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How Does a Welfare State achieves Fiscal Sustainability? A Study of the Impact of Tax Equity¹

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Additional information is available at the end of the chapter

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Abstract

This study seeks to identify institutional characteristics of financially sustainable welfare states that focus on tax structure. Using data collected from 17 OECD countries from 1986 to 2013, this study investigates the characteristics of fiscal sustainability of each welfare state. The model of simultaneous equations (three-step least-squares method) is used for treating simultaneousness between fiscal sustainability and welfare expenditures. As a result, increasing the level of tax burden generally has a positive effect on the fiscal sustainability of the welfare state. However, the most important point that should be considered is the manner of raising tax revenue that affects the sustainability of economic, political, and social dimensions for securing fiscal sustainability. Specifically, it is necessary to raise the equity between the sources of taxation in accordance with the ability to pay principle. Improving vertical equity can also make a positive contribution to the fiscal sustainability in order to secure the political legitimacy of the tax and mitigate the regressive burden, which may result from the expansion of a consumption tax. Finally, it is beneficial to fiscal sustainability of the welfare state to diversify the financial base by combining the ability to pay principle and the benefit principle.

Keywords: fiscal sustainability, welfare state, taxation, tax equity, comparative studies

1. Introduction

This chapter begins with the question of the claim that all welfare states face financial difficulties. In other words, it stems from the question: “Are there no strategies to ensure the fiscal sustainability of the welfare state while maintaining the appropriate level of welfare spending?” Early neo-Marxists predicted that the fiscal crisis of the welfare state was unavoidable

¹This paper is adapted from the author’s doctoral dissertation (in Korean).

due to contradictions in the capitalist mode of production, which caused the conflict of accumulation and justification [1, 2]. Streeck [3] also recently argued that the 2008 global financial crisis was an inevitable consequence of an unstable combination of capitalism and democracy in capitalist countries. His argument is that the financial crisis is the result of the demolition of democratic capitalism because of capital beyond democratic control in the process of post-capitalist transition to neoliberalism in the development and reinterpretation of new Marxist claims in the present situation.

However, it is difficult to accept these claims when we remember that the recent financial crisis has not appeared in all advanced western welfare states. In particular, it is not easy to assert that the fiscal crisis of the welfare state is inevitable, considering that it is not found in the Nordic countries, which provide generous welfare benefits, but it is found in Southern Europe, where the level of welfare spending is low and the social security system is not sufficiently developed when compared to other western welfare states. Therefore, it is necessary to identify what kind of welfare state is fiscally sustainable, as well as the difference between fiscally sustainable countries and nonsustainable countries.

In fact, if the government has sufficient fiscal space and the state is able to cope with increasing debt without damaging fiscal sustainability [4] for welfare expenditures, the problem of fiscal sustainability will not rise seriously. The methods of securing financial resources include the expansion of taxes or nontax receipts, the reduction of public expenditures, the adjustment of expenditure priorities, and increase in expenditure efficiency, currency issuance, and foreign aid [5]. One of the key strategies that advanced welfare states can implement to mitigate financial tensions is to increase tax revenues or reduce welfare spending on major public expenditures. Often in high-income countries, cuts in spending are considered to be superior to revenue increases [6]. It is argued that adjustments through a reduction in public spending are less likely to lead to a recession than tax expansion and may also have a positive impact on growth. According to this assertion, the best way to ensure the fiscal sustainability of a welfare state is to reduce welfare expenditures.

Although, reducing welfare spending is not the only answer to the financial crisis facing the welfare state, because cutting public spending is not always possible and feasible. Alesiana and Giavazzi [6] point out that public spending reduction strategies that are accompanied by appropriate monetary policy play an important role in sound financing, but this is not always possible. As noted, EU countries have limited monetary policies at a single national level [7]. In addition, the sudden reduction of welfare benefits often leads to opposition from the people in the form of restrictions to the government's response to the need for welfare due to new social risks, as well as political resistance from citizens who enjoyed existing welfare benefits [8, 9]. Of course, spending rebalancing and rationalization can be a useful means of securing financial resources within a given budget in the short term. However, as time goes by, marginal returns of spending rebalancing and rationalization are inevitably reduced, and as a result, these are not a fundamental alternative [5].

Therefore, we should focus on resource mobilization in order to secure predictable and sustainable financing [5]. This study focuses on the tax system, which is the main resource for advanced welfare countries among various resource mobilization methods. First, taxation plays an important role in ensuring national policy capacity [10]. It can also lead or inhibit capital accumulation,

which is the tax base of welfare states, by changing individual and corporate investments, savings, and work behaviors [11]. In addition, since taxation acts as a key factor that regulates the members of the political community and forms a reciprocal obligatory relationship between them, how taxation is formed is closely related to political and social sustainability [12].

In Section 2, which follows, existing research on the determinants of the fiscal sustainability of the welfare state is examined in order to discuss limitations of this research and explain the approach of this study, which strives to address the limitations of existing research. Section 3 identifies the research methods adopted in this study. Section 4 describes the results of the analysis, and Section 5 discusses the implications of this study.

2. Theoretical background

2.1. Existing research on determinants of fiscal sustainability

Research on the financial issues of the welfare state is a classic theme of the welfare state. This is divided into studies focusing on economic factors and studies focusing on institutional factors.

2.1.1. *Economic factors*

Macroeconomic factors related to the fiscal sustainability of the welfare state include economic growth rates and interest rates, the gap between economic growth rates and interest rates, economic openness and financial market accessibility, and inflation.

At first, the fiscal sustainability of the welfare state is related to the economic growth [13–16]. If the economy grows smoothly, the tax is easily collected. In particular, progressive tax can be applied at a higher rate depending on the increase in income, so that tax rate growth is higher than the economic growth rate. In addition, inflation that accompanies economic growth can lead to a substantial decline in debt value, because debt is a nominal asset, and its value is fixed and transferred to the future. In the low growth phase, however, tax revenue was limited, and real debt burdens were likely to increase. In addition, due to the decrease in income, the debt burden was sure to increase.

The effects of interest rates on national debt have also been important [13, 16]. In the context of the emphasis on interest rates, some studies have focused on the initial level of debt [17, 18]. This is because countries with high initial debt have high interest rates on national debt, and their fiscal capacity is sensitive to changes in interest rates [19]. Therefore, there is a greater risk that fiscal sustainability will be weaker than that found in countries with low debt level.

Meanwhile, some studies have demonstrated that primary balance is important [14, 20]. Sakuragawa and Karou [14] examined the phenomenon that the real interest rate on government bonds is low, while the national debt surge is comparable to the gross domestic product in developed countries as well as Japan by incorporating the concept of intermediation cost is explained. Specifically, government bonds are not very sensitive to interest rate changes because intermediation costs lower deposit interest rates and bond return replaces deposits. Therefore, they argued the interest rate was not the primary factor, but, rather, the level of the primary balance.

Some have paid attention to access to markets where the government can borrow money [21–24]. Drelichman and Voth [23] attempted to account for the fact that eighteenth-century England, whose financial position was worse than Spain's in the sixteenth century, did not face insolvency. Specifically, England was able to borrow at a lower rate of interest than the market interest rate through financial repression, so the cost of interest was low. Thus, the interest burden on repayment of government bonds could be significantly reduced. Moreover, with financial globalization, the government took notice not only of the domestic market, but also the foreign market. In particular, low-income countries with low financial capacity can reduce the burden of foreign debt by improving access to financial markets due to globalization [13, 22, 24], while developed countries do not have a statistically significant impact of the global capital market on fiscal sustainability [24].

In the past, inflation was the main variable of fiscal soundness [25]. Because the national debt is a nominal asset, a slight rise in prices alone can significantly lower the real value of government bonds. However, recently developed countries have guaranteed the independence of the Central Bank in order to prevent inflation risks arising from the arbitrary use of monetary policy. Thus, the importance of monetary policy and inflationary taxation on fiscal soundness has weakened [26]. Especially in the case of European Union countries, it is argued that monetary policy cannot be utilized in accordance with the reality of each country, and thus, it is further argued that there is a limit to the guarantee of financial stability [13, 26].

As confidence in monetary policy weakened following, the influence of fiscal policy began to be emphasized [26]. The most important variable is the aging population. Aging of the population leads to a reduction in the number of workers who can contribute to public finance, an increase in the burden of care, and an increase in welfare spending for the elderly. This may in turn increase the financial burden of the government and undermine financial stability. However, government spending does positively affect the sustainability of national debt, depending on the sector or the form of expenditures [20, 27]. In terms of financial revenues, Kaplanoglou and Rapanos [27] demonstrate that increasing the progressive tax burden may contribute to fiscal sustainability.

2.1.2. Institutional factors

Institutional factors identified in the empirical study are divided into two areas: political systems and financial systems. The former is a form of political decision-making [28], such as the electoral system or the political decision-making, and the latter implies a condition that restricts the adoption of fiscal policy [28].

The influence of elections has been considered important in relation to political institutions [29–35]. Theoretically, as politicians have incentive to increase the likelihood their reelection by using more public spending and debt accumulation. In addition, this may cause financial instability when financial status is arbitrarily adjusted in a strategic act to hinder the ability of the next elected candidate to enact policy. The empirical research also examines the relationship between political change and national debt accumulation, but the results are not constant [36, 37]. Some authors point out that these inconstant results are related to the lack of control over the nature of political systems in each country [38], because the structure of decision-making changes the incentives of politicians [39].

At first, decentralization has become a major concern in terms of the decision-making structure of fiscal policy. When there are a large number of participants in the decision-making process, each participant may represent only a narrow range of interest groups. Therefore, it may not be easy to reach consensus due to conflicting interests among participants. Indeed, if there is a structured coalition government or a strong bipartisan system, fiscal soundness is likely to be undermined [40]. In addition, there are slight differences in operational definitions, but generally, it is argued that the higher the number of expenditure departments or the larger the size of the Cabinet, the lower the financial performance [41–44]. In addition, there is a tendency for expansion of deficit and debt when there are a large number of effective political parties in the coalition or there is a small share of the ruling party in Parliament [43, 45].

The ideological composition of the Cabinet was also affected. The greater the proportion of politicians supporting a left-wing ideology in the Cabinet, the greater the likelihood that the state's fiscal soundness will deteriorate [43]. Traditionally, politicians who support a leftist ideology are relatively supportive of public spending, particularly welfare spending, and have a tolerance for fiscal deficit [46, 47]. However, it is difficult to say with certainty that finances are unstable in the tradition of a representative system. This is consistent with Schmidt [48], who contended that the political composition or ideological differences of a government should not only lead to differences in financial performance, but that the political and economic conditions of each country should also be taken into account. In countries where a social democratic ideology is dominant within the Cabinet, social security spending is generally high, but the level of welfare spending and debt accumulation in these countries has not been high since mid-1970s [48]. While the left wing is generally favorable to a high tax burden and increased public spending, it is also true that differences in the composition of financial and tax systems have played a more important role than ideology in actual history [10].

As mentioned above, the influence of political formulations is limited, and studies focusing on financial systems have recently expanded. Since 1970s, OECD countries have pursued a series of reforms to effectively manage government spending growth and overcome fiscal deficits [49, 50]. In addition, it is necessary to establish a budget system for total budget allocations. In recent empirical studies, the introduction of a top-down budgeting system has had a positive effect on fiscal soundness [27]. In addition, the introduction of explicit fiscal rules has proved effective [51].

The introduction of a fiscal system that controls public expenditures and revenue levels is effective in promoting fiscal soundness, but caution is needed in interpreting it. First, the effectiveness of the fiscal system affects final fiscal performance in combination with the attributes of the political system in each country [52]. Indeed, Hallerberg et al. [32, 33] formulate a centralization index and a rule index for the political system and fiscal policy decision structures to determine their impact on the rate of change in national debt. According to their results, strong fiscal rules in a representative council system and a concentration of decision-making power over fiscal policy decisions in a majoritarian system or among mixed-government countries have a statistically significant effect on reducing the national debt ratio.

2.2. Limitations of existing studies and approaches of this study

There are two limitations in the existing research in identifying the determinants of fiscal sustainability of the welfare state. These are further divided into two dimensions: the measurement of dependent variables and the composition of independent variables.

2.2.1. Measuring the fiscal sustainability of the welfare state

In the previous study, the fiscal sustainability of the welfare state has been replaced by the level of the primary balance or the national debt level. However, the financial condition of the state cannot be exclusively evaluated using either values, because it means that even if deficit occurs, state can recover fiscal balance without default [53–55]. Moreover, the financial problems of the welfare state are not problems that can be solved through the technicalities that control the level of public expenditures or tax revenues. This is, in the end, a matter of politics [8]. Therefore, in order to gain a comprehensive understanding of fiscal sustainability, it should be conceptualized and measured in accordance with the economic structure and institutional capacity of the state.

Related to this, the research of Ostry et al. [56] and Ghosh et al. [57] is useful. Their research reflects the context in which public finance is embedded [58]. Changes in financial conditions do not always cause financial crises in the welfare state. We must consider the political, economic, and social contexts that might lead to a financial crisis.² They define the fiscal space as the gap between the debt limit and current debt level implied by the country's historical fiscal adjustment for understanding fiscal sustainability like **Figure 1** [56, 57].

First, the solid line represents the behavior of the primary balance as a function of debt. It reflects the nonlinear relationship between the primary balance and the public debt. Specifically, the primary balance shows little response to rising debt at very low levels of debt. Fiscal policy makers do react to changes in the level of public debt unless the public debt is fairly high [59], so the increase in the primary balance appears negligible. However,

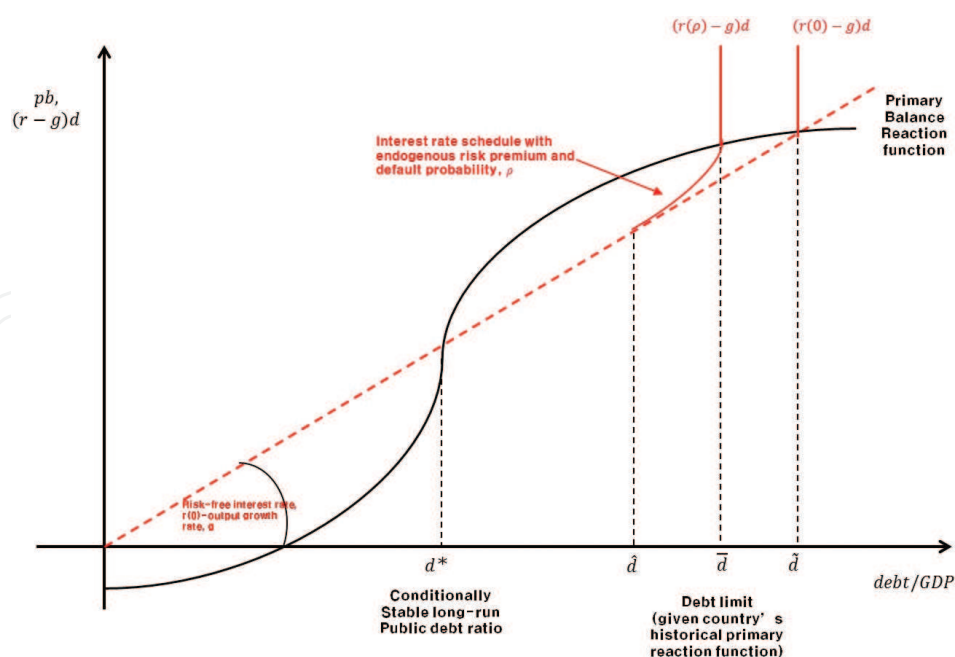


Figure 1. Determination of debt limit from Ostry et al. [56]: 8; Ghosh et al. [57]: F11.

²The Bohn test, which draws implications from the manner in which fiscal policy has responded to increases in public debt, is also considered the context-embedded public finance, and it has two limitations [56]. That does not address the nonlinear relationships between primary balance and public debt and does not consider endogenous relationship between interest rates and public debt.

excessively high levels of debt may make it difficult to offset debt accumulation, because the marginal response of the primary balance to public debt is lower [60] and adjustment effort peters out as tax increases or spending cuts become politically infeasible [61].

Next, the dashed line shows the effective interest rate schedule, given the interest rate-GDP growth rate differential multiplied by the debt ratio. At low levels of debt, the interest rate is the risk-free rate, by assuming that output growth is independent of the public debt or the interest rate, so this schedule is simply a straight line with a slope determined by the risk-free interest rate-growth rate differential. When there is an unexpected economic shock, there is a stronger likelihood that public debt will accumulate, which means the debt reaches the debt limit, the interest rate is rapidly increased because of risk premiums. In this case, creditors may be reluctant to buy public bonds because of concerns about the potential for the country to declare bankruptcy. To secure public finances, countries should be willing to raise the interest rate through the application of risk premiums because of the increased default risk. This is represented by the solid rising curve between \hat{d} and d^* .

Between these two lines, there are several intersections. The lower intersection (d^*) defines the conditional stable point. There is positive relationship between the primary balance and the public debt, so if a shock raises the debt level above this point, then the primary balance in subsequent periods will offset the higher interest payments and the debt ratio returns to its long-run average. However, the upper intersection (\hat{d}) cannot guarantee fiscal sustainability. If the debt exceeds this point, then it will rise forever, because the primary surplus will never be enough to offset the growing debt. This point represents the public debt limit, which is the critical point of debt led by the historical fiscal response without special action of the government [56]. If there is no fiscal space and a debt limit, current fiscal stance does not take the ability to afford the debt burden. That is, country is not always facing a fiscal crisis, but it is difficult to ensure the fiscal sustainability unless significant change of current fiscal stance [56].

At this point, in this study, I examine fiscal sustainability in the welfare state by calculating the fiscal space of the welfare state like Ostry et al. [56] and Ghosh et al. [57]. However, I have included some additional considerations for measuring fiscal sustainability in the welfare state. First, I select variables to estimate the fiscal reaction function based on theory and previous studies. I excluded some similar variables (openness, inflation, oil prices, and nonoil commodity prices) and replaced them with more appropriate variables to avoid multicollinearity problems. In addition, I include public welfare spending instead of total public expenditure in examining the fiscal sustainability of the welfare state. Second, the interest rate is estimated by the vector autoregressive (VAR 1) model based on Polito and Wickens [62, 63] to avoid the problems caused by arbitrary regulations as well as to reflect the endogenous relationship between debt and interest rate.

2.2.2. Determinants of fiscal sustainability of welfare states

Although the composition of the national finance has recently been pointed out as a determinant of fiscal sustainability [6, 27], empirical research has lacked reflection them. In the previous study, total public spending and total tax burden level were mostly considered, focusing on identifying whether spending cutoff strategies and tax expansion strategies are more effective to ensure fiscal sustainability [56, 64]. It is true that those were difficult to suggest specific policy measures to enhance the fiscal sustainability of the welfare state. Related to this, this study focuses on tax structure as a determinant of fiscal sustainability of welfare state.

Basically, tax is a representative resource mobilization tool of the advanced welfare state. Therefore, the level of tax burden in terms of public revenue should be discussed in relation to the fiscal sustainability of the welfare state. In order to cover welfare expenditures, a certain level of tax burden must be guaranteed, but if the tax burden is too high, it is not easy to increase the burden level [19, 65]. There are many reasons for the increase in incentives for tax avoidance and tax evasion. On the other hand, too low level of tax burden can also negatively impact fiscal sustainability. This is because there is a high possibility that sufficient financial resources are not available for public expenditure.

In addition, the structural characteristics of tax, especially tax equity, should be considered as the main factors. Because taxation inevitably violates the private ownership of a member, a lack of reasonable grounds for who owes taxes can lead to tax resistance and promote social conflict and division. Therefore, taxes must be imposed on the basis of justifiable grounds to secure political support for welfare states [12]. Indeed, the views on the taxation of the public are determined not by the level of burden but by the fairness of burden [27, 66]. The fairness of taxation can be defined as the principle of the ability to pay and the benefit principle. The former is the view that members of society are obliged to pay taxes regardless of the benefits they receive from the state as a member of the state. Accordingly, it is fair and desirable to pay taxes according to the ability to pay or to charge. On the other hand, the principle of benefit attaches importance to the exchange of benefits from tax and public goods, with the view that the taxpayer will pay the benefits of the provision of national services. In other words, it is fair to pay fair compensation for benefits.

Tax on the basis of each principle can have a different impact on the fiscal sustainability of a welfare state. First, in relation to the principle of ability to pay, direct taxation with a high tax rate can have a negative impact on economic growth by lowering incentives for labor and high tax evasion in the high-income class. On the basis of this, the enhancement of tax progressivity may hinder the fiscal sustainability of the welfare state. However, it is also true that people are not always opposed to high-level taxation [67]. In addition, the Progressive Tax System can be designed to lower income inequality by designing the higher income group to pay a higher tax burden than the low-income group, thus contributing to social sustainability by preventing conflicts between taxpayers and beneficiaries due to worsening income distribution.

Meanwhile, the horizontal equity, one part of ability to pay, is also considered. Related to this, the possibility of taxation of capital and property is lowered due to the intensification of tax competition caused by globalization [68], and advanced welfare countries have shown a tendency to rely on a consumption tax rather than an income tax. Unlike in the past, the gap between the labor and the capital is significantly increasing, while the gap between the labor and the consumption is significantly decreasing. Recalling that vertical equity and horizontal equity are inseparable, and that inequity on one side is not offset by the achievement of equity through other principles [69], the inhibition of confidence that the tax burden is fairly distributed can make it difficult and may not only lead to a lack of financial resources to support the welfare state, but also to difficulties in obtaining political support. Thus, the widening gap between tax sources have a negative effect on the fiscal sustainability of the welfare state as the level of equity is raised to the level of horizontal equity.

On the other hand, social security contributions and the contributions of the private sector are closely related to the principle of benefit. This is mainly used for specific social security

purposes so that it can maintain actuarial soundness and positively affect the fiscal sustainability of the welfare state. In addition, political support will likely be high because it pays for the benefits that will come in the future [70]. Particularly in the case of contributions by the private sector, the loyalty of the contributors may be higher because it is more exclusive than the social security tax. However, this may lead to the undesirable exclusion of low-income people, which may hinder social and political sustainability. In this sense, it is possible that the social security system is limited to a small number of full-time workers and the corporation, so it leads to unfairness in the tax burden and severe tax resistance [71–73].

As mentioned above, each aspect of equity in the tax structure may have different impacts on the fiscal sustainability of the welfare state. In addition, the tax structure may change the impact of welfare expenditures on the fiscal sustainability of a welfare state. First, increasing welfare expenditures worsens the nation's financial condition. However, if the level of welfare spending is combined with a sufficient level of tax burden and a fair tax burden, then the negative impact of welfare expenditures may decrease [61, 74]. Thus, we must examine the moderating effects of tax structure on the impact of welfare expenditures and fiscal sustainability, as well as the direct effects of tax structure on fiscal sustainability.

3. Research method

3.1. Analysis target and timing

The analysis of national finances should incorporate careful selection of the analysis target because analysis results may be different depending on which country is analyzed. Because, there is a huge gap between the high- and low-income countries' socioeconomic development levels, especially in terms of the level of public expenditures, the taxation capacity, and the tax structure, so it is necessary to analyze the two groups separately. This chapter analyses the 17 OECD countries, and considering the possibility of data access and the analysis of OECD major countries is reasonable in order to draw implications in the establishment of a welfare state with a financial balance. Specifically, the analysis includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Next, this chapter analyzes the fiscal sustainability of welfare states over the course of 28 years, from 1986 to 2013, while the independent variables, including tax structure and welfare expenditures, are based on the period from 1985 to 2012, lagged term ($t - 1$), considering temporal precedence as a requirement for causality.³ Those OECD countries have undergone a series of welfare and tax reforms to alleviate the burden of national financing, having experienced severe economic downturns during the mid to late 1970s. Since the effects of reform are not immediately

³This is based on the fact that the expenditures for that year are carried out in accordance with the previous year's budget plan. The analysis is also conducted by adding value from 5 years prior to reflect the medium-term fiscal plan in high-income countries as a 5-year plan. In the determinants of fiscal sustainability of the welfare state, the correlation between welfare expenditures and fiscal capacity may not be reflected within a short time frame. In particular, the impact of fiscal capacity on welfare expenditures is likely to be seen in the medium term, because in high-income countries, the level of public expenditures is usually determined through the medium- and long-term financial management of the country.

apparent, but, rather, come after a certain period of time, this study has limited its analysis to late 1980s, specifically since 1986 (independent variables since 1985). In addition, until early 1990s, most advanced welfare states demonstrated a relatively moderate increase in national debt. However, since mid-1990s, sovereign debt has soared, and concerns about the national debt have become more widespread since the 2008 global financial crisis. Therefore, it is possible to derive timely policy implications for ensuring the fiscal sustainability of the welfare state by analyzing the period when the national debt had soared and a widespread financial crisis occurred.

3.2. Method of analysis

This study constructs simultaneous equations to control the inverse causal relationship between welfare expenditures and fiscal sustainability by examining the effects of tax structure on the fiscal sustainability of the welfare state. Existing studies have focused on the impact of fiscal spending on fiscal soundness [55, 64]. It is not only welfare expenditures that affect national finances, but also the government's fiscal capacity for welfare expenditures, which will be limited if finances are not sufficient in the long term. In other words, the financial condition of the state also affects welfare expenditures. If the effect of financial power on welfare expenditures is not reflected in the analytical model, there is a possibility that the estimation will be biased due to the endogeneity problem. In this study, the simultaneous equations model is set and analyzed. Thus, this study constructs a simultaneous equations model with two dependent variables. The first dependent variable is the fiscal sustainability of the welfare state and is measured by the fiscal space of each year on each welfare state. The second dependent variable is the level of public social welfare expenditures, which reflects public welfare efforts or the level of benefits enjoyed by the public.

Model estimations are adopted as a three-step least-squares method devised by Zellner and Theil [75]. This is a combination of the two-step least-squares method and the seemingly unrelated regression model, and all of the equations comprising the simultaneous equations are simultaneously estimated so that the correlation between the error terms of each equation is reflected in the analysis [75]. Using this method, we can derive the coincidental estimator from the simultaneous equations model and find a more efficient estimator than the one using the two-step least-squares method. Additional consideration utilizing national panel data is also considered for treating the endogeneity problem caused by non-modeled factors in the use of national panel data, which may lead to bias in statistical estimation. Specifically, a fixed-effects model with national dummy variables is constructed and analyzed in each equation of simultaneous equations. Additionally, the financial capacity of advanced welfare states has undergone structural changes since late 2000s [76], so the equations analyzed reflect the effect of timing changes, including year dummy (before 2008 and after then) variables.

3.3. Operational definition of variables

3.3.1. *Dependent variables*

The fiscal sustainability of the welfare state, the first dependent variable, is measured as fiscal space, which can be specified by the gap between current debt levels and debt limits according to Ostry et al.'s [56] and Ghosh et al.'s [57] method of calculating. Fiscal space is not merely a source of funds to meet the current welfare needs of the public. Rather, it plays

an important role in resource mobilization to cover future spending, as well as cushioning against unexpected risks [77, 78]. In other words, the issue of fiscal space is a question of whether countries can finance their obligations, including social security, without sacrificing economic growth and stability based on fiscal sustainability [5, 50]. Therefore, fiscal space can be a useful tool in examining the fiscal sustainability of the welfare state.

In order to derive the abovementioned fiscal space as shown in **Figure 1**, it is necessary to estimate the fiscal reaction function and select the appropriate gap between the interest rate and the growth rate [57]. This is because it is necessary to determine the debt limit of each country on the basis of the intersection of the estimated base on the fiscal reaction function and the interest repayment schedule. This study estimates the fiscal reaction function through pooled time series analysis and uses a vector autoregressive model for estimation to establish the gap between the appropriate interest rate and the growth rate. The description of variables used for estimating the fiscal reaction function is shown in **Table 1**.⁴

Next, one of the most important points to be considered in determining the national debt limit, along with the estimation of the fiscal reaction function, is how to define the long-term interest rate [56].⁵ This study estimates the interest rate through vector autoregulation (VAR), similar to the works of Polito and Wickens [62, 63]. This is because it not only avoids arbitrary problems, but also reflects the endogenous relationship between the interest rate and the national debt level (**Table 2**). In this study, the autoregressive model is used to model the endogenous relationship between the interest rate and the national debt, adding government revenue, government spending, debt, the economic growth rate, the inflation rate, and short- and long-term interest rates [62, 63]. The gap between these estimates and the average real growth rates of the countries from 1985 to 2013 are used to calculate the debt limit and determine fiscal space based on this. The contents and data sources of the variables used for estimating the fiscal reaction function are shown in **Table 3**.

The second dependent variable is public welfare expenditures. This is the level of public (general government) social welfare spending that reflects public welfare efforts or the level of benefits enjoyed by the public. Total public welfare expenditures divided by the gross domestic product is used to control differences in the welfare expenditure level according to the level of economic scale by country.

⁴The dependent variable is the primary balance, and the independent variables are the financial factors (national debt, public welfare expenditures, output gap, inflation rate), the economic structural factors (unemployment rate, service industry ratio, portion of involuntary part-time work, economic openness, aging rate, future old age portion), and political and financial institutional factors (election, change of ideology, mandatory political system, concentration index, fiscal rule index). In this study, it is based on the works of Ostry et al. [56] and Ghosh et al. [57], but some variables are excluded in consideration of multicollinearity.

⁵Ostry et al. [56] determined long-term interest rates in two ways. The first assumes that the observed interest rate itself reflects the perceived probability of bankruptcy of a country, so the current market rate is used as the long-term interest rate. In this case, it is possible to overestimate the maximum value of sustainable debt by overlooking the fact that the interest rate rises as the debt level approaches its limit, and the risk of bankruptcy increases. An alternative method of overcoming this limitation is to use the interest rate, which is calculated by taking into account the endogenous relationship between debt levels and interest rates. Specifically, they used the calculated interest rate, assuming a recovery rate of 90% when bankruptcy occurred. Alternative methods which they used help to accurately estimate fiscal space by reflecting endogenous relationships between interest rates and macroeconomic variables. However, the abovementioned study does not provide a clear basis for assumptions used in interest rate estimation. Therefore, it is not free of the problems caused by an arbitrary definition of the recovery rate [80]. In order to overcome these limitations, this study uses the estimates through VAR.

Categories		Definition	Sources
Dependent variable	Primary balance	Government net borrowing or net lending excluding interest payments on consolidated government liabilities/nominal GDP	OECD Economic Outlook OECD Social Expenditures database
Independent variables	Finance	Lagged debt	OECD Employment and Labor Market Statistics database
		Output gap	
		Welfare expenditures	
		Inflation	
	Economic structure	Unemployment	OECD Employment and Labor Market Statistics database
		Service industry	
		Part-time worker	
		Self-employed	
		Capital openness	Chinn-Ito index (KAOPEN) http://web.pdx.edu/~ito/Chinn-Ito_website.htm
		Age dependency	OECD Employment and Labor Market Statistics database
		Future dependency	
	Political and fiscal systems	Election	Comparative political dataset/IMF fiscal rules database
		Political stability	
		Majority system	
		Centralization	
		Fiscal rule	

Table 1. Variables for estimating the fiscal reaction function.

Categories			Mean	Standard deviation	Minimum	maximum
Dependent variable	Primary balance		0.249	3.693	-10.505	15.786
Independent variables	Finance	Lagged debt	71.681	28.763	16.079	166.190
		Output gap	-0.049	2.622	-13.851	9.579
		Welfare expenditures	22.763	4.857	10.565	35.517
	Economic structure	Inflation	2.935	2.755	-0.900	23.015
		Unemployment	7.636	3.940	0.457	24.885
		Service industry	2.679	0.793	1.232	5.384
		Part-time worker	3.071	1.649	0.295	9.714
		Self-employed	15.987	9.116	6.536	50.708
		Capital openness	1.929	0.908	-1.188	2.390
		Age dependency	15.466	2.015	10.255	21.080
		Future dependency	31.238	5.987	18.478	51.991
	Political and fiscal systems	Election	0.292	0.455	0.000	1.000
		Political stability	0.353	0.772	0.000	3.000
		Majority system	0.177	0.382	0.000	1.000
		Centralization	0.672	0.115	0.370	1.000
		Fiscal rule	0.419	0.172	0.242	0.908

Table 2. Descriptive statistics of variables for estimating fiscal reaction function.

3.3.2. Independent variables

Tax structure, a major independent variable, is divided between the ability to pay principle and the benefit principle. The former is divided into horizontal equity and vertical equity. In the following section, the operation of each principle is described in detail.

Variables	Definition	Sources
Public debt	General government public debt as a percentage of GDP	OECD Economic Outlook No. 97 (Edition 2015/1)
Government revenue	Total government revenue as a percentage of GDP	
Government expenditure	Total government expenditure as a percentage of GDP	
Output gap	Difference between actual GDP and potential GDP	
Inflation	The annual percentage change in the cost to the average consumer of acquiring a basket of goods and services	
Long-term interest rate	Interest rate of government bonds maturing in 10 years	
Short-term interest rate	Interest rate which is money market rate	

Note: Each variable in the estimated variables is included from $t-1$ to $t-n$. $t = 1, \dots, 27$.

Table 3. Variables for estimating long-term interest rate.

3.3.2.1. *Measurement of horizontal equity*

Horizontal equity identifies the tax rate gaps between labor and assets and labor and consumption, which are major tax sources because guaranteeing horizontal equity means that equity is ensured among the tax bases [69]. In particular, despite the weakening of the tax base, labor taxation is the most basic tax in all countries, so horizontal equity is defined based on the labor tax. Specifically, each tax rate on the labor, capital, and consumption of households is derived, and the tax rate differences between labor and capital taxation and labor and consumption tax are calculated based on the method proposed by Macdaniel [79].⁶ According to the study, the government's tax revenue is divided into labor tax, capital tax, private consumption tax, and private investment tax. Moreover, the average tax rate of each tax base is calculated by dividing each tax revenue from each source into the corresponding tax sources [79].

3.3.2.2. *Measurement of vertical equity*

Vertical equity, one aspect of the ability to pay principle, is measured by the relative ratio of the marginal tax rate among income groups. In the comparison of tax progressivity among countries, a structural approach has been utilized to compare statutory tax rates, as well as comparisons within specific income groups. In this study, the structural approach is used for cross-country comparisons, although it is recognized as a valid criticism that it is difficult to reflect differences in taxable income using this [84, 85]. This study reflects the differences between progressivity in the low-income class (67% of the average wage and the average wage) and progressivity in the high-income class (comparison between the average wage and the average wage of 167%) considering data accessibility. In addition, this study measures the actual burden level, excluding benefits by subtracting the transfer of cash so as to more accurately measure the progressivity. For the values which are calculated as mentioned above, the higher the value, the stronger the progressivity, and the lower the value, the more regressive it is. This approach has the advantage of reflecting the degree of progressivity. The marginal tax rate data among the income groups for estimates of progressivity were used by Nickell [86] and the OECD Taxing Wages Database. That database provides marginal tax rates for OECD countries between 1960 and 2004. On the basis of this, the OECD has calculated the marginal tax rates of each country since 2000, and this study combines both datasets.

3.3.2.3. *Measurement of the benefit principle*

The benefit principle is specified by the share of social security contributions in GDP [73]. The social security contribution is a welfare state resource that is provided through contributions made by both employers and employees. This is a fixed use, and it is based on a burden corresponding to the benefits, so it is related to the benefit principle [73]. In addition, the proportion of private contributions to welfare resources supplements the benefit principle.

⁶The reason for using this method is as follows. First, it uses only one dataset, OECD national accounts, so it resolves the problem of differences in reflection times in the figures according to the differences in accounting methods by using two datasets, OECD national accounts and revenue statistics, similar to the existing studies of Mendoza et al. [81] and Carey and Rabesona [82, 83]. Second, this method overcomes the overestimation of consumption tax, one of the limitations of existing methods caused when consumption and investment taxes are not separated. In this method, the consumption tax remains separate from taxation on investments so that it can be more accurately measured.

Categories		Variables	Definition	Sources
Equation. 1	Dependent variable	Fiscal sustainability	Fiscal space	OECD National account
	Independent variables	Welfare expenditures	Total public welfare expenditures/ nominal GDP	OECD Social Expenditure Statistics
		Tax burden	Total tax revenue/nominal GDP	OECD Tax Dataset
		Ability to pay principle	Horizontal equity	OECD National account
			Gap between effective tax rate on labor and capital	
		Vertical equity	Gap between effective tax rate on labor and consumption	OECD National account
			$((1 - \text{marginal tax rate of average wage } 67\%)/(1 - \text{marginal tax rate of average wage } 100\%)) - 1$	
			$((1 - \text{marginal tax rate of average wage } 100\%)/(1 - \text{marginal tax rate of average wage } 167\%)) - 1$	
		Benefit principle	Social security contribution/ nominal GDP	OECD Revenue Statistics: financing of social security benefits
			Mandatory private contribution/ total social security revenue	
Equation 2	Dependent variable	Welfare expenditures	Total public welfare expenditures/ nominal GDP	OECD Social Expenditure Dataset
	Independent variables	Fiscal sustainability	Fiscal space	OECD National account
		Generosity of public pension	Index of public pension considering the replacement rate, qualifications, scope or coverage, and waiting period	Scruggs et al. [88] CWED2
		Generosity of public unemployment insurance	Index of unemployment insurance considering the replacement rate, qualifications, scope or coverage, and waiting period	
		Generosity of sickness insurance	Index of sickness insurance considering the replacement rate, qualifications, scope or coverage, and waiting period	

Table 4. Variables for estimating determinants of fiscal sustainability of welfare state.

Private contributions are generally designed to benefit contributors and are not reflected in government finances, but they can have a positive impact on the maintenance of public welfare programs. Thus, this study uses the share of social security contributions and the share of private contributions as proxies of the benefit principle.

3.3.2.4. *Measurement of the generosity of the welfare system*

To identify the simultaneous equations model, the second equation, which has welfare expenditures as a dependent variable, requires additional exogenous variables, excluding the fiscal sustainability variable with endogeneity.⁷ In this study, it is possible to identify the model by introducing the generosity of the public pension, unemployment insurance, and disease insurance of the Comparative Welfare Entitlement Dataset 2 (CWED2). These variables are calculated by taking into account the replacement rate, qualifications, scope or coverage, and waiting period [87, 88] (Table 4).

4. Determinants of fiscal sustainability in welfare state

In the first equation, where fiscal space as the proxy of fiscal sustainability is a dependent variable, welfare expenditures have a negative impact on the fiscal sustainability of the welfare state at a statistically significant level. Moreover, although the magnitude of the negative impact of welfare spending in the lagged term is somewhat smaller, the increase in welfare spending in the medium term tends to lower fiscal space even further. On the other hand, the results of the second equation with welfare expenditures as a dependent variable demonstrate that welfare expenditures increase as the fiscal space increases at a statistically significant level in the medium-to-long term. This supports the argument that it is essential to secure fiscal space for the continuation of the welfare state in the long term [5].

If we look only at the results of the first equation, it may be argued that public welfare spending must be reduced, because welfare spending lowers the nation's fiscal space. However, considering the political resistance that may be caused by the reduction of welfare expenditures, it is necessary to examine how financial resources can positively influence fiscal sustainability. At first, increase of tax revenue may offset the negative impact of welfare expenditures on the fiscal sustainability of the welfare state as well as positively affect the fiscal sustainability of the welfare state (Table 5).

It is noted that the perception of tax burden is not absolutely influenced by the level of the burden, but, rather, it is influenced by equity [27, 66]. This study examines the level of tax burden and the taxation specified by the fairness principle and analyzes the effects of taxation on the fiscal sustainability of the welfare state. In addition, the impact of welfare expenditures on fiscal sustainability may change according to tax structure characteristics. Even if increases in welfare expenditures negatively affect national finances, the public may be willing to accept

⁷In the process of estimating the fiscal space of the welfare state not only are the demand factors reflected, which are likely to drive welfare expenditures. In this situation, if these variables included to estimate fiscal sustainability are used, there is the possibility that the endogeneity problem will occur. Therefore, it is necessary to include variables with high relevance to welfare expenditures while minimizing the problem of endogeneity.

Dependent variables	Independent variables	Model 1		Model 1	
		Coefficient	Standard error	Coefficient	Standard error
Fiscal sustainability Equation 1	Welfare expenditure ($t - 1$)	-4.32	0.35***	-3.74	0.34***
	Welfare expenditure ($t - 5$)			-1.79	0.39***
	Tax burden	1.01	0.50*	1.84	0.52***
	Gap between effective tax rate on labor and capital	1.64	2.23	-2.66	4.07
	Gap between effective tax rate on labor and consumption	-83.60	22.70***	-131.0	22.53***
	Progressivity (low income group)	-23.78	8.80**	-31.50	9.79**
	Progressivity (high income group)	4.37	7.72	-0.18	7.51
	Social security contribution	3.80	1.21**	4.75	1.17***
	Mandatory private contribution	0.97	0.22***	0.99	0.21***
	Welfare expenditures * tax burden			0.24	0.05***
	Welfare expenditures * gap between effective tax rate on labor and capital			-4.32	3.50
	Welfare expenditures * gap between effective tax rate on labor and consumption			-11.85	3.97**
	Welfare expenditures * progressivity (low income group)			3.36	2.04
	Welfare expenditures * progressivity (high income group)			-0.77	1.56
	Welfare expenditures * social security contribution			0.29	0.12*
	Welfare expenditures * mandatory private contribution			0.08	0.04*
Welfare expenditures Equation 2	Constant term	139.13	24.05***	141.22	23.26***
	Fiscal sustainability ($t - 1$)	-0.07	0.01***	-0.07	0.01***
	Fiscal sustainability ($t - 5$)	0.05	0.01***	0.05	0.01***
	Generosity of public pension	0.44	0.16**	0.40	0.16*
	Generosity of public unemployment insurance	0.42	0.16*	0.42	0.17*
	Generosity of sickness insurance	0.65	0.24**	0.65	0.24**
	Constant term	11.67	2.51***	11.66	2.52***

Dependent variables	Independent variables	Model 1		Model 1	
		Coefficient	Standard error	Coefficient	Standard error
Number of obs	Equation 1	304		303	
	Equation 2	304		303	
F value	Equation 1	792.60***		779.06***	
	Equation 2	122.71***		123.37***	

*p < 0.05.
 **p < 0.01.
 ***p < 0.001.
 †p < 0.1.

Table 5. Determinants of fiscal sustainability on welfare state.

the financial burden in the long run by recognizing the tax burden differently, considering the benefits of the fiscal expenditure and the fairness of the tax burden [61, 74]. For example, a fair tax burden may offset the negative effects of welfare spending and may also have a positive impact on fiscal sustainability. For this reason, this study focuses on the moderating effect of the tax structure on the relationship between welfare expenditures and fiscal sustainability, as well as the direct effect of the tax structure on fiscal sustainability.

Specifically, the gap in the tax base, especially the gap between labor taxation and consumption taxation, hinders the fiscal sustainability of the welfare state in terms of horizontal equity. In addition, the negative effect of welfare expenditures on fiscal sustainability tends to become larger as the gap between labor and consumption increases. On the other hand, the direct effect of the gap between labor and capital taxation does not have a statistically significant effect. Although the impact of the gap between labor and capital taxation on fiscal sustainability is not statistically significant, the negative effects of welfare expenditures on fiscal sustainability intensify when tax equity is not guaranteed. In other words, if the tax burden is not distributed fairly among the tax base (labor, capital, and consumption), it is difficult to guarantee the fiscal sustainability of the welfare state.

Second, the effect of the level of vertical equity on the fiscal capacity of the welfare state is mixed. The increase of the progression in low-income groups has a statistically significant negative impact on fiscal capacity, while the increase of progressivity in the high-income group is not statistically significant, although it demonstrates a positive impact. In addition, the latter also alleviates the negative impact of welfare expenditures at a statistically significant level. Related to this, it is worth noting that severe income tax burdens on low-income households may have a negative impact on improvements to the fiscal sustainability of the welfare state.

It is important to point out the relationships between the ability to pay principle and fiscal sustainability of the welfare state. This is also associated with mixed analysis results in vertical equity. The golden age of the welfare state, from 1930 to 1960, had been supported by the ability to pay principle. As the principle of social justice based on equity was expanded, demand for redistribution expanded, and income tax assumed stronger progressive characteristics. This is due to the fact that in the reality of social ills caused by the monopoly of the capital growth process, the state faithfully tries to tame the working class and to correct the

unfairness of disparity. In this way, it is difficult to say the more progressive taxation makes always the more tax avoidance of the high-income class [67].

However, if progressive tax burdens are recognized to be unfair, their impact may vary, because the excessive burden can foster tax evasion [67]. As it is actually known, in 1970s, taxes were raised faster than income, political rebellion became fierce, and most high-income countries stopped raising income taxes to prevent capital from being exported abroad (businesses) and the emigration of productive workers. The problem is that lowering the tax burden on capital raises the risk of hindering horizontal equity with labor taxation and the reduction of tax progressivity [68]. In this manner, if the ability to pay principle is not guaranteed, it is possible to both diminish tax progressiveness and increase the possibility of tax avoidance.

This is because vertical equity and horizontal equity are inseparable. Both principles have goals that seek to achieve, and one principle cannot replace the other. In other words, inequalities caused by each equity principle are not offset by the achievement of equity through other equity improvements, so that each principle must be resolved directly to the unfairness of the respective side [69]. When vertical equity does not guarantee tax breaks for capital (businesses) and high-income earners, the fair burden condition may be violated, which will enhance the tax resistance of the people and promote tax evasion, even if horizontal equity is raised. Therefore, fairness of the burden according to the ability to pay can be realized when horizontal equity and vertical equity realize their respective goals. Taxation will then work to contribute positively to fiscal sustainability.

On the other hand, in terms of the benefit principle, the increase of social security contributions has a positive effect on the fiscal sustainability of the welfare state and also has the effect of offsetting the negative impact of welfare expenditures on fiscal sustainability. In addition, the increase of mandatory private contributions positively affects fiscal sustainability, even though this is not included in the government's finances. These public finance sources related to the benefit principle carry high political acceptability, because it is easy to secure political support for the burden in terms of direct benefit to the person [89]. In addition, private mandatory contributions can alleviate the fiscal burden of a country without public welfare efforts. Therefore, in order to secure the fiscal sustainability of the welfare state, it appears necessary to diversify the financial structure of the welfare state by making appropriate use of both social security contributions and private contributions.

5. Conclusion

This study identifies determinants of fiscal sustainability of the welfare state by focusing on tax structure. As confirmed by the results of the study, it is essential to secure financial resources to maintain the welfare state. In the short term, fiscal space may not drive the expansion of welfare expenditures, but it nonetheless leads to this in the medium-to-long term. The problem is that an increase in welfare spending may worsen fiscal sustainability, and it is not always an appropriate solution to reduce welfare expenditures in order to increase fiscal space, which is in keeping with the arguments of welfare state opponents. It is impossible

to cut welfare spending thoughtlessly because many social problems should be addressed through collaborative social efforts, and it is also not a suitable alternative to increase welfare spending indefinitely while worsening fiscal space because this may over time dismantle the financial base of the welfare state. It is therefore important to seek ways to maintain welfare spending while ensuring fiscal sustainability.

As can be seen from the analysis results, the level of tax burden is an important aspect of fiscal sustainability in the welfare state. Tax revenue is the funded basis for maintaining the welfare state, so increasing tax compliance to offset the negative impact of increasing welfare spending will promote social cohesion. However, the national financial effort to maintain the welfare represents more than collecting additional taxes. The excessive burden does not always have a positive impact on fiscal sustainability, and it is not always possible for a country to collect more tax revenues to expand welfare. Thus, the most important aspect of total tax revenue that should be considered is the manner in which tax revenue is raised because depending on which method is adopted, the impact of taxation on the sustainability of economic, political, and social dimensions varies. As indicated in this study, it appears that securing tax fairness contributes to the fiscal sustainability of the welfare state. The following aspects of the tax structure may positively contribute to fiscal sustainability of the welfare state.

First, in terms of the ability to pay principle, the achievement of equity between the tax base and improvements in progressivity may play a positive role in the fiscal sustainability of the welfare state. It appears obvious that the reduction of the gap between labor taxation and consumption taxation plays a significantly positive role in ensuring fiscal sustainability. Consumption tax may play a more positive role than taxation on labor in terms of social and political sustainability, as well as economic sustainability. In fact, advanced welfare countries have been interested in indirect taxation, including consumption tax, for which it is easy to secure public revenues in order to overcome the financial crisis, while it is difficult to secure tax revenue from direct taxes such as income tax and corporation tax, which are sensitive to economic changes [90–93]. In addition, it can contribute to the achievement of intergenerational equity by relieving elderly households, which are often more heavily burdened [94]. Moreover, in the event that the labor taxation base is broken due to labor market dualization and declining employment rates, a consumption tax based on universal solidarity is one way to secure a wide tax base.

However, if we rely only upon the expansion of the consumption tax, it can place an excessive burden on the low-income class due to the regressive tax burden. Therefore, it is necessary to ensure sufficient welfare benefits for low-income people, along with progressive taxation, in order to relax the regressive burden and to narrow the gap between the consumption tax and the labor tax. Specifically, improving vertical equity may also result in a positive contribution to the fiscal sustainability of the welfare state and will secure the political legitimacy of the tax and mitigate the regressive burden that may result from the expansion of a consumption tax. In particular, it is worth noting that a progressive tax on high-income earners does not always cause tax evasion. For example, if the tax burden is in accordance with appropriate benefits that are provided by the state, a progressive tax increases tax compliance. Thus, broadening the tax base by means of the consumption tax must be done in a manner that allocates the fair burden to all citizens according to the ability to pay, which ultimately ensures the fiscal sustainability of the welfare state.

Finally, diversifying the financial base of the welfare state by combining the ability to pay principle and the benefit principle is advantageous to the fiscal sustainability of the welfare state. Raising social security contributions or private contributions also has a positive effect on fiscal sustainability according to these principles. However, public services through these sources are limited to a small number of regular employees, and this may cause labor tax resistance and the social exclusion of low-income or irregular workers, as well as unemployed. Thus, it must be implemented by diversifying the funding base of the welfare state with a combination of the ability to pay principle and the benefit principle to maintain solidarity.

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