minister as 1 and the rest as 0; the ruling party dummy set the period of the administration (including confidence-and-supply agreements) as 1 and the rest as 0.

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[29] Appendix D shows the correspondence between successive cabinets and each dummy variable.

[30] Specifically, we used the Kishi Cabinet (*d_Kishi*), the Ikeda Cabinet (*d_Ikeda*), the Sato Cabinet (*d_Sato*), the Tanaka Cabinet (*d_Tanaka*), the Miki Cabinet (*d_Miki*), the Suzuki Cabinet (*d_Suzuki*), the Nakasone Cabinet (*d_Nakasone*), the Kaifu Cabinet (*d_Kaifu*), the Hashimoto Cabinet (*d_Hashimoto*), the Koizumi Cabinet (*d_Koizumi*), and the Shinzo Abe Cabinet (*d_Abe2*, after the inauguration of the second Shinzo Abe Cabinet).

Below, we describe the interaction terms ($T_l \Delta X_k$ in equation (2)). The interaction term was obtained by multiplying each cabinet (ruling party) period dummy by each independent variable. Each dummy is 1 only when in charge of the government, and 0 at other times. Therefore, by multiplying these by each independent variable, we can see the effect of each independent variable on the transition of income inequality in each administration. Additionally, in equation (2), by summing the coefficient β of the independent variable and the coefficient γ of the interaction term, the factors substituted by the independent variables in each administration were clarified in terms of their size and effects on income inequality. However, the Abe Cabinet, which was ongoing as of September 2017, we analyzed the data before September 2017.

Using these variables, an analysis was conducted for a total of 744 months from October 1955 to September 2017. Seasonal adjustments were made using a 12-month moving average for all the independent variables and the dependent variable. Additionally, this study performed Engle's ARCH test in advance; as a result, the ARCH effect was confirmed in all models. Thus, we performed an empirical analysis after selecting the most appropriate ARCH model using Wald statistics. Subsequently, the Wald statistics are used again to select an appropriate lag order for each regression equation of each cabinet (ruling party). Finally, multicollinearity was verified using variance inflation factor (VIF).

Analysis Results

Table 3.1 is based on the hypotheses explained in the previous section. Results are consistent with the hypotheses about some variables: tariff burden ratio, direct tax and social insurance contribution rate. However, the effect of public works expenditure indicates a negative trend, and policy interest rate has a significantly positive influence in some models, unlike in the hypotheses.

On the cabinet (ruling party) dummies, the Ikeda cabinet dummy indicates a significantly negative value of -0.0012, the Takeshita cabinet dummy is -0.0003, and the Democratic Party administration dummy is -0.0002. On the ideological side, the Ikeda Cabinet turned away from the Kishi Cabinet’s anti-communist and hawkish lines, emphasizing the Income Doubling Plan and pacifism. Hatoyama Cabinet, under the Democratic Party of Japan, emphasized cooperation with East Asian countries and emphasized dialogue. The Takeshita Cabinet emphasized pacifism and the minimum necessary defense. Conversely, in social security, the Ikeda Cabinet inherited the Kishi Cabinet and emphasized redistribution. The Hatoyama Cabinet also emphasized redistribution, at least on the surface, such as child allowances and free highways, while

Table 3.1 Effects of Government Policies on Income Inequality in Japan.

	(1)	(2)
D.PUBLICGDP	-0.0103	-0.0140
	[-1.43]	[-1.74]*
D.INTERESTRATE	0.0067***	0.0040*
	[4.23]	[1.66]
D.TARIFFRATIO	-0.0982***	-0.1478***
	[-8.36]	[-16.13]
D.DIRECTTAXP80P100	-0.4224***	-0.2647***
	[-65.83]	[-42.90]
D.PEDUCPI	0.0000**	-0.0000***
	[2.53]	[-2.87]
d_Kishi	-0.0001***	
	[-5.31]	
d_Ikeda	-0.0012***	
	[-75.05]	
d_Sato	0.0001***	
	[7.62]	
d_Tanaka	0.0001**	
	[2.04]	
d_Miki	0.0002***	
	[10.27]	
d_Suzuki	0.0004***	
	[14.40]	
d_Nakasone	0.0002***	
	[18.97]	
d_Takeshita	-0.0003***	
	[-14.92]	
d_Kaifu	-0.0001***	
	[-2.83]	
d_Hashimoto	0.0005***	
	[60.36]	
d_Koizumi	0.0003***	
	[27.14]	
d_Abe2	0.0002***	
	[17.46]	
d_LDPSDPJ		0.0003***
		[22.47]
d_DPJ		-0.0002***
		[-8.86]
d_NKP		0.0002***
		[19.22]
Constant	-0.0001***	0.0000
	[-10.28]	[0.79]
N	743	743
ARCH	ARCH(1)	ARCH(1)
Engle ARCH	647.796	678.302
VIF	1.28	1.06
Wald	21400.89	4898.52

Notes: 1. The dependent variables were *D.GINID* for all estimations. Table 3.7 presents the details of the independent variables.

2. *, **, *** indicate that they are significant at 10%, 5% and 1% level, respectively. Numbers in parentheses are regression coefficients, and numbers in parentheses are t-values.

the Takeshita Cabinet abolished excise tax, which had a regressive character. From the above, these cabinets and ruling parties are dovish in military and diplomacy, and they both emphasize redistribution. Additionally, even if redistribution is emphasized like in the Kishi Cabinet, the negative value may be smaller if it is a hawking in military and diplomacy.

Otherwise, the Hashimoto Cabinet (0.0005), the Suzuki Cabinet (0.0004), the Koizumi Cabinet (0.0003), and the LDP-SDPJ coalition administration (0.0003) indicate strongly positive values. In ideology, the LDP-SDPJ coalition administration, especially the Murayama Cabinet, is a dovish group with a thin pro-US color. Conversely, the Koizumi administration, being pro-US, which sent the self-defense forces to Iraq as a, and there is no common. However, these cabinets have in common that they emphasize fiscal equilibrium, reduce public work, and promote small government policies such as the reorganization and privatization of ministries.

Tables 3.2, 3.3, 3.4, and 3.5 indicate the effects of independent variables on inequality for each cabinet (ruling party) using the interaction term obtained by multiplying each cabinet (ruling party) dummy by each independent variable.[31] These tables show the effects of fiscal policy (expenditure side), monetary policy, trade policy, and fiscal policy (revenue side) of each cabinet and ruling party on income inequality.

Table 3.2 indicates the effect of the public works expenditure on inequality for each cabinet. In Kishi, Ikeda, Sato, and Tanaka Cabinets,[32] the sum of the coefficients of *D.PUBLICGDP* and interaction term between the dummy and public works expenditure ((*D. PUBLICGDP*) *(*Dummy*), including each lag order) tends to be negative except for the Ikeda Cabinet. Particularly, *D. PUBLICGDP* is negatively significant throughout this period, and the interaction term and its lag order are not significant or negatively significant in the Kishi, Sato, and Tanaka Cabinets. However, in the Ikeda Cabinet, the effect of widening income inequality can be confirmed immediately after increasing public works projects. However, during the Miki and Suzuki Cabinets[33] from the 1970s to the early 1980s, inequality tended to widen owing to the increase in public works projects.

[31] Table 3.6 shows the effects of each policy for each cabinets or ruling parties.

[32] The term of office of these cabinets roughly corresponds with the period of high economic growth.

[33] The term of each of these cabinets is within the period of stable growth from the 1970s to the early 1980s.

Table 3.2 The Effect of Fiscal Policy (Expenditure Side) on Income Inequality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D.PUBLICGDP	-0.0214**	-0.0266***	-0.0163*	-0.0237**	0.0212**	0.0082	-0.0232**	-0.0189**
	[-2.05]	[-2.67]	[-1.85]	[-2.44]	[2.02]	[0.76]	[-2.26]	[-2.13]
(D. PUBLICGDP)	-0.0221	0.0301***	0.0121	-0.0013	-0.0036	0.0053	0.0041	0.0204***
*(Dummy)	[-0.77]	[3.75]	[0.54]	[-0.18]	[-0.31]	[1.49]	[0.87]	[2.65]
(L1D. PUBLICGDP)	-0.0256	0.0343	0.0106	-0.0038	-0.0029	0.0103*	0.0028	0.0185*
*(Dummy)	[-1.08]	[0.71]	[0.43]	[-0.43]	[-0.46]	[1.96]	[0.34]	[1.83]
(L2D. PUBLICGDP)	-0.0249	0.0454	0.0122	-0.0063	-0.0018	0.0128	0.0043	0.0175*
*(Dummy)	[-0.99]	[1.02]	[0.50]	[-0.46]	[-0.47]	[1.46]	[0.18]	[1.74]
(L3D. PUBLICGDP)	-0.0170	0.0488	0.0153	-0.0086		0.0129	0.0054	0.0106
*(Dummy)	[-0.65]	[0.70]	[0.43]	[-1.10]		[0.90]	[1.30]	[0.09]
(L4D. PUBLICGDP)	-0.0211***	0.0416	0.0153	-0.0079*		0.0114	0.0048	0.0105
*(Dummy)	[-3.09]	[1.04]	[0.36]	[-1.68]		[0.90]	[0.92]	[0.35]
(L5D. PUBLICGDP)	-0.0218**	0.0323	0.0145	-0.0088		0.0112	0.0050	0.0138
*(Dummy)	[-2.38]	[0.88]	[0.39]	[-0.67]		[0.65]	[0.59]	[1.49]
(L6D. PUBLICGDP)	-0.0150	0.0327	0.0095	-0.0041		0.0109	0.0038	0.0122
*(Dummy)	[-0.71]	[0.61]	[0.34]	[-0.17]		[1.05]	[0.44]	[0.89]
(L7D. PUBLICGDP)	-0.0173	0.0157	0.0081	-0.0029		0.0117	0.0029	0.0114***
*(Dummy)	[-1.06]	[0.31]	[0.53]	[-0.72]		[1.10]	[0.51]	[3.59]
(L8D. PUBLICGDP)	-0.0133	-0.0078	0.0074**	-0.0047		0.0110	0.0020	
*(Dummy)	[-0.31]	[-0.13]	[2.11]	[-1.22]		[0.50]	[0.26]	
(L9D. PUBLICGDP)	-0.0043	-0.0066		-0.0017		0.0105	0.0011	
*(Dummy)	[-0.79]	[-0.28]		[-0.18]		[0.71]	[0.15]	
(L10D.PUBLICGDP)	-0.0324***	-0.0075				0.0085**		
*(Dummy)	[-8.09]	[-0.14]				[2.05]		
(L11D.PUBLICGDP)	-0.0021	-0.0081						
*(Dummy)	[-0.30]	[-0.27]						
(L12D.PUBLICGDP)		-0.0040						
*(Dummy)		[-0.75]						
Constant	0.0001***	0.0001***	0.0001***	0.0001***	-0.000***	0.0000***	0.0001***	0.0001***
	[14.43]	[23.58]	[24.63]	[21.43]	[-5.81]	[2.96]	[21.97]	[23.23]
Dummy	d_Kishi	d_Ikeda	d_Sato	d_Tanaka	d_Miki	d_Suzuki	d_Nakasone	d_Takeshita
N	732	731	735	734	741	733	734	736
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	680.465	647.152	680.612	678.446	679.884	679.628	679.033	679.737
VIF	1.10	1.03	1.03	1.15	1.04	1.04	1.03	1.07
Wald	2452.68	10666.98	2992.48	2544.23	2056.50	699.15	2718.84	2895.92

Table 3.2 Continued.

	(9)	(10)	(11)	(12)	(13)	(14)	(15)
D.PUBLICGDP	-0.0096***	-0.0142*	-0.0125	-0.0217**	-0.0185**	-0.0266***	0.0275**
	[-1.28]	[-1.77]	[-1.28]	[-2.32]	[-2.30]	[-2.75]	[2.44]
(D. PUBLICGDP)	0.0218	0.0208**	-0.0067	-0.0176	-0.0060***	-0.0212	0.0010
*(Dummy)	[3.04]	[2.28]	[-0.11]	[-1.09]	[-3.32]	[-1.05]	[0.03]
(L1D. PUBLICGDP)	0.0114	0.0215*	-0.0053	-0.0433	0.0033	-0.0228	
*(Dummy)	[0.99]	[1.70]	[-0.41]	[-1.57]	[0.64]	[-1.02]	
(L2D. PUBLICGDP)	0.0074	0.0228	0.0092***	-0.0748	0.0193	-0.0225	
*(Dummy)	[0.33]	[1.43]	[3.08]	[-1.62]	[1.43]	[-0.84]	
(L3D. PUBLICGDP)	0.0075	0.0221		-0.0749	0.0213	-0.0226	
*(Dummy)	[1.24]	[0.77]		[-0.84]	[0.53]	[-0.80]	
(L4D. PUBLICGDP)		0.0203		-0.0661	0.0207	-0.0230	
*(Dummy)		[1.32]		[-0.75]	[0.54]	[-0.97]	
(L5D. PUBLICGDP)		0.0194		-0.0685	0.0150***	-0.0218	
*(Dummy)		[0.19]		[-0.85]	[4.27]	[-1.33]	
(L6D. PUBLICGDP)		0.0199***		-0.0868	0.0094***	0.0006	
*(Dummy)		[4.02]		[-1.07]	[3.61]	[0.05]	
(L7D. PUBLICGDP)		0.0228***		-0.1010*		0.0045	
*(Dummy)		[9.01]		[-1.76]		[0.79]	
(L8D. PUBLICGDP)		0.0284***		-0.0145		0.0043	
*(Dummy)		[15.83]		[-0.50]		[0.28]	
(L9D. PUBLICGDP)				-0.0105		0.0078	
*(Dummy)				[-0.18]		[0.35]	
(L10D. PUBLICGDP)						0.0110	
*(Dummy)						[0.18]	
(L11D. PUBLICGDP)						0.0065*	
*(Dummy)						[1.90]	
Constant	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	-0.0000***
	[27.85]	[27.72]	[14.99]	[24.85]	[25.06]	[26.21]	[-3.39]
Dummy	d_Kaifu	d_Hashimoto	d_Koizumi	d_Abe2	d_LDPSDPJ	d_DPJ	d_NKP
N	740	735	741	734	737	732	743
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	680.483	651.314	680.615	678.46	679.887	679.647	679.029
VIF	1.04	1.04	1.06	1.04	1.04	1.06	1.04
Wald	2707.72	4063.07	2393.59	3575.27	4053.41	4169.36	1866.21

Notes: 1. Dependent variables are *D.GINID* for all estimations. For details of independent variables, it is shown in Table 3.7.

2. *D.INTERESTRATE*, *D.TARIFFRATIO*, *D.DIRECTTAXP80P100*, and *D.PEDUCPI* were used as independent variables in all analyses in this table. However, independent variables other than those directly representing the analysis results are omitted because of space constraints.

3. Dependent variables are *D.GINID* for all estimations. As an example of how to read the table, Table 3.1 shows the note.

Table 3.3 The Effect of Monetary Policy on Income Inequality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D.INTERESTRATE	0.0038	0.0045*	0.0019	0.0038	-0.0068***	0.0037	0.0045*	0.0043*
	[1.42]	[1.71]	[0.83]	[1.35]	[-5.22]	[1.02]	[1.93]	[1.74]
(D. INTERESTRATE)	0.0028	0.0096***	0.0049	0.0002	0.0028***	-0.0010	-0.0010	0.0141***
*(Dummy)	[0.92]	[4.72]	[0.84]	[0.05]	[4.51]	[-0.21]	[-0.14]	[2.90]
(L1D. INTERESTRATE)	0.0037	0.0105	0.0052	-0.0001		-0.0012	-0.0014	0.0129
*(Dummy)	[0.97]	[0.87]	[0.72]	[-0.02]		[-0.22]	[-0.25]	[0.41]
(L2D. INTERESTRATE)	0.0040	0.0138	0.0092***	-0.0010		-0.0016	-0.0007	0.0130
*(Dummy)	[0.68]	[1.28]	[9.04]	[-0.24]		[-0.39]	[-0.07]	[1.04]
(L3D. INTERESTRATE)	0.0046	0.0154***		-0.0013		-0.0010	-0.0002	0.0090
*(Dummy)	[1.32]	[10.90]		[-0.35]		[-0.21]	[-0.06]	[0.84]
(L4D. INTERESTRATE)		0.0149***		-0.0008		0.0002	-0.0007	0.0086
*(Dummy)		[30.85]		[-0.19]		[0.11]	[-0.13]	[0.37]
(L5D. INTERESTRATE)				-0.0016		0.0033*	-0.0003	0.0119
*(Dummy)				[-0.29]		[1.78]	[-0.04]	[0.70]
(L6D. INTERESTRATE)						0.0034*	-0.0008	0.0085**
*(Dummy)						[1.72]	[-0.12]	[2.29]
(L7D. INTERESTRATE)						0.0035	-0.0020	0.0159***
*(Dummy)						[1.39]	[-0.29]	[13.62]
(L8D. INTERESTRATE)						0.0058***	-0.0022	
*(Dummy)						[4.69]	[-0.44]	
(L9D. INTERESTRATE)							-0.0019	
*(Dummy)							[-0.26]	
(L10D. INTERESTRATE)							-0.0015	
*(Dummy)							[-0.17]	
(L11D. INTERESTRATE)							-0.0022	
*(Dummy)							[-0.14]	
(L12D. INTERESTRATE)							-0.0021	
*(Dummy)							[-0.19]	
Constant	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0000**	0.0001***	0.0001***
	[18.37]	[18.88]	[32.32]	[22.29]	[41.70]	[2.36]	[23.13]	[23.67]
Dummy	d_Kishi	d_Ikeda	d_Sato	d_Tanaka	d_Miki	d_Suzuki	d_Nakasone	d_Takeshita
N	740	739	741	738	743	735	731	736
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	677.734	627.125	678.713	673.807	679.572	671.419	668.226	673.403
VIF	1.08	1.03	1.03	1.12	1.05	1.06	1.03	1.09
Wald	2389.37	7294.59	3774.89	2547.10	2824.39	736.06	3192.41	3083.86

Table 3.3 Continued.

	(9)	(10)	(11)	(12)	(13)	(14)	(15)
D.INTERESTRATE	0.0006	0.0043*	0.0049**	0.0046**	0.0046**	0.0046*	0.0016
	[0.27]	[1.93]	[2.07]	[2.04]	[2.02]	[1.92]	[0.52]
(D. INTERESTRATE)	0.0097***	0.0935***	-0.1385	-0.0706	0.0013	-0.1884	-0.0631**
*(Dummy)	[6.76]	[2.58]	[-1.01]	[-0.27]	[0.10]	[-1.09]	[-1.99]
(L1D. INTERESTRATE)	0.0075***	0.1080***	-0.2273*	-0.1025	-0.0066	-0.1427	-0.0222
*(Dummy)	[4.76]	[2.81]	[-1.72]	[-0.45]	[-0.47]	[-1.03]	[-0.45]
(L2D. INTERESTRATE)	0.0054**	0.1105*	-0.2799	0.0001	-0.0107	-0.1623	-0.0189
*(Dummy)	[2.38]	[1.91]	[-1.61]	[0.00]	[-0.47]	[-1.39]	[-0.26]
(L3D. INTERESTRATE)	0.0042*	0.1074	-0.3974*	0.1574	-0.0086	-0.1212	-0.0395
*(Dummy)	[1.75]	[1.15]	[-1.79]	[0.58]	[-1.54]	[-0.81]	[-0.57]
(L4D. INTERESTRATE)	0.0042	0.0986	-0.4547	0.1965	-0.0121	-0.1172	-0.0287
*(Dummy)	[1.09]	[1.36]	[-0.82]	[0.66]	[-1.01]	[-0.64]	[-0.44]
(L5D. INTERESTRATE)		0.0911	-0.5425	0.1079	-0.0130**	-0.1291	
*(Dummy)		[0.62]	[-1.43]	[1.16]	[-2.13]	[-0.93]	
(L6D. INTERESTRATE)		0.0896***	-0.6782***	0.2984***		-0.1483	
*(Dummy)		[2.71]	[-3.40]	[2.69]		[-1.01]	
(L7D. INTERESTRATE)		0.0807***	-0.6307***	0.3815*		-0.0191	
*(Dummy)		[5.93]	[-3.85]	[1.93]		[-0.19]	
(L8D. INTERESTRATE)		0.0479***	-0.8103***	0.5296			
*(Dummy)		[3.49]	[-3.79]	[1.17]			
(L9D. INTERESTRATE)			-0.9103***	0.2079			
*(Dummy)			[-4.62]	[0.30]			
(L10D.INTERESTRATE)			-1.0279***	0.2602			
*(Dummy)			[-4.34]	[0.74]			
(L11D.INTERESTRATE)			-0.9495**	0.4145*			
*(Dummy)			[-2.25]	[1.65]			
(L12D.INTERESTRATE)			-0.6069*	0.5213*			
*(Dummy)			[-1.78]	[1.66]			
Constant	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	-0.0000***
	[28.57]	[27.72]	[18.11]	[23.00]	[24.37]	[25.36]	[-3.63]
Dummy	d_Kaifu	d_Hashimoto	d_Koizumi	d_Abe2	d_LDPSDPJ	d_DPJ	d_NKP
N	739	735	731	731	738	736	739
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	675.964	671.734	668.807	668.666	674.099	673.18	675.749
VIF	1.06	1.04	1.34	1.12	1.03	1.03	1.23
Wald	3339.08	3963.55	3202.96	3225.85	3611.85	3338.73	2503.70

Notes: 1. Dependent variables are *D.GINID* for all estimations. For details of independent variables, it is shown in Table 3.7.

2. *D.PUBLICGDP*, *D.TARIFFRATIO*, *D.DIRECTTAXP80P100*, and *D.PEDUCPI* are used as independent variables in all analyses in this table. However, independent variables other than those that directly represent results are omitted because of space constraints.

3. As an example of how to read the table, it is shown the note of Table 3.1.

Table 3.4 The Effect of Trade Policy on Income Inequality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D.TARIFFRATIO	-0.2551***	-0.2508***	-0.2308***	-0.2757***	-0.1732***	-0.1421***	-0.2557***	-0.2508***
	[-22.94]	[-23.16]	[-24.52]	[-24.30]	[-13.42]	[-11.53]	[-22.91]	[-22.62]
(D. TARIFFRATIO)	-0.0048	0.0135***	0.0039	-0.0022	-0.0029	-0.0021	0.0049	0.0121**
*(Dummy)	[-0.93]	[4.67]	[0.63]	[-0.80]	[-0.18]	[-0.15]	[1.18]	[2.49]
(L1D.TARIFFRATIO)	-0.0060	0.0094	0.0026	-0.0023	-0.0027	-0.0023	0.0034	0.0110
*(Dummy)	[-0.82]	[1.25]	[1.25]	[-0.41]	[-0.35]	[-0.14]	[0.46]	[1.60]
(L2D.TARIFFRATIO)	-0.0059	0.0119	0.0018*	-0.0031	-0.0019	-0.0035	0.0036	0.0102
*(Dummy)	[-0.49]	[0.58]	[1.89]	[-0.10]	[-0.67]	[-0.29]	[0.11]	[1.61]
(L3D.TARIFFRATIO)	-0.0042	0.0122		-0.0043		-0.0028	0.0057	0.0056
*(Dummy)	[-0.46]	[0.68]		[-0.12]		[-0.16]	[0.62]	[0.27]
(L4D.TARIFFRATIO).	-0.0035	0.0103		-0.0042		-0.0026	0.0059	0.0052
*(Dummy)	[-0.14]	[0.87]		[-0.56]		[-0.18]	[1.26]	[0.50]
(L5D. TARIFFRATIO)	-0.0041	0.0080		-0.0043		0.0007	0.0052	0.0071
*(Dummy)	[-0.80]	[0.67]		[-0.72]		[0.04]	[0.36]	[1.26]
(L6D. TARIFFRATIO)	-0.0039	0.0079		-0.0022		-0.0038	0.0026*	0.0033**
*(Dummy)	[-1.09]	[0.50]		[-0.06]		[-0.30]	[1.69]	[2.20]
(L7D. TARIFFRATIO)	-0.0048***	0.0037		-0.0016		-0.0058		
*(Dummy)	[-3.34]	[0.26]		[-0.56]		[-0.46]		
(L8D. TARIFFRATIO)		-0.0019		-0.0020		-0.0009		
*(Dummy)		[-0.11]		[-0.69]		[-0.04]		
(L9D. TARIFFRATIO)		-0.0011				0.0005		
*(Dummy)		[-0.44]				[0.03]		
Constant	0.0001***	0.0001***	0.0001***	0.0001***	-0.0000***	0.0000**	0.0001***	0.0001***
	[19.38]	[23.93]	[32.47]	[21.70]	[-5.93]	[2.45]	[20.68]	[22.97]
Dummy	d_Kishi	d_Ikeda	d_Sato	d_Tanaka	d_Miki	d_Suzuki	d_Nakasone	d_Takeshita
N	736	734	741	735	741	734	737	737
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	674.002	632.194	678.741	670.731	677.734	670.547	673.604	674.356
VIF	1.08	1.04	1.03	1.09	1.06	1.06	1.03	1.05
Wald	2252.95	9112.87	3769.46	2524.76	2068.13	714.05	2402.20	2844.89

Table 3.4 Continued.

	(9)	(10)	(11)	(12)	(13)	(14)	(15)
D.TARIFFRATIO	-0.2351***	-0.2543***	-0.2518***	-0.2577***	-0.2530***	-0.2536***	-0.1404***
	[-26.12]	[-25.91]	[-20.67]	[-26.75]	[-24.00]	[-24.18]	[-11.42]
(D. TARIFFRATIO)	0.0181**	0.0168**	-0.0071	0.0788***	-0.0123	-0.0133	0.0144
*(Dummy)	[1.98]	[2.22]	[-0.12]	[6.39]	[-1.51]	[-0.20]	[1.60]
(L1D. TARIFFRATIO)	0.0157***	0.0179**	-0.0067	0.1396***	-0.0165	-0.0138	0.0140
*(Dummy)	[2.97]	[2.16]	[-0.15]	[4.76]	[-1.10]	[-0.48]	[1.38]
(L2D. TARIFFRATIO)	0.0130***	0.0192*	0.0054	0.2665***	-0.0189	-0.0129	0.0084**
*(Dummy)	[6.17]	[1.84]	[0.27]	[4.22]	[-0.68]	[-0.64]	[2.00]
(L3D. TARIFFRATIO)	0.0117***	0.0186	0.0196***	0.4807***	-0.0191*	-0.0123	
*(Dummy)	[4.83]	[1.37]	[5.95]	[4.25]	[-1.75]	[-0.73]	
(L4D. TARIFFRATIO)	0.0074**	0.0172*		0.8012***	-0.0210***	-0.0113	
*(Dummy)	[2.41]	[1.95]		[4.72]	[-11.31]	[-0.93]	
(L5D. TARIFFRATIO)		0.0164			-0.0096***	-0.0104	
*(Dummy)		[1.13]			[-4.92]	[-1.02]	
(L6D. TARIFFRATIO)		0.0156*				-0.0114	
*(Dummy)		[1.93]				[-0.97]	
(L7D. TARIFFRATIO)		0.0122***				-0.0037	
*(Dummy)		[5.65]				[-0.39]	
(L8D. TARIFFRATIO)		0.0249***				-0.0045	
*(Dummy)		[15.19]				[-0.29]	
Constant	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	-0.0000***
	[26.49]	[27.76]	[15.34]	[21.30]	[23.93]	[25.46]	[-3.27]
Dummy	d_Kaifu	d_Hashimoto	d_Koizumi	d_Abe2	d_LDPSDPJ	d_DPJ	d_NKP
N	739	735	740	739	738	735	741
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	675.982	671.725	676.986	675.792	674.066	672.269	677.473
VIF	1.05	1.04	1.06	1.03	1.04	1.03	1.04
Wald	4172.83	4121.55	2559.94	1002.18	3776.31	3395.94	1758.76

Notes: 1. The dependent variables were *D.GINID* for all estimations. The details of the independent variables are presented in Table 3.7.

2. *D.PUBLICGDP*, *D.INTERESTRATE*, *D.DIRECTTAXP80P100*, and *D.PEDUCPI* were used as independent variables in all analyses in this table. However, independent variables other than those that directly represent the results are omitted because of space constraints.

3. As an example of how to read the table, it is shown the note of Table 3.1.

Table 3.5 The Effect of Fiscal Policy (Revenue Side) on Income Inequality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D. DIRECTTAX	-0.2507***	-0.2733***	-0.3513***	-0.2789***	-0.3615***	-0.2912***	-0.2710***	-0.2856***
	[-23.09]	[-31.53]	[-57.47]	[-33.62]	[-41.68]	[-23.17]	[-29.37]	[-34.81]
(D. DIRECTTAX)	-0.0001	0.0054***	0.0020	0.0000	-0.0008	-0.0003	0.0006	0.0019**
*(Dummy)	[-0.10]	[4.22]	[0.91]	[0.01]	[-0.21]	[-0.14]	[0.93]	[2.36]
(L1D. DIRECTTAX)	0.0007	0.0062	0.0009		-0.0008	-0.0003	0.0004	0.0017
*(Dummy)	[0.35]	[0.82]	[1.50]		[-0.39]	[-0.13]	[0.33]	[1.36]
(L2D. DIRECTTAX)	0.0011	0.0080			-0.0007	-0.0005	0.0005	0.0017
*(Dummy)	[0.29]	[0.86]			[-0.76]	[-0.27]	[0.04]	[1.11]
(L3D. DIRECTTAX)	0.0016	0.0084			-0.0003	-0.0004	0.0008	0.0010
*(Dummy)	[0.50]	[0.93]			[-0.38]	[-0.15]	[0.71]	[0.05]
(L4D. DIRECTTAX)	-0.0009	0.0071*				-0.0004	0.0008	0.0015***
*(Dummy)	[-0.30]	[1.67]				[-0.16]	[1.36]	[5.40]
(L5D. DIRECTTAX)	-0.0032	0.0055				0.0001	0.0005	
*(Dummy)	[-1.50]	[1.36]				[0.03]	[0.74]	
(L6D. DIRECTTAX)	-0.0029**	0.0054				-0.0005		
*(Dummy)	[-2.01]	[0.71]				[-0.27]		
(L7D. DIRECTTAX)	-0.0025	0.0026				-0.0008		
*(Dummy)	[-0.67]	[0.42]				[-0.42]		
(L8D. DIRECTTAX)	-0.0016	-0.0012				-0.0001		
*(Dummy)	[-0.73]	[-0.17]				[-0.04]		
(L9D. DIRECTTAX)	-0.0009	-0.0007				0.0001		
*(Dummy)	[-1.03]	[-0.32]				[0.02]		
(L10D.DIRECTTAX)	-0.0009**					-0.0000		
*(Dummy)	[-2.08]					[-0.00]		
(L11D.DIRECTTAX)	-0.0006					0.0001		
*(Dummy)	[-0.63]					[0.05]		
(L12D.DIRECTTAX)						0.0000		
*(Dummy)						[0.00]		
Constant	0.0001***	0.0001***	0.0001***	0.0001***	-0.0000***	0.0000**	0.0001***	0.0001***
	[15.87]	[21.60]	[32.09]	[21.74]	[-6.53]	[2.43]	[18.91]	[21.96]
Dummy	d_Kishi	d_Ikeda	d_Sato	d_Tanaka	d_Miki	d_Suzuki	d_Nakasone	d_Takeshita
N	735	737	743	743	743	734	741	739
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	673.12	628.034	680.61	678.449	679.562	670.551	677.289	676.189
VIF	1.07	1.04	1.04	1.15	1.07	1.07	1.03	1.05
Wald	2158.83	12657.10	3724.80	2388.99	2174.93	714.58	2081.57	2774.67

Table 3.5 Continued.

	(9)	(10)	(11)	(12)	(13)	(14)	(15)
D. DIRECTTAX	-0.2492***	-0.2799***	-0.2787***	-0.2724***	-0.3049***	-0.2765***	-0.2453***
	[-33.48]	[-39.31]	[-28.80]	[-33.17]	[-28.86]	[-32.87]	[-31.59]
(D. DIRECTTAX)	0.0021***	0.0021	0.0007	-0.0007	0.0010	0.0021	-0.0011***
*(Dummy)	[3.80]	[0.87]	[0.17]	[-0.18]	[0.67]	[0.02]	[-6.04]
(L1D. DIRECTTAX)	0.0013**	0.0023	0.0007	-0.0008	0.0010	0.0022	
*(Dummy)	[2.01]	[1.07]	[0.41]	[-0.48]	[0.72]	[0.01]	
(L2D. DIRECTTAX)	0.0009	0.0026	0.0020	-0.0007	0.0009	0.0021	
*(Dummy)	[0.71]	[1.44]	[1.28]	[-0.71]	[0.79]	[0.01]	
(L3D. DIRECTTAX)	0.0006	0.0025	0.0031	-0.0006	0.0009	0.0021	
*(Dummy)	[0.52]	[1.41]	[0.04]	[-0.76]	[0.90]	[0.01]	
(L4D. DIRECTTAX)	0.0008	0.0024	0.0029	-0.0005	0.0008	0.0021	
*(Dummy)	[0.41]	[1.57]	[0.04]	[-0.79]	[0.94]	[0.01]	
(L5D. DIRECTTAX)		0.0023	0.0034***		0.0007**	0.0021	
*(Dummy)		[0.94]	[11.33]		[2.11]	[0.01]	
(L6D. DIRECTTAX)		0.0027***	0.0016***			0.0010	
*(Dummy)		[8.40]	[6.43]			[0.01]	
(L7D. DIRECTTAX)		0.0033***					
*(Dummy)		[14.48]					
Constant	0.0001***	0.0001***	0.0001***	0.0001***	-0.0000***	0.0001***	0.0001***
	[28.81]	[26.41]	[15.06]	[22.93]	[-3.22]	[20.55]	[28.76]
Dummy	d_Kaifu	d_Hashimoto	d_Koizumi	d_Abe2	d_LDPSDPJ	d_DPJ	d_NKP
N	742	736	740	742	741	740	743
ARCH	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)	ARCH(1)
Engle ARCH	678.739	672.687	676.888	678.704	677.501	676.723	678.667
VIF	1.05	1.04	1.05	1.03	1.03	1.03	1.03
Wald	3500.39	3604.58	2241.37	2753.32	1951.30	2549.23	1753.82

Notes: 1. The dependent variables were *D.GINID* for all estimations. The details of the independent variables are presented in Table 3.7.

2. *D.PUBLICGDP*, *D.INTERESTRATE*, *D.TARIFFRATIO*, and *D.PEDUCPI* were used as independent variables in all analyses in this table. However, independent variables other than those that directly represent the results are omitted because of space constraints.

3. As an example of how to read the table, it is shown the note of Table 3.1.

Conversely, during the Nakasone, Takeshita, and Kaifu Cabinets,[34] increase in public works projects tends to reduce inequality again, and although the negative effect of *D.PUBLICGDP* is strong overall, over half of the interaction terms (including their lags) in the Takeshita Cabinet are significantly positive, and the negative effects of *D. PUBLICGDP* are largely offset, especially immediately after policy enforcement. Considering that public works projects have been on a downward trend during the bubble period since the Nakasone Cabinet, which advocated a neo-liberal policy, this policy may increase income inequality.[35]

In the Hashimoto and Koizumi Cabinets, public works projects were on a downward trend;[36] however, in the Hashimoto Cabinet, inequality tends to increase as public works projects increase, so we can conclude that the reduction in public works projects has reduced inequality. In the Koizumi Cabinet, although *D.PUBLICGDP* is negative, it is not significant, and the individual effect of the second-order lag is positively significant. Hence, the reduction does not significantly increase inequality. Additionally, the sum of the coefficients of *D.PUBLICGDP* and the coefficients of the interaction term are negative in the coalition government of the LDP and SDPJ and the DPJ government. Because of the collapse of the bubble economy and the Great Hanshin-Awaji Earthquake during the coalition government of the LDP and SDPJ, coupled with the bankruptcy of Lehman Brothers and the Great East Japan Earthquake during the DPJ government, their periods were extremely recessions in Japan. However, because the SDPJ and DPJ avoided public works, they reduced public work despite the recession and earthquake, resulting in increasing inequality.

Table 3.3 indicates the effect of the policy interest rate on inequality for each cabinet. The sum of the coefficients of *D. INTERESTERATE* and the coefficients of the interaction term ((*D. INTERESTERATE) *(Dummy)*) are significantly positive in cabinets before the collapse of the bubble economy. Many successive cabinets before the bubble economy (before the Nakasone Cabinet) lifted the economy (Table 3.6), resulting in trickle-down effects and reducing the disparity by distributing income to common Japanese people. On

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[34] The term of each of these cabinets is within the bubble period.

[35] The period of in office of each cabinet is shown in Appendix D, and the transition of public works spending during the period is shown in Figure 3.1, respectively.

[36] Similar tendency as the Hashimoto Cabinet can be seen in the coalition government of the LDP and the NKP. Additionally, the period of in office of each cabinet is shown in Appendix D, and the transition of public works spending during the period is shown in Figure 3.1, respectively.

the other hand, during the Takeshita and Kaifu Cabinet,[37] monetary policy was tightened to curb the economy. These monetary policies functioned effectively within observable range. However, after the collapse of the bubble economy, the signs are negative in the Koizumi Cabinet, the coalition government of the LDP and SDPJ, and the coalition government of the LDP and NKP.

Given the fact that successive governments since the Murayama Cabinet in the mid-1990s stimulated the economy by reducing policy interest rates (Figure 3.1 and Table 3.6,) the effect of the policy may exist to a certain extent. However, wealth does not reach the common people before the burst of the bubble economy; however, when the economy improves, inequality will also increase. Conversely, the Koizumi Cabinet tightened monetary policy during the economic recovery period, which decreased inequality over time from the policy and reduced inequality that had widened because of the temporary economic upheaval. In the second and third Abe Cabinet, income inequality narrowed over time from the monetary easing policy, resulting in the success of the trickle-down theory. The monetary policy effect of the Abe Cabinet is compatible with that of Greenwood and Jovanovic (1990). Additionally, this result contradicts that of Inui et al. (2017), that is, the effects of monetary policy have been decreasing in Japan since the 2000s.

Table 3.4 indicates the effect of the tariff burden ratio on inequality for each cabinet. If the coefficients of the tariff burden ratio themselves are added to the coefficients of the interaction term (*(D. TARIFFRATIO) *(Dummy)*), almost all models are significantly negative. Additionally, the coefficient of the tariff burden rate is significantly negative in almost all models. This result and Figure 3.1 suggest that free trade policies (decrease in tariff burden ratio) since the 1970s (Tanaka Cabinet) may have been a major factor in increasing income inequality. However, under the Second and Third Abe Cabinet, all coefficients of the interaction term are significantly positive, and the sum of the coefficients with *D.TARIFFRATIO* is also significantly positive after a lag of two months or more. In the Second and Third Abe Cabinet, the tariff burden ratio was flat to slightly rising, which means that there inequality had a slight increase.

Table 3.5 indicates indicate the effect of the direct tax and social insurance contribution rate (for upper income groups) on inequality for each cabinet. If direct tax and social insurance contribution rate themselves are added to the coefficients of the interaction term (*(D. DIRECTTAX) *(Dummy)*), all models are significantly negative.

[37] Each of these cabinets' terms are within the bubble period.

Additionally, in all models, the coefficient of the contribution rate itself is significantly negative. This suggests that the distribution policy through tax collection works significantly affects income inequality. Moreover, this result and Figure 3.1 suggest that strengthening progressive taxation—an increase in direct tax and social insurance contribution rate for upper income groups—may contribute to decreasing income inequality.

3.5 Conclusion

In this study, we reconfirm the main points of our analysis and suggest policy proposals for decreasing income inequality. First, in Japan, if the cabinet or ruling party's ideology is a pacifist (dovish), and regardless of whether redistribution is actually effective, in a government that has a mindset of wanting to redistribute to the people, income inequality tends to shrink. Additionally, even if the government emphasizes redistribution, the effect would be somewhat offset if the government is hawkish. Conversely, income inequality would increase if the government emphasizes administrative or financial reforms and primary balance and promotes small government policies reducing the functioning of the government regardless of their political ideology.

Second, in Japan, public works expenditure increased before the Suzuki Cabinet (1980s) and decreased from the Suzuki Cabinet to the DPJ government. Public works projects were expanded from the Kishi Cabinet to the Sato Cabinet and the Miki Cabinet. However, inequality decreased in the former and increased in the latter. Hence, former cabinets were in periods of high economic growth and, therefore, a virtuous cycle of growth and distribution was successful. Conversely, the Miki Cabinet was a period of stable growth with a lower growth rate than the former; therefore, redistribution was unsuccessful. During the bubble (after the Nakasone Cabinet) and recession periods after the 1990s, public works projects tended to shrink, but inequality increased slightly in the former and decreased in the latter. Additionally, the disparity widened as public works were reduced by administrations wherein the non-LDP was heavily involved (the LDP-SDPJ coalition government and the DPJ government) during extreme recession. Additionally, the number of public works expenditures dropped sharply in the Nakasone and Koizumi Cabinets, which are oriented toward limited government, and inequality is increasing.

From the above, the inequality would decrease when public works projects are promoted during extreme booms, such as the high economic growth and bubble period and extreme recessions such as in the mid-1990s or the early 2010s. However, the

disparity may increase when public works projects are promoted during other times. Furthermore, inequality is increasing because of the shrinking of public works projects in the Nakasone and the Koizumi Cabinets (which are oriented toward limited government) and the LDP-SDPJ coalition and DPJ governments (which avoid public works). Therefore, from the redistribution perspective, improper allocation may be made in Japanese public works projects (this is partly consistent with previous research in Section 3.2). However, the LDP-SDPJ coalition and the DPJ governments increased income inequality by reducing public work projects in the extreme recession. Therefore, promoting public works projects during extreme recessions from the redistribution perspective.

Third, the impact of trade policies on income inequality has been consistently large, and free trade policies since the 1970s (Tanaka Cabinet) may have increased income inequality in Japan. Moreover, increasing direct tax and social insurance contribution rates consistently reduced inequality. Therefore, from the redistribution perspective, the Japanese government should strengthen protection trade policies and progressive taxation systems. However, the rise in tariff ratio resulted in increasing inequality only in the Second and Third Abe Cabinet in the 2010s. Therefore, when decreasing domestic income inequality, the Japanese government should prioritize the progressive tax system and the social security system with the principle of ability to pay rather than adopting protectionist policies by looking overseas.

Fourth, since the Hashimoto Cabinet, successive LDP governments have strengthened the progressive tax system of direct tax and social insurance contributions. However, these have increased income inequality through free trade policies and monetary easing through zero interest rate policies. These policies have been somewhat consistent in the current LDP administration and may have been instrumental in the widening income inequality levels observed in recent years in Japan. Exceptionally, the Second and Third Abe Cabinet succeeded in decreasing income inequality through the monetary easing policy and aggressive fiscal policy; however, the recession caused by the effects of COVID-19 would make distributing wealth to the common people difficult because of the economic upheaval. Therefore, if the government applies monetary easing as an economic stimulus measure, reducing inequality by strengthening protection trade policies may be desirable. However, globalization has made the maintenance of protection trade policies difficult. When maintaining free trade policies, considering social security policies may be desirable, such as enhanced unemployment compensation, as a response to increased inequality.

From the analyses and the Japanese government's budget trends regarding direct tax

and social insurance contributions, we determined that the government has adopted policies to reduce income inequality. Moreover, given the recent recession in Japan, also referred to as the "lost three decades," a compelling point can be made for the adoption of monetary easing as an economic stimulus package. However, the Japanese government has recently adopted a free trade policy, and, despite the extreme recession period, public works have not been sufficiently implemented (a factor that widens income inequality). For example, COVID-19-induced 2020 recession, strengthening the economy and correcting inequality by implementing public works projects would be necessary. However, because of improper resource allocation, public work projects may not be very effective in general recessions in Japan. Therefore, the Japanese government should not only focus on the public investment of some vested interest groups but also correct resource allocation and make efficient public investment by increasing general public investment. Moreover, we suggest that the government implements social security policies to mitigate widening inequality because of free trade policies.

Finally, we believe that the cabinet's attitude toward income inequality cannot be ignored. The Ikeda Cabinet, which made the Income Doubling Plan, stated that it would enhance social security and correct income inequality in their policy speech; despite all major economic policies working to reduce income inequality, they succeeded in reducing inequality for other reasons. Hence, Cabinets must be more aware of income inequality for it to be corrected.

Table 3.6 Transitions and Effects in Gini Coefficient and Each Policies Before and After Each Cabinet and Ruling Party Takes Office.

	GINI (*GINID*)	Public works expenditure (*PUBLICGDP*)		Policy interest rate (*INTERESTRATE*)		Tariff burden ratio (*TARIFFRATIO*)		Direct tax/Social insurance contribution rate (*DIRECTTAXP80P100*)	
	Difference	Difference	Effect	Difference	Effect	Difference	Effect	Difference	Effect
d_Kishi	0.0070	0.0072	-	0	No	0.0287	-	-0.0281	-
d_Ikeda	-0.0762	0.0026	-	-0.0073	+	0.0132	-	0.0011	-
d_Sato	-0.0211	0.0045	-	-0.0232	+	-0.0120	-	-0.0019	-
d_Tanaka	0.0118	-0.0006	-	0.0475	No	-0.0391	-	-0.0058	-
d_Miki	-0.0061	0.0013	+	-0.0250	-	0.0072	-	0.0203	-
d_Suzuki	0.0019	-0.0002	+	-0.0350	+	0.0007	-	0.0258	-
d_Nakasone	0.0097	-0.0061	-	-0.0300	+	0.0082	-	0.0111	-
d_Takeshita	-0.0000	-0.0039	-	0.0075	+	-0.0068	-	-0.0109	-
d_Kaifu	-0.0020	-0.0006	-	0.0175	+	0.0059	-	0.0088	-
d_Hashimoto	0.0052	-0.0016	+	-0.0006	+	-0.0033	-	0.0036	-
d_Koizumi	0.0072	-0.0079	-	0.0024	-	-0.0070	-	0.0094	-
d_Abe2	0.0027	0.0009	-	-0.0014	+	0.0009	+	0.0044	-
d_LDPSDPJ	0.0054	-0.0097	-	-0.0131	-	-0.0086	-	0.0062	-
d_DPJ	-0.0076	-0.0025	-	-0.0001	No	-0.0003	-	0.0104	-
d_NKP	0.0086	-0.0098	+	-0.0007	-	-0.0101	−	0.0256	−

Notes: 1. The details of the successive Japanese cabinets and ruling party dummies are shown in Appendix D.

2. The difference of each variable is the value of the month wherein each cabinet and ruling party resigned minus the value of the last month before they took office.

3. The effect of each policy is the sum of the coefficient values of each independent variable (alternative variable for each policy) and the coefficient values of the interaction terms (including lag) in Tables 3.2, 3.3, 3.4, and 3.5. However, the policy interest rate of the Kishi Cabinet is unchanged, the policy interest rate of the DPJ administration remains almost unchanged, the significance of each variable is weak, and the policy interest rate of the Tanaka Cabinet is not significant in the involved variables. Therefore, we concluded that their policies were ineffective.

Table 3.7 Descriptive Statistics and Data Sources.

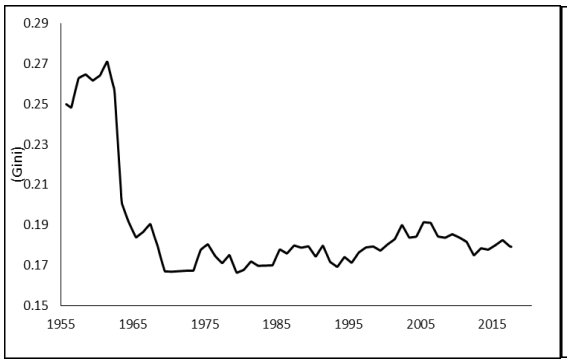
Variables	N	Mean	Var.	Std. Dev.	Minimum	Maximum
D.GINID	743	-0.0001	5.30E-07	0.0007	-0.0047	0.0013
D.PUBLICGDP	743	-2.18E-06	2.32E-07	0.0005	-0.0027	0.0033
D.INTERESTRATE	743	-0.0001	0.0004	0.0021	-0.01	0.02
D.TARIFFRATIO	743	-2.05E-05	2.59E-07	0.0005	-0.0025	0.0022
D.DIRECTTAXP80P100	743	0.0001	4.35E-07	0.0007	-0.0031	0.0015
D.PEDUCPI	743	13.4521	15470.6083	124.3809	-747.5410	710.9971
GINID	744	0.1879	0.0008	0.0275	0.1663	0.2710
PUBLICGDP	744	0.0193	2.36E-05	0.0049	0.0087	0.0321
INTERESTRATE	744	0.0360	0.0882	0.0297	-0.0006	0.09
TARIFFRATIO	744	0.0353	0.0004	0.0202	0.0114	0.0780
DIRECTTAXP80P100	744	0.1651	0.0016	0.0401	0.1035	0.2216
PEDUCPI	744	11322.7100	26372209.9105	5135.3880	1657.3350	21468.9900

Variables	Units	Data Sources
D.GINID		Ministry of Internal Affairs and Communications of Japan (various years)
D. PUBLICGDP	Public Expenditure/GDP	Japanese Ministry of Finance (various years a), special issues of the National Treasury.
D.INTERESTRATE	%	1. Japanese official discount rate Bank of Japan (2019a) 2. Uncollateralized overnight call rate in Japan Bank of Japan (2019b)
D.TARIFFRATIO	Tariff Revenue/Total Import value	1. Tariff revenue ・National general account portion of the tariff revenue Japanese Ministry of Finance (various years a), special issues of the National Treasury. ・National special account portion of the tariff revenue Japanese Ministry of Finance (various years a), special issues of the domestic economy (fiscal and financial statistics). Local Finance Association (various years) 2. Total import value Japanese Ministry of Finance (various years b) Japanese Ministry of Finance (various years c) Japanese Ministry of Finance (various years d)
D.DIRECTTAXP80P100	Direct Tax and Social Insurance/Pre-Tax Income	Ministry of Internal Affairs and Communications of Japan (various years)
D. PEDUCPI	Japanese yen (JPY)	Japanese Ministry of Finance (various years a), special issues of the National Treasury.

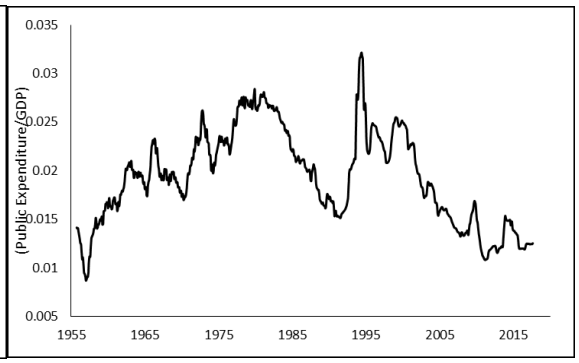
Notes:
1. "*D*" at the beginning of each variable means the difference.
2. For *D.INTERESTRATE*, we use the Japanese official discount rate before June 1995 and use the uncollateralized overnight call rate in Japan after July 1995 as the policy interest rate.
3. For *D.DIRECTTAXP80P100*, this study calculates the variable using the average income of the 5th (highest 20%) quintiles in the Ministry of Internal Affairs and Communications of Japan (various years). Specifically, each item of "actual income" and "disposable income" is materialized using the CPI (base year is 2015). Then, the difference between the "actual income" item and the "disposable income" is divided by the "actual income."
4. For *D. PEDUCPI*, the Japanese consumer price index (base year is 2015) is used for price adjustment.

Figure 3.1 Transition of Variables Used in Analyses.

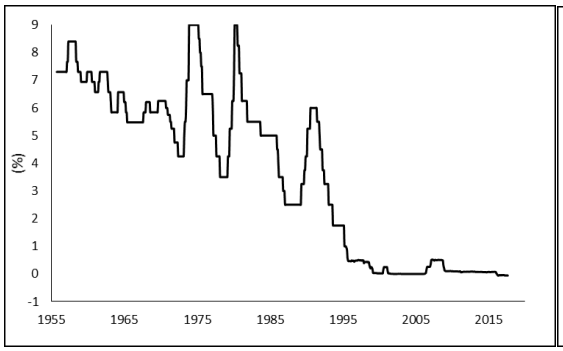
(a) Gini Coefficient (Redistributed Income, GINID)



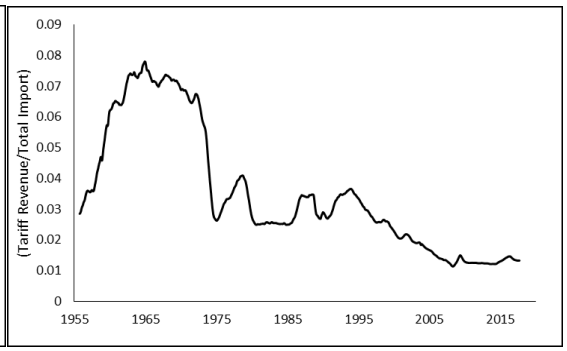
(b) Public Works Expenditure (PUBLICGDP)



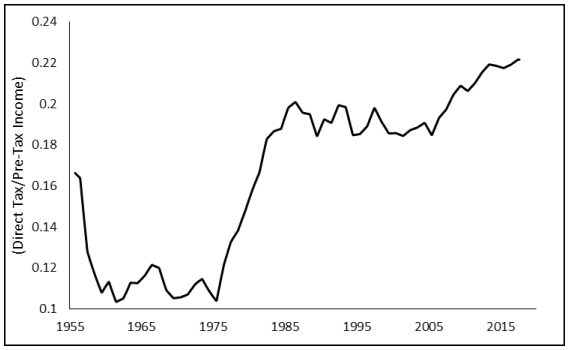
(c) Policy Interest Rate (INTERESTRATE)



(d) Tariff Burden Ratio (TARIFFRATIO)



(e) Direct Tax and Social Insurance Contribution Rate (DIRECTTAXP80P100)



Chapter 4
Human Heterogeneity and Inequality in the World

4.1 Introduction

Especially in developing countries, people may be dissatisfied with their governments due to the high level of income inequality and their awareness of inequality. In an awareness survey mainly targeting OECD countries and Europe, the proportion of citizens who answered that their country was an unequal society showed higher values in non-OECD member countries with lower income levels such as Ukraine and Bulgaria (Murata and Aramaki, 2013). Moreover, many developing countries were originally colonies of the European and American powers and their borders after independence were largely based on the borders of the colonial era, so the ethnicities and religions of the people are diverse. Especially in Africa, Western colonial masters divided the continent with artificial borders, separating the peoples of countries that shared the same culture and language and forcing together neighboring different ethnic groups to form a country. In many regions, ethnic and religious conflicts have led to civil wars, ethnic cleansing, and general unrest (Oyewole, 2007). Such a social background is one of the causes of increasing income inequality in developing countries.

Conversely, especially in the United States, Western Europe, and the European Union, due to the recession caused by the socioeconomic burden of the COVID-19 pandemic and the influence of affirmative action policies that give preferential treatment to specific minorities implemented in each country, the issue of “reverse discrimination” has been raised by white men and, in recent years, white women (Sanders, 2003; Orife, 2016; Schmidt et al., 2020). Therefore, discrimination against people with different attributes is a major issue in the world, especially today, and the impact of human heterogeneity such as race and religion on income inequality is one of the most important problems.

The effect of human heterogeneity on income inequality has been discussed in various ways from the socioeconomic perspective. Becker (1964) systematized human capital theory, which is widely used to discuss inequalities in educational background, based on the discussion by Smith (1784). Additionally, Becker (1971) stated that an individual’s discriminatory taste was expressed as a coefficient defined as the monetary cost of a transaction as a method to reflect the effect of discrimination regarding human heterogeneities (race, religion, and culture, such as linguistic heterogeneity) on the economy. Moreover, by using a neoclassical model using a utility function, the impact of

productivity differences on income inequality can be explained.

In contrast, some research has been conducted on the causes of income inequality in developing countries and the relationship between heterogeneity and income inequality in developed countries. Lee (2005) showed using unbalanced panel data for developing and developed countries that a strong interaction between democracy and public sector development explains domestic income inequality. Beggs et al. (1997) analyzed black population concentration and black-white inequality using data aggregated from personal and county-level data in the US in the 1980s to the labor market area (LMA) level. Additionally, Dincer and Lambert (2012) analyzed the direct and indirect effects of ethnic and religious heterogeneity on income inequality and on welfare programs across the US using each state's indices of fractionalization and polarization, finding a positive relationship between ethnic and religious polarization and income inequality. Moreover, they also found an inverse-U-shaped relationship between ethnic and religious fractionalization and income inequality.

Additionally, there have been some empirical analyses using micro data of the relationship between wage inequality and ethnic or religious conflicts. Vilerts and Krasnopjorovs (2017) used anonymized micro data from the Labour Force Survey in Latvia to estimate the ethnic wage gap between Latvians and non-Latvians and identify the explanatory factors. Kobayashi (2017) analyzed statistical discrimination such as wage inequality due to religious beliefs in the Japanese labor market using individual workers' data in Japan. Moreover, Bohn (2007) and Akdede (2012) use the concept of ethno-linguistic polarization and fractionalization to discuss the impact of ethnic and linguistic culture on income inequality and redistribution.

The main contributions of this study are threefold: First, there are very few econometric analyses that describe the effects of such diversity on the development of income inequality across countries using macro data. Therefore, the whole picture of the impact of ethnic and religious diversity on the development of income inequality worldwide has not been presented. Therefore, we study the impact of such diversity on income inequality worldwide. Second, when ethnic diversity has an impact on income inequality, it is not clear whether it is due to racial or cultural differences. Regarding religious diversity, it is also not clear whether it is due to religion or customs other than religion.[38] Therefore, this study conducts a long-term quantitative analysis using panel data on the effects of race, religion, and cultural diversity and the effects of government

[38] In this analysis, we use native language as an alternative variable for culture.

policies on income inequality in the world. Third, we constructed and analyzed new variables related to race, language, and educational background fractionalization and polarization. We hope through this study to inspire measures against the problem of inequality.

The remainder of this paper proceeds as follows. Section 4.2 presents theoretical studies on inequality and heterogeneity from a socioeconomic perspective. Section 4.3 outlines the model constructed to clarify the determinants of inequality, the empirical analysis method employed, and the variables used. Section 4.4 presents the results of our analysis and discusses the relationship between various human heterogeneities and our results from an interdisciplinary perspective. Section 4.5 presents the conclusions and political implications.

4.2 Various Kinds of Heterogeneity and Inequality

In this section, we explain theoretical studies on human inequality and heterogeneity from a socioeconomic perspective. First, we explain the human capital theory, which is a basic theory widely used to explain the economic significance of education and training and the wage gap. Using this theory, we can explain educational heterogeneity. Smith (1784) likens a human being who has been educated at great time and effort for certain occupations that require special skills and proficiency, to an expensive machine. Smith (1784) believed that they are able to recover all their wages and their education costs, at least with the ordinary profit of capital of equal value. Becker (1964) systematized Smith's idea as human capital theory. Below, we consider the motives for children to receive higher education based on Becker (1964). According to Becker, private costs of education are divided into direct and indirect costs. The "indirect cost" is the opportunity cost, that is, the income that would have been obtained if the child had worked without going to school. Households demand education as long as the benefits outweigh the costs, comparing the costs associated with additional education with the present value of the benefits. If the marginal rate of return decreases as the level of education increases (diminishing returns), then there is an optimal equilibrium point for education investment levels. Therefore, if the household is financially reasonable, they act accordingly. In other words, educational inequality changes due to the interaction between household wealth inequality and the disparity of individual abilities. In a case where there is a system to reduce inequality in households (guaranteed equality of educational opportunities), such as free tuition fees for higher education, most of the inequality in educational background depends on individual ability. In other words, if the inequality is large when the

educational background is diverse, equality of opportunity is guaranteed; however, if the inequality is small when it is diverse, equality of opportunity is not guaranteed, and it is considered that the disparity between generations is inherited.

Second, we summarize the effects of discrimination on the economy. Each hypothesis about discrimination could explain each heterogeneity of race, religion, and culture, such as linguistic heterogeneity. Becker (1971) stated that an individual's discriminatory taste is expressed as a coefficient (discrimination coefficient), defined as the monetary cost of a transaction. A discrimination coefficient means that an individual is willing to pay their income to a person with a particular attribute (e.g., white people), but not to a person with a different attribute (e.g., black people, Asian people). This coefficient is expressed as the wage gap between racial groups (Becker, 1971).[39] Therefore, the discriminated (minority) group is at a disadvantage in terms of employment, but the wages of the discriminating (majority) group rise and it is not efficient for management dominated by the majority group. As a result, discrimination decreases national income,[40] and the income of both groups is reduced (Becker, 1971). However, the hypothesis that both sides suffer losses does not always hold true, and it has been argued that the majority actually benefits at the expense of the discriminated minority (Jain, 1982). In fact, Altonji and Blank (1999) showed that wages for blacks, Hispanics, and women in the United States in 1979 and 1995 tended to be lower than for white men. Of these, wages for women in 1995 tended to improve significantly compared to 1979, but wages for Blacks and Hispanics did not improve; on the contrary, wages for Hispanics worsened. This result shows that racial wage discrimination is a deeper problem than wage discrimination against women.

Based on Becker's hypothesis, Borjas and Bronars (1989), Black (1995), and Bowlus and Eckstein (2002) analyzed the effects of prejudice (Altonji and Blank, 1999). Black (1995) assumes that there are two types of workers in the market with equal productivity and leisure preferences, type A and type B, and that there are two types of employers, type p and type u. Type p employers are prejudiced against type B workers and only employ type A. Type u employers simply pursue profit maximization. Both workers face a search cost of c per period. A fraction γ of workers are type B and $1-\gamma$ are

[39] This hypothesis is applicable not only to racial discrimination but to other discrimination such as ethnicity and gender.

[40] In fact, in the United States, empirical analysis conducted in 1960s confirmed the existence of economic loss due to racial discrimination (Joint Economic Committee, 1965; Bergman, 1971; Agarwal, 1984).

type A, θ of firms are type p, and 1−θ of firms are type u. If at least one of the wages (W_{pa}) offered by type p and the wage (W_{ua}) offered by type u exceed the reservation value (U_a), type A selects a company with a high offered wage. Type B chooses to work if the wage (W_{ub}) provided by type u exceeds the reserved value (U_b). In this model, $U_b < U_a$ because type B can only receive offers from (1−θ) of type u. Because the wage depends on the worker type, $W_{pa} = W_{ua}$. The solution of the worker's search problem indicates that $U_b < U_a$ if $W_{pa} = W_{ua}$. Type u firms use the fact that type B workers have higher search costs than type A workers because they spend time in contact with type p firms. Therefore, as long as type p companies do not disappear from the market, type u companies can offer type B a lower wage than type A ($W_{ub} < W_{ua}$).

Conversely, some researchers have discussed statistical discrimination by employers in the presence of imperfect information about the skills of the minority group. Research on statistical discrimination can be broadly divided into two categories. One is to investigate how previous beliefs about group member productivity influence hiring and payment decisions. Coate and Loury (1993) found that stereotypes represented by race and gender can be self-confirmed and lead to discriminatory equilibria. Coate and Loury (1993) also showed that affirmative action policies may work to both improve and worsen the situation. The other type of research concerns the consequences of group differences in the accuracy of the information that employers have regarding individual productivity. Their research is based on the assumption that it is difficult for a company to specify the true productivity of a group of workers who share a particular attribute due to cultural differences. Aigner and Cain (1977) emphasized that as long as productivity depends on the quality of matching of workers' skills and work requirements, companies devalue the expected productivity of uncertain groups.

However, an important point to keep in mind in fully explaining the changes in wage inequality is not only to explain the contributions of the changes observed between groups, but also to explain the significant changes in inequality within the group (Katz and Autor, 1999). Katz and Autor (1999) used US gender-specific wage data from 1963 to 1995 in an analysis of variance of the changes, and more than 50% of the changes in all era groups were explained by within-group change.

Third, we summarize the impact of productivity differences on income inequality. Studies of productivity differences could explain the heterogeneity of race, religion, education, and culture, such as linguistic heterogeneity. This study explains the optimum

working hours of an individual using a neoclassical model[41] with a utility function that represents an individual's preferences for consumption and leisure. The utility of an individual is expressed as a function of consumption C and leisure time L ($U = U(C, L)$). Let T be the available time (excluding physiologically necessary time, such as sleep) within a certain period. If leisure time is L, working time h is given by $h = T - L$. Assuming that the hourly wage is w and the non-working income is I, C and L satisfy equation (4.1).

$$C \leq wh + I \;=\; w(T - L) \;+ I \tag{4.1}$$

If $\bar{I}$ indicates the total income (working income and non-working income) when all T are worked in market labor, equation (4.1) can be rewritten as follows:

$$C + wL \leq \bar{I} \equiv wT + I \tag{4.2}$$

The individual selects the (C, L) that maximize the utility function U (C, L) given by consumption and leisure under the budget constraint of equation (4.2). This shows that the total income $\bar{I}$ covers the cost of consumption of goods and leisure, and w is the leisure price. In this way, if leisure is considered a consumer good, the theory of labor supply is nothing but the theory of consumer choice in microeconomics.

The utility of labor and leisure is different for each attribute, such as ethnicity, and some ethnic groups prioritize labor while others prioritize leisure. This can affect productivity and create wage inequality. In the United States, the prevalence of physical inactivity during leisure time was 37.6% in Hispanics, 31.85% in Blacks, 23.95% in Asians, and 21.2% in Caucasians (Bennett et al. 2006). Workers with lower socioeconomic status may have less access to leisure time physical activity opportunities, particularly if they need to work longer hours to earn adequate income (Wu and Porell, 2000; Caban-Martinez et al., 2007), and the less productive racial or ethnic groups may have less physical activity opportunities in their leisure time; therefore, their prevalence may increase. This result may demonstrate that there are racial or ethnic groups that are less productive and thus less valuable for leisure and wages. Similar phenomena occur between different attributes, such as those between different races. Parotta et al. (2014) found that ethnic diversity was significantly and negatively correlated with firm productivity because of barriers to communication and culturally diverse integration costs. Alternatively, Peri (2016) discussed worker productivity by distinguishing it mainly based on education level, such as "college-educated" and "non-college-educated."

[41] Details of such a labor supply model are given in Blundell and MaCurdy (1999).

4.3 Measurement of Heterogeneity and Empirical Model

In this study, we mainly focus on the world for which data are available and analyze how the following independent variables affect the income inequality level. Next, we verify the hypothesis that diversities such as race, religion, language, and educational background had a large positive impact on the fluctuation of income inequality level. Additionally, we test the hypothesis that diversity impedes the reduction in income inequality level.

This study uses cross-country panel data for 116 countries and regions from 1995 to 2019 based on the World Bank (2020) and the World Fact Book published by the Central Intelligence Agency (CIA), among others. However, we used panel data every five years in this analysis. Specifically, we group the data from 1995 to 1999 as 1995–1999, the data from 2000 to 2004 as 2000–2004, the data from 2005 to 2009 as 2005–2009, the data from 2010 to 2014 as 2010–2014, and the data from 2015 to 2019 as 2015–2019. Moreover, we calculated the data for every five years by averaging the data for each year. There are several types of panel data analysis, but as a general analysis method, this study uses a random effect model (REM) and a fixed effect model (FEM), as there expects to have an individual effect. The regression equations are applied to the data, and each equation is analyzed using multiple methods, such as FEM and REM. The Hausman test is then used to select the most appropriate method. The regression equations and variables used are as follows:

$$GINI_{it} = \alpha_i + \Sigma\beta_k X_{(it)j} + \sum T_t + \varepsilon_{it}, \tag{4.3}$$

where *i* is the country to be analyzed and *t* is the observation year. *GINI* is the Gini coefficient, α_i indicates individual effects, X_j is the dependent variable, and ε_{it} is the error term. The period dummy T_t is the control variable. In addition, the sign in parentheses predicts the effect of the independent variable on the dependent variable. This study selected certain social factors based on Lee (2005) and Dincer and Lambert (2012). In this analysis, we test for multicollinearity using the variance inflation factor (VIF); however, since the coefficients between *RACEFRAC* and *RACEPOLA* and between *RELIFRAC* and *RELIPOLA* exceeded 10, these variables were not used in the same regression. Moreover, we use the Bayesian information criterion (BIC) to select a model that fits well.

In this analysis, the concept of ethnicity is considered a combination of two different factors, race and language, defined as follows. First, ethnicity is defined as a group that shares language and race. In other words, only if language and culture are the same does this study define them as the same ethnic group. Second, regarding race, groups with a

certain degree of matching physical characteristics are defined as the same race.[42] Third, a language (linguistic) group is defined as a group whose mother tongue is the same language. For example, a person whose mother tongue is Japanese but who has acquired English and Spanish is defined as a member of the Japanese group.

Dependent Variable

The dependent variable is the Gini coefficient (*GINI*) of each country.

Independent Variables

First, we explain the control variables. The net migration rate per 1,000 people (*MIGRATION*, +)[43] was derived using equation (4.4); *POP* indicates the total population in each country, and *NI* indicates the natural increase rate per 1000 people.

$$MIGRATION_t = \frac{1000(POP_t - POP_{t-1})}{POP_t} - NI_t \tag{4.4}$$

Government tax revenue as a percentage of GDP (*TAX*, −) is an alternative variable for the size of the public sector. However, especially in least developed countries (LDCs), even if the public sector is large, there is a tendency to postpone the inequality correction policy because it is in the stage of prioritizing economic growth over inequality correction. To check robustness, some models in Appendix H use government expenditure as a percentage of GDP (*GOVEX*, −). The legislative index of political competitiveness (*LIEC*, −) ranges from 1 to 7, with higher values indicating that the government has a competitive electoral system. If the values is less than 6, that nation's electoral system is not competitive.

Religion variables (*Protestant, Catholic, Orthodox, Sunni, Shia, Buddhistmahaya, Buddhisttheravadins, Hindu*) are the proportions of believers of each religion by country. In Table 4.1 and Appendices F, G, and H, we use these religious variables as control variables. Race variables (*Eastasiapacific, Latinamerican, European, Middleeastnorthafrica, Southasian, African*) are the proportions of residents of each race by country. In Appendix H, we use these race variables as the control variables to eliminate the individual influence of each religion and thereby perform an analysis for the whole world.

Second, we explain the variables related to heterogeneity. According to Greenberg (1956) and Montalvo and Reynal-Querol (2003), the forms of the fractionalization indices

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[42] Refer to the definitions of the variables *RACEFRAC* and *RACEPOLA* for specific racial classifications in this study.

[43] Italic letters in parentheses are the labels of the variables, and the signs are derived by each hypothesis.

are as follows:

$$FI_i = 1 - \sum_{j=1}^{J} \left(\frac{n_{ij}}{N_i}\right)^2 \tag{4.5}$$

where $\frac{n_{ij}}{N_i}$ is the proportion of people affiliated with group *j* in country *i*. Fractionalization indices range from 0 to 1. Therefore, the fractionalization indices increase as the number of groups increases. FI is often used in socioeconomics, especially in studies on ethnicity and language. Moreover, the calculation method of *FI* is in agreement with the Gini–Simpson index (Simpson, 1949; Herfindahl, 1997), which is widely used mainly in biology, as in biodiversity calculations. Therefore, *FI* is used in other fields, such as biology, without being bound by the framework of socioeconomics, and is a concept used interdisciplinarily.

An alternative indicator of diversity is the polarization index of Montalvo and Reynal-Querol (2002) and Montalvo and Reynal-Querol (2003).

$$PI_i = 1 - \sum_{j=1}^{J} \left(\frac{0.5 - \pi_{ij}}{0.5}\right)^2 \pi_{ij} \tag{4.6}$$

where π_{ij} is equal to $\frac{n_{ij}}{N_i}$. The polarization indices range from 0 to 1. Contrary to what happens with the fractionalization index, polarization reaches a maximum when there are two major groups of equal size. *FI* takes a higher number as a society is fractionalized, and *PI* takes a higher number as it is polarized.

In this analysis, we hypothesize that income inequality tends to increase due to the fractionalization and polarization of social diversity, such as race, religion, language, and educational background heterogeneities. Appendix I indicates the relationship between each fractionalization index and each polarization index. The relationship between racial polarization and fractionalization is almost directly proportional; however, in education and language, as Dincer and Lambert (2012) argue, their relationship is partly depicted as an inverted U-shaped curve. The relationship between religious polarization and fractionalization tends to be an inverted U-curve, but it is close to a direct proportion. Similarly, the relationship between educational polarization and fractionalization is close to negative. Linguistic diversity also tends to show an inverted U-curve; however, most of the samples are concentrated from the left to the middle of the curve, and when only that part is extracted, the shape is close to a direct proportion.

After collecting data on ethnic groups and organizing them by race, the racial fractionalization indices (*RACEFRAC*, +) and polarization indices (*RACEPOLA*, +) were calculated according to the above calculation method. In this analysis, we use the ethnic data by CIA (2020) and organize them into East Asia & Pacific, Latin American, European, Middle East & North African, South Asian, and African races.

Similarly, this study calculated the religious fractionalization indices (*RELIFRAC*, +) and polarization indices (*RELIPOLA*, +). We use 2000, 2010, 2015, and 2020 data published in the "World Religion Database."[44] However, as there are no data for 2005, we used linear interpolation for the data for that year. In addition, to clarify the effects of religious diversity in detail, we use religious fractionalization indices using denomination (*RELIFRACSECT*, +) and religious polarization indices using denomination (*RELIPOLASECT*, +) as independent variables in Appendix G.

For the heterogeneity of education, we calculate educational fractionalization indices (*EDUFRAC*, −) and polarization indices (*EDUPOLA*, −) in the same way. In particular, this study classifies residents aged 25 and over in each country based on the educational background of the International Standard Classification of Education (ISCED). Specifically, the diversity of educational backgrounds is calculated by their final educational background (less than primary education, primary education, lower secondary education, upper secondary education, post-secondary non-tertiary education, and bachelor's or equivalent).

Regarding linguistic heterogeneity, this study calculates linguistic fractionalization indices (*LINGFRAC*, +) and polarization indices (*LINGPOLA*, +). For this calculation, we use panel data for the native language population in each country from the United Nations.[45]

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[44] The religious classifications used are as follows.

Agnostic, Atheist, Baha'i, Buddhist (Mahayanist, Theravadin, and Lamaist), Chinese folk religious, Christian (Protestant, Catholic, Orthodox, and Independents), ethnic religious, Hindu, Judaism, Muslim (Sunni, Shia, Schismatic), new religion believers, and Spiritist. The classifications in parentheses are denominations within each religion, and they are treated separately only for *RELIFRACSECT* and *RELIPOLASECT*.

[45] In this analysis, the language group is regarded as one cultural unit, and since it is used as an alternative variable of culture, we use the data of the native language. However, languages have a communication function, and the data on languages that people can use to communicate in each country or region are posted in the CEPII distance database (http://www.cepii.fr/anglaisgraph/bdd/distances.htm). An analysis of the

Dummy variable

Using panel data every five years in this analysis, we use periods other than the reference period (2015–2019) as the period dummy variable (*d_2000*, *d_2005, d_2010, d_2015*).

4.4 Empirical Result using Panel Data

From the results in Table 4.1, *RACEFRAC* and *RACEPOLA* serve to decrease income inequality. However, according to Table 4.1 (4), part of the effect of racial diversity on income inequality can be explained by linguistic fractionalization and polarization. In contrast, *RELIFRAC* and *RELIPOLA* serve to increase income inequality. However, according to Appendix G, religious diversity as measured by denomination may not have an effect on income inequality. In addition, in the diversity of race and religion, although the signs are the same for each, the absolute value of the fractionalization effect may be large between the effects of polarization and fractionalization. Therefore, income inequality tends to decrease when more races settle in the region than when two races dominate in the region, and inequality tends to increase when the believers of more religions settle in the region than when two religions dominate.

Moreover, discrimination within the denominations of each religion may have shrunk slightly in recent years. Additionally, from Table 4.1, *EDUFRAC* and *LINGFRAC* have significantly negative effects on inequality, and *LINGPOLA* has a significantly positive effect. This result means that income inequality increases when the language becomes extremely polarized in the region. Moreover, on the surface, increasing educational inequality has resulted in a decrease in income inequality.

The legislative index of political competitiveness (LIEC) has a significantly negative effect. This is thought to be because competitive election systems tend to reduce income inequality. Considering the BIC results in Table 4.1, *MIGRATION* and *TAX* may not have a significant effect on inequality. In addition, we confirm the robustness in Appendix H, but there is little extreme change in the significance of the coefficients of each variable. However, changes such as *EDUPOLA*[46] becoming significantly negative at the 10% level were examined in detail. This reinforces the finding that increasing educational inequality reduces income inequality on the surface. Although *EDUFRAC* exceeds *EDUPOLA* in

impact of reduced barriers due to language communication on income inequality is an issue to be considered in the future.

[46] In Appendix F, *EDUPOLA* shows a negative value; however, it does not exert a significant effect.

the absolute value of the coefficient, there is no change in the result that the effect of fractionalization on inequality is larger.

Below, we discuss the results of the empirical analysis using the recent transitions in the heterogeneity index shown in Figure 4.1. According to the results, racial diversity tends to reduce income inequality, especially in countries with advanced racial fractionalization. As shown in Figure 4.1 (a), the diversity of races in each country is flat or slightly shrinking. The interracial income inequality reduction policies of each country's public sector should thus be effective. However, considering that racial diversity is flat or slightly shrinking, they may need to be careful not to be too particular about racial differences. Religious diversity increases income inequality, but as far as the coefficient is concerned, the effect of religious fractionalization outweighs the effect of polarization. Furthermore, in recent years, the diversity of religions in each country has been increasing (Figure 4.1 (b)). Therefore, increasing inequality due to religious differences is a serious problem, and the public sector in each country should devise corrective measures immediately.

From the result, at a first glance, increasing educational inequality has resulted in decreasing income inequality. According to Becker (1964), educational inequality changes due to the interaction between household wealth inequality and the disparity of individual abilities. However, when the equality of educational opportunities is guaranteed, the educational background depends on individual ability. Therefore, if inequality decreases when educational background is diverse, equality of opportunity is not guaranteed, and inequality between generations is inherited.[47] In addition, Figure 4.1 (c) and Appendix I indicate that the polarization and fractionalization of educational background are highly stable in many countries. Compared to the analysis results, this value is likely to be due to household wealth rather than individual ability. Therefore, the public sector should implement policies to ensure equal opportunities for education.

[47] In a society with strong capital constraints, if the child of a wealthy household is more capable, the educational background and ability are proportional, so the diversity of educational background and income inequality should have a positive relationship. Alternatively, if the child of a poor household has a higher ability, the diversity of educational background and income inequality have a negative relationship. Since the Gini coefficient reflects income inequality, not asset inequality, in a society without capital constraints, educational background diversity and income inequality should show a positive relationship. Therefore, this result suggests that capital constraints are strong and that the poorer people in the world may have higher capacities.

Table 4.1 The Effects of Racial, Religious, Educational, and Linguistic Heterogeneity on Inequality in the World.

Hausman Independent Variables	FEM (1)	FEM (2)	FEM (3)	FEM (4)
MIGRATION	0.0001	0.0001	-0.0020	-0.0028**
	[0.07]	[0.08]	[-1.50]	[-2.20]
TAX	-0.0008	-0.0011	-0.0011	0.0042**
	[-0.71]	[-0.94]	[-0.92]	[2.36]
LIEC	-0.0073**	-0.0068**	-0.0162	-0.0092***
	[-2.62]	[-2.38]	[-1.14]	[-3.66]
RACEFRAC	-0.1273*		-0.2124**	-0.0279
	[-1.90]		[-2.14]	[-0.86]
RACEPOLA		-0.0571*		
		[-1.81]		
RELIFRAC	0.5442***		0.7808***	0.6182**
	[3.05]		[2.82]	[2.44]
RELIPOLA		0.2205**		
		[2.60]		
EDUFRAC			-0.3136***	
			[-3.18]	
EDUPOLA			-0.1130	
			[-1.29]	
LINGFRAC				-0.0465***
				[-2.92]
LINGPOLA				0.0401*
				[1.72]
Constant	-0.1377	0.0804	0.0447	-0.0431
	[-0.60]	[0.37]	[0.12]	[-0.19]
N	293	293	121	116
R-squared	0.2245	0.1943	0.5749	0.6001
Adjusted R-squared	0.1795	0.1476	0.4998	0.5259
BIC	-1435.3520	-1424.1620	-729.2924	-636.6634
VIF	2.11	2.02	2.41	2.53

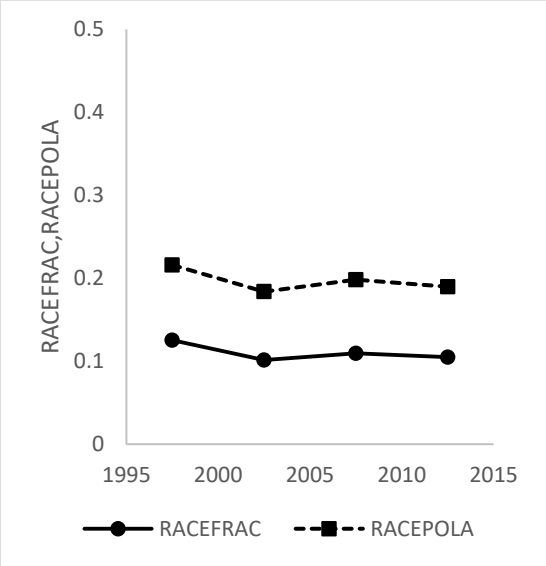
Notes: 1. *, **, *** indicate that they are significant at 10%, 5% and 1% level, respectively. Numbers above brackets are regression coefficients, and numbers in brackets are *t*-values. However, to correct for heteroskedasticity, the *t*-value is used as the coefficient divided by a robust standard error.

2. This table indicates the results of models of analysis targeting each country in the world.

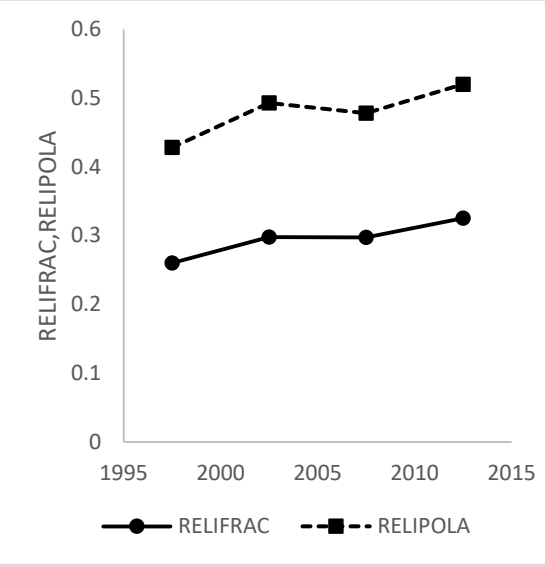
3. In all models in this table, we use religion variables (*Protestant, Catholic, Orthodox, Sunni, Shia, Buddhistmahaya, Buddhisttheravadins, Hindu*) as control variables and period dummies (*d_2000*, *d_2005, d_2010, d_2015*).

Figure 4.1 Time Series Transition of Racial, Religious, Educational, and Linguistic Heterogeneity.

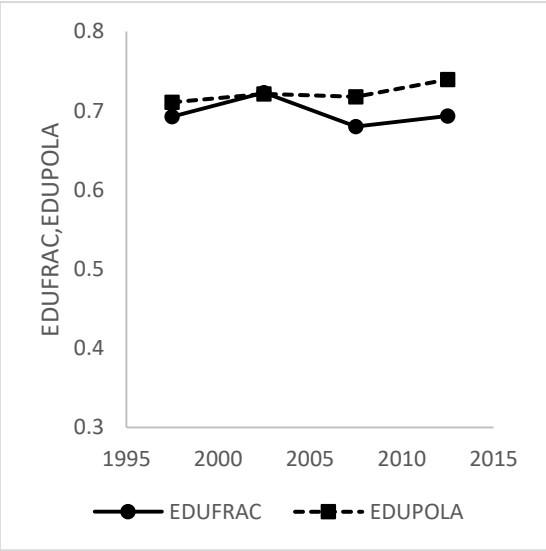
(a) Racial Heterogeneity



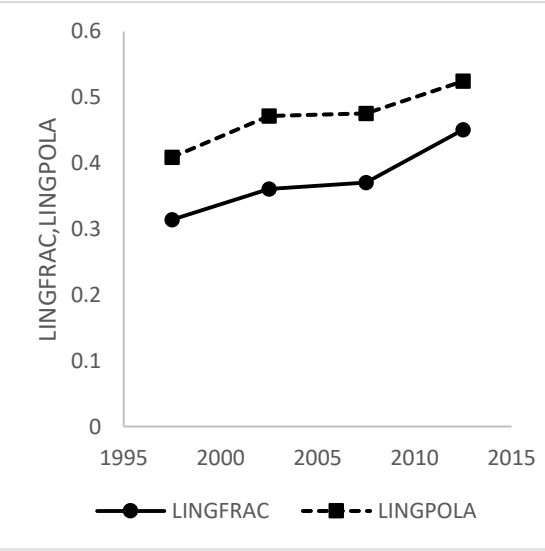
(b) Religious Heterogeneity



(c) Educational Heterogeneity



(d) Linguistic Heterogeneity



From Table 4.1, we see that linguistic polarization has a weak effect on increasing inequality, and linguistic fractionalization clearly reduces inequality. This is in partial agreement with the result of ethnic diversity in Dincer and Lambert (2012); however, in our analysis, the effect of widening the disparity tends to shrink slightly in both cases. In this study, the influence of ethnic diversity is divided into the effects of race and language, and we find that linguistic heterogeneity has a greater influence on the transition of

inequality than does racial heterogeneity. In addition, Figure 4.1 (d) indicates that linguistic heterogeneity has tended to expand in recent years. Based on the above, the policies of the public sector are somewhat effective but not sufficient, and efforts should continue to be made to reduce inequality. Next, we discuss the relationship between racial, cultural, and religious heterogeneities and our results from an interdisciplinary perspective.

Differences between Racial and Cultural Heterogeneity

Sears and McConahay (1973) and Pettigrew and Meertens (1995) showed that negative attitudes toward minority people are based on differences in cultural characteristics, not biological characteristics in the United States and four European countries. Ramos et al. (2020) proposed that racism could be conceptualized as containing two different dimensions, biological racism and cultural racism, rather than as a single phenomenon. The former means that people classify and hierarchize humans into racial groups based on the concept of "race," and the latter means that people classify and hierarchize humans into cultural groups based on the concept of "culture." Ramos et al. (2020) conducted a comparative analysis based on these concepts and found that cultural racism was clearly more normative.

In our analysis, *RACEFRAC* and *RACEPOLA* correspond to biological racism, and *LINGFRAC* and *LINGPOLA* correspond to cultural racism. In our analysis, the results of racial diversity decrease income inequality. Conversely, linguistic (cultural) polarization has a weak effect on increasing inequality, and linguistic (cultural) fractionalization reduces inequality.[48] The latter result is in partial agreement in Dincer and Lambert (2012); however, in our analysis, the effect of increasing the inequality tends to shrink slightly in both cases compared to Dincer and Lambert's analysis. The results of our analysis may also suggest that linguistic (cultural) discrimination is a more serious problem than racial (biological) discrimination. In addition, considering that racial diversity is rather negatively significant in our result, discrimination against majority may occur if policies are implemented that give preferential treatment to minority races after classifying them by race. However, affirmative action policies are likely to function effectively when classified by cultural units.

[48] Religious diversity can be seen as an example of cultural heterogeneity in a broad sense, but both *RELIFRAC* and *RELIPOLA* are significantly positive. It is presumed that this is because religious heterogeneity is less affected by policies based on racial heterogeneity than linguistic heterogeneity.

Differences between Religious and Denominational Heterogeneity

Our analysis results show that religious heterogeneity increases income inequality, while differences between denominations within a religion do not affect income inequality. Therefore, we consider the differences within the denominations of Christianity, Islam, and Buddhism. This study first considers the differences between the major denominations within Christianity: Protestant, Catholic, and Eastern Orthodox. Huntington (1996) considered Western countries, which are dominated by Protestant believers, and Western and Central European countries, which are dominated by Catholic believers, to be members of the same civilization of Western Christianity, but he distinguished Orthodox civilization (Eastern Europe and Central Asia) from other Christian civilizations. Huntington insisted that the social values of modern society were rooted in religious culture, and that the ways of thinking that distinguished Western culture from Eastern Orthodox (or Islamic) culture reflected the difference in values for democracy. Indeed, the Eastern Orthodox cultural sphere was once under the influence of the former Soviet Union, and few countries in the Islamic cultural sphere have adopted electoral democracy. However, according to Norris and Inglehart (2002), the values for democracy are not so different between the Western and Islamic regions, but there is a slight divergence in the Eastern Orthodox region. However, in the Islamic world, the strong societal role of religious authorities is stronger than in the West, and gender equality has not advanced. Eastern Orthodox regions showed values intermediate between the Western and Islamic worlds (Norris and Inglehart, 2002). Therefore, Eastern Orthodox culture has some cultural differences from Protestant and Catholic, but the differences are considered to be smaller than those between Islam and Christianity.

In the Middle East, where Muslims occupy the majority, Sunnis have dominated and held strong power for many years. However, a new order led by Iran, sometimes referred to as the ‘‘Shia Crescent,’’ is emerging in the Middle East in the 21st century (Wright and Baker, 2004; Helfont, 2009; Balanche, 2018). Moreover, large and influential Sunni organizations such as the Muslim Brotherhood are more closely aligned with Iran and Hezbollah[49] than they are with the Sunni Arab regimes (Helfont, 2009). The main factors that affect their relationship revolve around four general ideological axes: 1) Iran as a champion of political Islam, 2) Iran as steadfastly anti-Israel and anti-American, 3) Iran as a champion of Shiism, and 4) Iran as nationalist (Helfont, 2009). From the above, the large and influential Sunni organizations prioritize uniting as the same Islamic religion

[49] A Lebanese Shia Islamist political organization and militant group.

and fighting the Jews and Christians of different religions rather than the differences between the Sunnis and Shiites. Therefore, in recent years, the conflict between denominations has been reduced, even in the Middle East, where there are many Muslims.

In Buddhism, there are two major denominations, Theravada Buddhism, which is mainly followed in Southeast Asia, and Mahayana Buddhism, which is practiced in East Asia. The difference between Theravada and Mahayana is in the value placed on compassion embedded in the Mahayana goal of practicing to liberate all sentient beings from suffering, as opposed to the individual liberation goal of Theravada. Mahayana Buddhism arose in part out of dissatisfaction with the Theravada focus on the individual realization of the practitioner (Powers, 1995; Kwah, 2020). However, Buddhist traditions share a doctrinal foundation in teaching,[50] and there is little difference between the two (Rahula, 1996; Kwah, 2020). Buddhism more strongly emphasizes universal compassion and tolerance than in the typical monotheistic religions of Christianity, Islam, and Judaism (Clobert et al., 2014), and in fact East Asia, which has a relatively large number of Buddhists, is relatively religiously tolerant (Clobert et al., 2014). Accordingly, there may be few conflicts between Buddhist denominations. Therefore, although there are some cultural and psychological differences between denominations within each religion, they are likely to be smaller than the differences between religions such as Christianity and Islam.

4.5 Conclusion

In this section, we discuss the analysis results and draw our conclusions. Religious fractionalization and polarization increase income inequality levels; however, religious diversity by denomination may not have an effect on income inequality. This result indicates that the coexistence of different religions may have a more positive effect on inequality than different denominations of the same religion.

The fractionalization of educational background reduces inequality. This means that equal educational opportunities are inadequate in the world. Educational background fractionalization is caused by individual ability and the inheritance of educational background by family environment; however, corrective measures by the public sector for employment and social insurance do not function. Therefore, countries need to implement policies to ensure equal educational opportunities. This result cannot be

[50] Specifically, the Four Noble Truths, the Eightfold Path, and Dependent Origination are the same in both teachings.

explained by racial differences. In contrast, the legislative index of political competitiveness can be explained by educational background fractionalization. In other words, in a country with a competitive election system, it is unlikely that measures have been taken to correct the educational background gap and that they are functioning.

Extreme language polarization increases inequality, but fractionalization decreases inequality. This result is in partial agreement with the results regarding ethnic diversity in Dincer and Lambert (2012). However, this analysis found that linguistic polarization has a weak effect on increasing income inequality, and linguistic fractionalization clearly reduces inequality. In addition, unlike the results for ethnic diversity in Dincer and Lambert (2012), we find that racial diversity reduces inequality. Moreover, linguistic diversity explains some of the impacts of racial diversity on inequality.

From the above, regarding racial discrimination, in recent years, due to the social situation against racial discrimination, societies such as public institutions have taken measures against income inequality represented by affirmative action policies. In addition, awareness of ethnic inequality in different language (cultural) units may have increased, and similar corrective actions may have been taken. However, discrimination is not considered to be based on the physical characteristics of the race, such as appearance, but on cultural characteristics. Therefore, discrimination against majority would occur if income inequality correction measures are taken based on physical characteristics. Therefore, when income inequality correction measures are implemented, this should be done based on cultural units such as language units. Instead, issues that do not involve racism or ethnic discrimination tend to be ignored. Therefore, it is desirable that the public sector of each country focus on discrimination issues that do not involve racial discrimination, such as religious discrimination, and take measures to correct inequality.

Table 4.2 Descriptive Statistics.

Variables	Obs.	Mean	Var.	Std. Dev.	Minimum	Maximum
GINI	293	0.3881	0.0086	0.0926	0.2350	0.6390
MIGRATION	293	-0.1978	34.8830	5.9062	-27.6133	35.1753
TAX	293	16.8431	32.4922	5.7002	5.5838	39.7967
GOVEX	283	0.1676	0.0035	0.0591	0.0513	0.8100
LIEC	293	6.6918	0.9399	0.9695	1	7
RACEFRAC	293	0.1102	0.0285	0.1689	0	0.6154
RACEPOLA	293	0.1970	0.0826	0.2875	0	0.9796
RELIFRAC	293	0.2956	0.0355	0.1885	0.0067	0.7576
RELIPOLA	293	0.4799	0.0687	0.2621	0.0133	0.9598
RELIFRACSECT	293	0.4628	0.0409	0.2023	0.0156	0.8556
RELIPOLASECT	293	0.6054	0.0292	0.1709	0.0310	0.8802
EDUFRAC	121	0.6942	0.0100	0.0998	0.1556	0.8241
EDUPOLA	121	0.7262	0.0059	0.0766	0.2849	0.8931
LINGFRAC	116	0.3740	0.0699	0.2644	0.0232	0.9373
LINGPOLA	116	0.4710	0.0660	0.2569	0.0458	0.9351

Chapter 5
Conclusion

As previously stated, the main purpose of this study is to indicate the factors that influence changes in income inequality, and identify optimal policies that could help remedy problems of inequality. At least in contemporary societies, each factor that effects income inequality has differences in spread of period and spatial expanse. Therefore, this study conducts a multifaceted analysis from various conditions according to the factors that affect inequality.

In Chapter 2, empirical analysis was conducted on the assumption that changes in the labor ratio from the traditional sector to the modern sector due to industrial structure change affects income inequality (Kuznets, 1955; Kwon, 2016), and on the assumption that developed countries with similar economic development experience industrial structure changes at about the same rate in the order of agriculture, manufacturing, (low skill) service sector, and knowledge sector. In other words, we believe that the industrial structure, which may have changed over a medium term span of about 30 years, to other structure changes may be the same in wide regions of similar economic development not just in one country.

Empirical analysis results in Chapter 2 reveal a relationship that is consistent with Kuznets curve between income inequality and the agriculture–manufacturing structural change by the 1970s in OECD countries. From the 1980s to the 2000s, “The Great U-Turn,” which refers to events that expanded income inequalities once again (Harrison and Bluestone, 1988) is observed between inequality and the manufacturing–service structural change. A relationship that is consistent with Kuznets curve is observed again between inequality and the service–knowledge structural change after the 2010s. This result suggests that income inequality expanded in OECD countries until recently because the service–knowledge structural change occurred after inequality expanded because of the manufacturing–service structural change. The results also suggest that the above assumptions are correct to some extent and industrial structure change may depend on the stage of economic development.

The policies and ideologies of a country's administration affect domestic income inequality, that is, inequality within a narrow range. The LDP was formed in 1955 and has been the ruling party of Japan for most of the time since then. Therefore, in Japan, the change of prime minister has had a similar effect to the change of government. Due to the frequent changes of prime ministers, changes in the Cabinet's policies and ideologies

occur within a short span of about 5 years or less has had a great impact on the transition of domestic income inequality. In Chapter 3, we use monthly data since 1955 and an ARCH model that corresponds heteroscedasticity. Additionally, we use an interaction term that is multiplied by a one-by-one cabinet (ruling party) period dummy and the explanatory variable that corresponds with each policy, and then incorporated a distributed lag model into the analysis.

The analysis results from Chapter 3 show that when the Japanese cabinet or ruling party's ideology is dovish or when the cabinet or ruling party has a mindset of wanting to redistribute wealth to citizens, inequality tends to shrink in Japan. In addition, since the Hashimoto Cabinet, successive LDP administrations have strengthened the progressive burden of direct tax and social insurance contributions, but at the same time they have increased inequality through free trade policies and monetary easing such as the zero interest rate policy without fiscal expansion. However, when monetary easing and fiscal expansion are used together, as in the Second and Third Abe Cabinets, inequality tends to decrease. Moreover, cabinets headed by non-LDP members such as the SDPJ and the DPJ tend to reduce public works and increase inequality, even in extreme recessions.

Human heterogeneity such as race, religion, language, and educational background also have caused differences in the living environment within and between attributes and have affect long-term inequality. In Chapter 4, we focus on the effect of human heterogeneity on income inequality from empirical analysis based on data from the entire world. The analysis eliminates regional impacts and supposes how social diversity affects income inequality on a global basis in a common way over a long term. Based on the results of the analysis and from previous studies related to socioeconomics, cultural anthropology, sociology, and religious studies, we make policy recommendations to address the issue of global income inequality.

Analysis results in Chapter 4 show that linguistic polarization increases income inequality weakly although racial heterogeneity decreases inequality. Though the results regarding linguistic diversity are similar to the effects of ethnic diversity in Dincer and Lambert (2012), the inequality tends to be smaller than in Dincer and Lambert (2012). The results are generally consistent with research that finds cultural racism to be a more normative concept than biological or outward racism (Sears and McConahay, 1973; Pettigrew and Meertens, 1995; Ramos et al, 2020). Although policies administered to correct racism also reduce inequality, so-called “reverse discrimination” may also occur against the background of biological racism. Cultural racism tends to be corrected as well, but it seems to be somewhat inadequate. This discussion suggests that governments

should implement in cultural units when implementing income inequality correction measures regardless of the region. On the other hand, according to the analysis results, heterogeneity that is not directly related to racial discrimination, such as educational background diversity tends to be ignored, therefore it is desirable that governments take measures against such other forms of discrimination.

Knowledge and technological innovations have been at the forefront of economic development, as seen by the industrial revolution and introduction of the combustion engine in the 1800s, and assembly line and scientific management techniques of the 1900s (Schumpeter, 1939; Arrow, 1962; Kwon, 2016). Innovations in knowledge and technology are now created in the knowledge sector. The knowledge sector can be roughly divided into two types: the creative core type such as writers, researchers, and product developers who create new theorems, strategies, and products that can be used universally; and creative professional types such as lawyers, bureaucrats, and doctors who use their knowledge to solve various problems (Florida, 2002). However, as artificial intelligence develops in the future, it is expected that many creative professionals will be replaced by artificial intelligence, therefore, surplus labor will be generated in creative professionals, and the structural change from creative professionals to creative core may occur.

Therefore, especially in developed countries, by paying attention to the inequality between creative professionals and creative core that will occur in the future and indicating the relationship between the transition of this inequality and the industrial structure change may help to solve the problem of inequality. Based on the above discussion and Chapter 2, if the new structure change occurs after the service-knowledge structure change is completed in the future, governments especially in developed countries should survey and grasp the implications of the new change. Governments should formulate their economic growth strategies after understanding the current stage of economic development and its position. Needless to say, if the region is still in the previous economic development stage, the government should develop a strategy according to that stage.

After emphasizing economic growth and securing sufficient wealth in this way, the government should distribute regional wealth in an appropriate manner. According to Chapter 3, not only economic and social welfare policies but government ideology and attitudes toward income distribution are also important when redistributing wealth. Therefore, the government should place politicians and bureaucrats who value efficiency at the center when economic growth needs to be emphasized, and politicians and

bureaucrats who emphasize fairness at the center when redistribution needs to be emphasized. Moreover, in countries where a fair electoral system is secured, residents should vote after understanding not only the policies of each political party and candidate, but their ideologies and attitudes toward income distribution. Regarding the method of redistribution, we suggest that redistribution is carried out by aggressive fiscal policy beyond “Abenomics” after achieving economic growth through monetary easing based on “Abenomics.”

According to Chapter 4, it is desirable to regard cultural attributes rather than sticking to distinctions of appearance represented by skin color when selecting the target and degree of income redistribution. Moreover, attributes such as religion that are not directly related to appearance should also be considered. Furthermore, governments in many countries would need to realize equal opportunity in education. Discrimination against different attributes is a fundamental problem and takes a very long time to resolve, but excessive affirmative action policies can lead to discrimination against majority. Therefore, the government should frequently research income and assets when implementing redistribution policies. Specifically, policies such as preferentially distributing public works projects to low-income ethnic groups could be considered.

The following describes the characteristics of this study and where it differs from previous studies. Chapter 2 shows that the industrial structure that forms the cause of economic growth and income inequality has changed and is affecting the degree of inequality in developed countries, and also identifies the era in which each structure change actually occurred in units of decades, and confirms the transition of each structure change. Moreover, the ongoing service-knowledge structure change is consistent with Kuznets’ inverted U-curve, indicating that the Kuznets hypothesis is not a thing of the past.

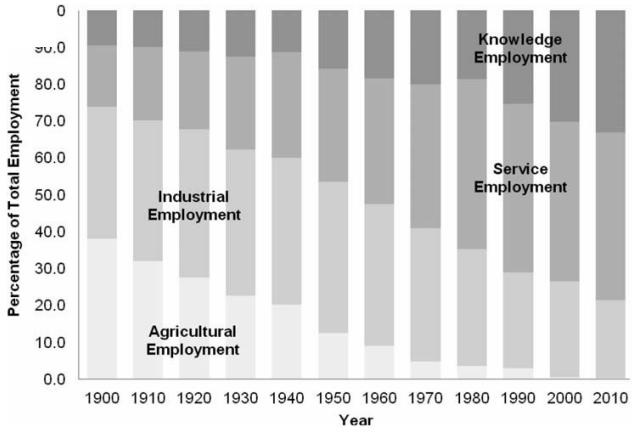
Chapter 3 analyzes the impact of successive governments' policies and ideologies on income inequality in order to consider concrete income redistribution policies. In governments where the SDPJ and the DPJ, whose ideologies are dovish, participated in the ruling party, we found that public works projects were significantly reduced and inequality increased despite the great recession. Although the DPJ government has reduced the Gini coefficient during its term due to its attitude toward other policies and inequality, this result means that the SDPJ and the DPJ complied with the primary balance and so increased the inequality through fiscal equilibrium.

Chapter 4 analyzes the impact of heterogeneity of each attribute on income inequality in order to identify specific targets for income redistribution. As a result, both

racial fractionalization and polarization are significantly reducing the inequality. This result would mean that many governments are caught up with the biological attributes of race when implementing policies to reduce inequality. Negation of the Kuznets hypothesis, emphasis on primary balance, and affirmative action based on appearance distinctions are all discussions or policies in line with the social trends of the time. Therefore, it should be noted that social trend-agnostic discussions and appropriate policy implementation may reduce inequality, reduce people's intrinsic dissatisfaction, and improve socioeconomic status.

Appendices

Appendix A. Employment Transitions in the United States.



Sources: Kwon (2016).

Appendix B. Panel Unit Root Test on Level Data for the Analysis of Chapter 2.

		N	Time Trend		No Time Trend	
			Statistics	*p*-value	Statistics	*p*-value
P90P100	Fisher-ADF	434	63.0864	0.0002	63.0167	0.0002
	IPS	434	-2.9439	0.0016	-3.1570	0.0008

Notes: Null hypothesis: The panel contains a unit root.

IPS: Im et al. (2003) test.

Fisher-ADF: Fisher type ADF (Maddala and Wu 1999; Choi 2001) test.

Appendix C. Variable Definitions and Sources Related to the Analysis of Chapter 2.

Variables	Definitions	Data Sources
Dependent Variable		
P90P100	Income ratio of the richest 10 percent of each country. We use disposable income when measuring this variable.	Alvaredo et al. (2016)
Independent Variables		
The Great U-Turn		
IMPORTGDP	The total value of imports as a proportion of GDP (% of GDP).	OECD (2018)
UNIONDENSITY	A percentage of individuals with union membership. In other words, the union membership rate divided by the total number of workers.	OECD (2018)
FEMALELABOR	A percentage of the working-age women (ages 15-64) that is economically active: all women who supply labor for the production of goods and services during a specified period. It is calculated as the female labor force divided by the total working-age women population.	OECD (2018)
2NDSCHOOLENROLL	A percentage of total enrollment (secondary school) to the total population of the age group that officially corresponds to the level of secondary education in each country. However, it may exceed 100% depending on the skipping class and repetition.	World Bank (2020)
Industrial Structure Changes		
INDAGRI	The absolute difference between the ratios of the primary and secondary sector workers. The primary and the secondary sector are defined as follows according to the ISIC classification. The primary sector is defined agriculture, forestry and fishing (equivalent to section A in ISIC Rev.3.1 and Rev.4). The secondary sector is defined mining, manufacturing, electricity, gas, water supply and construction (equivalent to section B-F in ISIC Rev.3.1 and Rev.4).	ILO (2018)
SERIND	The absolute difference between the ratios of the secondary sector and service sector workers. Service sector is defined trade, transportation, accommodation and food, and business and administrative services (equivalent to section G-K in ISIC Rev.3.1 and G-N in ISIC Rev.4).	ILO (2018)
KNOWSER	The absolute difference between the ratios of the service sector and knowledge sector workers. Knowledge sector is defined public administration, community, social and other services and activities (equivalent to section L-Q in ISIC Rev.3.1 and O-U in ISIC Rev.4).	ILO (2018)

Appendix D. List of Japanese Cabinets and Cabinet (Ruling Party) Dummies Related to the Analysis of Chapter 3.

Cabinet	In office	Party of the Prime Minister	Cabinet Dummy	Ruling Party Dummy	Remarks
Ichiro Hatoyama	Dec.1954–Dec.1956	JDP (Japan Democratic Party) →LDP			The LDP was formed in Nov 1955. The LDP has maintained its ruling party status for most of the time.
Tanzan Ishibashi	Dec.1956–Feb.1957	LDP			
Nobusuke Kishi	Feb.1957–Jul. 1960	LDP	*d_Kishi*		
Hayato Ikeda	Jul.1960–Nov. 1964	LDP	*d_Ikeda*		
Eisaku Sato	Nov.1964–Jul. 1972	LDP	*d_Sato*		
Kakuei Tanaka	Jul.1972–Dec. 1974	LDP	*d_Tanaka*		
Takeo Miki	Dec.1974–Dec.1976	LDP	*d_Miki*		
Takeo Fukuda	Dec.1976–Dec.1978	LDP			
Masayoshi Ohira	Dec.1978–Jun. 1980	LDP			
Zenko Suzuki	Jul.1980–Nov. 1982	LDP	*d_Suzuki*		
Yasuhiro Nakasone	Nov.1982-Nov.1987	LDP	*d_Nakasone*		
Noboru Takeshita	Nov. 1987–Jun. 1989	LDP	*d_Takeshita*		
Sosuke Uno	Jun. 1989–Aug. 1989	LDP			
Toshiki Kaifu	Aug.1989–Nov. 1991	LDP	*d_Kaifu*		
Kiichi Miyazawa	Nov.1991–Aug. 1993	LDP			
Morihiro Hosokawa	Aug.1993–Apr. 1994	JNP (Japan New Party)			An eight-party coalition government was formed. The LDP lost its ruling party status for the first time.
Tsutomu Hata	Apr.1994–Jun. 1994	JRP (Japan Renewal Party)			
Tomiichi Murayama	Jun. 1994–Jan. 1996	SDPJ		*d_LDPSDPJ*	The coalition government of the LDP, the SDPJ and the NPS was launched.
Ryutaro Hashimoto	Jan. 1996–Jul. 1998	LDP	*d_Hashimoto*	*d_LDPSDPJ* (–May.1998)	The SDPJ and the NPS left the ruling party in May 1998.
Keizo Obuchi	Jul. 1998–Apr. 2000	LDP		*d_NKP* (Nov.1999 –)	NKP joined the ruling party in Oct 1999.
Yoshiro Mori	Apr. 2000–Apr. 2001	LDP		*d_NKP*	
Junichiro Koizumi	Apr. 2001–Sep. 2006	LDP	*d_Koizumi*	*d_NKP*	
Shinzo Abe	Sep. 2006–Sep. 2007	LDP		*d_NKP*	
Yasuo Fukuda	Sep. 2007–Sep. 2008	LDP		*d_NKP*	
Taro Aso	Sep. 2008–Sep. 2009	LDP		*d_NKP*	
Yukio Hatoyama	Sep. 2009–Jun. 2010	DPJ		*d_DPJ*	The DPJ defeated the LDP in the general election.
Naoto Kan	Jun. 2010–Sep. 2011	DPJ		*d_DPJ*	
Yoshihiko Noda	Sep. 2011–Dec. 2012	DPJ		*d_DPJ*	
Shinzo Abe	Dec. 2012–Sep. 2020	LDP	*d_Abe2*	*d_NKP*	The LDP defeated the DPJ in the general election.
Yoshihide Suga	Sep. 2020–Oct. 2021	LDP			
Fumio Kishida	Oct. 2021–	LDP			

Notes: 1. The correspondence between the names of political parties and abbreviations is as follows. LDP: Liberal Democratic Party; SDPJ: Social Democratic Party of Japan; NPS: New Party Sakigake; NKP: New Komeito; DPJ: Democratic Party of Japan.

2. The Suga and Kishida Cabinets are coalition governments of the LDP and the NKP, but since this study uses data before September 2017, it is not subject to the NKP dummy.

Appendix E. Unit Root Test and Johansen's Co-integration Test Related to the Analysis of Chapter 3.

Unit root Test

Variables		Level				First Difference			
		Time Trend		No Time Trend		Time Trend		No Time Trend	
		Statistics	*p*-value	Statistics	*p*-value	Statistics	*p*-value	Statistics	*p*-value
GINID	ADF	-1.817	0.6963	-3.899	0.0020	-3.120	0.0285	-3.572	0.0063
	PP	-1.580	0.8000	-2.314	0.1674	-4.975	0.0002	-4.908	0.0000
PUBLICGDP	ADF	-1.615	0.7863	-1.198	0.6742	-18.719	0.0000	-18.684	0.0000
	PP	-2.198	0.4912	-1.896	0.3342	-19.237	0.0000	-19.217	0.0000
INTERESTRATE	ADF	-2.228	0.4742	-0.968	0.7649	-24.048	0.0000	-24.064	0.0000
	PP	-2.999	0.1324	-1.290	0.6336	-24.958	0.0000	-24.972	0.0000
TARIFFRATIO	ADF	-4.497	0.0015	0.442	0.9830	-6.331	0.0000	-6.287	0.0000
	PP	-3.049	0.1189	-0.462	0.8993	-6.406	0.0000	-6.349	0.0000
DIRECTTAXP80P100	ADF	-3.060	0.1128	1.928	0.8986	-3.481	0.0415	-3.447	0.0000
	PP	-3.572	0.0323	0.309	0.9777	-4.785	0.0005	-4.712	0.0001
PEDUCPI	ADF	0.820	1.0000	-2.942	0.0407	-17.820	0.0000	-17.472	0.0000
	PP	0.181	0.9957	-2.238	0.1928	-17.929	0.0000	-17.670	0.0000

Johansen's Co-integration Test

Trace Test					Maximum Eigenvalue Test				
Null Hypothesis	Alternative Hypothesis	Trace Statistics	5% Critical Value	1% Critical Value	Null Hypothesis	Alternative Hypothesis	Max Statistics	5% Critical Value	1% Critical Value
r=0	r≥1	206.8656	192.89	204.95	r=0	r=1	68.0154	57.12	62.8
r≤1	r≥2	138.8501	156	168.36	r=1	r=2	39.6348	51.42	57.69
r≤2	r≥3	99.2153	124.24	133.57	r=2	r=3	31.1558	45.28	51.57

Notes: 1. Null hypothesis of unit root test: The time-series data contain a unit root.
ADF: Augment Dickey-Fuller (Dickey and Fuller, 1979; Said and Dickey, 1984) test. PP: Phillips and Perron (1988) test.

2. This study is used the trace test and the maximum eigenvalue test which is based on Johansen (1988). In this table, "r" refers to the number of co-integration vectors in the model.

Appendix F. The Effects of Racial, and Religious Heterogeneity on Inequality in the World (Analysis Related to Chapter 4).

Hausman	FEM	FEM
Independent Variables	(1)	(2)
MIGRATION	-0.0018	-0.0028**
	[-1.33]	[-2.18]
TAX	-0.0015	0.0037**
	[-1.32]	[2.36]
LIEC	-0.0203	-0.0087***
	[-1.30]	[-3.13]
RACEFRAC	-0.2259*	-0.0308
	[-1.91]	[-0.79]
RELIFRAC	0.8263**	0.6254**
	[2.65]	[2.44]
Constant	-0.3567	-0.0023
	[-0.84]	[-0.01]
N	121	116
R-squared	0.5042	0.5345
Adjusted R-squared	0.4280	0.4592
BIC	-720.2880	-628.5520
VIF	2.43	2.45

Notes. 1. An example of how to read the table is presented in Table 4.1.

2. Models (1) and (2) of this table correspond to the sample sizes in Tables 4.1 (3) and (4), respectively.

3. In all models in this table, we use religion variables (*Protestant, Catholic, Orthodox, Sunni, Shia, Buddhistmahaya, Buddhisttheravadins, Hindu*) as control variables and period dummies (*d_2000*, *d_2005, d_2010, d_2015*).

Appendix G. The Effects of Racial, and Religious (Denomination) Heterogeneity on Inequality in the World (Analysis Related to Chapter 4).

Hausman	FEM	FEM
Independent Variables	(1)	(2)
MIGRATION	0.0002	0.0002
	[0.18]	[0.21]
TAX	-0.0011	-0.0011
	[-0.94]	[-0.92]
LIEC	-0.0072**	-0.0072**
	[-2.61]	[-2.60]
RACEFRAC	-0.1222*	
	[-1.90]	
RACEPOLA		-0.0567*
		[-1.81]
RELIFRACSECT	0.0691	
	[0.54]	
RELIPOLASECT		0.0158
		[0.22]
Constant	0.3481**	0.3855**
	[1.99]	[2.46]
N	293	293
R-squared	0.1730	0.1683
Adjusted R-squared	0.1251	0.1201
BIC	-1416.5230	-1414.8460
VIF	1.96	1.86

Notes. 1. An example of how to read the table is presented in Table 4.1.

2. In this table, we use types of religious diversity by denomination (*RELIFRACSECT*, *RELIPOLASECT*) as independent variables.

3. In all models in this table, we use religion variables (*Protestant*, *Catholic*, *Orthodox*, *Sunni*, *Shia*, *Buddhistmahaya*, *Buddhisttheravadins*, *Hindu*) as control variables and period dummies (*d_2000*, *d_2005*, *d_2010*, *d_2015*).

Appendix H. Robustness Checks for the Analysis of Chapter 4.

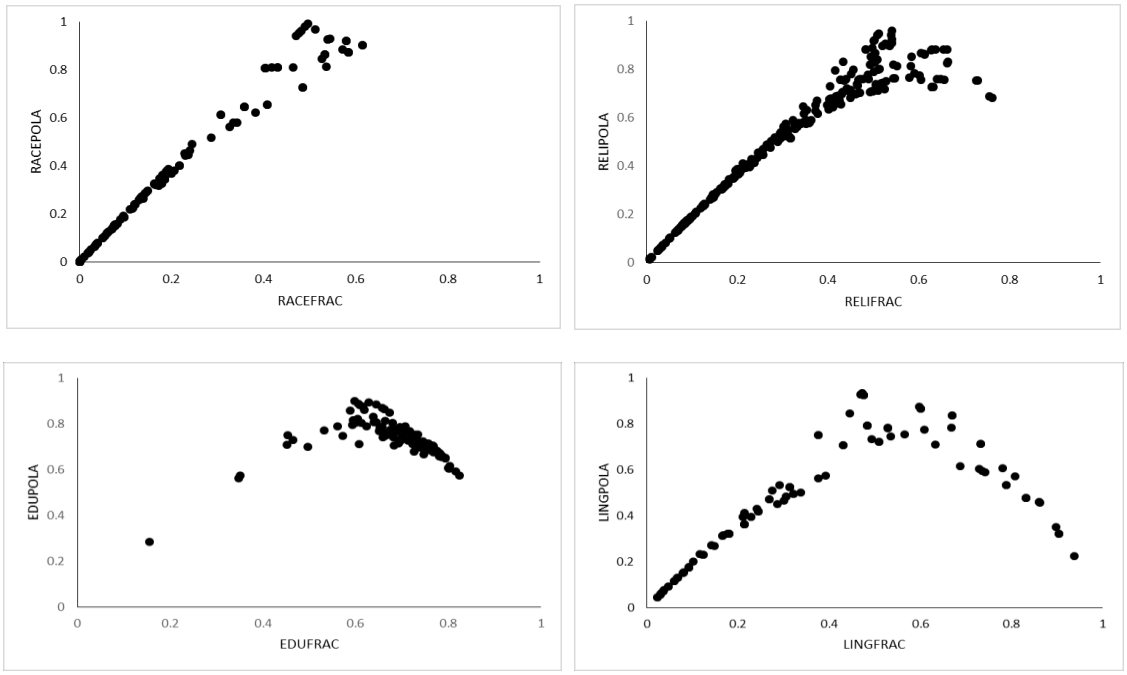
Hausman Independent Variables	FEM (1)	FEM (2)	FEM (3)	FEM (4)	FEM (5)	FEM (6)	FEM (7)	FEM (8)
MIGRATION	0.0004	0.0005	-0.0023	-0.0025*	0.0002	0.0002	-0.0030	-0.0011
	[0.47]	[0.55]	[-1.47]	[-1.89]	[0.19]	[0.23]	[-1.35]	[-0.74]
TAX	-0.0003	-0.0003	-0.0015*	0.0064***				
	[-0.24]	[-0.25]	[-1.77]	[3.83]				
GOVEX					0.0022	-0.0037	-0.0553	-0.0248
					[0.09]	[-0.15]	[-0.87]	[-0.94]
LIEC	-0.0085***	-0.0083***	-0.0071	-0.0114***	-0.0081**	-0.0081**	-0.0172	-0.0096**
	[-2.79]	[-2.73]	[-0.45]	[-4.30]	[-2.53]	[-2.58]	[-0.70]	[-2.44]
RACEFRAC	-0.4751***		-0.1616	-0.3014	-0.4905***		-0.0678	-0.3101
	[-3.82]		[-0.82]	[-1.49]	[-4.61]		[-0.29]	[-1.51]
RACEPOLA		-0.2458***				-0.2817***		
		[-2.91]				[-4.07]		
RELIFRAC	0.4939***		1.0124***	0.2675	0.4993***		0.8628***	0.3314*
	[3.05]		[4.05]	[1.35]	[2.63]		[3.18]	[1.96]
RELIPOLA		0.1825**				0.1773*		
		[2.33]				[1.95]		
EDUFRAC			-0.3047***				-0.3226***	
			[-2.91]				[-3.50]	
EDUPOLA			-0.1480*				-0.1907*	
			[-1.70]				[-1.67]	
LINGFRAC				-0.0501***				-0.0368*
				[-3.17]				[-1.76]
LINGPOLA				0.0454*				0.0311
				[1.71]				[1.16]
Constant	0.0943	0.3112	-0.2153	0.5249**	0.0914	0.3351	-0.3809	0.5168***
	[0.39]	[1.26]	[-0.45]	[2.52]	[0.34]	[1.37]	[-0.85]	[2.81]
N	293	293	121	116	283	283	118	115
R-squared	0.2766	0.2483	0.6467	0.7382	0.2775	0.2532	0.6403	0.6333
Adjusted R-squared	0.2176	0.1871	0.5584	0.6691	0.2163	0.1900	0.5475	0.5355
BIC	-1421.6350	-1410.4170	-722.9196	-662.0303	-1374.9760	-1365.6360	-699.4745	-615.8388
VIF	3.44	3.61	3.35	4.47	3.39	3.55	3.86	4.19

Notes. 1. An example of how to read the table is presented in Table 4.1.

2. In this table, in order to check the robustness of results in Table 4.1, some variables different from those in Table 4.1 were used for confirmation.

3. In all models in this table, we use religion variables (*Protestant*, *Catholic*, *Orthodox*, *Sunni*, *Shia*, *Buddhistmahaya*, *Buddhisttheravadins*, *Hindu*), and race variables (*Eastasiapacific, Latinamerican, European, Middleeastnorthafrica, Southasian, African*) as control variables and period dummies (*d_2000*, *d_2005*, *d_2010*, *d_2015*).

Appendix I. Relationship between Fractionalization and Polarization.



Appendix J. Data Resources Related to the Analysis of Chapter 4.

Dependent Variable

1. *GINI*

The World Bank, "World Bank Open Data", 2020.

https://data.worldbank.org/indicator/SI.POV.GINI (accessed 20 September 2020).

Independent Variables

1. *MIGRATION*

The World Bank, "World Bank Open Data", 2020.

・*POP*: Population (total)

https://data.worldbank.org/indicator/SP.POP.TOTL (accessed 20 September 2020).

2. *TAX*

The World Bank, "World Bank Open Data", 2020.

https://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS (accessed 20 September 2020).

3. *GOVEX*

The World Bank, "World Bank Open Data", 2021.

https://data.worldbank.org/indicator/NE.CON.GOVT.ZS (accessed 25 May 2021).

4. *LIEC*

The World Bank, "Database of Political Institutions", 2020.

https://datacatalog.worldbank.org/dataset/wps2283-database-political-institutions (accessed 20 September 2020).

5. *RACEFRAC*, *RACEPOLA*, race variables (*Eastasiapacific, Latinamerican, European, Middleeastnorthafrica, Southasian, African*)

・The proportion of people affiliated to each race in the total population in each country

Central Intelligence Agency, "The World Factbook", 2020.

https://www.cia.gov/library/publications/the-world-factbook/fields/400.html (accessed 21 September 2020).

6. *RELIFRAC*, *RELIPOLA, RELIFRACSECT, RELIPOLASECT* ,religion variables (*Protestant, Catholic, Orthodox, Sunni, Shia, Buddhistmahaya, Buddhisttheravadins, Hindu*)

Johnson,T. M., and B. J. Grim, "World Religion Database", 2021 (accessed 18 June 2021).

7. *EDUFRAC*, *EDUPOLA*

The World Bank, "World Bank Open Data", 2021.

・Educational attainment, at least completed primary, population 25+ years, total (%) (cumulative)

https://data.worldbank.org/indicator/SE.PRM.CUAT.ZS (accessed 25 June 2021).

・Educational attainment, at least completed lower secondary, population 25+, total (%) (cumulative)

https://data.worldbank.org/indicator/SE.SEC.CUAT.LO.ZS (accessed 25 June 2021).

・Educational attainment, at least completed upper secondary, population 25+, total (%) (cumulative)

https://data.worldbank.org/indicator/SE.SEC.CUAT.UP.ZS (accessed 25 June 2021).

・Educational attainment, at least completed post-secondary, population 25+, total (%) (cumulative)

https://data.worldbank.org/indicator/SE.SEC.CUAT.PO.ZS (accessed 25 June 2021).

・Educational attainment, at least completed short-cycle tertiary, population 25+, total (%) (cumulative)

https://data.worldbank.org/indicator/SE.TER.CUAT.ST.ZS (accessed 25 June 2021).

・Educational attainment, at least Bachelor's or equivalent, population 25+, total (%) (cumulative)

https://data.worldbank.org/indicator/SE.TER.CUAT.BA.ZS (accessed 25 June 2021).

8. *LINGFRAC*, *LINGPOLA*

United Nations, “UN Data”,2021.

・Population by language, sex and urban/rural residence

http://data.un.org/Data.aspx?d=POP&f=tableCode:27 (accessed 25 June 2021).

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