

# A Study on Government Size and Tax Structure

December 2013

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# I

## Introduction

With the passage of time and progression of economic development, both the tax burden ratio and public burden ratio have soared in most countries, including in South Korea, but the respective levels of burden ratio and rates of increase vary widely.<sup>1)</sup> The factors underlying these rising burden ratios and differences, as well as the identification of the optimal tax and public burden ratios for each country, have been important areas of interest for scholars and policymakers. They are currently the subject of considerable attention, particularly in South Korea where the methods for raising public funds and their optimal scale have emerged as a major social issue given the recently expanding fiscal demands posed by an aging population and increasing range of social welfare systems. Compared to other countries and to the social and economic demands of today, Korea tends to be perceived as maintaining relatively low tax and public burden ratios. Therefore, critical issues for examination include: How far should South Korea increase its tax and public burden ratios? To what extent can it increase these ratios while maintaining the framework of current tax structures? If these burden ratios were to be substantially increased, how would Korea be required to change its tax structures?

This study will shed light on the factors that trigger changes in tax and public burden ratios of Korea and other OECD member nations, along with

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1) The tax burden ratio refers to the ratio of tax revenues in a given country to its total GDP, while the public burden ratio means the ratio of the sum of tax revenues and social security contributions (mainly consisting of social insurance premiums) to GDP.

international variations, and will reveal relevant implications. In addition, it will analyze the correlations between tax burden ratios and tax structures and suggest pertinent policy directions. Traditionally, studies on the determinants of the tax burden ratios or public burden ratios of a given country have concentrated on analyzing those factors that affect fiscal demands. It is easily imaginable, however, that the costs incurred while raising public funds may in fact influence decisions regarding the scale of public burdens. If a country is able to raise a similar amount of funds at a lower cost thanks to heightened tax efficiency, it will be able to further expand its tax burden ratio. In addition, if it is required to raise its tax burden ratio in response to growing fiscal demands, it will likely be able to do so in with greater facility if it can reform its tax structures so as to improve taxation efficiency (Becker and Mulligan, 1998).

Taxation efficiency involves, above all else, efficiency in tax administration, as well as efficiency in taxation systems for individual tax items and in the composition of tax items. This study focuses on the composition of tax items in order to analyze the relations between the composition of tax revenues from respective tax items and tax burden ratios.

This study consists of five chapters including the introduction (Chapter I). Chapter II reviews the historical trends of tax and public burden ratios in Korea over the last six decades and discusses related policy issues. Chapter III explores determinants of tax and public burden ratios, and Chapter IV analyzes the relations between tax and public burden ratios and tax structures. Lastly, Chapter V summarizes the major findings of the study and discusses related policy implications.

## II

# Changes in Tax and Public Burdens in Korea and Related Characteristics

This chapter utilizes a range of statistical data to observe characteristics of the process of change in tax and public burden ratios in Korea and to review the connected policy issues. The first section will study the characteristics of the changes in tax and public burden ratios, followed by a review of changes in tax revenue structures. The final section will briefly summarize the discussions in this chapter and review policy issues.

### 1 Trends in Tax and Public Burden Ratios

#### A. Trends in Tax Burden Ratios<sup>2)</sup>

<Table II-1> and [Figure II-1] show tax burden ratios in South Korea since 1953.<sup>3)</sup> The rate begins at 5.3 percent in 1953, but steadily increased over the next 60 years to reach 20.2 percent in 2012, approximately 3.8 times higher. Viewed by period, Korea's finances were in an absolute deficit in the years

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2) This part cites the discussion found on pp. 20–25 of An (2012a), together with updated data for 2011 and 2012.

3) The method of calculating tax burden ratios and a discussion of the issue of consistency in time-series data are explained in detail in An (2012a).

following the Korean War, and loans and aid from other countries played a greater role than did tax revenues. The share of loans among all fiscal revenues exceeded 40 percent in 1953, and the share of aid accounted for 40-50 percent between 1955 and 1960. Against this backdrop, one of the most important goals of tax policy in the 1950s was securing the tax revenues necessary in order to achieve financial independence.

In the 1950s, the Korean government engaged in a number of efforts to increase tax revenues, such as expanding the number of taxable items and strengthening the consumption tax, but it failed to achieve any substantial short-term outcomes. Reflecting the severe volatility of the annual tax burden ratios of the time, the ratio exceeded 11 percent in 1955, 1959, and 1960, but it mainly remained in the 7-9 percent range between 1954 and 1965.

〈Table II-1〉 Trends in Tax Burden and Public Burden Ratios<sup>1)</sup>

(Unit: %)

	Tax Burden Ratio	Public Burden Ratio		Tax Burden Ratio	Public Burden Ratio
1953	5.3		1983	17.2	17.4
1954	9.2		1984	16.2	16.4
1955	11.3		1985	15.8	16.1
1956 <sup>2)</sup>	—		1986	15.4	15.6
1957	7.1		1987	15.7	16.0
1958	8.6		1988	16.1	16.0
1959	11.7		1989	16.5	16.8
1960	11.6		1990	17.4	19.5
1961	9.3		1991	16.6	19.1
1962	10.2		1992	16.9	19.1
1963	8.2		1993	16.8	19.5
1964	6.8		1994	17.3	19.8
1965	8.3		1995	17.6	20.0
1966	10.3		1996	17.9	20.6
1967	11.6		1997	17.4	20.3
1968	13.4		1998	17.0	20.3
1969	14.0		1999	17.2	20.7

〈Table II-1〉 Continue

(Unit: %)

	Tax Burden Ratio	Public Burden Ratio		Tax Burden Ratio	Public Burden Ratio
1970	14.3		2000	18.8	22.6
1971	14.4		2001	18.8	23.0
1972	12.3	12.5	2002	18.8	23.2
1973	11.9	12.0	2003	19.3	24.0
1974	13.0	13.2	2004	18.4	23.3
1975	14.8	14.9	2005	18.9	24.0
1976	16.1	16.2	2006	19.7	25.0
1977	16.0	16.2	2007	21.0	26.5
1978	16.4	16.6	2008	20.7	26.5
1979	16.7	17.0	2009	19.7	25.5
1980	16.8	17.1	2010	19.3	25.1
1981	16.6	16.8	2011	19.8	25.9
1982	16.8	17.0	2012	20.2	26.5

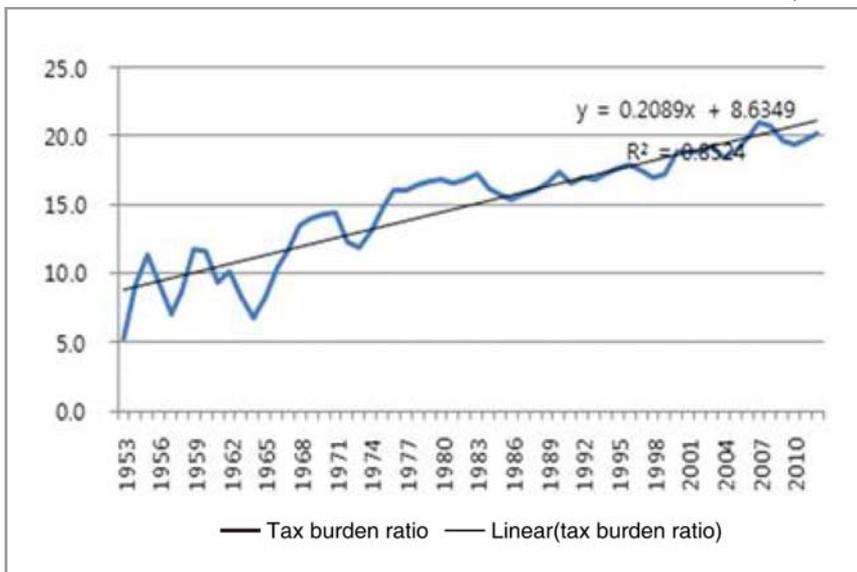
Note: 1) GDP figures calculated on a 2005 basis were used for this table. For figures prior to 1969 for which GDP based on 2005 terms has not been announced, GDP on a 1975 basis was converted to 2005 by applying the average difference between GDP on a 2005 basis for the years between 1970 and 1975 and GDP based on 1975 terms.

2) The reason for the absence of data for 1956 is that, in the initial years of the Korean government, the fiscal year started on April 1 and ended on March 31. In 1954, the fiscal year was changed to end on June 30, 1955; fiscal year 1955, however, was shifted once again to start on July 1 and end on December 31, 1956. Since the fiscal year was amended from 1957 to fall between January 1 and December 31 of every year, data for 1956 is unavailable.

Source: Tax Bureau of the former Ministry of Finance, *Statistical Yearbook of Tax*, each year, National Tax Service, *Statistical Yearbook of National Tax*, annual, Bank of Korea, Economic Statistics System, Economic Planning Board, Major Economic Indicators, 1982, 1983. Data up until 2010 are requested from p. 22 of An(2012a).

[Figure II-1] Trends of Tax Burden Ratios (1953-2012)

(Unit: %)



Note: 1. An average of the 1955 and 1957 data was used for 1956.  
 Source: Update of data from p. 23 of An (2012a).

After recording 10.3 percent in 1966, the tax burden ratio showed a solid upward trend over the next decade to reach 16.1 percent in 1976. The National Tax Service was established in 1966, and while it is difficult to accurately quantify its contribution to increasing tax revenues, the figures on tax burden ratios suggest that the NTS greatly contributed to securing more stable tax revenues. Following the establishment of the NTS, the rate of year-on-year increase of tax revenues stood at 59.9 percent in 1966, 37.8 percent in 1967, 50.0 percent in 1968, and 36.3 percent in 1969.

Entering the 1970s, the tax burden ratio remained at a relatively low level of around 12 percent between 1972 and 1974. From the end of the 1960s until 1971, the Korean government streamlined consumption tax system as a preliminary measure to introducing a value added tax. In addition, the government announced an emergency measure on August 3, 1972, in order to initiate tax

support for industrial rationalization. Another emergency measure announced on January 14, 1974, accompanied expanded tax support for low-income earners and restructuring of consumption and property tax systems designed to curb the consumption of luxury goods.

The tax burden ratio marked 16.1 percent in 1976 before climbing to 16.7 percent in 1979. Afterwards, the ratio hovered for a considerable period of time in the mid-to-higher ranges of the 16-percent level and the lower-to-mid ranges of the 17-percent level. It actually fell to the level of 15 percent in the early 1980s. The ratio did not rise again until the late 1990s, but the figure was approaching 19 percent by 2000.

Despite the continued increase in tax burden, South Korean government finances remained in a chronic deficit throughout the 1960s and 1970s, and the country's tax revenues only accounted for 70 percent at best (in 1968) of overall public budget. With the exception of a few years, the scale of fiscal deficits during the 1970s accounted for 2-4 percent of GDP and reached 4.3 percent in 1980.

Assuming power under these fiscal circumstances, the Chun Doo-hwan administration directed the focus of its economic policy on addressing issues stemming from the breakneck economic growth of the 1960s and 1970s, as well as on sustaining economic growth while at the same time bulwarking national economic stability. The administration implemented robust austerity measures designed to stabilize prices, including reducing annual expenditures and improving the efficiency of governmental spending, thereby ensuring fiscal soundness. Tax policy did not undergo any substantial changes outside of reducing the top corporate tax rate to 30 percent from the mark of 40 percent set by the administration in its initial stages and introducing an education tax system in 1982. Although the tax burden ratio dipped into the 15-percent range between 1985 and 1987, the firm tight-money policy and the booming economy of the late 1980s contributed to substantially improving the nation's fiscal security. As a result, the deficit of 4.3 percent in 1980 improved to one of 1.2 percent in 1984 and then broke through to a surplus of 1.2 percent in 1987.

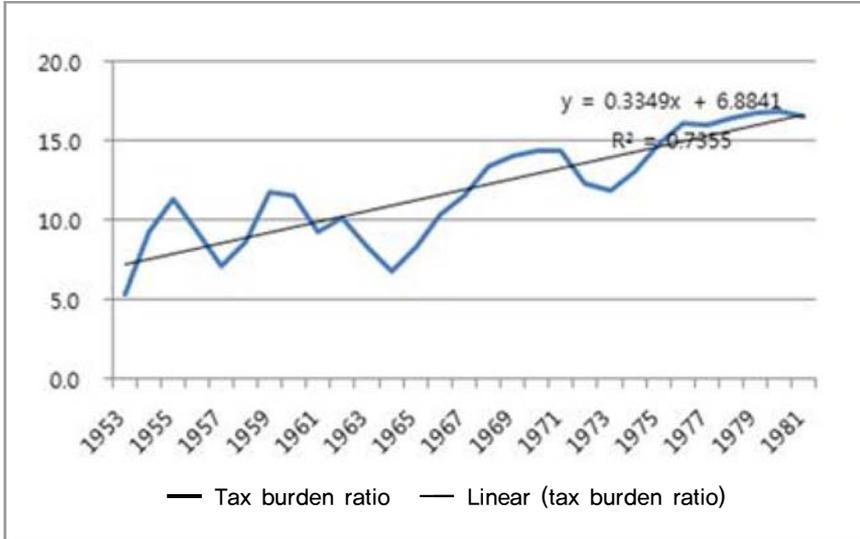
In the late 1980s, the long-repressed demands for democratization and decentralization were reflected in government policy. Cigarette taxes were introduced as part of a reorganization of local taxes in preparation for a system

of local government. Furthermore, tax structures were reformed in response to ongoing globalization, such as by streamlining income tax systems, alleviating corporate tax burdens, and reducing customs duties. In addition, the government began to introduce long-delayed welfare schemes, and, unlike in previous versions, the concepts of equity, fairness, and balanced development became primary keywords in the 6th Five-Year Economic and Social Development Plan launched in 1988. The tax burden ratio rose to 16.1 percent in 1988 from the 15-percent level maintained over the preceding several years. It showed a slightly increasing trend for a time, but overall remained mainly stagnant around the 16-percent level up until the early 1990s. With the introduction of the national pension system in 1988, the difference between the public burden ratio and tax burden ratio began to increase, a phenomenon which will be discussed further in the following subsection. The tax burden ratio continued its upward trend until reaching 21 percent in 2007. The ratio then fell from 2008 to 2010, but rose again in 2011 and 2012.

[Figure II-2] and [Figure II-3] demonstrate the trends in the annual tax burden ratio and the respective trend lines for the period up to 1980 and the period from 1981. When compared, the two graphs suggest that the tax burden ratio increased at an annual average of 0.33 percentage points until 1980, but rose at an annual average of 0.15 percentage points since, less than half the rate prior to 1980. As seen in [Figure II-1] above, the tax burden ratio increased by 0.21 percentage points on average each year from 1953 and 2012. Although the ratio achieved a rapid rate of increase across the board until the 1970s, with high annual volatility, both the annual range of fluctuation and average annual rate of increase contracted from the 1980s to demonstrate a more stable tendency.

[Figure II-2] Trends of Tax Burden Ratios (1953-1980)

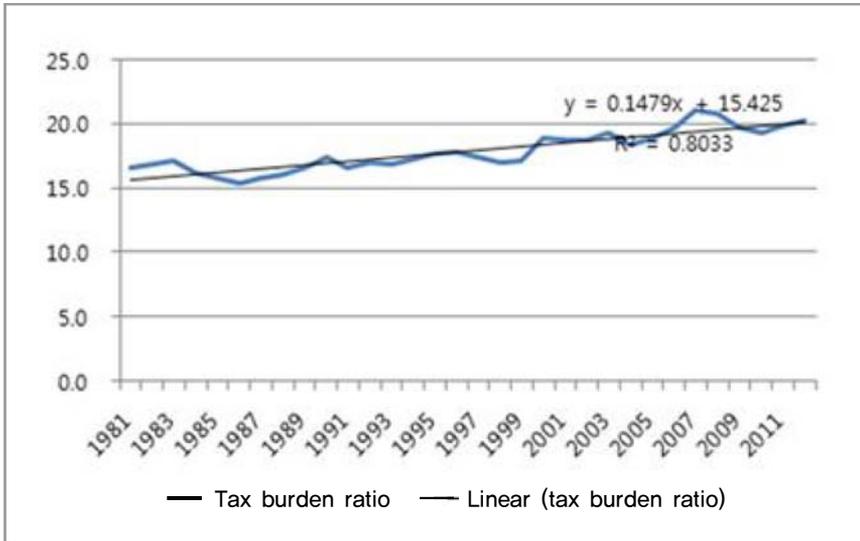
(Unit: %)



Note: 1) An average of the 1955 and 1957 data was used for 1956.  
Source: p. 25 of An (2012a).

[Figure II-3] Trends of Tax Burden Ratios (1981-2012)

(Unit: %)



Source: Update of data from p. 25 of An (2012a).

## B. Trends in Public Burden Ratios<sup>4)</sup>

In the 1960s, the public burden ratio coincided with the tax burden ratio due to the absence of separate social security systems, but the introduction of a national health insurance system in 1972 initiated a gap between the two. The national pension system, launched in 1988, further widened the gap. The gap had not exceeded 0.3 percentage points in preceding years, but it increased to 2.1 percentage points in 1990, 3.8 percentage points in 2000, and to 5.7 percentage points in 2010, recording an increase of 1.7-1.9 percentage points

4) This part reproduces the discussion on pp. 26–27 (first paragraph) of An (2012a), together with updated data for 2011 and 2012.

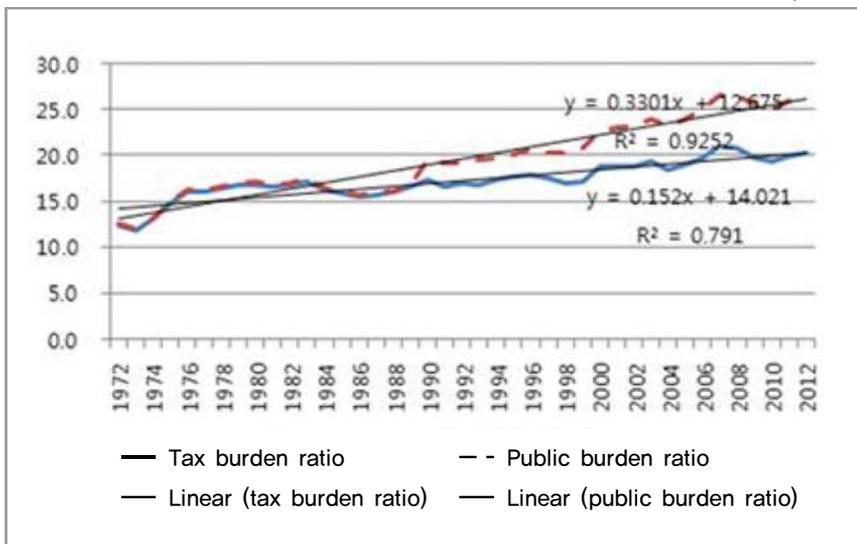
per decade (see <Table II-1>).

[Figure II-4] illustrates the trends in public burden ratios and tax burden ratios since 1972. It reveals one of the singularly interesting characteristics of these trends: The increase rate of the tax burden ratio has significantly slowed since the 1980s, but public burden ratios maintained a similar rate of increase with that for tax burden ratios up to the 1980s. The estimated equations of the trend lines in [Figure II-4] suggest that public burden ratios increased by an annual average of 0.33 percentage points from 1972 to 2010, which is a similar level to that of tax burden ratios during the 1950-70s (see [Figure II-2]). Therefore, it can be concluded that the ratio of public burden against total GDP from 1953 to 2010 increased annually by 0.33 percentage points on average.

Tax burdens needed to be increased in order to support fiscal independence in the 1950s and 1960s and to spur economic development during the 1970s. The expansion of welfare services was the major driver behind increasing public burdens since the 1990s. Exceptionally, the 1980s were a period when public burdens were maintained at a reasonably low level and fiscal soundness was encouraged, largely because fiscal demands for economic development had begun to contract at a point when welfare demands had not yet begun to rise. The fiscal soundness achieved in this period was later of significant assistance to South Korea in promptly recovering from the devastating economic crisis of the late 1990s.

[Figure II-4] Trends of Tax Burden Ratios and Public Burden Ratios (1981-2012)

(Unit: %)



Source: Update of data from p. 26 of An (2012a).

### C. Economic Development and Tax and Public Burden Ratios<sup>5)</sup>

According to Wagner's law, economic development in a country leads to increasing demands on the public sector and therefore results in increasing tax burden ratios, since demands for public services, including education, public order, and social welfare, grow as incomes rise. Therefore, income growth is expected to raise tax and public burden ratios.

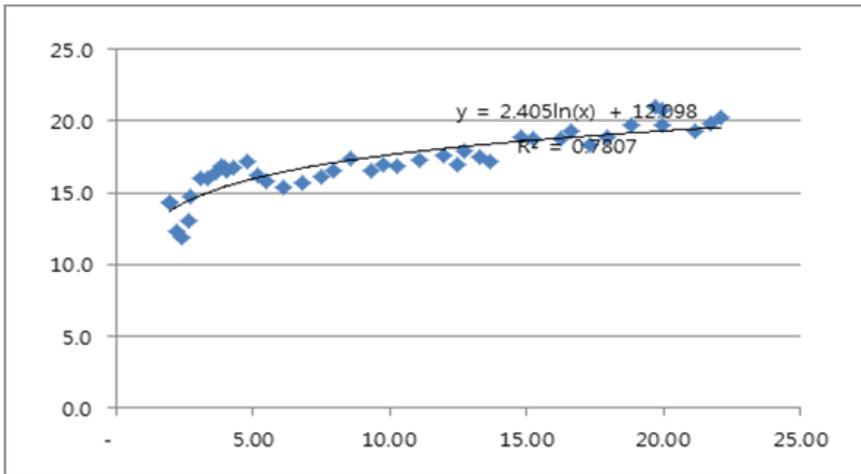
[Figure II-5] shows how tax burden ratios in South Korea evolved as national income grew. The horizontal axis refers to per capita GDP (real terms in units of million KRW), and the vertical axis demonstrates tax burden ratios in

5) This part reproduces the discussion in pp. 28 (last paragraph)–30 of An (2012a), together with updated data for 2011 and 2012.

percentage terms. The per capita GDP and tax burden ratios form a logarithmic function, which means that when GDP levels are substantially low, tax burden ratios increase at a rapid pace according to income growth, but their rate of increase slows when income levels are maintained high.

[Figure II-5] Per Capita GDP and Tax Burden Ratios (1970-2012)

(Unit: %, million Won)



Note: Per capita GDP is expressed in real terms on a 2005 basis.  
Source: Update of data from p. 29 of An (2012a).

According to Kim (1994), the tax burden ratio of a country is mainly determined by its tax capacity and public preferences. When constraints on tax capacity are high, the ratio is determined by tax capacity, but otherwise it is determined according to public choice based on interactions between voters, politicians, government officials and special interest groups. For example, less-developed countries show a low tax capacity, and their tax burden ratios are therefore defined mainly by their tax capacities. However, income growth increases tax capacity and weakens the constraints placed upon it, allowing voter preferences and the influence of politicians and government officials to play a major role in determining tax burden ratios. Since Korea's budgets were in

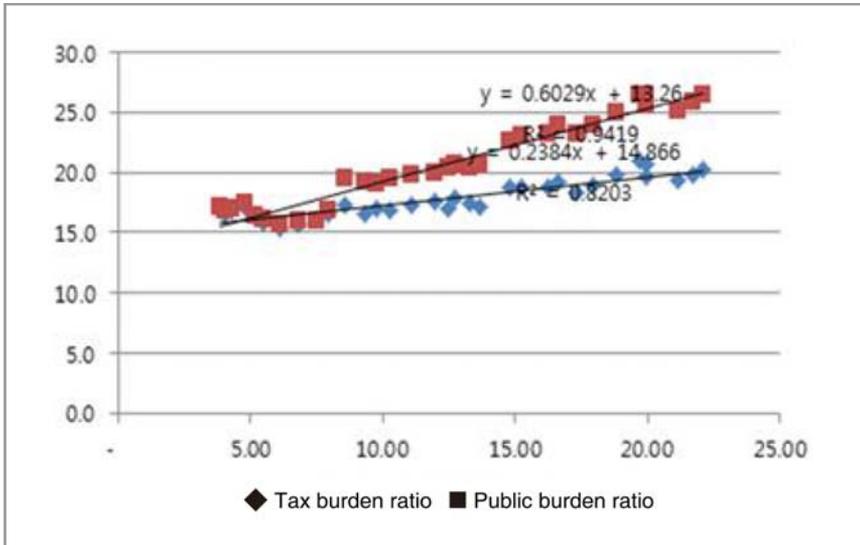
a chronic deficit until the late 1970s, which is before per capita real national income reached KRW 5 million (in 2005 terms), tax capacity determined the national tax burden ratios.

In the meantime, the Roh Tae-woo administration increased both the tax burden and public burden ratios in response to social demands for welfare services following the political democratization of the 1980s, and thereafter voter preferences and the influence of politicians and government officials have played a vital role in determining tax burden ratios. Per capita income in 1988 amounted to KRW 7.52 million, with the tax and public burden ratios hovering around 16 percent. The years between 1980 and 1988 marked a transition period as the determinants of tax burdens switched over from tax capacity to public will. In addition, the constraints on tax capacity were considerably eroded during this time, but voter preferences and political influence had not yet been fully factored in as the country was still undergoing democratization. It is believed that government officials exerted substantial influence during this period based on their access to relatively more information, which contributed to ensuring fiscal soundness through strong retrenchment in finances.

[Figure II-6] demonstrates the relations between per capita GDP and tax and public burden ratios since 1980, revealing that public burden ratios bear a closer relationship with per capita GDP than do tax burden ratios. According to simple regression analysis, the public burden ratio rose by 0.6 percentage points for each KRW 1 million rise in per capita GDP, which corresponds to 2.5 times the range of change of tax burden ratios. This difference is mainly generated by the differences between public burden ratios and tax burden ratios since the late 1980s. Korea introduced social insurance systems as a response to demands for social welfare services that emerged in the 1980s. With the increase of per capita GDP increased by KRW 1 million, the tax burden ratio rose by 0.24 percentage points.

[Figure II-6] Per Capita GDP and Tax and Public Burden Ratios (1970-2012)

(Unit: %, million Won)



Source: Update of data from p. 29 of An (2012a).

## 2 Changes in Composition of Tax Items of Tax Revenues

<Table II-2> provides changes in tax revenues since the 1980s by five-year period and by tax item. In an environment of changing tax and public burden ratios, the most important goal of tax policy during the 1960s was to expand tax revenues as a means to achieve fiscal independence, while the goals in the 1970s were expanded to increasing the financial resources available for economic development. The Korean government next slowed the rate of increase of tax burden ratios in the 1980s and pursued fiscal soundness by curbing expenditures. From the onset of political democratization until the late 1980s, the government increased both the tax and public burden ratios in an effort to augment its social welfare spending. Based on these classifications by period, the changes in tax revenue distribution by tax item present certain identifiable characteristics.

In the 1960s and 1970s when Korea was focused on economic development, and in the early 1980s when such a policy remained in place, the weight of income taxation was substantially lower than in other periods. The sum of income tax, corporate tax, and social security contributions accounted for 23.7 percent in the 1970s and 25.9 percent in the early 1980s, remarkably lower than the 40 percent or higher levels achieved in other periods. The sum of income tax and corporate tax alone stood at 22.7 percent in the 1970s and 24.5 percent in the early 1980s, still lower than the level of 27-30.7 percent in place during other periods.

**<Table II-2> Periodical Changes in the Composition of Tax Revenues**

(Unit: %)

	1972– 1982	1983– 1987 (Chun Doo- hwan)	1988– 1992 (Roh Tae- woo)	1993– 1997 (Kim Young- sam)	1998– 2002 (Kim Dae- jung)	2003– 2007 (Roh Moo- hyun)	2008– 2011 (Lee Myung- bak)
Income taxes	23,7	25,9	38,6	41,3	44,5	50,0	52,3
(PIT+CT)	22,7	24,5	30,7	28,3	27,0	29,3	29,5
PIT	12,1	13,4	17,6	17,3	15,1	14,3	14,6
CT	10,6	11,1	13,1	11,0	11,9	15,0	14,9
SSC	1,0	1,4	7,9	13,1	17,5	20,8	22,8
Consumption taxes	34,2	34,2	32,5	32,4	31,4	29,1	26,6
GCT	15,7	21,0	19,2	18,7	17,3	17,2	17,0
ICT	18,6	13,3	13,3	13,7	14,1	11,9	9,6
Property tax	8,9	9,2	11,6	13,6	12,2	12,2	11,6
PHT	2,5	2,7	2,8	3,3	2,6	2,8	3,3
Public burdens	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Note: The period since 1983 was divided by presidential term, and the composition of tax revenues by tax items was averaged from the second year after each presidential inauguration to the first year after the next presidential inauguration.

PIT: Personal Income tax, CT: Corporate tax, SSC: Social Security Contribution, GCT: General Consumption Tax, ICT: Individual Consumption Tax, PHT: Property holding tax

Source: OECD, tax database.

Compared to the low share of income taxation during the 1970s and early 1980s, the ratio of consumption taxes accounted for 34.2 percent in both periods, higher than during any other period. Individual consumption taxes formed a large share of the total in the early 1970s when value added tax had yet to be introduced, but the ratio of general consumption tax grew larger after such a tax was introduced, accounting for 21 percent of the overall public burden in the early 1980s under the Chun administration.

Despite differences among periods, it is observable that as the Korean economy continued to grow over the long term, the ratio of income taxation increased while that of consumption taxation declined. The combined ratio of income and corporate tax stood at 22.7 percent in the 1970s and rose to 29.5 percent between 2008 and 2011; in particular, the ratio of corporate tax increased nearly 1.5 times from 10.6 percent in the 1970s to 14.9 percent between 2008 and 2011. The combined ratio of income tax, corporate tax, and social security contributions significantly increased from 23.7 percent to 52.3 percent over the same period. This was largely because the proportion of social security contributions within public burdens in the 1970s rose from 1 percent to 22.8 percent during the 2008-2011 period. The corporate tax rate has been consistently on the decline since the 1990s, but the resulting tax revenues have mostly increased at a rapid pace.

The ratio of consumption tax contracted from 34.2 percent in the 1970s to 26.6 percent during the 2008-2011 period. The ratio of individual consumption tax fell notably further than did general consumption tax: Accounting for 18.6 percent in the 1970s, the ratio started to decline following the introduction of the value added tax system and restructuring of the individual consumption tax system to keep step with shifting economic environments, finally reaching 9.6 percent during 2008-2011, almost half the level of the 1970s. The ratio of general consumption tax increased with the introduction of value added tax to reach 21 percent in the early 1980s, but gradually began to fall afterwards. Such a decrease occurred because the value added tax rate was fixed at 10 percent despite the growth in income tax revenues stemming from economic growth and the reform of tax systems, and because income elasticity of VAT was lower than that of income tax.

Lastly, the proportion of property tax grew from the late 1980s, but the

ratio of property possession tax alone showed little volatility.

# III

## Determinants of Public Burden Ratios

This chapter aims to illuminate the determinants of public burden ratios based on reviewing previous studies and data from OECD member states, as well as to identify the implications on pending issues related to public burden ratios in South Korea.<sup>6)</sup>

### 1 Public Burden Ratios of OECD Member Nations: Differences and Trends

Public burden ratios vary substantially among OECD members. According to data from 2010, Denmark has the highest public burden ratio at approximately 48 percent, and the ratio exceeds 40 percent in three other Scandinavian countries (including Sweden) and in eight additional European countries including

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6) The public burden ratio is the outcome of dividing the sum of total tax revenues and social security contributions by GDP. Whether to direct the focus of discussion on public burden ratio or on tax burden ratio depends on how similar we perceive social security contributions to be to taxes. In general, the term "total tax revenues as a share of GDP" as used by the OECD indicates the public burden ratio in Korea, which instead expresses the notion of tax burden ratio as "the ratio of tax revenues, excluding social security contributions, against GDP." This is a perspective more based on the belief that social security contributions are part of taxes in a broader sense. This chapter adopts this perspective in directing the discussion to public burden ratio rather than tax burden ratio, except for when discussing tax burden ratios excluding social security contributions in order to distinguish the concept from public burden ratios.

Belgium, Italy, and France.<sup>7)</sup> The lowest ratios were found in Mexico and Chile, at less than 20 percent, and Korea and the United States reported quite low ratios at around 25 percent. The highest public burden ratio is found to be at minimum two times higher than its lowest counterpart.

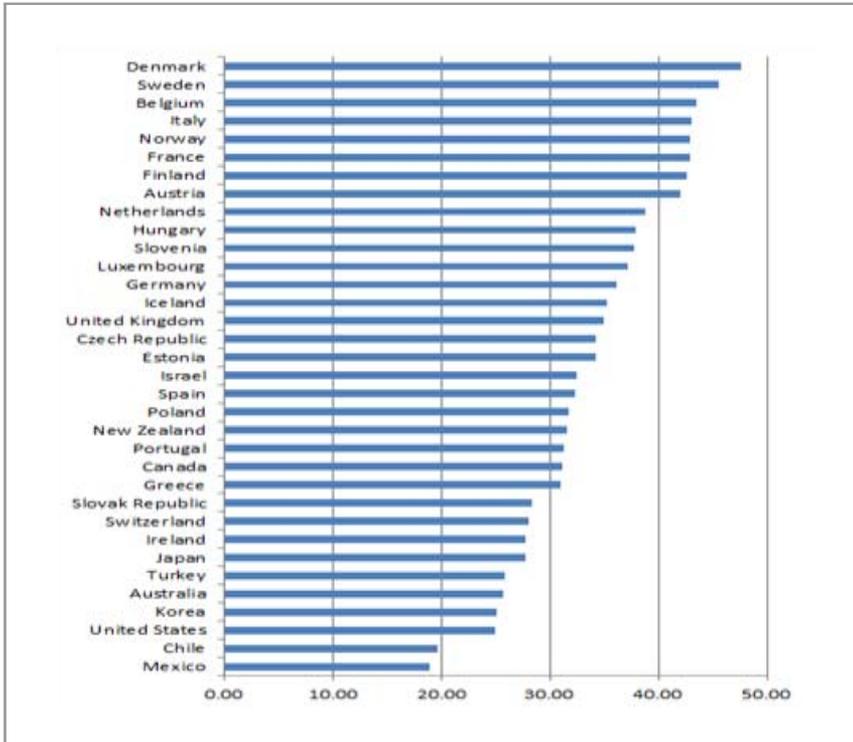
Among OECD members, the public burden ratio in South Korea is near the lowest, falling below all but a few countries. Statistics compiled from the years before Chile and Turkey joined the OECD describe Korea as having the second lowest ratio, behind Mexico. In recent years, only Mexico, Chile, and Turkey have lower ratios than does Korea, while the United States maintains a similar ratio. Mexico shows the lowest ratio in the OECD and its public burden ratio has remained 3-7 percentage points lower than Korea's since 1990. Chile is home to the second lowest level, currently with a slightly higher figure than to Mexico. While Turkey consistently had one of the lowest levels in the early 1990s, the country's public burden ratio has since begun to soar, surpassing that of Mexico and Chile from the mid- and late 1990s and currently gaining on the level of Korea.<sup>8)</sup> The U.S. public burden ratio notched 27 percent in the early 1990s, approximately 8 percent higher than that in Korea. However, the United States witnessed its public burden ratio falling to the 25-percent level in the wake of the global financial crisis, while Korea's ratio continued to increase, and therefore the two countries now maintain a similar level.

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7) The ratio is relatively high, around 30 percent, in all other Europe countries, with the exceptions of Switzerland and Slovakia.

8) The public burden ratio in Turkey increased by around 10 percentage points, from 15 percent in 1990 to 25 percent in recent years, showcasing the greatest increase among OECD members. Over the past 20 years, Korea follows with the second largest increase in public burden ratio.

[Figure III-1] Public Burden Ratios in Different Countries

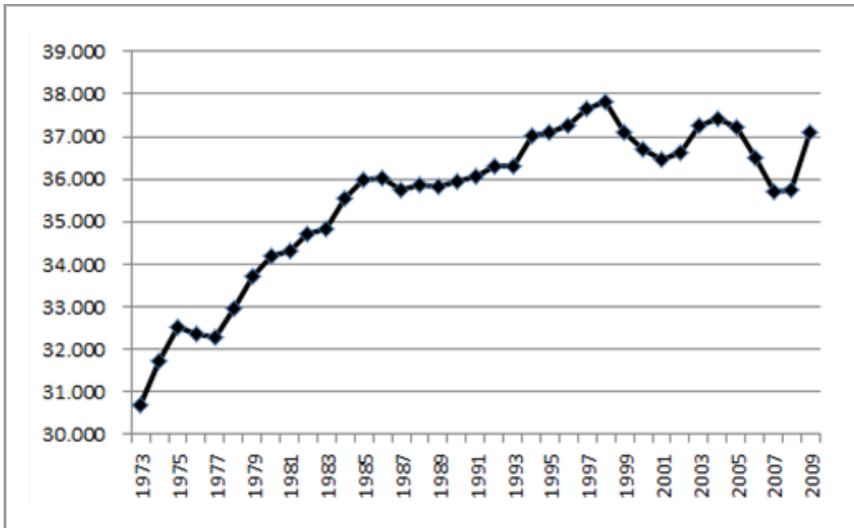


Source: OECD Revenue Statistics.

The trends in average public burden ratio among the OECD member nations allows for observation of long time-series data.<sup>9)</sup> The average ratio quickly rose to the 36 percent level in the mid-1980s from slightly over 30 percent in 1973, and shows only limited fluctuations thereafter. The average public burden ratio was the highest in the mid-1990s at around 38 percent and has fallen slightly since.

9) This means the average figures of 22 countries that provide a relatively long-term time-series data, excluding Korea, Mexico, and newcomers to the OECD.

[Figure III-2] Trends of Average Public Burden Ratio of OECD Members



Source: OECD Tax database.

Changes in each country can be observed from a total of 25 countries, excluding newcomers to the OECD that lack sufficient time-series data. In most OECD member nations, recent public burden ratios are remarkably higher than they may have been in the early 1970s. The greatest increase was found in Italy, whose ratio rose by around 19 percentage points, from less than 24 percent in 1973 to over 42 percent in recent years. Portugal and Spain each witnessed jumps in their ratio of around 14 percentage points, and Greece rose by 12 percentage points, recording the highest increase among the four Southern European countries. The ratios in Korea and Turkey each climbed by more than 10 percentage points, and those in Luxembourg and France also increased by roughly 10 percentage points. The countries whose current level of public burden ratio approximates the level in the early 1970s (slight decrease or less than 1 percentage point increase) number only four: Ireland, the Netherlands, the United States, and Canada.

Among these four countries, the United States has maintained a limited range

of increase or decrease since the 1970s, but the other three countries passed through a considerable bounce followed by a significant plunge. Sweden has also experienced substantial fluctuation. What distinguishes Sweden from the three above countries, however, is that, despite its precipitous drop from its peak, Sweden's ratio soared to such a degree that its current level is still more than 5 percentage points higher than the level of the early 1970s.

This typical case of a ratio peaking then plummeting is found in Sweden, Ireland, the Netherlands, and Canada. All four saw their public burden ratio fall by 5-9 percentage points from a respective highest level achieved at a point between the late 1980s and early 1990s. The ratio in Ireland increased by more than 8 percentage points, from 28 percent in 1979 to more than 36 percent in 1988, but later fell by 7-9 percentage points to reach its current level of 27 percent. Sweden supported a ratio of nearly 40 percent in the early 1970s, which then soared to 52 percent around 1990 before sinking by 7 percentage points to its current level of slightly over 45 percent. The ratio in the Netherlands maintained a level of 40 percent in the early 1970s and then rose to 45 percent in the late 1980s, but also fell by 7 percentage points to bottom out at 38 percent. Canada's public burden ratio soared to 37 percent in the early 1990s, but after plunging by 5-6 percentage points, it currently stands at around 31 percent.

Spain, Iceland, Australia, and New Zealand have also all experienced a significant fall off from their public burden ratio apogees, but unlike the four countries described above, it is difficult to determine whether this fall is relatively permanent. Comparable to the drop-off in Canada, Spain witnessed a sharp fall from its highest level, but while the public burden ratio fell in Canada in the 1990s, Spain's crested in 2007, which was prior to the global financial crisis, and had fallen by 5 percentage points in 2011 from its 2007 level, presumably owing to the aftereffects of the economic turmoil in Europe. The ratio in New Zealand marked its highest standing at around 37 percent in the late 1980s and has since shown considerable fluctuation by period. The recent public burden ratio fell by around 6 percentage points from its peak in the 1980s, marking a larger drop than seen in Canada, but New Zealand showcases a different trend in that its ratio bounced back to 35 percent between 2006 and 2007 to approach an all-time high and only then plummeted again in the aftermath of the global financial crisis.

As discussed, public burden ratios have substantially fallen in some countries since the early 1990s, but they are still rising or have decreased only within a limited range from their highest point in more than half the countries studied, such as among a number of non-European countries including Korea, Turkey, Mexico, and Japan, as well as some European nations (Italy, Portugal, Switzerland, Germany, Norway, Belgium, France, Austria, and Luxembourg). In addition, the scale of withdrawal from the highest point has been largely limited in the United States, Finland, Denmark, and the United Kingdom, which had already reached the level of 35 percent by the mid-1970s and still maintains this level.

## 2 Determinants of Public Burden Ratios and Related Effects

Factors affecting public burden ratios (or variables correlated to public burden ratios) can be divided into variables regarding tax systems and administration; variables related to fiscal expenditures or other financial circumstances; and variables that reflect political, economic, and social structures and characteristics. Some variables are relatively autonomous, while others are more secondary and impacted by other variables. Variables related to finances and taxes are generally secondary variables. However, not all factors reflecting political, economic, and social structures and characteristics are necessarily essential; both essential and secondary variables are included.

Any component that influences public burden ratios can be considered through two viewpoints. For convenience of discussion, this paper will define these as focused on the aspects of the supply side and demand side for tax burdens. This is understandably not a novel viewpoint; while differing in their precise terms, existing studies have proposed similar perspectives. The demand side for tax burden refers to a route through which a variable can facilitate high tax burdens.<sup>10)</sup> Tax burdens need to be increased in order to manage

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10) Kim (1994) used the term 'tax capacity' for such variables and specifically emphasized three

large-scale fiscal expenditures or respond to aggravated financial conditions. In this regard, finance-related variables have value mainly in terms of the demand side of tax burden. Since some characteristics of tax systems serve to help form a social consensus on high tax burdens or securing tax revenues in a more effective and efficient manner, they have their influence mainly in terms of the supply-side. Other political, economic, and social variables are a mixed form of variable affecting both the demand and supply sides. Some variables operate on both sides of tax burdens simultaneously.

An and Choi (2013) utilized data from OECD member nations to study the effects of each factor presented in the following table on public burden ratios and how such factors will affect ratios in South Korea in the future. The outcomes are summarized in the following paragraphs.

For the determinants of public burden ratios, the most important factors include population structure and certain variables that reflect the characteristics of a country and its political structures. Public burden ratios tend to increase as a population ages. Among the various characteristics of a country and its political structure, variables with high statistical relevance include distinctions between European and non-European countries and between presidential systems and parliamentary governments. Even when other variables are controlled, European countries show higher public burden ratios than their non-European counterparts, and nations with a presidential system were found to have lower ratios. Income variables may exert a high influence upon public burden ratios until the point at which income reaches a certain level, but above this threshold their effects were not clearly noted. Openness tends to have weak statistical relevance. Among fundamental economic variables, the proportion of the self-employed has a higher statistical relevance than the income level or openness variables, but its relevance is not as high as that of population structure and several other country-specific characteristics and political structures.

**〈Table III-1〉 Example of Determinants of Public Burden Ratios**

		Demand	Supply			
Essential	Economy	Income		○		
		Industrial structure and other variables of economic conditions		○	Industrialization serves as a factor facilitating tax collection.	
		Economic openness	○	○		
	Fundamental characteristics	Geographic and historic characteristics				
		Form of government (federal system or other central- or local-related variables)				
		Other				
		Population	Population structure	○		Aging population results in increasing demand for expenditures.
			Country size (population)			
			Population growth rate			
			Population density			
	Political and social variables	Related to social security	Income distribution, poverty, and other social indicators	○		
		Other	Integrity (corruption), government stability, and political stability		○	A society with higher level of transparency and trust has lower tax resistance, thereby remaining able to manage higher tax burdens.

〈Table III-1〉 Continue

			Demand	Supply	
Taxation	Tax structure	Tax rate, tax revenue structure, and efficiency of tax systems		○	
	Tax administration	Variables related to tax administration		○	
Finances	Fiscal expenditures and social security expenditures		○		It is inevitable to maintain a high tax burden ratio in order to maintain a high level of social security expenditures.
	Sovereign debt				

One of the reasons that the public burden ratio in Korea is below the OECD average is that population aging in Korea has progressed to a lesser degree compared to OECD counterparts. The high OECD average is attributable to the fact that European countries, which tend to have higher ratios than non-European countries, make up the majority of the OECD membership. Korea's relatively low ratio is also supported by the fact that OECD countries featuring a presidential system as does Korea tend to have lower public burden ratios than those with a parliamentary government. However, this tendency shows some uncertain aspects in relation to the question of whether a country has a lower ratio because it chose a presidential system, or if countries with a presidential system manifest additional fundamental variables reducing public burden ratios that we have failed to observe.

The major area of interest in the discussion surrounding the determinants of public burden ratios is whether the ratio in Korea is actually high or low (in comparison to the trends in other OECD countries with other variables controlled). However, this decision must go unresolved since estimates of

Korea's optimal public burden ratio or a ratio reflecting the experience of other OECD members will vary significantly depending on which variables are selected for inclusion among the determinants of public burden ratios. Excluding variables such as income level, degree of openness, or even population structure, one of the single most important explanatory variables, does not result in a notable difference in the estimated optimal tax burden ratio for cases in which they are factored. However, whether or not a country is European or has a presidential system are found to exert a remarkable influence over estimations of Korea's optimal public burden ratio or a projected ratio reflecting the experience of OECD member nations.

The public burden ratio of Korea will be most impacted by the changes in its population structure, and political and societal transformations are expected to exert greater influence than do income level and other economic conditions. It is difficult to assert that the ratio will rise further, even if income levels continue to rise. However, if the ratio of the self-employed were to fall in Korea, it might help elevate the public burden ratio. Even if a number of factors undergo changes in the future, the level of public burden ratio in Korea may maintain its current distance from the average level of European countries or of the European-dominated OECD. Additionally, it is currently difficult to draw a confident conclusion on how changes in political structure will affect public burden ratios.

# IV

## **Analysis of Relations between Tax Revenue Structures and Tax Burden Ratios**

This chapter examines the relations between tax burden ratios and tax revenue structure. According to statistical data on OECD members, countries with high tax and public burden ratios tend to have a high proportion of income tax and general consumption tax among total tax revenues, while other tax items do not manifest any evident correlation with tax burden ratios. In this chapter, whether such relations are a result of statistical coincidence or causality will be examined.

The first section is dedicated to a comparative analysis of tax revenue structures and tax burden ratios among OECD member nations. The following section will summarize the research results that describe the relations between tax burden ratios and tax revenue structures, introduce a theoretical model to explain such relations, and detail the progress of empirical analysis. In the last section, an empirical analysis will be undertaken utilizing data on OECD countries. A number of studies have conducted examinations of the effects of tax revenue structures on tax burden ratios, but here the focus will be on the rarely addressed topic of the effects of tax burden ratios on tax revenue structures as well as the substitution relationship between tax items.

## 1 Tax and Public Burden Ratios and Composition of Tax Revenues of OECD Nations<sup>11)</sup>

<Table IV-1> provides tax revenue structures for each of four groups of OECD countries categorized according to their level of public burden ratio. Among these countries, public burden ratios are evenly distributed from the lowest level of 18.1 percent (Mexico, 2010) to the highest of 48.2 percent (Denmark). Some areas showing notable gaps in the scale were used to classify the countries into the four groups.

Group I, with public burden ratios lower than 27 percent, consists of non-European countries, while all the European countries belong to either Group II, III, or IV. Group II includes the non-European countries that do not belong to Group I, Southern European countries, and some Eastern European countries, all with a ratio of 28-32.4 percent. These European nations have lower incomes than do most other countries in Europe. Group IV mainly consists of wealthy nations from Northern Europe, and most countries in this group are small in scale and open in nature with a ratio of 42-48.2 percent and per capita GDP of at least USD 40,000. Lastly, Group III includes Scandinavian countries that did not reach Group IV, Eastern European countries that do not belong to Group II, and the United Kingdom and Germany from Western Europe. The average per capita GDP of Groups I through IV increases from USD 21,519 → USD 29,353 → USD 32,964 → USD 49,896, respectively, indicating that public burden ratios and per capita GDP bear a positive relationship.

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11) The content of this section was presented at a seminar commemorating the 20th anniversary of the Korea Institute of Public Finance, An (2012b), pp. 18–20.

**<Table IV-1> Ratios of Tax Revenues to GDP by Group and Tax Item (2010)**

(Unit: %, USD)

Group (Public burden ratio)	South Korea (25.1%)	Group I (Less than 27%)	Group II (28–33%)	Group III (34–40%)	Group IV (42% or over)	Total
Income tax	3.6	6.0 <sup>1)</sup>	7.0	7.8	12.6	8.7
Corporate tax	3.5	3.1 <sup>1)</sup>	2.8	2.4	3.5	2.8
Social security	5.7	4.8	7.8	11.7	11.7	9.2
General consumption tax	4.4	4.4	6.7	7.9	8.1	6.7
Individual consumption tax	2.7	2.1	2.5	3.5	2.8	2.7
Property tax	2.9	1.9	1.9	1.6	1.8	1.8
Public burden	25.1	24.0	30.7	36.3	43.8	33.8
Tax burdens	19.3	19.1	22.8	24.6	32.1	24.6
Per capita GDP	21,529	29,353	32,964	38,706	49,863	37,709
Countries		Mexico, Chile, United States, Korea, Australia, Turkey, Japan	Ireland, Slovakia, Switzerland, Greece, Canada, New Zealand, Portugal, Spain, Poland, Israel	Estonia, Czech Republic, United Kingdom, Germany, Iceland, Luxembourg, Hungary, Slovenia, Netherlands	Austria, Finland, Norway, France, Italy, Belgium, Sweden, Denmark	All OECD member nations

Note: 1) Average of countries excluding Chile and Mexico, both of which do not provide separate statistics for income tax and corporate tax.

Source: OECD, tax database. An (2012b), p. 19, recitation.

The comparison of each group's composition of tax revenues suggests that countries with higher public burden ratios tend to have higher ratios of income tax, social security contributions, and general consumption tax. From Group I to Group IV, the proportion of income tax ascends from 3.6% → 7.0% → 7.8% → 12.6%. The proportion of social security contributions and general consumption tax also increases from Group I toward Group IV (4.8% → 7.8% → 11.7% → 11.7%, and 4.4% → 6.7% → 7.9% → 8.1%, respectively). Considering that some countries do not maintain a separate account for social security contributions, the combined ratio of individual income tax and social security contributions also showcases a clear incline from Group I to Group IV with 10.8% → 14.8% → 19.5% → 24.3%.

In the meantime, the ratio of corporate tax tends to decrease from Groups I to III, but Group IV features the highest ratio of corporate tax. Individual consumption tax does not reveal a clear pattern, and the ratio of property tax is similar among all four groups.

## **2 Literature Survey on the Relationship between Tax Burden Ratio and Tax Revenue Composition**

The following paragraphs will summarize the existing studies addressing the relations between tax burden ratio and tax revenue composition and set the direction for this research. The study of the relations between tax burden ratio and tax revenue composition conventionally begins with the latter's influence on economic growth. If the effect on economic growth can vary according to tax revenue composition when securing a given tax revenue, the negative effect of the tax upon economic growth could be minimized by reformulating tax revenue composition, which would then provide governments with the means to increase tax burdens. We will, therefore, review in the following sections the preceding studies related to the effects of tax revenue composition on economic growth, as well as existing studies on the relations between tax burden ratio and tax revenue composition.

### A. Efficiency of Taxation Structure: Composition of Tax Revenue and Economic Growth

The effect of tax on economic growth and the related mechanisms vary by tax item. In the case of consumption taxes, value-added tax is largely considered to have little negative impact on personal and corporate decision-making. Consumption tax does not discriminate between current and future consumption, and thereby does not affect the interest rate of savings or personal decisions regarding savings. For that reason, consumption tax is considered as a tax that stimulates savings when compared with income tax, the empirical evidence for which is not particularly solid.

As with income tax, consumption tax could influence employment and labor hours. If it triggers employee wage increases in response to price hikes, it could have a negative influence on employment. In this case, however, it is similarly difficult to find empirical evidence to support such a hypothesis because most studies regarding the effect of tax on employment do not include consumption tax as a research subject.

The property tax imposed annually on the possession of real estate is known to be the tax with the least-negative effect on economic growth. Property tax does not affect personal and corporate demand and supply of labor and capital, investment, technology innovation, or education to the same degree as do other tax items. Real estate tax is difficult to avoid and its tax sources are not internationally transferable. In addition, it serves as a valuable means of enhancing the accountability of government—especially local governments. A well-designed taxation system can also contribute to the effective utilization of land.

Personal income tax affects the use of labor and productivity. The impact of labor income tax on the supply of labor is divided between an influence over the personal employment decisions and its effect on labor hours. Viewing this from the perspective of income effect and substitution effect, the former is displayed as an expansion of the labor supply by decreasing after-tax income and the latter as a decrease in the labor supply through a reduction in the relative profit rate. The overall effect, therefore, depends on which side predominates,

a question which is an object of empirical analysis.

A labor income tax partially attributed to employers instead of wholly to labor translates into an increase in labor costs for employers, resulting in a decrease in demand for labor. Labor income tax also brings about changes in capital intensity by causing a change in the relative prices of capital and labor. This is a phenomenon occurring when the labor/capital ratio strays further from the optimal point due to labor income tax, resulting in lowering total factor productivity (TFP).

Personal income tax on capital income could have a negative influence on savings by reducing after-tax income. Tax on capital gains also affects the demand and supply of venture capital. Since venture capital plays a crucial role in the formation and growth of businesses in the high technology sector, tax policies can also influence TFP through effects on this sector.

Corporate tax serves as a factor curbing investment by increasing the user costs of capital. An open economy with free movement of capital is affected more than its counterparts. While personal income tax on capital income mainly impacts investment by small-sized businesses which mobilize capital from intra-national savings, corporate tax sways that of large-scale corporations.

Corporate tax also has a significant effect on productivity. First, it makes the capital-labor ratio more inefficient by altering their relative prices, consequently reducing TFP. Second, the complexity of corporate tax compounds both tax compliance costs on the part of corporations and government administrative costs, acting as a major obstacle to the efficient use of production factors. Third, a high tax burden discourages investment sentiment for innovative activities by decreasing the after-tax profit rate. Lastly, it can obstruct foreign direct investment, restricting technology transfer from multinational corporations.

A number of empirical studies regarding the effect of taxation systems on economic growth focus on estimating how much national income decreases per every unit of increase in tax revenue for a particular tax item — or how much of an additional burden an economy is required to shoulder. This estimate is known as marginal efficiency cost (MEC) or marginal excess burden (MEB) and can be approached through one of the following two methods.

One is to establish a computable general equilibrium model (CGE model) and simulate the effects on the overall economy when shifting the burden from

one particular tax item to another. This estimation largely shows that efficiency costs are higher in the order of capital income tax, labor income tax, and consumption tax. The work by Ballard, Shoven and Whalley (1985), a classic among studies estimating marginal efficiency cost using a CGE model, drew a conclusion based on 1973 US data that the marginal efficiency cost of labor income tax was 0.23 and that of capital income tax was 0.46. This means that for every one unit increase, the overall economy has to assume an additional burden of 0.23 in the case of labor income tax and 0.46 in the case of capital income tax. In Korea, Kim and Kim (2007) estimated MEC using empirical data for the period of 1970 to 2004 to establish a CGE model: the marginal efficiency cost as of 2004 was 0.298 for capital income tax, 0.212 for labor income tax, and 0.155 for general consumption tax.

Other studies have evaluated the effect of changes in taxation systems on economic growth through regression analysis using macro data. For example, the OECD (2008) performed regression analysis by means of the pooled mean group (PMG) method, utilizing data from 21 member countries where consistent data on the variables required for analysis of the period of 1971-2004 were available. The analysis results are summarized as follows: First, an increase in tax revenue was found to have a negative influence on national income. Second, if consumption tax and property tax burdens are eased and the income tax burden in a broad sense, which includes personal income tax and corporate tax, is raised, then national income declines. On the other hand, when tax burden is shifted from income taxes to consumption and property tax, national income increases. Third, national income decreases when shifting consumption and property tax burden to income tax; the excess burden from shifting to corporate income tax appeared to be much higher than when shifting to personal income tax. The estimated coefficient of personal income tax was -1.13 and that of corporate tax was -2.01, both with high reliability. Lastly, national income increases further when shifting tax revenue from income tax to consumption tax than when transferring it to property tax.

On the other hand, Acosta-Ormaechea and Yoo (2012) drew a significantly divergent conclusion using similar methodology as did OECD (2008). For dependent variables, OECD (2008) used changes in per capita GDP, but Acosta-Ormaechea and Yoo (2012) adopted changes in the economic growth

rate. While the research by OECD (2008) used OECD countries as subjects, Acosta-Ormaechea and Yoo (2012) extended its research boundary beyond this group by including into their samples a total of 69 countries ranging from low-and mid-income to high-income countries. Unlike other studies, the results of this research indicated that personal income tax and social security contributions had a more negative influence on economic growth than did corporate tax. What converged with other studies was that income tax, including corporate tax and personal income tax, had a more negative influence on economic growth than general consumption tax and property tax.

#### **B. Tax Efficiency and Government Size: Becker and Mulligan (1998)**

As expansion of the size of government became a subject of public attention, a number of studies on the causes of fiscal expansion by governments were conducted in the 1980s and 1990s. Most of them, however, focused more on the demand side of finance than on the supply side. The demand-side studies spotlighted the expansion of demand for public services, including income redistribution and the roles of interest groups. For example, Meltzer and Richard (1981, 1983) developed a theory that interest groups formed by income level enter into coalitions and contribute to expanding the size of the government by voting for policies that increase income redistribution.<sup>12)</sup> Husted and Kenny (1997) emphasized the voting rights of lower-income classes and found that the abolition of the poll tax and expansion of the voting rights for lower-income classes sparked a subsequent increase in welfare spending.<sup>13)</sup> The interest group theory of Olson provides another example of a study in political economics stressing the demand side.

Studies emphasizing the supply side are few: Kau and Rubin (1981, 2002) analyzed governmental capability to secure tax revenue, and Becker and Mulligan (1998) presented a theory which accounts for factors underlying mounting fiscal

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12) Mueller (2003), p. 512.

13) Mueller (2003), p. 517.

size while addressing both the supply and demand sides. These studies drew the conclusion that, compounding demand-side factors, enhancing efficiency in taxation played an important role in enlarging fiscal scale on the supply side. Following the bureaucracy model proposed by Niskanen (1971), Kau and Rubin assumed that government bureaucrats develop policies that maximize the size of government. Under this assumption, constraints on the supply side play the role of curbing an excessive expansion of government. Therefore, the relaxation of restrictions on the supply side through enhancing tax efficiency may enable the size of government to be enlarged.<sup>14)</sup> Regarding tax efficiency, whereas Kau and Rubin focused on the development of industry, advancement of technology, expansion of tax sources by economic growth, and efficiency of tax administration, Becker and Mulligan regarded tax revenue structure as a major factor. If efficiency of tax structure decreases and deadweight loss increases due to changes in tax revenue structures, political pressure from taxpayer groups seeking to minimize tax burdens intensifies, ultimately reducing total tax revenue and government spending. This means that tax structures affect the size of government by means of influencing the tax burden ratio. If a government that wishes to increase the tax burden ratio improves the efficiency of the tax structure and thus mitigates taxpayer resistance, reverse causality where an increase of the tax burden ratio improves the efficiency of the tax structure may occur.

Becker and Mulligan (1998) showed that tax structure efficiency resulted in an increase in the tax burden ratio through a cross-sectional data analysis using 1972-1990 data from 83 countries. The efficiency indices used in the analysis are as follows:

- (a) Ratio of social security contributions, wage tax, and consumption tax against total tax revenue (BMi)
- (b) Proportion of the average personal income tax rate of the entire economy to maximum statutory tax rates of personal income tax (BMii)
- (c) Periods of years after the initial introduction of value-added tax (BMiii)

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14) Mueller (2003), p. 529.

The first index reflects the results of existing research that the efficiency of value-added tax, tax on wages, and social security contributions which take the form of a wage tax is the highest among all tax items. The second index evaluates the universality of income tax based on the perspective that universal tax is more efficient. The third index underlies the premise that the tax systems of nations which earlier introduced value-added tax — the most effective tax item — would be more efficient than those of others. This paper by Becker and Mulligan presented the result of regression analyses using  $BM_i$  and  $BM_{ii}$ , which reflect the efficiency of a tax system. In addition to these, the paper also reported the results of an analysis making use of indexes adopted by other studies to refer to the efficiency of tax collection and administrative systems, such as the share of those engaged in agriculture among the economically active population, an index indicating the efficiency of government administration, and an index for industrial modernization. The results are illustrated in <Table IV-2>.

The efficiency index of tax systems appeared to bear an overall positive relation with total revenue/GDP ratio. The first result shows that if  $BM_i$  is used as a tax efficiency index, the estimated coefficient is positive and significant. And the estimated coefficient of  $BM_i$  is reduced to one-third of its level and the  $R^2$  is significantly increased when per capita GDP is included in the explanatory variables; if a Europe dummy variable is added, the estimated coefficients became negative figures. Per capita GDP appeared to have positive relations with government scale in all the estimated equations. Becker and Mulligan emphasized that per capita GDP itself serves as an index for tax efficiency, since efficiency of tax collection increases with per capita GDP.

Becker and Mulligan (1998) also analyzed whether the exogenous expansion of fiscal scale changed a tax system to enhance its efficiency by investigating data on war-time government finances in the U.S. (1940-1944) and the government finances of oil-exporting countries during the oil shock of the 1970s to verify reverse causality. The result showed that exogenous expansion of fiscal scale did not result in changes to the efficiency of tax structures. This indicates, as the authors assert, that although efficiency of tax structures contributes to increasing tax burden ratios, reverse causality does not occur.

**〈Table IV-2〉 Results of Empirical Analysis on the Influence of Tax Efficiency on Government Scale — Becker and Mulligan (1998)<sup>5)</sup>**

Independent variable	Dependent variables								
	Total government tax revenue/GDP (1973–1990 averages)								
Tax efficiency	0.31 (0.08)	0.10 (0.07)	-0.02 (0.08)	0.17 (0.08)	0.65 (0.18)	0.68 (0.18)	1.31 (0.37)	0.19 (0.05)	0.17 (0.12)
(Index) <sup>1)</sup>	BMi	BMi	BMi	NAG	BMii	BMii	BMii	ADM	IND
Other Independent Variables:									
Log (Per capita GDP) <sup>2) 3)</sup>		0.07 (0.01)	0.05 (0.01)	0.01 (0.02)	0.03 (0.02)	0.04 (0.02)	0.05 (0.03)	0.07 (0.02)	0.01 (0.04)
Democracy index <sup>4)</sup>						-0.06 (0.06)	-0.11 (0.07)	-0.11 (0.07)	-0.08 (0.08)
Europe dummy			0.11 (0.03)	0.11 (0.03)	0.05 (0.03)	0.06 (0.03)	-0.03 (0.05)	-0.03 (0.05)	-0.01 (0.05)
N	83	83	83	83	53	53	32	32	32
R2	0.15	0.43	0.51	0.54	0.65	0.64	0.41	0.42	0.20

Note: 1) Tax efficiency index

BMi: Ratio of social security contributions, wage tax, and value-added tax against total tax revenue (1973–1990 averages)

BMii: Index of average tax rate of personal income tax in the total economy (1973–1990 averages) divided by maximum statutory tax rate (in 1984)

NAG: Proportion of non-agricultural population out of overall economically active population (World Bank)

ADM: Administrative efficiency of a government (Adelman and Morris, 1971, pp. 76–78, Index within a range of 0–1)

IND: Industrialization index (Adelman and Morris, 1971, pp. 97–99, Index within a range of 0–1)

2) 1972–1989 average; 1973–1990 average for some countries.

3) Per capita GDP is based on the US dollar value reported in 1985 as provided in Penn World Tables.

4) Democracy index is the average figures of 1975 and 1994 from Barro (1996, 〈Table 8〉).

5) The values in parentheses are standard deviations.

Source: Becker and Mulligan (1998), p. 21.

Keen and Lockwood (2006, 2010) and Lee, Kim and Borchering (2013) conducted research in order to determine whether or not the superior efficiency of value-added tax compared to other tax items plays a role as a money-machine in expanding fiscal revenue. Keen and Lockwood (2006) proposed two hypotheses regarding value-added tax and fiscal scale. One is that, with all other conditions being equal, governments which introduced value-added tax attain a greater fiscal scale than do their counterparts. The other is that value-added tax is a factor in enlarging the fiscal scale of a government: as Becker and Mulligan asserted, since value-added tax is an efficient tax item, nations which utilize value-added taxes enlarge their fiscal scale to a greater extent than do their counterparts. Keen and Lockwood termed the first theory the weak money-machine hypothesis and the second as the strong money-machine hypothesis, and then attempted to substantiate them through empirical analysis.

Keen and Lockwood (2006) tested the two aforementioned money-machine hypotheses using panel data drawn from OECD countries. To test the weak form of money-machine hypothesis, the authors reviewed whether the government size of countries which introduced a value-added tax system was in fact larger than those of their counterparts. Panel regression analysis was conducted, setting government size as a dependent variable, independent variables to include the introduction of value-added tax as a dummy variable, and variables to explain fiscal demand as control variables. The results showed that the fiscal scales of countries which had introduced a value-added tax system were indeed on the whole larger than those of their counterparts.

Granger causality analysis and regression analysis were used to test the strong form of money-machine hypothesis. In the Granger causality analysis, the causality between total tax revenue and value-added tax revenue was reviewed, revealing that bidirectional causality existed when testing causality between the two variables, excluding controlled variables. When controlled variables representing fiscal demand were included among the explanatory variables, the increase in total tax revenue expanded the value-added tax revenue, but there was no reverse causality identified.

In regression analysis, fiscal revenue was set as a dependent variable, and panel regression analysis was performed by including value-added tax revenue as an explanatory variable in addition to a dummy variable representing the

introduction of value-added tax and other control variables to explain fiscal demand. The analysis revealed that total tax revenue increased in proportion to the rise of value-added tax revenue. A substantial part of the increment of value-added tax revenue, however, is offset by a decline in tax revenue from other tax items, leaving only a share of the increment reflected.

Keen and Lockwood (2010) estimated the influence of the introduction of value-added tax on government revenues by means of 25 years of panel data with the subject expanded to 145 countries around the world. They reached the conclusion that the introduction of a value-added tax has a positive influence on government revenues, estimating a 2-equation system composed of twin functions — one to determine the introduction of a value-added tax and the other to represent the effect of the introduction of a value-added tax on fiscal revenues.

Lee, Kim and Borcherding (2013) conducted a study examining the relations between the introduction of a value-added tax and fiscal scale, following up on the study of Keen and Lockwood (2006, 2010). They particularly focused on the substitution effect that Keen and Lockwood had identified. Through empirical analysis, they demonstrated that if fiscal demand is inelastic against price, enhancing tax efficiency following the introduction of value-added tax can result in substituting for ineffective taxation through a substitution effect rather than impacting composite fiscal revenues. In an empirical analysis utilizing panel data from OECD countries, they drew the conclusion that the introduction of a value-added tax has a negative influence on revenue from other tax items and little effect on tax revenues.

### C. Policy Implications and Limitations of Existing Studies

Considering the aforementioned discussion, the positive effect obtained from enhancing tax efficiency by adjusting the composition of tax revenues depends on the degree to which it may be substituted by other tax items. The abovementioned studies, however, feature the potential for improvement in estimating their effects. Becker and Mulligan (1998) did not address the possibility of substitution by other tax items. Keen and Lockwood (2006) inferred

that a significant amount of value-added tax was used as a substitute for other tax items and only a small amount of it was related to an expansion of fiscal revenue, mentioning that the coefficients of value-added tax revenue among independent variables were less than one in estimation results of functions representing total tax revenue. While Lee, Kim and Borcharding (2013) strived to directly estimate the substitution effect, they used dummy variables representing the introduction of value-added tax instead of value-added tax revenue as explanatory variables, which is limited in terms of assessing the substitution effect. They included only the introduction of a value-added tax among dependent variables and did not apply an index which represents value-added tax revenue when analyzing the effects of value-added tax on total tax revenue.

Another limitation of exiting studies is that they focus on the effect of the introduction of a value-added tax on fiscal revenues without conducting further investigations into the impact on the revenue from value-added tax of the expansion of fiscal demand caused by other factors. Becker and Mulligan (1998) theoretically demonstrated that an expansion of fiscal demand could drive tax structures in an efficient direction. In an empirical analysis, however, they concluded that the expansion of fiscal demand appeared to not have induced tax structures toward efficiency, mentioning that tax structures did not show any notable changes during particular periods when fiscal demand increased due to temporary causes such as war. The particular periods discussed in the study, however, were highly exceptional circumstances and the increases in fiscal demand occurred over only relatively short-term periods, suggesting that other factors rather than efficiency might have played a role as dominant factors. In their Granger causality analysis, Keen and Lockwood (2006) drew the conclusion that total tax revenue triggered an expansion of value-added tax revenue when other factors representing the characteristics of individual countries were considered together, but that there was no reverse causality. However, they made no mention of the notion that a rise in fiscal demand may increase tax revenue from other tax items as well as value-added tax revenue and that the share of value-added tax revenue may not expand in such a case. While explaining the result that the introduction of value-added tax did not have a crucial impact on fiscal revenues, Lee, Kim and Borcharding (2013) mentioned the potential

for reverse causality, but did not attempt to carry out an empirical analysis.

### 3 Empirical Analysis on Relations between Tax Burden Ratio and Tax Revenue Composition

From the existing studies reviewed above, three hypotheses on the relations between tax burden ratio and tax revenue composition can be established as follows:

First, enhancing tax efficiency through changes in tax revenue composition leads to an increase in the tax burden ratio. In other words, the introduction of value-added tax — an efficient tax item — or an expansion of the percentage share of value-added tax to tax revenue results in an increase of the total tax burden. This hypothesis is based on the premise of the Leviathan hypothesis that bureaucrats endeavor to maximize the government's size.

Second, not all the increments of tax revenue from efficient tax items are reflected as an increase in total tax revenue, but they may also cause a partial reduction in tax revenue from other more inefficient tax items. Lee, Kim and Borcharding (2013) illustrated how the effect of enhancing tax efficiency resulting from the introduction of a value-added tax was offset by a reduction in tax revenue from other tax items.

Third, when governments need to increase tax revenue due to non-tax factors such as fiscal demands, tax revenue from tax items with high efficiency is a priority consideration. Becker and Mulligan (1998) and Lee, Kim and Borcharding (2013) mentioned the possibility of such causality in a theoretical discussion.

Existing studies have empirically demonstrated that the aforementioned effect was in fact produced, focusing on testing the first hypothesis; the effect not being large enough, they have suggested the existence of a substitution effect as in the second hypothesis. Lee, Kim and Borcharding (2013) reached the conclusion that enhancing tax efficiency does not in actuality translate into an improvement in the tax burden ratio due to a strong substitution effect. As for the second hypothesis, Lee, Kim and Borcharding (2013) attempted to conduct

an empirical analysis, but since they analyzed the effects of the introduction of a value-added tax on tax revenue by tax item rather than the effects of value-added tax revenues, it is difficult to recognize the scale of the substitution effect by increases in value-added tax revenue. For the third hypothesis, systematic empirical analysis has yet to be attempted.

In this study, the three aforementioned hypotheses will be tested by estimating a simultaneous equation consisted of estimating equations which account for share of tax burden and tax revenue by tax item to total tax revenue utilizing panel data from OECD nations.

#### A. Estimation Model and Data

The following investigation examines how much an increase in tax revenue from efficient tax items is substituted by a decrease in tax revenue from other items, what effect an exogenous increase in a tax burden ratio has on the composition of efficient and inefficient tax items, and what influence a change in the itemized percentage share of tax revenue has on total tax revenue. The following simultaneous equation models were estimated for the analysis using panel data from OECD countries.

$$y_{it} = \beta y_{it} + \gamma X_{it} + \mu_i + \eta_t + \epsilon_{it} \quad (\text{Equation IV-1})$$

$$y_{it} = \begin{bmatrix} PIT_{it} \\ CIT_{it} \\ VAT_{it} \\ TR_{it} \end{bmatrix}, \quad \beta = \begin{bmatrix} 0 & \beta_{pc} & \beta_{pv} & \beta_{pT} \\ \beta_{cp} & 0 & \beta_{cv} & \beta_{cT} \\ \beta_{vp} & \beta_{vc} & 0 & \beta_{vT} \\ \beta_{Tp} & \beta_{Tc} & \beta_{Tv} & 0 \end{bmatrix}$$

The subscripts  $i$  and  $t$  represent country and time, respectively, while PIT, CIT, and VAT stand for the ratios of personal income tax, corporate tax, and value-added tax revenue to total tax revenue, respectively. Becker and Mulligan (1998) used the sum of value-added tax, income tax, and social security contributions as indexes to represent tax efficiency, but Keen and Lockwood (2006) and most other studies only used value-added tax as a research subject.

Since tax efficiency varies by tax item, we constructed a model to analyze factors affecting the three tax items which constitute the bulk of tax revenue. TR represents the percentage share of total tax revenue in GDP, that is, the tax burden ratio. As itemized tax revenue corresponds to total tax revenue when simultaneous equations that include all tax items are established, property tax, individual consumption tax, and other tax items were excluded from the model.

Keen and Lockwood (2006) analyzed the effect of the ratio of value-added tax revenue against GDP on that of total tax revenue to GDP. If other tax items also affect total tax revenue at the same level as does value-added tax revenue, a simple analysis of relations between value-added tax revenue and total tax revenue is insufficient to prove the money-machine role of value-added tax. Considering these issues, this present study made two major enhancements: one is that personal income tax and corporate tax, the two major tax items alongside value-added tax, were included in the estimation equation; the other is that the ratio of tax revenue by tax item against total tax revenue was used for analysis instead of that against GDP. The ratios of tax revenue by each against GDP constituting a portion of the tax burden ratio are most likely to have statistically positive relations with total tax revenue. In the meantime, the ratio of value-added tax against total tax revenue and tax burden ratio have weaker statistical correlations.

As social security contributions were not included in total tax revenue in this study, TR is identical to the tax burden ratio. In many countries, social security contributions are collected independently from tax and managed through a separate accounting. The rise and fall of social security contributions, therefore, is determined by the fiscal demands of the corresponding social insurance and appears to be operated irrespective of the efficiency of taxes in effect. Thus, we excluded social security contributions from this analysis.

The aforementioned simultaneous equation system is composed of four functions, accounting for the proportion of personal income tax, corporate tax, and value-added tax against overall tax revenue, and for tax burden ratios. By including share of tax revenue from other tax items and tax burden ratios into the explanatory function for the ratio of tax revenue by tax item, we can observe the influence of the substitution effect between tax items and changes in the tax burden ratio on the composition of tax revenue by item. The effect of changes

in tax revenue composition on tax burden ratios is expected to be identifiable by adding share of tax revenue by tax item to the explanatory variables of the tax burden ratio equation. The first term on the right-hand side of the above equation (Equation IV-1) is that which would play such a role.

The second term on the right-hand side of the equation consists of control variables which affect the composition of tax revenues by tax item in addition to tax revenue. Controlled variables include aging index (AGEDO), GDP per capita (GDPC), population density (LPOPDEN), trading index (TRADE) as the variable representing degree of openness, foreign direct investment ratio (FDI), proportion of the agricultural sector (AGRI), scale of GDP (LGDP), debt ratio (DEBT), export ratio (EXP), compensation of employees ratio (COEG), and household consumption expenditure ratio (HFCONS). Most of these were previously described in Chapter III as factors affecting fiscal demand, and some of them are included as explanatory variables on individual tax items. AGEDO represents the ratio of the population 65 and older to the economically active population; TRADE stands for the sum of the ratio of exports and imports to GDP, FDI for the ratio of net inflows of foreign direct investment against GDP, AGRI for the ratio of added value in the agricultural sector against GDP, DEBT for the ratio of central government debt against GDP, EXP for export-to-GDP ratio, COEG for the employee wages appearing in the ratio of national income accounts against GDP, and HFCONS for the ratio of final household consumption expenditure against GDP.

The aging index (AGEDO), population density (LPOPDEN), and GDP per capita (GDPC) have been included in most estimation equations. Rasin, Sadka and Swagel (2001) studied the effect of aging on capital and labor income and arrived at the conclusion that if aging causes an increase in welfare expenditures for the elderly, the burden of capital income tax increases and that of labor income tax decreases. As societal aging progresses, the elderly assume a growing proportion of all voters. As a result, it tends to be believed that the progression of aging makes the elderly increasingly influential in elections, resulting in a decline of the percentage share of capital income tax, of which most of the elderly pay more, and an increase in the labor income tax mainly paid by younger generations. However, even when aging progresses, if the median voter is a young worker, he or she would vote preferentially for a policy to impose more

tax on the elderly by taking into account that a large share of the increased tax revenue would be used for supporting the elderly. Viewed from this perspective, the ratio of value-added tax, which is paid relatively more by the elderly whose incomes are less than their consumption, could increase according to progress of aging.

Per capita GDP and population density were used as indexes to reflect the efficiency of tax administration. This is based on the assumptions that tax administration improves with economic development and that tax administration is more efficient among a dense population distribution than in the case of a sparser population distribution. As described in Chapter III, population density also affects fiscal demand.

To review the control variables included in individual equations, the ratio of value-added in agricultural sector against GDP (AGRI) and that of employee wages against GDP (COEG) were included as controlled variables in the case of labor income tax. It is conventionally recognized that a large share for the agricultural sector translates into low efficiency of income tax administration. As employee wages are distributed to labor from total revenue, the share of employee wages is expected to show a positive relation with personal income tax burden, a large portion of which is born by labor income.

As for the function of corporate tax, the share of the sum of exports and imports divided by GDP (TRADE), which stands for the degree of openness, and the scale of GDP (LGDP) were included in the control variables. As small-scale open economies consider their relative tax burden compared with other countries to be a central factor in their corporate tax policy, they are expected to maintain relatively low corporate tax rates. In addition, the ratio of inflows of foreign investment (FDI) against GDP was used to indicate degree of openness. Population density was excluded due to it being considered not to substantially affect corporate tax administration, unlike value-added tax.

For the function of value-added tax, the respective ratio of exports (EXP) and household consumption expenditures (HFCONS) against GDP were included in the controlled variables. As household consumption expenditure falls under the category of tax base of value-added tax, if other conditions are equal, the share of private consumption expenditures is expected to serve as a factor to increase value-added tax revenues. As value-added tax is not imposed on exports,

a large share of exports is expected to lead to lower value-added tax revenues.

The function for tax burden ratio includes TRADE, LGDP, and the ratio of central government debt to GDP (DEBT) as control variables. An open economy which depends largely on international trade is expected to maintain its tax burden ratio low in order to protect its export competitiveness, and if economies of scale exist in the supply of public goods, GDP should have negative relation with tax burden ratio. The debt-to-GDP ratio is a variable which reflects fiscal pressure on a government.

Most of the factors affecting fiscal demand reviewed in Chapter III were included as control variables, with the exception of a few variables for which consistent data were not available. Those variables which were classified as national characteristic-related variables were excluded as well, such as the division between European and non-European, economic system, form of government, democratization, and form of welfare state. The research objects of this investigation are 20 OECD member countries for which data on all the aforementioned variables from the 1995-2008 period are available. These countries had all been members prior to South Korea joining the OECD. They show no clear distinctions among themselves in terms of economic system and democratization, and, except for a handful, most are European countries. In this study, where an analysis of panel data is attempted, it is expected that the state dummy variable in the fixed effect analysis will be able to offset a considerable degree of the variations among countries.

The last three terms on the right side of the equation are error terms which stand for country fixed effect, time fixed effect, and random effect.

Tax revenue data by tax item and total tax revenue, GDP per capita, and debt ratio were acquired from the OECD database. Population-related data such as population size, population density, and aging index, as well as export- and import-related data and data on employee wages and household consumption expenditures, were converted to percentage terms from the WDI database of the World Bank. The proportion to GDP or to total tax revenue was applied by converting it into a percentage and natural logarithms were employed for GDP per capita and population density. The object period was the 14 years from 1995 to 2008, and data from 20 countries for which all required data were available were analyzed. The following <Table IV-3> summarizes the data used

for analysis.

**〈Table IV-3〉 Summary of Data Used in Estimation**

Variables	Description	Average	Standard Deviation	Minimum Value	Maximum Value
TR	Total tax revenue <sup>1)</sup>	27.11607	6.993673	17	49.7
PIT	Personal income tax <sup>2)</sup>	33.21266	10.25501	13.82979	55.34884
CIT	Corporate tax <sup>2)</sup>	12.06665	5.347189	2.739726	36.6523
VAT	Value-added tax <sup>2)</sup>	26.80772	6.742094	9.734513	42.37288
GDP	GDP per capita	25924.06	9315.092	7469.001	61342.11
AGEDO	Aging index	21.28708	4.166481	8.31056	30.63155
POPDEN	Population density	127.8485	132.3546	2.66801	504.4728
AGRI	Agriculture <sup>1)</sup>	3.342673	1.92857	0.850317	11.5524
TRADE	Trade <sup>1)</sup>	84.72791	35.16689	22.97596	183.6237
EXP	Exports <sup>1)</sup>	43.21499	18.59295	9.387428	99.5489
FDI	FDI <sup>1)</sup>	4.728952	6.494547	-5.89528	51.89585
COEG	Employee wages <sup>1)</sup>	48.28	5.590567	35.5	60.5
HFCONS	Household consumption expenditures <sup>1)</sup>	55.14043	6.153827	39.16721	70.57731
GDP	GDP	1,084,105	2,340,458	6196.97	1.42e+07
DEBT	Debt ratio <sup>1)</sup>	44.52817	20.6342	7.99	113.616

Note: 1) Ratio divided by GDP (%)

2) Ratio divided by total tax revenue (%)

Prior to estimating simultaneous equation models, the issue of identification

should be reviewed: that is, whether or not the solution to respective endogenous variables included in simultaneous equation models exists must be examined. The simplest manner is to compare the number of endogenous and exogenous variables included in each equations. When the number of endogenous variables which are included in the equation and not standardized is  $M_i$ , and the number of exogenous variables that are not included in the equation is  $K_i$ , if  $M_i > K_i$ , then the equation is not identified and is impossible to estimate. If  $M_i = K_i$ , a system of simultaneous equations is clearly identified and has a unique solution.<sup>15)</sup>

We have four endogenous variables and four equations. The exogenous variables included in the four individual equations are arranged in <Table IV-4>. Each individual equation includes three un-standardized endogenous variables and four to five exogenous variables out of the 12 variables. The common variable included in all equations is per capita GDP.

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15) Song and Jeong (2002), p. 132.

**<Table IV-4> Independent Variables Included in Individual Functions**

Variables	Description	TR	PIT	CIT	VAT
GDP	GDP per capita	○	○	○	○
AGEDO	Aging index		○	○	○
POPDEN	Population density	○	○		○
AGRI	Agriculture <sup>1)</sup>		○		
TRADE	Trade <sup>1)</sup>	○		○	
EXP	Exports <sup>1)</sup>				
FDI	FDI <sup>1)</sup>			○	
COEG	Employee wages <sup>1)</sup>		○		
HFCONS	Household consumption expenditures <sup>1)</sup>				○
GDP	GDP			○	
DEBT	Debt Ratio <sup>1)</sup>	○			
EU dummy					○

Note: 1) Ratio divided by GDP (%)

## B. Methods and Result of Estimation

In order to estimate the substitution effect for value-added tax, most existing studies estimated a single function accounting for tax burden ratio or individual functions separately in the case of estimating tax revenue-estimating functions from multiple tax items. In contrast, this study specified estimating functions by considering the three-stage least squares method (3SLS) for three functions which account for the respective ratios of income tax, corporate tax, and value-added tax, plus an additional function for tax burden ratio, all as simultaneous equations. In multiple estimating equations, the 3SLS method estimates corresponding equations simultaneously in a case where a dependent variable in one equation is included in the explanatory variables in another equation.

<Table IV-5> shows the estimation results involving three different methods:

the first column illustrates results derived through the 3SLS method, pooling all the data and not considering them as panel data; the second column displays the results of country fixed-effect analysis based on the estimation using dummy variables distinguishing countries; the third column provides year fixed-effect analysis estimated by using dummy variables by year. The areas which show the effects of tax burden ratio and share of tax revenue by tax item, the major area of interest for this study, have been shaded for emphasis. While the year fixed effect, which analyzed international changes, has the same nature as a cross-sectional analysis, country fixed effect analyzing intra-national changes by year has the same nature as a time series analysis.

The estimation result shows that there are significant differences between country fixed effect and year fixed effect. This distinction is especially clear in the effect of changes in the tax burden ratio. For year fixed-effect analysis, an increase in tax burden ratio caused a rise in personal income tax and value-added tax, but showed no significant influence on corporate tax. This means that countries with a higher tax burden ratio collect more tax revenue from personal income tax and value-added tax than do their counterparts. This result supports the third of the three hypotheses detailed at the beginning of this section: when governments need to increase tax revenue due to non-tax factors, they preferentially increase tax revenue from tax items showing higher efficiency.

As for the analysis result on country fixed effect, an increase in the tax burden ratio was found to expand personal income tax, corporate tax, and value-added tax. This suggests that when governments need to raise the tax burden ratio due to non-tax factors, they make use of major tax items equally instead of focusing on one specific item.

The estimated coefficients by tax item, however, turned out to be higher in the order of 1.0130 for corporate tax, 0.9161 for income tax, and 0.6858 for value-added tax. This order is the exact opposite of what was drawn from the efficiency evaluation by tax item reviewed earlier and implies that countermeasures by individual governments facing an expansion of fiscal demand could be markedly different from those suggested by the theoretical discussions reviewed previously. To elaborate, when a government needs to increase tax revenue due to expanded fiscal demand, it increases tax revenue from all major tax items rather than preferentially increasing revenues from tax items with higher

efficiency. On the contrary, it was found that tax revenue from corporate tax, characterized by low tax efficiency, increases more.

**(Table IV-5) Results of Estimating Relations between Tax Burden and Tax Revenue Structure**

		Pooled-3SIS	Fixed effect (Country)	Fixed effect (Year)
PIT	TR	0.3756***	0.9161***	0.3050***
	VAT	-0.7970***	-0.8660***	-0.7665***
	CIT	-1.0639***	-0.6902***	-0.9875***
	LGDP	2.9859***	6.8049***	4.3842***
	AGRI	-0.3944*	0.0762	-0.2170
	LPOPDEN	-0.5568**	-28.0324***	-0.6759**
	COEG	-0.0664	0.1226	-0.0528
	AGEDO	0.3445***	-0.0975	0.4241***
CIT	TR	0.3007*	1.0130***	-0.0016
	PIT	-0.8953***	-0.9809***	-0.8899***
	VAT	-0.7791***	-1.1926***	-1.1269***
	LGDP	3.6129***	51.0958***	2.9257*
	AGEDO	0.3767*	-0.2489*	0.6896***
	TRADE	0.0113	-0.0111	0.0245**
	LGDP	-0.0924	-40.2334***	-1.3873*
	FDI	0.0181	-0.0000	0.0044
VAT	TR	0.2586***	0.6858***	0.2441***
	PIT	-0.8400***	-0.7198***	-0.8972***
	CIT	-0.5298***	-0.6150***	-0.6571***
	AGEDO	0.5318***	-0.1574	0.5599***
	EXP	0.1148***	-0.0071	0.1095***
	HFCONS	0.1847*	0.1388*	0.1556*
	LPOPDEN	-0.9539***	-30.5325***	-0.9831***
	LGDP	-0.5827	7.8965***	0.5142
EU	1.8080*		1.3050	
TR	PIT	1.1466***	0.6338***	1.3784***
	CIT	1.1824***	0.5388***	1.1288***
	VAT	0.2899***	0.5204**	0.1308
	LGDP	-3.1165**	36.3756	-9.0168***

〈Table IV-5〉 Continue

	Pooled-3SIS	Fixed effect (Country)	Fixed effect (Year)
TRADE	-0.0073	0.0109	-0.0079
LPOPDEN	1.1928***	63.3547*	2.0656***
LGDP	-3.1198***	-41.5063	-3.8957***
DEBTG	0.0280*	0.0025	0.0019

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

One possible explanation for this phenomenon is that political resistance varies by tax item. Supposing that policy is determined by reflecting the preference of median voters, if these voters are wage earners and lack extensive knowledge regarding the attribution of corporate tax and believe it to be unrelated to themselves since it is paid by corporations, they may prefer an increase in corporate tax over one on personal income or value-added tax when addressing the need to increase government revenue. In addition, because median voters' incomes are usually below average, they may prefer raising personal income tax, which is paid to a greater degree by the rich, rather than increasing the value-added tax. If such a preference on the part of median voters exercises overwhelming leverage, the priorities for expansion of tax revenue could be the order of corporate tax, personal income tax, and value-added tax when facing the need to increase the tax burden ratio.

However, the facts that countries with higher tax burden ratios have a larger share of income tax and value-added tax and that the ratio of corporate tax is not significantly affected by tax burden ratios imply that the reactions revealed by the abovementioned intra-national analysis do not persist over the long term. Governments develop policies to enhance the efficiency of the national economy over an extensive period, and refining tax system efficiency can be said to be one of them. Governments exert sustained efforts to improve tax efficiency, since only nations which maintain efficient tax systems by overcoming political obstacles to efficiency are able to maintain a high tax burden ratio.

To elaborate, when faced with a need to raise the tax burden ratio due to swelling fiscal demands, most OECD countries can be observed to have immediately increased personal income tax, corporate tax, and value-added tax

simultaneously, but from among them increasing corporate tax relatively more and value-added tax relatively less. Such a result may be the product of firm resistance from low- and mid-income groups toward increases in the value-added tax. However, the power of tax-structure efficiency to check revenue source procurement in the demand side is fairly strong as well, and there is a limit on increasing the tax burden ratio through the expansion of tax revenue via inefficient tax items. This is demonstrated by the fact that the share of value-added tax and income tax in countries which have higher tax burden ratios is larger than that found in their counterparts, and that the share of corporate tax does not show any considerable difference.

The findings estimated while excluding all dummy variables for fixed-effect analysis are similar to those from year fixed-effect analysis, which can be interpreted as international changes being large enough to dominate the overall picture compared with intra-national ones.

As for the substitution effect of tax revenue, personal income tax, corporate tax, and value-added tax were observed to show fairly strong mutual substitution effects: an increase in the share of value-added tax leads to a decrease in those of personal income tax and corporate tax, the decline range of corporate tax being larger than that of personal income tax. This means that the effect of value-added tax on substituting corporate tax is larger than the effect on substituting personal income tax, which is a phenomenon common to state fixed-effect and year fixed-effect analysis, but the effect of value-added tax being substituted by corporate tax appeared to be larger in intra-national changes. An increase in the share of personal income tax also leads to a decrease in the share of corporate tax and value-added tax, and an increase in the share of corporate tax causes a resulting decline in the shares of personal income tax and value-added tax.

Examining the influence of changes in tax revenue share by tax item on the tax burden ratio, the above three tax items all appeared to manifest a positive relation with the tax burden ratio. This suggests insufficiencies in the conclusions by previous studies that value-added tax plays a role as a money-machine by reviewing the effect of the introduction and scale of revenue of value-added tax. This is because tax burden ratio signifies the sum of the ratios of tax revenues from each tax item against GDP, and tax items other than value-added tax may

have positive relations with tax burden ratios. The fourth panel of <Table IV-5> shows that, besides value-added tax, the share of personal income tax and that of corporate tax have a positive relation with the tax burden ratio. A comparison of estimated coefficients reveals that personal income tax and corporate tax have a larger influence on increasing the tax burden ratio than does value-added tax, which is commonly observed in analyses of changes both among and within nations. In particular, the analysis of changes between nations displayed that value-added tax has no effect on increasing the tax burden ratio.

Such findings show that the hypothesis presented by Becker and Mulligan (1998) was not congruent with the observed reality when they asserted that, because value-added tax is an efficient tax item, it is more effective to increase tax burden ratios than are other tax items, thus featuring the potential to undermine public welfare by excessively expanding the scale of government. Governments aim at increasing tax burden ratios when they raise the ratio of corporate tax or personal income tax among total tax revenues; in other words, the only purpose of increasing tax revenues from inefficient tax items is to expand tax revenues. Therefore, an increased proportion for these tax items among total tax revenues appears to directly lead to higher tax burden ratios. In the case of value-added tax, it is natural that an increase in the share of value-added tax revenue would be less connected with an expansion in tax burden ratio than are other tax items if a considerable portion of value-added tax revenue is used to substitute for other more inefficient tax items.

As for estimated coefficients of other variables, the analysis of changes between nations indicated that nations with higher national per capita income (LGDP/C) showed a larger share of personal income tax and corporate tax and that such an effect regarding value-added tax was apparent only in the analysis of intra-national changes. In the examination of changes among nations, the aging index appeared to increase the respective ratio of personal income tax, value-added tax, and corporate tax together, but degree of openness had little influence over tax revenue structures. Against all expectations, estimated coefficients of population density in the function of income tax and value-added tax appeared to be negative values, but they had positive figures in the function of tax burden ratio. Debt ratio proved to have no significant influence on the tax burden ratio.

# V

## Summary and Conclusion

Methods for raising public funds and their optimal scales have emerged as an important social issue in response to the recent expansion of fiscal demands due to an aging population and growing social welfare systems. Compared to other countries and to the social and economic demands of today, Korea tends to be perceived as maintaining relatively low tax and public burden ratios. Therefore, critical issues for examination include: How far should South Korea increase its tax and public burden ratios? To what extent can it increase these ratios while maintaining the framework of current tax structures? If these burden ratios were substantially increased, how would Korea be required to change its tax structures?

Along with those underlying international variations, this study sheds light on factors related to changes in the tax and public burden ratios of Korea and other OECD member nations, and also analyzed the correlations between tax burden ratios and tax structures. Traditionally, studies on the determinants of the tax burden ratios or public burden ratios of a particular country have concentrated on analyzing the factors that affect fiscal demands. It is easily imaginable, however, that the costs incurred while raising public funds may in fact influence decisions on the scale of public burdens. If a country is able to raise a similar amount of funds at a lower cost thanks to heightened tax efficiency, it will be able to raise its tax burden ratio. In addition, if it is required to raise its tax burden ratio in response to increasing fiscal demands, it will likely be able to do so with greater facility if it is able to reform its tax structures so as to heighten taxation efficiency. Taxation efficiency involves, above all

else, efficiency in tax administration, as well as efficiency both in taxation systems for individual tax items and in the composition of tax items. This study focused on the composition of tax items and analyzing its relations with tax burden ratios.

A cross-sectional analysis of the composition of tax revenues in OECD countries found that nations with higher public burden ratios also have higher ratios of income tax, social security contributions, and general consumption tax. This study examined whether any underlying structural sources could be identified for such international differences, with a particular focus on the causal relationship between differences in burden ratios and differences in the composition of tax revenues. For this specific question, burden ratio was used to refer to tax burden ratio rather than public burden ratio, since social security contributions are often collected for purposes distinct from those of general tax and managed based on separate accounting, which requires unique reasoning compared to that applied in a general discussion on tax efficiency.

By integrating the existing research results, this study proposed three hypotheses on the relations between tax revenue composition and tax burden ratios and examined them based on panel data from OECD countries over the period between 1995 and 2008.

The three hypotheses were: (1) Enhancing tax efficiency by changing the composition of tax revenues results in increased tax burden ratios; (2) the increments in tax revenues from efficient tax items result in reducing tax revenues from other substantially inefficient tax items; and (3) if a government needs to increase tax revenues due to non-tax reasons, it preferentially raises those derived from more efficient tax items. Existing studies have suggested that the results of empirical analysis support the first and second hypotheses, while the third hypothesis is built upon theoretical deductions rather than empirical analysis.

This study attempted to improve upon previous research and verify all three hypotheses based on a simultaneous equation model consisting of functions to explain the ratio of tax revenues from each tax item and a function to explain tax burden ratios. By using panel data, it also compared the results of the country fixed effects model and the year fixed effects model. The former is a time-series analysis of changes within a country, while the latter provides a cross-sectional

analysis of differences among countries.

Regarding the third hypothesis, the analysis of international changes observed that an increase in tax burden ratios gives rise to an increase in the ratios of value added tax and individual income tax, which are regarded as relatively efficient, but does not exercise any meaningful influence upon the ratio of corporate tax. This means that governments do in fact prefer to increase tax revenues from more efficient tax items when faced with the necessity to raise tax burden ratios.

Meanwhile, the analysis of intra-national changes found that the effect of an increase in tax burden ratios is greatest on corporate tax, followed by individual income tax and then value added tax. This is likely a result of the diverse preferences for each tax item on the part of voters, and particularly of the political resistance to value added tax overwhelming, at least over the short term, the lure of improved efficiency. However, this analysis also reveals that tax efficiency has a substantial power for curbing the increase in tax burden ratios on the supply side of financial resources. Ultimately, countries with higher tax burden ratios tend to maintain a high ratio of value added tax.

It was also found that these three tax items display a mutual substitution effect. For example, an increase in the proportion of individual income tax leads to a lowering of the proportions of corporate tax and value added tax. An increase in the proportion of value added tax also reduces the share of corporate tax and that of individual income tax, but it is estimated that the former decreases more than the latter due to the effect of efficiency.

Lastly, this study drew the conclusion that an increased ratio of tax revenues from more efficient tax items does not lead to increasing the scale of public finance. An increase in the proportion of individual income tax, corporate tax, and value added tax each has an effect on increasing tax burden ratios, but the first two have a greater effect compared to value added tax. This is because the government increases individual income tax and corporate tax only when it is imperative to expand fiscal revenues, but it may raise the ratio of value added tax when it wishes to substitute for inefficient tax items. This also proves the invalidity of the hypothesis that improving the efficiency of tax structures by increasing revenues from value added tax based on the Leviathan model results in aggravating the welfare of the general public through excessive

governmental expansion.

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