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Factors of Income Tax Revenue Changes in 2011~2017

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I. Introduction

The purpose of this study is to analyze factors affecting income tax revenue change, and to draw policy implications from the findings. Factors affecting income tax revenue include: changes in the effective tax rate resulting from changes in the tax regime; changes in the actual income; and changes in the report ratio (ratio of reported income to actual income) attributable to administrative improvements. However, data required for statistical analysis is often restricted by the progressive nature of the tax rate structure and the diversity of income deductions and tax credits. For this reason, it can be difficult to provide a comprehensive overview of which factor contributed how much. This issue has resulted in the limited number of studies that focus on factors contributing to increased income tax revenue.

In a report published by the Korea Institute of Public Finance (KIPF), Park et al. (2012) analyzed factors causing changes in income tax. They categorized factors into tax base factors and tax regime factors. For tax base factors, the report compared changes in the nominal GDP with the changes in the tax base. For tax regime factors, the report analyzed the relationship between the tax base and the tax revenue. In a way, this study expands upon the analysis by Park et al. (2012). However, departing from a simple comparison of the tax base and the tax

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revenue, we seek to examine actual changes in the tax regime, the resulting gap in the effective tax rate among different income brackets, and the resulting changes in the tax revenue. Then, in addition to comparing changes in the nominal GDP and changes in the tax base, we also seek to determine the effects of changes in the tax regime and changes in tax administration with regards to the tax revenue. We also assess the combined effects of tax base factors and that of tax regime factors to changes in tax revenue.

Another point of departure from Park et al. (2012) is that this study focuses on identifying factors that caused changes in income tax revenue since the report's publication. The growth rate of income tax revenue typically remains between 1 and 1.5 times the growth rate of the nominal GDP. However, between 2011 and 2016, except for 2013, the yearly income tax revenue growth rate was between 2.4 and 3 times the GDP growth rate. These unusual changes warrant further investigation into their cause.

Oh (2018) used income tax data in the *Statistical Yearbook of National Tax* to analyze factors affecting income tax revenue. Oh (2018) identified two factors affecting income tax revenue: tax base factors and factors affecting the effective tax rate. The tax base factors were further categorized into factors attributable to the number of taxpayers and factors attributable to the average income. Factors affecting the effective tax rate were further categorized into factors attributable to average income, factors affecting income distribution, and factors attributable to changes in the tax regime. Oh's analysis employed a version of the method used by Park (2016), who identified and analyzed factors affecting value-added tax (VAT) revenue, after revising the method to include an income tax revenue analysis. A notable feature of Oh's analysis is that it included income distribution, which was not included in the analysis of factors affecting VAT revenue Income distribution is not a significant factor for VAT, because VAT has a single tax rate. On the other hand, the income tax rate progressively changes depending on the income level. Therefore, changes in income distribution significantly affect income tax revenue.

In this study, we employ the method used in Oh (2018) and take it a step further. Given the progressive nature of the income tax rate structure, Oh (2018) separated factors affecting income distribution from factors affecting the effective tax rate attributable to changes in average income. We further identified different cohorts in accordance with income brackets, and analyzed factors affecting tax revenue in each cohort. Then, we combined the findings to identify factors affecting income tax revenue. When using the average income and the variance of income to understand the effect of changes in the overall income distribution on tax revenue, the effect of income distribution can be identified using a single indicator, though

such an approach may oversimplify the effect of income distribution. In this study, we further divide changes in the average effective tax rate of all taxpayers into changes in the effective tax rate for each cohort and changes in the percentage of each cohort's income in the overall income, that is, changes in income distribution. This approach allows us to specifically examine the income cohort, where changes in the tax regime affect income tax revenue by changing the effective tax rate, and cohorts in which income growth results in tax revenue growth. We also combine the effects identified with different cohorts in order to investigate the effects of changes in the effective tax rate and changes in income distribution. Oh (2018) solely examined factors affecting income based on reported income, and did not analyze factors affecting the latter. We also examine whether changes in reported income are attributed to actual changes in income, or changes in reporting behaviors.

II. Data and Method

1. Concept of Income and Scope of Analysis

This study focuses on employment income tax and global income tax, which include the largest percentages of all income taxes. The same tax regime applies to both employment income tax and global income tax. In Korea, the tax imposed on an individual taxpayer is determined as follows. First, the taxpayer's income is determined by deducting the necessary expenses from the gross revenue. If there are no necessary expenses, the total revenue is equal to the income. For employment income, necessary expenses also include commuting expenses. To account for these expenses, Korea deducts a specified amount from the employment income under a system called the Employment Income Deduction. The total amount of the Employment Income Deduction is quite large, which may raise suspicion if its entire amount is to be regarded as necessary expenses. However, there is no denying that this deduction is at least partially related to the expenses needed to provide labor. For business income, necessary expenses refer to expenses incurred while conducting business.

Second, non-taxable income is deducted from the taxpayer's income to determine the taxable income. Third, various income deductions are applied to the taxable income to calculate the tax base, and the relevant tax rate is then applied to the tax base to determine the calculated tax amount.

The actual amount owed by the taxpayer is determined by deducting various tax credits

from the calculated tax amount. This amount is called the determined tax amount. This study focuses on income, which is the total revenue minus the necessary expenses, and the determined tax amount. Here, the effective tax rate is defined as the ratio of the determined tax amount to the income. We use the income and the effective tax rate to subsequently analyze factors affecting the growth of income tax revenue.

Before we go further, it is worth noting two possible issues. The first issue is the possible overlap between global income and employment income. Taxpayers who only earn employment income should have their employment income taxes calculated by filing year-end tax settlement for employment income. Taxpayers who have earned both employment income and other types of income should file global income tax return, which cover both their employment income and other types of income. Employment income-only taxpayers should also file global income tax return if they did not file the year-end tax settlement for employment income. The statistical data used in this report comes from the *Statistical Yearbook of National Tax* published by the National Tax Service (NTS). The data contains both year-end tax settlement for employment income and global income tax return. Therefore, the data from global income tax return includes the employment income of taxpayers who filed both year-end tax settlement for employment income and global income tax return. For these taxpayers, their employment income is reflected in both the employment income tax data and the global income tax data. According to the global income tax return data from 2017, employment income accounted for 35.9% of the total reported global income.[1]

Another noteworthy issue is that for global income, the income amount is determined by deducting necessary expenses from the gross revenue. If the total revenue includes employment income, the Employment Income Deduction for the employment income is also deducted as a necessary expense. For business income, the income amount is determined by deducting necessary expenses from the gross revenue. Expense deductions do not apply to interests and dividends; for these items, the total revenue is equal to the income amount. Such income can be readily used as an indicator for assessing purchasing power. However, the total wage is included in the global income only after applying the Employment Income Deduction. Note that it is doubtful whether the entirety of the Employment Income Deduction should be regarded as a necessary expense. The expenses required to earn employment income, such as commuting expenses, are quite limited. Therefore, unless it is possible to separate the expenses required for provision of labor from the Employment Income Deduction, it would

1 NTS, *Statistical Yearbook of National Tax*, 2018, Table 3-1-2 Filing of Total Revenue and Taxable Income

be more consistent with the economic definition of income to regard the total wage as the income amount without deducting the entire Employment Income Deduction as a necessary expense.

Based on these considerations, it would be best to divide income into non-overlapping items such as employment income and business income, interest, and dividends, and to analyze the data for each item and the tax burden for each element. The *Statistical Yearbook of National Tax* provides data on the respective sizes of income items including employment income, business income, interest, and dividends. However, it is impossible to identify the tax burden for each item because the global income tax is progressively determined depending on the total income. In addition, no data is available for the specific data of different income levels. For this reason, in this study, we analyze the global income as a whole without dividing it into income items.

2. Identifying Factors Affecting Income Tax Revenue

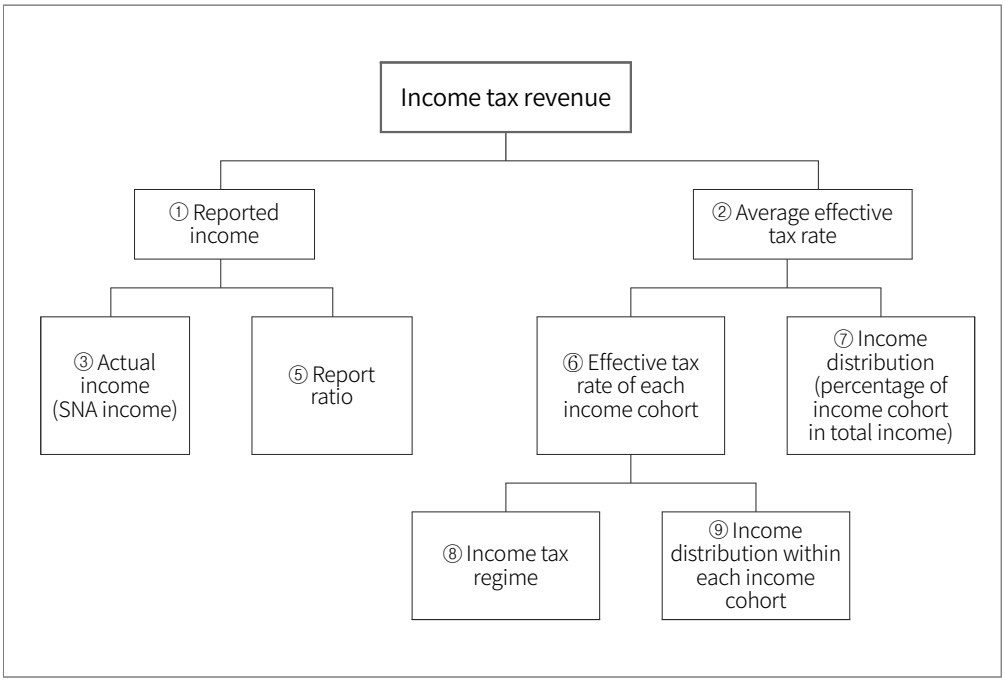
We analyzed factors affecting the changes in employment income tax revenue and the changes in global income tax revenue. The identified factors are represented in Figure 1. Changes in the income tax revenue can be divided into changes caused by changes in the reported income and changes in the average effective tax rate. Here, the "effective tax rate" refers to the ratio of the determined tax amount to the reported income. "Average" indicates that the tax rate was calculated by dividing the total determined tax by the total income without considering income levels. The effective tax rate is different from the statutory tax rate; it refers to the ratio of the actual tax paid to the income before income deductions and other reductions. Therefore, the effective tax rate may be affected by both changes in the statutory tax rate as well as the deduction system.

Secondly, we analyzed factors affecting the reported income and the average effective tax rate. Changes in the reported income can be further divided into changes caused by actual changes in income and changes in the report ratio. Income tax is levied based on tax reports taxpayer file with the NTS. If the NTS have all information regarding actual income, taxpayers will accurately report their income. If not, taxpayers can be motivated to under-report their income.

Developments in information technology and the resulting development of a national tax administration have greatly enhanced the NTS' ability to collect information. This change is expected to encourage taxpayers to report their income more accurately and raise the report

ratio. Therefore, in this study, we separate the changes caused by actual income changes and the changes caused by changes in the report ratio.

Figure 1_Identification of Factors Affecting Income Tax Revenue



Source: Present study

We also analyze factors affecting the average effective tax rate. Identifying factors affecting the average effective tax rate is difficult for income tax, due to its progressive nature. Oh (2018) identified three factors affecting the effective tax rate: changes in the tax regime; changes in average income, and changes in the variance of income distribution. However, it is doubtful whether these three factors are sufficient for our analysis. In particular, using variance as a factor may result in treating an increase in the number of low-income earners the same as an increase in the number of high-income earners, because variance simply measures the distance from the mean value. Given the progressive nature of income tax, notably in terms of its effect on the average effective tax rate, an increase in variance caused by the increased number of low-income earners should be quite different from an increase in variance caused by the increased number of high-income earners. Granted, this issue can be minimized by combining

changes in average income with the effect of changes in variance; however, such an analysis requires careful interpretation.

In this study, at the risk of increased complexity, we took an alternative approach. We divided taxpayers into different income cohorts, and calculated the average effective tax rate of each cohort. Then, we analyzed the effect of changes in the effective tax rate in each cohort on the overall average effective tax rate. That is, we identified respective changes in the effective tax rate among high-income earners or low-income earners, and then analyzed the effect of each on the overall average effective tax rate. In addition, even when different cohorts display the same effective tax rate, an increase in the number of high-income earners may increase the average effective tax rate. Therefore, we calculated the percentage of each cohort in the total income, and identified the effect of the change on the average effective tax rate. The purpose of this approach is to understand how changes in income distribution affects the average effective tax rate and, as a result, affects tax revenue.

Changes in the effective tax rate of a specific cohort may be affected by both the effective tax rates applied to individual taxpayers in the cohort and changes in the income distribution within the cohort. Changes in the effective tax rates of individual taxpayers within a cohort are mainly attributable to changes in the income tax regime, whereas changes in the regime may include changes in deductions and changes in the tax rate structure. An individual taxpayer's effective tax rate may be also affected by changes in their eligibility for basic deductions, changes in the amount of donations, changes in educational expenses, and other changes based on the individual's financial situation. However, if such changes are different among individuals, these individual-level changes may cancel each other out, thus reducing the effect of these changes on the effective tax rate in the cohort.

In terms of income distribution changes within a cohort, the effective tax rate of the cohort may decline if the number of taxpayers closer to the lowest income in the cohort increases while the number of taxpayers closer to the highest income decreases. In the opposite case, the effective tax rate of the cohort may increase even without changes in the tax regime. Microdata on individual taxpayers are required to separate the changes in the effective tax rate attributable to changes in the tax regime and those attributable to income distribution in each cohort. For this study, we used the data disclosed by the NTS through *Statistical Yearbook of National Tax*. The data are aggregated by income cohort. For this reason, when analyzing the changes in the effective tax rate in each cohort, we did not separate the changes attributable to changes in the tax regime and those attributable to changes in income distribution within the cohort. However, we divided the taxpayers into the finest income

brackets available in the *Statistical Yearbook of National Tax*. Therefore, any change in the income distribution within each cohort is expected to have limited influence on the average effective tax rate.

3. Method and Data

A. Factors Affecting Income Tax Revenue: Reported Income vs Effective Tax Rate

Tax revenue (R) can be represented as reported income (Y^R) multiplied by the average effective tax rate (T^e). The average effective tax rate is tax revenue divided by the reported income.

$$R = Y^R \times T^e \qquad \text{Equation (1)}$$

$$T^e = \frac{R}{Y^R} \qquad \text{Equation (2)}$$

Using Equation (1), changes in the tax revenue can be divided as follows.

$$\Delta R = (\Delta Y^R \times \overline{T^e}) + (\Delta T^e \times \overline{Y^R}) \qquad \text{Equation (3)}$$

where Δ represents changes over a single period, and $\overline{Y^R}$ and $\overline{T^e}$ represent the mean of the reported income and the average effective tax rate in the current period and the previous period, respectively. The equation shows that changes in tax revenue can be divided into changes attributable to changes in the reported income and those attributable to the average effective tax rate.

B. Identification of Factors Affecting Reported Income

1) Concept and Data of Actual Income and Reported Ratio

Reported income refers to income reported by the taxpayer to the NTS for the purpose of tax return. In a world where the tax law is enforced to the letter, all income would be reported. However, the reality is different. An individual's income may include non-taxable

income and some non-taxable income items are subject to mandatory reporting, while others are not. Even for items subject to reporting requirements, it is impossible to verify whether a taxpayer reported an accurate amount. As for taxable income, taxpayers are required to report all such income. However, some taxpayers may report reduced amounts, and some others may not report their income at all.

Other than reported income, data available for identifying taxpayers' income levels includes household income data in the national account, that is, the income of households and non-profit organizations in income accounts under the System of National Accounts (SNA). If the household income in the national account (SNA income) accurately represents the income attributable to domestic households, and all household income is reported to the NTS, the reported income should be the same as the household income. However, the two income data are quite different from each other. First, some non-taxable income items are not subject to reporting requirements. And even for items subject to reporting requirements, households may choose not to report them. Second, even for taxable income, some taxpayers may choose not to report them or reduce their amount. Third, there may be some statistical errors.

The data used in this study as household income in the national account includes income attributable to households and non-profit organizations. Even though the income earned by non-profit organizations may not be significant, it has the potential to produce a discrepancy between household income and reported income. And there are differences in the concept of income. Business income in the tax return is determined by deducting necessary expenses from gross revenue. In the national account, this item is referred to as business surplus. In the case of a sole proprietor who runs a sizable business that operates in a similar way to a corporation, income earned by the proprietor is not included in the business surplus on individual. This income is treated in a manner similar to dividends from a corporation, under the title of quasi-corporation business income withdrawal. The investment income payment in the national account refers to the amount deemed to have been paid by a financial institution to an asset owner, including statutory reserves for insurance policy holders, interest from pension management, and investment income such as dividends. Including these amounts in household income may increase the accuracy in understanding the flow of profits among economic actors. However, given the purpose of income tax, these deemed payments do not constitute taxable income. The tax return data should also be analyzed with caution. Global income does not include deficits of businesses. That is, a taxpayer's income is included in the data only if their gross revenue exceeds the necessary expenses. In the other case, it is disregarded, while in the national income date the deficits are also considered as negative

income. In addition, the NTS uses data that simply combines year-end tax adjustments for employment income, withheld income reports, and global income tax reports. As such, there may be overlaps and omissions among the data sets.

In this study, by comparing the income reported to the NTS and the income included in the national account, we seek to understand how much of the actual income is identified by the NTS. However, as mentioned above, the two sets of data cannot be readily compared because of non-taxable income, differences in the concepts of some statistical items, differences in classification, and the possible overlap in NTS data. In addition, the income data in the national account is not necessarily an accurate representation of actual income. The national account data was also estimated based on various survey data and indirect data. Despite these shortcomings, however, the income data in the national account is the only official estimate produced by the state to measure actual income. The national account is used as official statistics pertaining to the size of economy used by each country. Therefore, in this study, we identify the report ratio by comparing the income data from the national account and the reported income data. In other words, for the purpose of this study, "report ratio" (ratio of reported income to actual income) refers to the ratio of reported income to SNA income.

Considering the discrepancy between the reported income data and the income data in the national account, however, and potential error in the income estimation for the national account, the ratio of reported income to SNA income cannot be readily defined as the report ratio. To be more precise, changes in the ratio of reported income to SNA income denotes changes in the reported income that are not explained by changes in the SNA income. This ratio can be affected by changes in the actual report ratio, or errors in income estimation in the national account. Therefore, this study focuses on changes in the ratio, rather than its magnitude. Given the fact that the national account uses a consistent method for its estimation, and errors in the estimation do not significantly vary year to year, changes in the ratio of reported income to SNA income are likely to be caused by changes in the report ratio. For this reason, we define the report ratio as the ratio of reported income to SNA income, and regard changes in the ratio as indicating changes in the report ratio. In other words, while the magnitude of the report ratio defined in this study may not aptly represent the actual report ratio, it would not be grossly unreasonable to assume that changes in the former aptly represent changes in the latter.

At the risk of omitting some income items, we compared the individual items of reported income and individual items in the national account and then selected and compared similar

items, as shown in Table 1. For employment income, we compared total wages from tax return data with wages in the household/NPO SNA income.[2] "Compensation of employees" does not readily lend itself to a comparison with total wages, as the former includes employers' social insurance contributions. Social insurance contributions paid by employers are not considered as wages, for purposes of taxation. For business income, we combined the business income data from general tax reports and the business income data for year-end adjustments from withholding tax reports. The business income data for year-end adjustments from withholding tax reports cover the business income of those who do not required to file global income tax return for their business income. For the national account data, we combined business surplus, quasi-corporation income withdrawal, and rent into the operating profit. Rent is included in business income for tax purpose. For interest and dividends, we compared the interest and dividend payment data from withholding progress reports with the interest and dividend in property income data for the national account. We did not include reinvestment profits or investment income payments for foreign direct investments.

Table 1_Comparing Income Reported to NTS with Income from National Accounts

Income reported to NTS		Household/NPO income in national accounts	
Income	Data	Income item	Data
Employment income	- Total wage in the year-end settlement for employment income (excluding daily workers income)	Wage	- Wage and salaries in compensation of employees
Business income	- Business income in global tax returns - Business income in withholding progress report	Operating profit	- Business surplus - Quasi-corporation income withdrawal in property income - Rents in property income
Interest income	- Interest payment in withholding progress report	Interest income	- Interests in property income
Dividend income	- Dividend payments in withholding progress report	Dividend income	- Dividends in property income

Source: National Tax Service, Statistical Yearbook of National Tax, 2018
Bank of Korea (2015), Chapter II, Section 4

2 Income earned by day laborers should be included as employment income. However, for the sake of consistency, we did not include income earned by daily workers.

Global income includes interest income, dividend income, business income, employment income, pension income, and other income. We identified factors affecting national account income and report ratio for each of the interest income, dividend income, business income, and employment income. Then, we obtained a weighted average of the items to identify factors affecting changes in the global income reported. Each element was weighted based on its percentage in the sum of those incomes. Of the income items comprising global income, we did not include pension income or other income in our analysis, as these two items comprised only 0.2% and 0.8%, respectively, of the global income in 2017. In 2017, business income accounted for 55.4% of the global income, employment income accounted for 35.9%, dividend income accounted for 6.7%, and interest income accounted for 1%.[3]

2) Identification of Factors Affecting Reported Income

Where reported income is Y^R, SNA income is Y^N, and the ratio of reported income to SNA income is r, the factors of the change in reported income as follows when divided into the change in SNA income and the change in report ratio.

$$\Delta Y^R = (\Delta Y^N \times \bar{r}) + (\overline{Y^N} \times \Delta r) \qquad \text{Equation (4)}$$

The first term on the right hand side of the equation represents the contribution of the change in SNA income to the change in reported income, and the second term represents the contribution of the change in the report ratio.

C. Identification of Factors Affecting the Effective Tax Rate

Where the average effective tax rate of all taxpayers is T^e, the average effective tax rate of the cohort in the income bracket i is t_i, and the percentage of the income of the cohort in the total income is s_i, the average effective tax rate is the sum of the respective average effective tax rate of each cohort multiplied by the percentage of the income of the cohort.

$$T^e = \Sigma_{i=1}^{n} (t_i \times s_i) \qquad \text{Equation (5)}$$

3 See NTS, *Statistical Yearbook of National Tax,* 2018, Tables 3-1-2 and 3-2-3.

Using this equation, we identified two factors affecting the average effective tax rate: changes in the effective tax rate of each cohort, and changes in the percentage of each cohort in the total income.

$$\begin{aligned} \Delta T^e &= \Sigma_{i=1}^{n}((\Delta t_i \times \overline{s_i}) + (\overline{t_i} \times \Delta s_i)) \\ &= \Sigma_{i=1}^{n}(\Delta t_i \times \overline{s_i}) + \Sigma_{i=1}^{n}(\overline{t_i} \times \Delta s_i) \end{aligned} \qquad \text{Equation (6)}$$

The effect of changes in cohort i on the average effective tax rate can be identified as follows: the effect of changes in the effective tax rate of the cohort ($\Delta t_i \times \overline{s_i}$) ; and the effect of changes in the percentage of the cohort in the total income ($\overline{t_i} \times \Delta s_i$). By combining these two factors, we can understand the effect of each cohort on changes in the effective tax rate. In addition, by combining the effect of changes in the effective tax rate in different cohorts ($\Delta t_i \times \overline{s_i}$), we can calculate the total effect of changes in the effective tax rate in each cohort on the average effective tax rate. Then, by combining the effect of changes in the percentage of different cohorts ($\overline{t_i} \times \Delta s_i$), we can understand the effect of changes in income percentages, that is, income distribution, on changes of the average effective tax rate.

The effective tax rate of a cohort may be affected by two factors. First, changes in the income tax regime may affect the effective tax rate even when reported income remains the same. Changes in the tax regime include changes in the nominal tax rate and changes to tax allowances programs such as deductions and credits. Second, changes in the income distribution within a cohort may affect the average effective tax rate of the cohort. If the number of high-income earners increases in a cohort, the average effective tax rate of taxpayers in the cohort increases. To distinguish between these two factors, we need microdata for individual taxpayers in the cohort. However, the NTS data used in this study only contains cohort-level information. Therefore, at this time, it is impossible to separate the two factors affecting the average effective tax rate of each cohort. If the average effective tax rate of a cohort changes despite the absence of changes to the tax regime, such a change may be regarded as being due to changes in the income distribution of the cohort.

III. Findings on Factors Affecting Income Tax Revenue

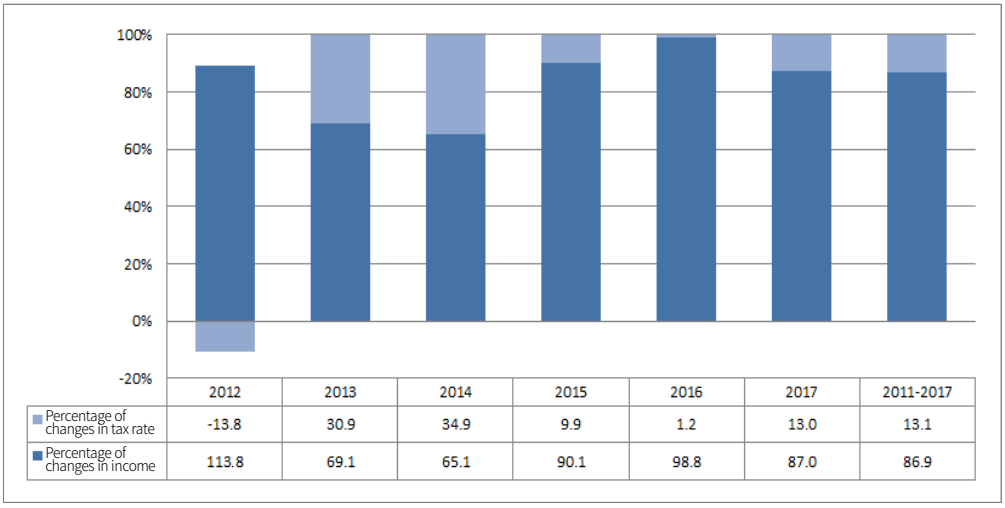
1. Reported Income vs Effective Tax Rate

A. Global Income Tax

We analyzed two factors to identify their contribution to global income tax revenue growth between 2011 and 2017: increase in reported income; and increase in the effective tax rate. The two factors explained 86.9% and 13.1% of the revenue growth, respectively. By year, increase in the effective tax rate recorded the highest contribution in 2014 at 34.9%, followed by 30.9% in 2013. In all the other years, changes in the contribution of the effective tax rate to revenue growth was fairly low. The effective tax rate is affected by changes in the income tax regime and changes in the reported income. Tax rate raise, adjustment of tax rate brackets, and revision of deduction/credit programs are aimed at changing the effective tax rate. In addition, under a progressive tax rate structure, income growth raises the average effective tax rate even when the tax regime remains the same. When taxpayers' income grows, higher tax rates apply.

Figure 2_Identification of Factors Affecting Global Income Tax Revenue: Reported Income vs Effective Tax Rate[1)]

(Unit: %)



	2012	2013	2014	2015	2016	2017	2011-2017
Percentage of changes in tax rate	-13.8	30.9	34.9	9.9	1.2	13.0	13.1
Percentage of changes in income	113.8	69.1	65.1	90.1	98.8	87.0	86.9

Note: 1) Percentages of changes in global income tax revenue explained by the two factors, changes in the effective tax rate and changes in reported income, respectively.

In 2014, the government replaced a large part of the income deduction programs for income tax with tax credit programs. In addition, the government lowered the tax base threshold for the highest income tax rate (38%) from KRW 300 million to KRW 150 million. These changes resulted in an increase in the effective tax rate for taxpayers in the middle- and high-income brackets. The government also lowered the threshold for global taxation on financial income from KRW 40 million to KRW 20 million in 2013, which is also the year when changes in the effective tax rate had a significant impact on tax revenue. As a result of this measure, taxpayers who earned between KRW 20 million and KRW 40 million in interest and dividends came to have their interest/dividend income included in their global income, which raised their overall tax rates. This change may have also raised the average effective tax rate. In 2012, the government raised the highest tax rate from 35% on KRW 88 million to 35% on up to KRW 300 million, and 38% on above KRW 300 million. However, in 2012, the average effective tax rate of all global income taxpayers decreased. In 2017, the government raised the highest tax rate (above KRW 500 million) by 3% to 40%. However, the effective tax rate increased by only 1.91%, recording a lower growth rate as compared to other years. In 2017, changes in the effective tax rate contributed to 13% of the year's global income tax revenue growth, and the other 87% was from an increase in reported income.

An increase in reported income contributes to tax revenue growth through two paths. First, it increases revenue growth by increasing the tax base. Second, an increase in income raises applicable tax rates, and the increase in effective tax rates results in revenue growth. In the above figure, the contribution of changes in reported income represents the first path, and changes in the effective tax rate are included in the second path. As previously mentioned, for global income tax, most of the increase in income tax revenue is explained by the first path (84.6% in 2010~2017). This finding suggests that changes in the effective tax rate caused by changes in reported income does not significantly contribute to global income tax revenue growth.

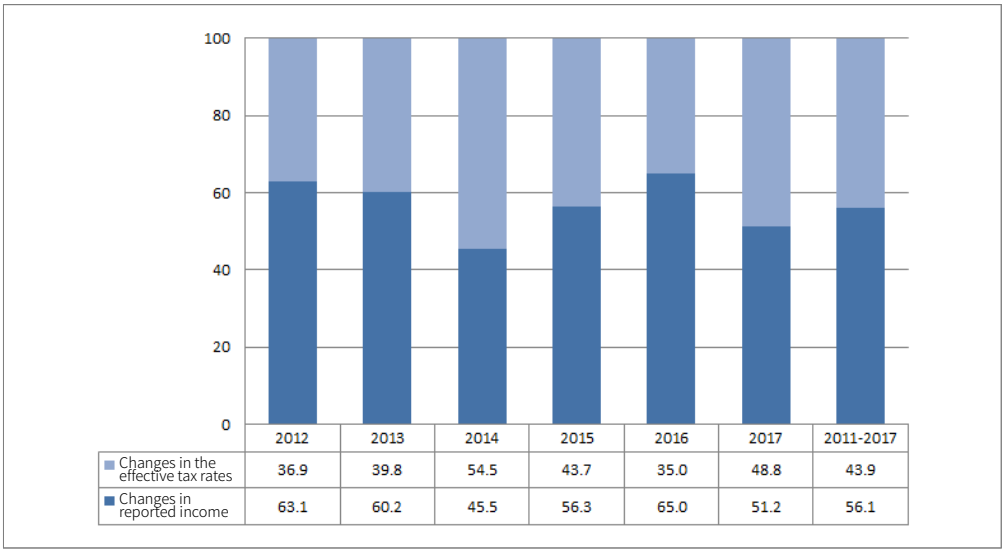
B. Employment Income Tax

We analyzed two factors affecting employment income tax revenue: an increase in reported income and an increase in the effective tax rate. In 2012, reported income contributed to 63.1% of the revenue growth for the year, with the effective tax rate contributing to the other 36.9%. In the following years, the effect of the effective tax rate increased; in 2017, the contribution of reported income was 51.2%, and the contribution of the effective tax rate was 48.8%. For the 2011~2017 period, the increase in reported income explained 56.1% of the revenue growth, and the increase in the effective tax rate explained

the other 43.9%. Of note, after replacing income deduction programs with tax credit programs in 2014, contributions from the increase in the effective tax rate surpassed that of reported income. The percentages were 54.5% and 45.5%, respectively.

Figure 3_Identification of Factors Affecting Employment Income Tax Revenue: Reported Income vs Effective Tax Rate[1)]

(Unit: %)



	2012	2013	2014	2015	2016	2017	2011-2017
Changes in the effective tax rates	36.9	39.8	54.5	43.7	35.0	48.8	43.9
Changes in reported income	63.1	60.2	45.5	56.3	65.0	51.2	56.1

Note: 1) Percentages of changes in employment income tax revenue explained by the two factors, changes in the effective tax rate and changes in reported income, respectively.

Employment income tax revenue and global income tax revenue recorded similar growth rates in the 2011~2017 period. However, the factors behind revenue growth were quite different. The growth of global income tax revenue could mostly be explained by an increase in reported income. However, the increase in reported income explains only a little more than a half of the employment income tax revenue growth, with the increase in the average effective tax rate explaining more than 40% of the growth. As for changes in the effective tax rate, the replacement of income deductions with tax credits in 2014 could have had a greater impact on employment income. Tax credits for medical expenses and education expenses, which comprise a key part of the new special tax credit programs, mostly apply to employment income. In addition, in 2014, the employment income tax deduction was reduced. Before 2014, a 5% deduction rate was applied to employment income exceeding KRW 45 million.

After the revision, 5% was applied to taxpayers earning employment income over KRW 45 million and less than KRW 100 million, and 2% was applied to the income over KRW 100 million.

An increase in the effective tax rate is affected by tax regime changes as well as changes in reported income. Between the global income tax and the employment income tax, an increase in the effective tax rate caused by an increase in reported income is expected to be higher for global income tax than for employment income tax. For global income tax, business income plays an important role, as individual taxpayers' income fluctuates and is unlikely to increase on a continual basis. Employment income mainly consists of wages, and most workers' wages tend to change in the same direction. Therefore, when the total employment income increases, most taxpayers' incomes increase, along with their average effective tax rates. This finding suggests that, while increases in reported income more directly affects global income tax revenue rather than indirectly through an increase in the effective tax rate, an increase in reported income indirectly affects employment income tax by raising the effective tax rate, in addition to directly increasing the revenue.

2. Identification of Factors Affecting Reported Income

A. Global Income Tax

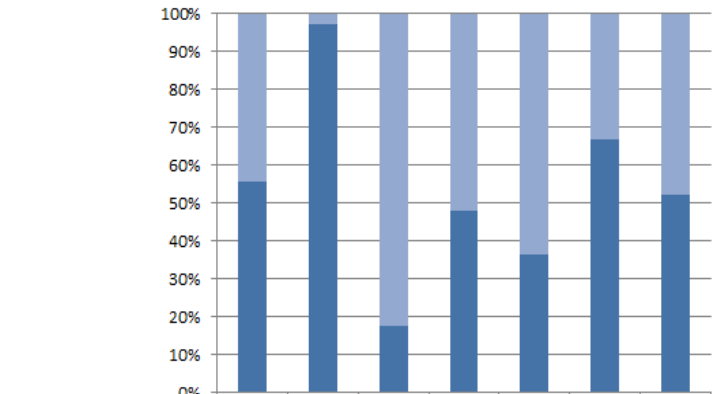
Figure 4 shows the effect of changes in the SNA income and changes in the report ratio on reported global income. In the 2011~2017 period, changes in the SNA income and changes in the report ratio explain 52.2% and 47.8% of the changes in reported income, respectively. However, the contribution percentages vary greatly from year to year. In 2012 and 2013, contributions from changes in the SNA income overwhelmed the effect of the report ratio. In 2014, the effects of these contributions were reversed. In 2015 and 2016, contributions from the report ratio surpassed contributions from the SNA income. However, in 2017, the contribution from the SNA income surpassed the contribution from the report ratio, at 66.9% and 33.1%, respectively.

An increase in the report ratio indicates a decline in the share of non-reported and under-reported income. Advancements in computer and IT seem to have contributed to reducing non-reports and under-reports caused by negligence, as well as a reduction in previous intentional non-reports and under-reports. Into the 2000's, the government took various measures to increase the report ratio of business income earners. The measures seem to have achieved significant results. The government recently launched a cash receipt system

to identify earnings from cash transactions, which are more difficult to identify than credit card transactions. To this end, the government has been expanding the scope of businesses subject to cash receipt requirements, especially sole proprietors who earn a significant part of their income from cash transactions. From an administrative standpoint, the government has actively been utilizing advancements in IT to analyze tax information and prevent taxes not imposed by error. These changes seem to have had great impact on increases in income reported by business income earners.

Figure 4_Identification of Factors Affecting Reported Income: Global Income[1)]

(Unit: %)



	2012	2013	2014	2015	2016	2017	'11-'17
Report ratio contribution: General income	44.5	2.8	82.4	52.0	63.5	33.1	47.8
Income contribution: General income	55.5	97.2	17.6	48.0	36.5	66.9	52.2

Note: 1) Percentages of changes in global income reported to NTS explained by the report ratio and the SNA income, respectively.

B. Employment Income Tax

For the employment income tax, the increase in SNA income explains more than two thirds of the increase in reported income. In 2011, 2012, and 2014, the increase in SNA income explained a little more than 65% of the increase in reported income. The percentage was between 70% and 80% in 2013 and 2017, and between 80% and 90% in 2015. In 2016, the percentage reached 95.8%, which means most of the increase in the reported income originated from the increase in SNA income. As for the contribution from the report ratio, the percentage was the lowest in 2016 at 4.2%. It increased to 18.5% in 2015, which was still lower than the

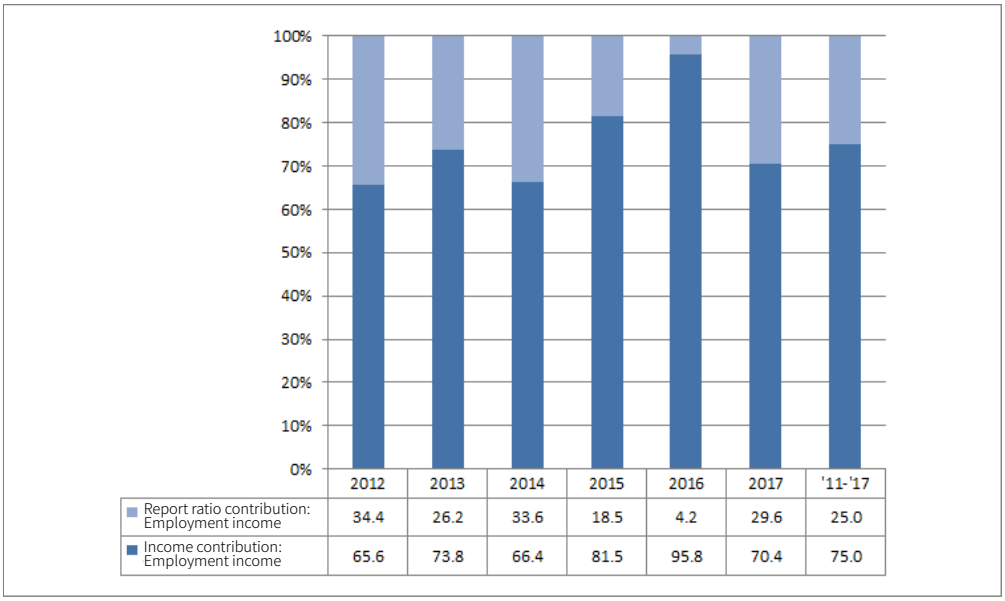
percentages in other years; the contribution percentage remained between 25% and 35%. Throughout the 2011~2017 period, changes in the report ratio explained 25% of the changes in the reported income, while changes in the SNA income explained the other 75%.

While lower than the report ratio for global income tax, the report ratio for employment income tax has been growing at a steady rate. Throughout the 2011~2017 period, the changes in the report ratio explained around 25% of the changes in the reported income, while changes in the SNA income explained the other 75%. This increase in the report ratio for employment income is worth noting, given the fact that employment income is rarely non-reported or under-reported, whether by mistake or intentionally.

It may be a result of the effect of increased tax base transparency in business income on the tax base transparency of employment income. If a business income earner wants to hide their income, they may also have to omit business expenses. If this approach is not a viable option, a business income earner needs to secure maximum deductions for the incurred expenses including payment for employees. The growth and dissemination of public insurance such as the National Health Insurance and the National Pension also seem to have

Figure 5_Identification of Factors Affecting Reported Income: Employment Income

(Unit: %)



	2012	2013	2014	2015	2016	2017	'11-'17
Report ratio contribution: Employment income	34.4	26.2	33.6	18.5	4.2	29.6	25.0
Income contribution: Employment income	65.6	73.8	66.4	81.5	95.8	70.4	75.0

Note: 1) Percentages of changes in employment income reported to NTS explained by the report ratio and the SNA income, respectively.

contributed to improving the report ratio. Earned Income Tax Credits for low-income groups may have also affected the improved report ratio for employment income tax.

3. Identification of Factors Affecting the Effective Tax Rate

A. Employment Income Tax

Table 2 presents factors affecting the average effective tax rate of employment income tax identified using the equations mentioned above. Figure 6 shows changes in the average effective tax rate of employment income tax explained by changes in the effective tax rate for each income cohort, and those due to changes in the percentage of each cohort's share in the total income.

The findings from the figure and the table can be summarized as follows. In 2014, in which the year over year (YoY) change in the average effective tax rate was the highest at 0.33%p, 0.11%p is explained by changes in the effective tax rate in each cohort; the other 0.22%p is explained by changes in the share of each cohort's income in the total income. As for changes in the effective tax rate by cohort, all cohorts below KRW 60 million recorded show a decrease in the effective tax rate. On the other hand, all cohorts above KRW 60 million showed an increase in the effective tax rate. The effect of the latter overwhelmed the effect of the former, resulting in an overall 0.11%p increase in the average effective tax rate. In the cohorts with increased effective tax rates, the increased effective tax rate was particularly significant in cohorts between KRW 60 million and KRW 200 million. In cohorts with decreased effective tax rates, the decreased effective tax rates in cohorts between KRW 10 million and KRW 40 million displayed a significant impact. These changes in the effective tax rate seem to have been caused by tax reform in 2014. In 2014, the government adjusted the income threshold for the highest rate, reduced the employment income deduction rates applicable to high-income earners, and replaced some of the income deduction programs with tax credit programs. The reform was aimed at improving income distribution by reducing the taxes imposed on low-income earners while increasing those imposed on high-income earners. As for percentage in the total income, all cohorts recorded an increase in income percentages, except for those below KRW 10 million, thereby raising the effective tax rate. The increase in income percentages in cohorts above KRW 60 million had significant impact on the increased tax rate, and the percentages of cohorts between KRW 100 billion and KRW 200 billion significantly increased.

Table 2_Identification of Factors Affecting Average Effective Employment Income Tax Rate[1)]

(Unit: %p, %)

		2012	2013	2014	2015	2016	2017	2011~2017
Changes in average effective tax rate		0.18	0.19	0.33	0.23	0.16	0.31	1.38
Effect of changes in effective tax rate by cohort	Changes in tax rate	0.06	0.05	0.11	0.04	0.02	0.04	0.34
	KRW 10 million or lower	0.40	0.44	-7.44	-0.08	0.50	0.23	-1.48
	KRW 20 million or lower	1.08	-0.13	-15.76	1.03	2.46	0.52	-3.07
	KRW 40 million or lower	14.45	9.59	-26.14	7.53	10.11	4.40	0.36
	KRW 60 million or lower	6.83	10.36	-4.22	8.70	-0.40	2.71	3.21
	KRW 80 million or lower	1.64	4.04	19.62	-1.04	-5.63	-0.57	4.93
	KRW 0.1 billion or lower	-0.62	0.86	18.21	0.82	-0.42	0.04	4.37
	KRW 0.2 billion or lower	-1.36	1.00	27.07	0.65	2.92	6.65	8.39
	KRW 0.3 billion or lower	0.35	1.39	8.19	0.32	-0.81	0.92	2.41
	KRW 0.5 billion or lower	0.92	1.06	6.39	0.67	0.62	1.64	2.32
	KRW 1 billion or lower	4.61	-0.59	4.31	0.27	0.56	0.97	2.01
	Above KRW 1 billion	6.95	-0.19	3.74	-0.46	0.07	-4.73	1.07
	Total	35.25	27.83	33.98	18.42	9.98	12.76	24.50
Effect of changes in percentage by cohort	Changes in tax rate	0.11	0.14	0.22	0.18	0.14	0.27	1.04
	KRW 10 million or lower	-1.09	-0.81	-1.50	-0.09	-0.27	-0.24	-0.78
	KRW 20 million or lower	-1.02	-1.13	1.21	-0.58	0.14	-0.13	-0.08
	KRW 40 million or lower	-4.02	-3.92	7.47	-6.96	-0.49	-0.27	-0.58
	KRW 60 million or lower	5.88	2.28	3.85	-7.96	-11.65	-4.08	-1.49
	KRW 80 million or lower	16.37	12.20	8.41	31.80	27.57	13.08	16.53
	KRW 0.1 billion or lower	17.27	9.96	5.12	10.36	6.85	0.36	7.41
	KRW 0.2 billion or lower	28.58	36.41	26.69	43.13	35.50	32.29	33.09
	KRW 0.3 billion or lower	12.43	6.40	3.13	7.74	11.19	7.65	7.36
	KRW 0.5 billion or lower	3.48	6.25	6.00	9.57	5.11	-0.30	4.80
	KRW 1 billion or lower	-3.22	3.61	3.01	0.87	6.05	8.06	3.25
	Above KRW 1 billion	-9.90	0.92	2.65	-6.33	10.03	30.81	5.97
	Total	64.75	72.17	66.02	81.58	90.02	87.24	75.50

Note: 1) The boxes highlighted in darker blue represent a greater impact on increase in effective tax rate, and boxes highlighted in lighter blue represent a greater impact on decrease in the effective tax rate.

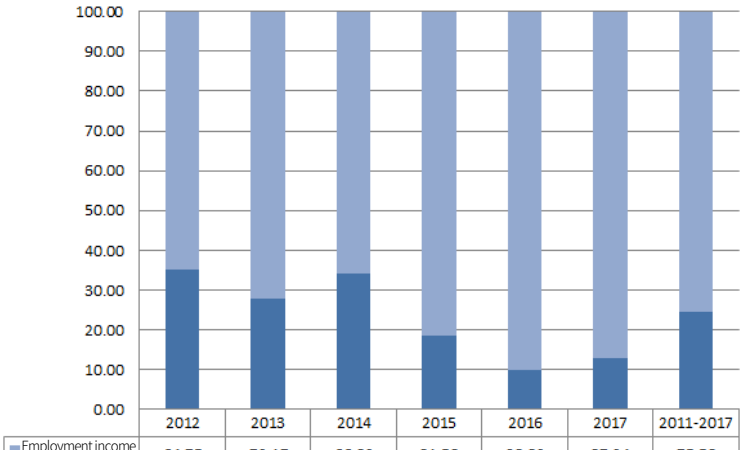
The last column of the table and figure show changes during the 2011~2017 period. The average effective tax rate increased by 1.38%p, of which 0.34%p came from changes in the effective tax rate in each cohort, and 1.04%p came from changes in the percentage of each cohort in the total income. When expressed in percentages, changes in the effective tax rate of each cohort explains 24.5% of the changes in the average effective tax rate during this period, and changes in the percentage of each cohort in the total income explains the other 75.5%.

In the effective tax rate of each cohort, the effective tax rate declined in the cohorts below KRW 20 million, and increased in all other cohorts. The increase in the effective tax rate

incurred a significant impact in cohorts between KRW 40 million and KRW 200 million, which seems to be the result of the income tax regime reform in 2014. As for changes in the percentage of each cohort in the total income, the percentage declined in cohorts below KRW 60 million, and increased in all other cohorts. The increase in the effective tax rate seems to have had a significant impact in cohorts between KRW 60 million and KRW 500 million.

Figure 6_Identification of Factors Affecting Average Effective Employment Income Tax Rate[1)]

(Unit: %)



	2012	2013	2014	2015	2016	2017	2011-2017
Employment income : % of total income	64.75	72.17	66.02	81.58	90.02	87.24	75.50
Employment income : Effective tax rate	35.25	27.83	33.98	18.42	9.98	12.76	24.50

Note: 1) Percentages of changes in average effective tax rates explained by the percentage of each cohort in total income and effective tax rate of each cohort, respectively.

B. Global Income Tax

Table 3 and Figure 7 summarize factors affecting the effective tax rate of the global income tax in the same manner as for the analysis of factors affecting the effective tax rate of the employment income tax. Between 2011 and 2017, by year, the effective tax rate of the global income tax increased by between -0.2%p and 0.56%p, which represents significantly larger yearly fluctuations than for the employment income tax. The year with the largest yearly fluctuation was 2014, when the government implemented a sizable income tax regime reform. The same trend was observed for the employment income tax. In 2014, the effective tax rate of the global income tax increased YoY by 0.56%p, of which 0.42%p could be attributable

to changes in the effective tax rate in each cohort, and 0.14%p was attributable to changes in the percentage of each cohort in the total income. The former explains 75.33% of the change, while the latter explains 24.67%. The effective tax rate declined in cohorts below KRW 40 million. The decline in the effective tax rate in cohorts below KRW 20 million seems to have played a significant role in lowering the average effective tax rate. The effective tax rate increased in cohorts above KRW 40 million. The increase in the effective tax rate in the cohorts between KRW 100 billion and KRW 500 million seems to have played a significant role in increasing the average effective tax rate. As for

Table 3_Identification of Factors Affecting Average Effective Global income tax Rate[1)]

(Unit: %)

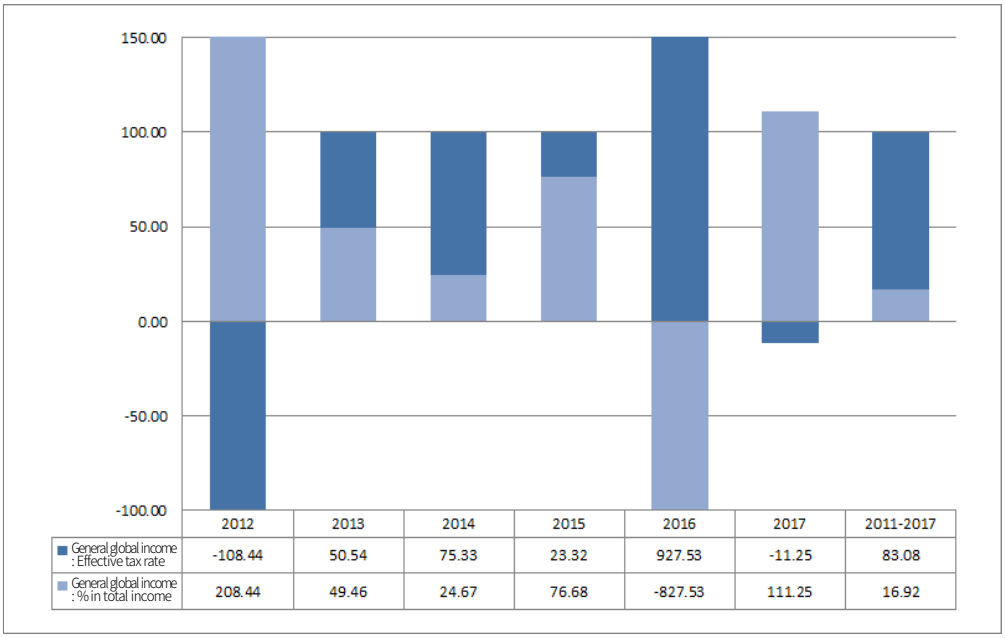
		2012	2013	2014	2015	2016	2017	2011~2017
Changes in average effective tax rate		-0.20	0.39	0.56	0.18	0.01	0.28	1.22
Effect of changes in effective tax rate by cohort	Changes in tax rate	0.22	0.20	0.42	0.04	0.14	-0.03	1.02
	KRW 10 million or lower	-1.50	0.71	-13.64	-0.11	57.90	13.10	-1.67
	KRW 20 million or lower	-0.29	0.47	-12.21	5.88	45.47	4.23	-3.09
	KRW 40 million or lower	17.39	22.59	-9.83	3.17	-26.45	-1.14	-0.33
	KRW 60 million or lower	31.54	10.07	6.70	3.80	28.50	-3.68	1.07
	KRW 80 million or lower	10.39	3.24	10.66	0.45	55.99	-5.07	3.72
	KRW 0.1 billion or lower	6.04	-0.18	9.21	0.71	45.50	-4.11	2.74
	KRW 0.2 billion or lower	9.61	0.14	30.17	-2.38	109.87	-14.16	9.67
	KRW 0.3 billion or lower	-1.15	4.21	17.47	0.04	75.05	-10.15	8.06
	KRW 0.5 billion or lower	-13.85	4.80	19.40	8.45	76.62	-7.31	13.35
	KRW 1 billion or lower	-38.60	5.51	10.79	9.44	120.06	0.15	16.71
	Above KRW 1 billion	-128.02	-1.01	6.60	-6.12	339.02	16.88	32.85
	Total	-108.44	50.54	75.33	23.32	927.53	-11.25	83.08
Effect of changes in percentage by cohort	Changes in tax rate	-0.42	0.19	0.14	0.14	-0.12	0.31	0.21
	KRW 10 million or lower	5.28	-0.64	0.16	-1.45	-17.35	-1.80	-2.29
	KRW 20 million or lower	8.36	-0.53	1.60	-2.74	29.33	-2.87	-1.45
	KRW 40 million or lower	-25.38	-5.71	3.94	-1.89	277.35	-1.87	6.90
	KRW 60 million or lower	-73.85	-17.22	-12.71	-2.02	136.44	-1.60	1.93
	KRW 80 million or lower	-30.46	-5.41	-12.15	11.38	-62.37	-1.43	-1.62
	KRW 0.1 billion or lower	-16.05	5.52	-6.82	6.57	-112.22	-2.17	0.53
	KRW 0.2 billion or lower	29.94	45.90	3.23	13.67	-380.38	-5.09	7.84
	KRW 0.3 billion or lower	36.94	24.03	9.58	-18.05	-195.22	4.73	2.16
	KRW 0.5 billion or lower	50.64	22.68	17.85	-10.52	105.57	-13.39	3.72
	KRW 1 billion or lower	69.66	2.98	12.05	12.47	304.60	-3.72	-1.01
	Above KRW 1 billion	153.37	-22.14	7.95	69.25	-913.27	140.45	0.20
	Total	208.44	49.46	24.67	76.68	-827.53	111.25	16.92

Note: 1) The boxes highlighted in darker blue represent a greater impact on increase in the effective tax rate, and the boxes highlighted in lighter blue represent a greater impact on the decrease in the effective tax rate.

changes in the percentage in the total income, the percentage declined in cohorts between KRW 40 million and KRW 100 million, lowering the average effective tax rate. The percentage increased in cohorts above KRW 100 million, raising the average effective tax rate. The increase in the percentage between KRW 300 million and KRW 1 billion seems to have played a significant role in the increased tax rate.

Figure 7_Identification of Factors Affecting Average Effective Global income tax Rate[1)]

(Unit: %)



	2012	2013	2014	2015	2016	2017	2011-2017
General global income : Effective tax rate	-108.44	50.54	75.33	23.32	927.53	-11.25	83.08
General global income : % in total income	208.44	49.46	24.67	76.68	-827.53	111.25	16.92

Note: 1) The boxes highlighted in darker blue represent a greater impact on increase in the effective tax rate, and the boxes highlighted in lighter blue represent a greater impact on the decrease in the effective tax rate.

Changes in the effective tax rate of each cohort in 2014 raised the average effective tax rate by 0.42%p, which is significantly higher than the 0.11%p increase for the employment income tax. In 2014, the government lowered the threshold for the highest tax rate (38%) from KRW 300 million to KRW 150 million, and replaced income deduction programs with tax credit programs. The tax-rate structure reform was applied to both employment income and global income, and the replacement of deduction programs was mostly applied to employment income. For this reason, we had expected that the effect of the 2014 tax reform on the effective

tax rate of each cohort would be greater for the employment income tax. However, surprisingly, changes in the effective global income tax rate in each cohort had a greater impact on the average effective tax rate than in the case of employment income tax. This might be the result of the fact that the average effective tax rate of the global income tax was higher than the average effective tax rate for the employment income tax. In fact, when expressed in percentage, the discrepancy in tax rate changes between the two taxes is significantly reduced: the global income tax rate increased by 3.04%, and the employment income tax rate increased by 2.48%.

In 2012, the government raised the tax rate for income above KRW 150 million from 35% to 38%. In the same year, the effective tax rate of the global income tax declined YoY by 0.2%p. Changes in the effective tax rate for each cohort raised the average effective tax rate by 0.22%p, and changes in the percentage of each cohort in the total income lowered the effective tax rate by 0.42%p. Specifically, the effective tax rate of each cohort increased in cohorts between KRW 20 million and KRW 200 million, and declined in cohorts above KRW 200 million. Overall, the former had a greater impact than the latter. As for the percentage of each cohort in the total income, the percentage declined in cohorts between KRW 20 million and KRW 200 million, and increased in cohorts above KRW 200 million. Overall, the percentage decline of the lower income cohorts had a greater impact than the percentage increase in the higher income cohorts.

In 2012, the government raised the tax rate for income above KRW 150 million from 35% to 38%, which was expected to raise the effective tax rate in cohorts above KRW 200 million. In reality, the increased tax rate lowered the effective tax rate in these cohorts. Overall, in cohorts above KRW 200 million, the increase in the percentage of each cohort in the total income raised the average effective tax rate, while changes in the effective tax rate of each cohort lowered the average effective tax rate. These findings suggest that, in cohorts above KRW 200 million, changes in the income distribution in each cohort had a greater role in lowering the effective tax rate than the effect of the changes in the tax regime.

The last column of the table and figure show changes in the average effective tax rate and factors affecting the effective tax rate during the 2011~2017 period. During the period, the average effective tax rate increased by 1.22%p, of which 1.02%p (83.08%) was attributable to changes in the effective tax rate of each cohort. The other 0.21% (16.92%) came from changes in the percentage of each cohort in the total income.

By cohort, changes in the effective tax rate of each cohort lowered the average effective tax rate in cohorts below KRW 40 million, and raised the average effective tax rate in cohorts

above KRW 40 million. In cohorts above KRW 100 million, changes in the effective tax rate of each cohort explains around 80% of the increase in the effective tax rate. In cohorts above KRW 300 million, the changes explain around 63% of the increase in the effective tax rate.

Changes in the percentage of each cohort in the total income revealed different impacts on the average effective tax rate depending on the cohort. The increase in percentages of the middle-income cohorts between KRW 20 million and KRW 60 million raised the average effective tax rate. The high-income cohorts between KRW 100 million and KRW 500 million, also had a significant role in raising the average effective tax rate. In the lowest-income cohorts below KRW 20 million, the middle-income cohorts between KRW 60 million and KRW 80 million, and the high-income cohorts between KRW 500 million and KRW 1 billion, changes in the percentage of each cohort in the total income had effects in the direction of lowering the average effective tax rate.

For employment income, over time, the impact of changes in the effective tax rate in each cohort declined while the impact of changes in the percentage in the total income increased. However, we could not identify any marked trends for global income. In addition, employment income increased over time, raising the average effective tax rate. In contrast, we could not identify any marked trends for global income. Changes in the effective tax rate in each cohort were the combined result of the effective tax rate caused by tax regime changes and changes in the effective tax rate caused by the changes in the income distribution in each cohort. However, except for 2014, when the government implemented the income tax regime reform, changes in the tax regime had little impact on changes in the effective tax rate.

4. Summary of the Findings

A. Employment Income Tax

Table 4 shows factors identified as affecting employment income tax revenue. The table has two panels: the top panel shows the YoY growth rate of tax revenue by year, and the impacts of reported income factors and effective tax rate factors. The bottom panel shows the impact of each factor in percentages.

Between 2011 and 2017, employment income tax revenue increased by 95.1%, of which 53.4%p originated from reported income factors, and 41.7%p came from effective tax rate factors. In percentages, the former factors contributed to 56.1% of the increase, while the

latter contributed to 43.9%. The YoY growth rate ranged from 9.2% (2016) to 14% (2014), and 6%p (2016) to 7.7%p (2012) of which came from the increase in reported income. The contribution of changes in the effective tax rate was the greatest in 2014 at 7.6%p, followed by 6.1%p in 2017, and between 3%p and 5%p in the other years.

Table 4_Identification of Factors Affecting Employment Income Tax Revenue Growth (Overall)

(Unit: %, %p)

	2012	2013	2014	2015	2016	2017	2011～2017
(growth rate)							
Tax revenue growth rate	12.2	11.6	14.0	11.2	9.2	12.6	95.1
Reported income	7.7	7.0	6.3	6.3	6.0	6.4	53.4
SNA income	5.0	5.2	4.2	5.2	5.7	4.5	40.0
Report ratio	2.6	1.8	2.1	1.2	0.3	1.9	13.4
Effective tax rate	4.5	4.6	7.6	4.9	3.2	6.1	41.7
Cohort effective tax rate	1.6	1.3	2.6	0.9	0.3	0.8	10.2
Percentage of cohort income	2.9	3.3	5.0	4.0	2.9	5.4	31.5
(percentage)							
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Reported income	63.1	60.2	45.5	56.3	65.0	51.2	56.1
SNA income	41.3	44.5	30.2	45.9	62.2	36.1	42.1
Report ratio	21.7	15.8	15.3	10.4	2.7	15.1	14.1
Effective tax rate	36.9	39.8	54.5	43.7	35.0	48.8	43.9
Cohort effective tax rate	13.0	11.1	18.5	8.0	3.5	6.2	10.8
Percentage of cohort income	23.9	28.7	36.0	35.6	31.5	42.6	33.1

Changes in reported income mostly originated from an increase in the SNA income. Reported income explains 56.1% of the tax revenue growth between 2011 and 2017, of which 42.1%p came from the increase in the SNA income, and 14.1% from the increase in the report ratio. As for revenue growth rate, 40%p of the 53.4% growth from increase in reported income is attributable to increase in the SNA income, while the other 13.4%p is attributable to changes in the report ratio. By year, the SNA income growth raised tax revenue YoY by between 4.2% and 5.7%, and the increase in the report ratio mostly resulted in a 2% YoY increase in tax revenue. However, the increase in the report ratio only raised tax revenue YoY by 0.3% in 2016, and 1.2% in 2015.

To further analyze the impact of changes in the effective tax rate between 2011 and 2017,

changes in the effective tax rate can explain 41.7% of the 95.1% employment income tax revenue growth in the period, of which 10.2%p came from changes in the effective tax rate in each cohort, and 31.5%p came from changes in the percentage of each cohort in the total income. By percentage, 10.9% of the tax revenue growth can be explained by changes in the effective tax rate in each cohort, while 33.1% is explained by changes in the percentage of each cohort in the total income. By year, changes in the effective tax rate in each cohort contributed explains around 1%p of the tax revenue growth. However, in 2014, changes in the effective tax rate of each cohort explains 2.6% of the YoY revenue growth, which can be attributed to the tax regime reform in the same year. In all other years, the government did not reform its tax regime to the extent that changes in tax revenue were induced through changes in the effective tax rate for each cohort. Considering the discrepancy in the impact of the effective tax rate between 2014 and all other years, the tax reform in 2014 seems to have raised tax revenue YoY by 1.5%.

Around 75% of the tax revenue growth coming from changes in the effective tax rate can be explained by changes in the percentage of each cohort in the total income. Between 2011 and 2017, changes in the percentage of each cohort in the total income explain around 33.1% of tax revenue growth during this period. By year, in 2014 and 2017, changes in the percentage of each cohort in the total income contributed to YoY tax revenue growth by 5% and 5.4%, respectively. The contribution ratio was 4% in 2015, and around 3% in all other years. Tax revenue growth resulting from changes in the percentage in the total income could be attributed to the progressive nature of the income tax regime. Supposing the government does not change the tax regime, if the economy grows and taxpayers earn more income, a larger number of taxpayers are subject to higher tax rates, resulting in a higher average effective tax rate and increased tax revenue. These factors explain around a third of the tax revenue growth between 2011 and 2017. In each year, these factors raise the tax revenue YoY by around 3%.

Figure 8 presents factors affecting employment income tax revenue growth in the 2011~2017 period: increase in SNA income, increase in the report ratio, changes in the effective tax rate in each cohort, and changes in the percentage of each cohort in the total income. The graph represents the numbers shown in Table 4. It is worth noting that, in the figure, the increase in SNA income explains around 42.1% of the tax revenue growth, and changes in the percentage of each cohort in the total income explains around 33.1%. These two factors, resulting from income growth, explains around 75.2% of the employment income tax revenue growth. The part explained by the increase in SNA income represents the tax revenue growth caused by the increase in the total income when the effective tax rate

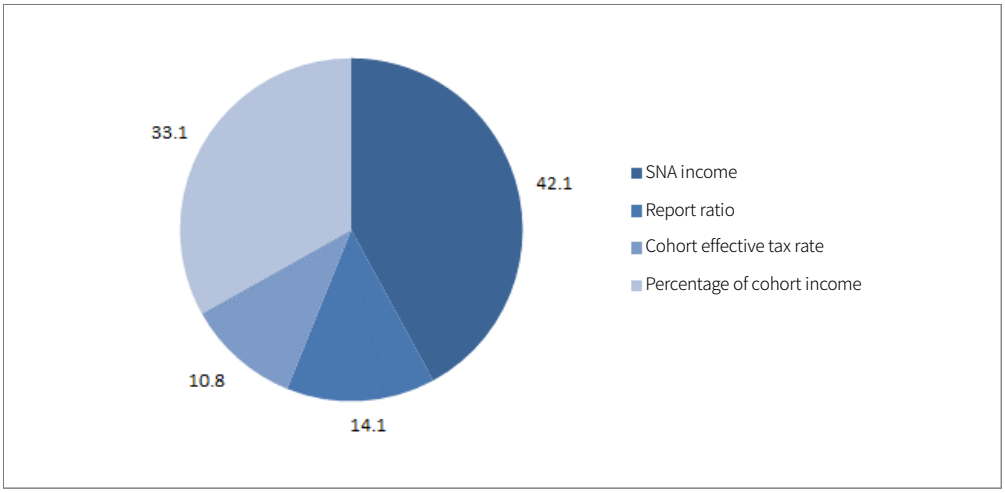
does not change. The part explained by changes in the percentage of each cohort in the total income represents the revenue growth resulting from taxpayers earning more income and being subject to higher tax rates. Changes in the percentage of each cohort in the total income might not result in increased tax revenue if the government adjusts its income deduction and tax credit programs (in terms of size, limit, and tax-rate thresholds) based on inflation and income growth. However, the Korean government does not adjust deduction/credit limits, amounts, and tax rate thresholds on a yearly basis depending on income and inflation, except for non-periodical adjustments aimed at fulfilling policy objectives. During the 2011~2017 period, the government did not adjust deduction/credit programs or tax-rate thresholds except for an adjustment of tax rate thresholds used to increase the tax burden on the highest-income cohorts. Therefore, it seems to have resulted in sizable tax revenue growth caused by changes in the percentage of each cohort in the total income.

Other than changes in income, changes in the effective tax rate in each cohort and changes in the report ratio are affected by changes in the tax regime and the administration. Changes in the report ratio explain 14.1% of the tax revenue growth between 2011 and 2017, while changes in the effective tax rate in each cohort explains around 10.8%. A higher report ratio indicates improvements in tax administration. The employment income tax is characterized by a higher report ratio than the other income taxes, which does not leave much room for further increase.

Changes in the effective tax rate in each cohort originate from changes in the tax regime and changes in the income distribution in each cohort. Changes in the effective tax rate in each cohort had the greatest impact in 2014, which can be attributable to the tax regime reform in the same year. Changes in the effective tax rate in each cohort also had impact on tax revenue growth in years without big changes in tax regime, which seems to be the result of changes in the income distribution in each cohort. Overall, changes in the income distribution in each cohort explains around a third of the YoY changes in Table 4, which are explained by changes in the effective tax rate in each cohort.

Figure 8_dentification of Factors Affecting Employment Income Tax Revenue (2011~2017)

(Unit: %)



Source: <Table 4>

B. Global Income Tax

Table 5 presents factors identified as affecting global income tax revenue growth. Between 2011 and 2017, global income tax revenue increased by 95.7%, of which 83.1%p (86.9%) came from an increase in reported income, and only 12.6%p (13.1%) came from an increase in the effective tax rate. This result is in stark contrast with employment income tax revenue growth, of which 56.1% and 43.9% were explained by these two factors, respectively.

Of the 83.1%p contributed by the reported income factors, 43.4%p (45.3%) came from increase in the SNA income, and 39.7% (41.5%) came from an increase in the report ratio. Tax revenue growth caused by the increase in the report ratio represents revenue growth caused by the increase in reported income not explained by the increase in SNA income. These changes seem to have been primarily driven by improvements in tax administration, including: improvements powered by advancements in IT, the mandatory issuance of cash receipts, and improvements in tax base transparency through multi-faceted efforts including the faithful report confirmation system.

To analyze factors affecting the effective tax rate, 10.4%p of the 12.6%p revenue growth from changes in the effective tax rate came from changes in the effective tax rate in each cohort, and 2.1%p came from changes in the percentage of each cohort in the total income.

They represent 10.9% and 2.2% of the tax revenue growth, respectively. The increase in tax revenue caused by the effective tax rate in each cohort is not significantly different from that of the employment income tax. This result can be attributable to the fact that, except for some income deduction programs, the tax regime of the global income tax also applies to the employment income tax. In addition, changes in the percentage of each cohort in the total income explain around a third of changes in the total employment income tax revenue. However, the same factor explains only 2.2% of the changes in the total global income tax revenue. The difference is attributable to differences in the nature of business income and employment income. Employment income mainly consists of wages received by employees. Economic growth results in increased wages received by employees, resulting in an increase in the taxable income of individual taxpayers. Under a progressive tax rate structure, it results in even greater increase in the effective tax rate. However, economic growth has less impact on distribution of business income. Income earned by individual taxpayers varies greatly from year to year, as does the number of taxpayers. Between 2011 and 2017, the number of taxpayers who reported employment income increased by 15.9%. In the same period, the number of taxpayers reporting global income increased by 61.6%.

Table 5_Identification of Factors Affecting Global Income Tax Revenue Growth (Overall)

(Unit: %, %p)

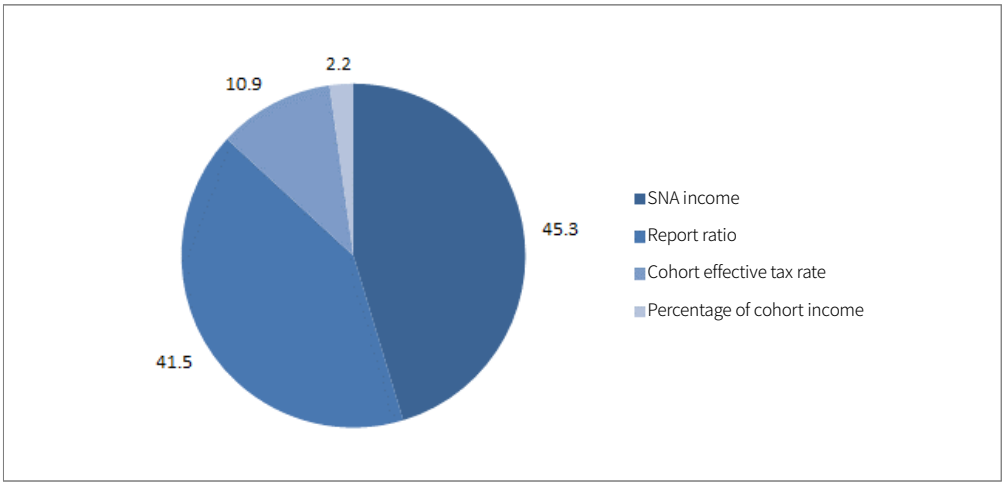
	2012	2013	2014	2015	2016	2017	2011~2017
(growth rate)							
Tax revenue growth rate	11.4	9.7	12.1	13.3	8.9	15.7	95.7
Reported income	13.0	6.7	7.9	12.0	8.8	13.7	83.1
SNA income	7.2	6.5	1.4	5.8	3.2	9.1	43.4
Report ratio	5.8	0.2	6.5	6.2	5.6	4.5	39.7
Effective tax rate	- 1.6	3.0	4.2	1.3	0.1	2.0	12.6
Cohort effective tax rate	1.7	1.5	3.2	0.3	1.0	- 0.2	10.4
Percentage of cohort income	- 3.3	1.5	1.0	1.0	- 0.9	2.3	2.1
(percentage)							
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Reported income	113.8	69.1	65.1	90.1	98.8	87.0	86.9
SNA income	63.2	67.1	11.4	43.3	36.1	58.2	45.3
Report ratio	50.6	1.9	53.7	46.8	62.7	28.8	41.5
Effective tax rate	- 13.8	30.9	34.9	9.9	1.2	13.0	13.1
Cohort effective tax rate	15.0	15.6	26.3	2.3	11.2	- 1.5	10.9
Percentage of cohort income	- 28.8	15.3	8.6	7.6	- 10.0	14.4	2.2

Unlike the employment income tax, global income tax revenue greatly varies from year to year, with no consistent pattern. The YoY tax revenue growth rate ranged from 8.9%p (in 2014) to 15.7%p (in 2017). YoY revenue growth from an increase in reported income ranged from 6.7%p (in 2013) to 13.7%p (in 2017). Contribution of the effective tax rate ranged from -1.6%p (in 2012) to 4.2%p (in 2014).

Figure 9 shows the factors affecting global income tax revenue growth during the 2011~2017 period: increase in SNA income, increase in the report ratio, changes in the effective tax rate in each cohort, and changes in the percentage of each cohort in the total income. The increase in SNA income explains 45.3% of the tax revenue growth, and the increase in the report ratio explains around 41.5%. These two factors explain 86.9% of the overall change, with changes in the effective tax rate in each cohort and changes in the percentage of each cohort in the total income explaining 10.9% and 2.2% of the growth, respectively.

Figure 9_Identification of Factors Affecting Global Income Tax Revenue (2011~2017)

(Unit: %)



Source: <Table 5>

As was the case with the employment income tax, the increase in SNA income explains the largest part of general tax revenue growth. The increase in SNA income explains around 42.1% of the employment income tax revenue growth, which is not significantly different from this factor's contribution to global income tax revenue. The percentage of the part

explained by changes in the effective tax rate in each cohort is also similar between the two taxes, at 10.9% for the global income tax, and 10.8% for the employment income tax. This finding seems to be the result of the same tax regime being applied to both the global income tax and the employment income tax.

As for differences between the two taxes, changes in the percentage of each cohort in the total income explains 33.1% of the employment income tax revenue growth between 2011 and 2017, and the increase in the report ratio explains 14.1%. However, for the global income tax, the percentage of each cohort in the total income explains only 2.2% of the revenue growth, and the increase in the report ratio explains 41.5%. For employment income, while the increase in the report ratio does not greatly impact the tax revenue growth, the overall increase in income raised the number of taxpayers subject to higher tax rates, which raised the average effective tax rate and increased the resulting tax revenue. For global income, a rapid increase in the report ratio had a significant impact on revenue growth. However, changes in the percentage of each cohort in the total income did not have a significant impact on revenue growth, because the number of taxpayers rapidly increased along with the reported income.

IV. Policy Implications

In this study, we used data from 2011~2017 to analyze factors contributing to rapid income tax revenue growth during this period. The increase in income is one major factor affecting income tax revenue. Around 40~45% of the increases in employment income tax and global income tax revenue originated from increases in income. In addition, when employment income increases, taxpayers are subject to higher tax rates, which also increases the average effective tax rate and tax revenue. This factor explains around a third of the employment income tax revenue growth. Therefore, an increase in income is the most important factor affecting tax revenue growth; the impact will be even greater if income grows at a faster rate. However, the current economy does not seem to be faring well. A recession is likely going to restrict income growth, which will significantly reduce tax revenue growth.

Another major factor affecting income tax revenue is changes in the effective employment income tax rate. When individual taxpayers earn more income, they are subject to higher tax rates, resulting in a tax burden that increases at a higher rate than their earned income. This factor explains around a third of the increase in employment income tax revenue, which originates from a progressive income tax structure.

A price index increase may raise the actual tax burden without an increase in real income,

fundamentally reducing after-tax real income. To prevent such a decline in after-tax real income, some countries link tax-rate thresholds and income deductions to the price index. Other countries adjust thresholds and available deductions every two or three years. In the past, Korea also adjusted deductions and thresholds every few years to prevent a rapid increase in tax burden. However, in recent years, the Korean government has not performed such adjustments, most notably during the 2011~2017 period.

This approach, in which the government maintains thresholds and deductions for a prolonged time, without adjustment based on price index and income growth, may allow the government to increase its tax revenue without the political burden commonly incurred from enacting tax reforms. However, it should be noted that increasing the tax revenue without taxpayers' consent may undermine the efficiency of the government's fiscal management and ultimately reduce its accountability to taxpayers. Taxpayers would not readily accept an increase in the effective tax rate caused by an increase in nominal income driven by inflation. If the current practice continues for a prolonged time, it may result in even greater discontent among taxpayers.

A progressive income tax regime may function as an automatic economic stabilizer, increasing tax revenue when the economy grows at a fast rate, and reducing tax burden during a recession. To benefit from this positive effect of the income tax, it might be better to maintain tax rate thresholds and deductions rather than risking reducing the tax burden during an economic upturn and increasing the tax burden during a recession. However, this stabilizing function is meaningful only during drastic fluctuations, which are not likely to last for a long time. Given the lessons learned during the 1997~1998 Korean Financial Crisis and the Global Financial Crisis in 2008, such periods are likely to last for around two or three years, and not longer than five years.

In terms of global income tax, improvements in the report ratio played a significant role in tax revenue growth. This growth seems to be mostly attributable to the improved transparency of the tax bases of business income earners. This improvement in transparency, in turn, seems to have mainly come from improvements in tax administration powered by advancements in IT, the adoption of mandatory cash receipt issuance, and the adoption of a faithful report confirmation system. Other positive factors include advancements in the National Pension, National Health Insurance, and other social insurance schemes. Furthermore, the improved transparency for business income positively affects the transparency of employment income. As such, the government needs to continue its efforts to improve the transparency of business income earners' tax bases, not only in terms of

increased tax revenue but also for a fairer distribution of the tax burden (horizontal equity). It should also be noted that tax revenue growth from an increased report ratio will diminish over time.

An increase in the report ratio for global income taxes provides crucial implications for discrepancies in the effective tax rates for both global income tax and employment income tax. The gap between the effective tax rates has been, in large part, intended by the government. The government intentionally set the effective employment income tax rates lower than the rates for global income tax to prevent employment income earners from bearing a higher burden than business income earners. However, this gap may actually discourage business income earners from faithfully reporting their income. In addition, we found that the increase in the report ratio explains 41.5% of the global income tax revenue growth between 2011 and 2017. The finding implies there were significant changes in the policy environment. The ratio of reported business income against SNA income increased rapidly from 50.14% in 2011 to 70.71% in 2017. Overall, the growth rate significantly increased from 2013 onwards. Considering the existence of various statistical issues present in this study, it might be rash to conclude that these figures represent the report ratio. However, it is reasonable to assume that changes in these numbers represent the degree of improvement in the report ratio. The report ratio for the employment income tax is 97.31% as of 2017, which indicates that the tax base transparency of business income earners remains lower than for employment income earners. However, it seems clear that the current situation differs greatly from the time when the government adopted and expanded on various approaches to create a gap between the effective tax rates of employment income tax and global income tax. The government needs to reassess this gap in effective tax rates based on consideration of changing situations.

As a final comment, the findings in this study suggest that it is improbable to expect income tax revenue growth comparable to the growth in past years. Income tax revenue rapidly increased during the 2011~2017 period, which was mainly driven by income growth, the prolonged absence of tax rate threshold and deduction adjustments, and improvements in the report ratio with regards to global income tax. Changes in the income tax regime aimed at revenue growth only played an auxiliary role in the actual revenue growth. Looking at future perspectives, income is not expected to increase at a rapid pace as it did on the past. Also, it seems that the government will have a hard time maintaining deductions and tax rate thresholds for a prolonged time without adjustments. The government has not changed these two factors for too long, as it is. In addition, given the very low inflation rate and economic

stagnation in recent years, maintaining thresholds and deductions will not have the same effect on tax revenue as it did in the past. As such, while the government still needs to improve the report ratio, the rate of improvement will inevitably dwindle over time.

In the past, changes in the income tax revenue had a limited impact on income tax revenue. Changes in the regime only explain 10% of the income tax revenue growth between 2011 and 2017. In addition, most of the 10% originated from the replacement of income deduction programs with credit programs in 2014. In all other years, there were no other tax reforms that had the same level of impact on tax revenue. However, if the government seeks to increase income tax revenue in the future, tax regime reforms are one of the major tools available. In this report, we do not provide suggestions regarding whether the government needs to increase its income tax revenue. That is a decision to be made based on a comprehensive consideration of the overall financial situation and developments in other taxes. We simply stress the need for active tax reforms if the government intends to increase its income tax revenue at a rate surpassing the income growth rate, because the tools used in the past—maintenance of thresholds and deductions and efforts to raise the report ratio—may no longer be an effective means of increasing the tax revenue.

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Estimation of Benefit from Public Rental Housing and its Implications

Jonghyeon Oh*

I. Introduction

Housing is one of the key requirements for living life with dignity, which makes housing policies an important means of improving people's quality of living. Over the past few decades, the Korean government has adopted various policies in attempts to provide people with residential security by stabilizing housing prices and rent, and developing public rental housing. Public rental housing mitigates instability in the rental housing market by offering lower rent than private rental housing. For this reason, it has played a crucial role in Korea's residential policy.

In this study, we used data from the 2018 Korea Housing Survey to estimate the benefit from public rental housing, especially Permanent Rental Housing and National Rental Housing, and how the benefit varies depending on income level and region. Among the various types of potential housing, we limited our analysis to apartments.

For the purpose of this study, the term "the benefit from public rental housing" is defined as follows. The rent for public rental housing is typically lower than for private rental housing. We defined the benefit as the gap between public rental housing rent and private public housing rent. In other words, if the rent for a public rental housing unit is lower than the rent for an equivalent private rental housing unit, the household living in the public rental housing

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unit enjoys the benefit of leading a high-quality life at a lower cost. However, it is impossible to directly identify rent gaps between various types of public rental housing and private rental housing units. For this reason, we used data from the 2018 Korea Housing Survey to estimate the benefit from public rental housing, and to then examine common characteristics.

Oh, Kim, and Gwon (2019) tackled a similar topic in their research. They estimated the size of social benefits-in-kind that ultimately go to households, and then used the method proposed by You and Kim (2017) to estimate the benefit from public rental housing. We updated the data used in Oh, Kim and Gwon (2019) by replacing the 2017 data with 2018 data. Our analysis is also distinguished from Oh, Kim and Gwon (2019) in that it explicitly considers specific types of public rental housing, and added the residential environment to the list of factors determining housing rent.

This study consists of the following chapters. Chapter II provides an overview of public rental housing in Korea. Chapter III summarizes basic statistics regarding public rental housing from the 2018 Korea Housing Survey data, and Chapter IV estimates the benefit from public rental housing. Chapter V presents the conclusions of this study.

II. Overview of Public Rental Housing

In Korea, the housing rental cost paid by tenants consists of nonreturnable monthly rent and returnable deposit. If a tenant paid a relatively large deposit, the tenant's monthly rent would be, in general, relatively low because the landlord could take a relatively large amount of interest or other investment incomes from the deposit in lieu of monthly rent. One of the special cases in this system is that a tenant pays only a returnable deposit without nonreturnable monthly rent. This kind of rental contract is called jeonse, which is the unique housing rental system to Korea. In the contract of jeonse, the amount of deposit would be decided to be a fraction of the market value of property, for example 50% to 80%, although the fraction would be largely different depending on region, residential environment, housing condition and so on.

There exist several types of public rental housing in Korea. Among them, the two most common types are Permanent Rental Housing and National Rental Housing. According to the 2019 Housing Manual published by the Ministry of Land, Infrastructure, and Transport (MOLIT), around 1,457 thousand public rental housing units were supplied in 2017. Among the housing units, National Rental Housing units comprise the largest portion at 36% (around 524 thousand units), followed by Permanent Rental Housing (including 50-year Rental

Housing) at 327 thousand units, or 22.4% of the total public rental housing units. Overall, National Rental Housing and Permanent Rental Housing account for around 58.4% of the total public rental housing units. In the public rental housing units, 16.6% of the total units (around 241 thousand units) were units in which the tenants hold the right of first purchase after a five or ten-year lease period. 13.4% of the total units (around 195 thousand units) were Government-Leased Rental Housing units, and Government-Purchased Rental Housing accounted for 7.1% of the total units, at around 103 thousand units. Other types of public rental housing include: Long-Term Jeonse Housing (around 33 thousand units), Employee Rental Housing (around 18 thousand units), and Happiness Housing (around 16 thousand units).

Table 1_Public Rental Housing in 2017

(Unit: 1,000 units, %)

Items	Total	Permanent Rental (including 50-year lease)			National Rental	Happiness Housing	Long-Term Jeonse	Public Rental with Purchase Right			Employee Rental	Government-Purchased	Government-Leased
		Subtotal	Permanent	50-year lease				Subtotal	10-year lease	5-year lease			
Units supplied	1,457	327	217	110	524	16	33	241	168	73	18	103	195
Portion	100	22.4	14.9	7.5	36.0	1.1	2.2	16.6	11.5	5.0	1.2	7.1	13.4

Source: Ministry of Land, Infrastructure and Transport (2019), *Housing Manual,* p. 399

In this study, we estimated the benefit from Permanent Rental Housing and National Rental Housing, which comprise the largest portion among all public rental housing units. Permanent Rental Housing and National Rental Housing are different in terms of lease period, eligible persons, unit size, and rent ratio. The provision of Permanent Rental Housing is a type of social aid for low-income and vulnerable groups. Permanent Rental Housing units can be leased for a period of 50 years or longer. However, they are available only to specific groups including low-income earners (welfare recipients), meritorious persons, and single-parent families. The exclusive private area of a Permanent Rental Housing unit is 40㎡ or smaller, and rent is at around 30% of the market rate.

National Rental Housing units are provided to low-income classes under or on the fourth income decile, although they usually earn higher income than Permanent Rental Housing tenants. National Rental Housing units are leased for 30 years or longer. The exclusive private area is usually 60㎡ or smaller, and rent is around 60% to 80% of the market rate. The eligibility requirements for National Rental Housing include income and asset requirements. As of 2019, to be eligible for National Rental Housing, an applicant's average monthly income should not

exceed 70% (for a unit with an exclusive private area of 60㎡ or smaller) or 100% (for a unit with an exclusive private area between 60㎡ and 85㎡) of the average monthly income of urban workers in the previous year. In addition, the value of an applicant's assets and vehicles should not exceed KRW 280 million and KRW 24.99 million, respectively. Here, asset value refers to an applicant's real properties, financial assets, vehicles, and other assets, less the amount of their debt.

Table 2_Permanent Rental Housing and National Rental Housing

Items	Permanent Rental Housing	National Rental Housing
Purpose	• Support lowest-income and vulnerable groups	• Ensure residential security of low-income groups
Lease period	• 50 years or longer	• 30 years or longer
Eligible persons	• Lowest-income groups including welfare recipients • Meritorious persons and single-parent families	• Low-income groups without home ownership (1st–4th income decile) • (Income Requirement) May not exceed 70% (for a unit with an exclusive private area of 60㎡ or smaller) or 100% (for a unit with an exclusive private area between 60㎡ and 85㎡) of the average monthly income of urban workers in the previous year • (Asset Requirement) value of assets and vehicles may not exceed KRW 280 million and KRW 24.99 million, respectively Here, asset value refers to an applicant's real properties, financial assets, vehicles, and other assets, less the amount of their debt.
Unit size (exclusive private area)	• 40㎡ or smaller	• (in general) 60㎡ or smaller
Rent ratio	• 30% of market rate	• 60–80% of market rate

Source: 1. Ministry of Land, Infrastructure, and Transport (2019), *2019 Housing Manual,* p. 246
2. Korea Land and Housing Corporation Application Center, https://apply.lh.or.kr/LH/index.html#GUD::CLCC_GUD_0040:1020301, last accessed on April 14, 2020

III. Basic Statistics of Korea Housing Survey

1. Analyzed Samples

In this study, we estimated the benefit enjoyed by households living in public rental housing units by using the raw data from the 2018 Korea Housing Survey. According to the 2018 *Korea Housing Survey: Statistics Report* (MOLIT, 2019), the Korea Housing Survey was conducted by MOLIT in collaboration with the Korea Research Institute for Human Settlements and Hankook Research to "understand the current status of the people's living."

Launched in 2006, the survey was conducted biannually until 2016, when it became an annual survey.

We used 2018 Korea Housing Survey data obtained from Statistics Korea's MicroData Integrated Service (MDIS). The 2018 survey on households was conducted from July 2 to December 7, 2018. The survey population consisted of the households and housing units surveyed during the 2016 Census, excluding those located in island areas and special social facilities. The target sample size was 61,000, and the effective sample size was 61,275.

Among the 61,275 households, 33.3% or 20,384 households live in rental housing units. The Korea Housing Survey categorizes rental housing into private rental housing, public rental housing, public rental housing with purchase right, and other rental housing. The "other rental housing" category includes rental apartment housing for government employees, military apartment housing, company housing, town hall rentals, local government-supplied commercial rental housing, and city government-supplied housing on state-owned lands.

In this category, 81.4% (16,594 households) of the total rental housing households live in private rental housing units, and 16.2% (3,299 households) live in public rental housing units. In other words, households living in public rental housing and private rental housing units comprise around 97.6% of the total rental housing households. Households living in public rental housing units with first right of purchase and other rental housing units number at 372 and 119, or 1.8% and 0.6%, respectively.

Table 3_Number of Units by Lease Type and Rental Housing Type

(Unit: no. of households)

Lease type	Rental housing type				Total
	Private rental	Public rental	Public rental with purchase right	Other rental	
Jeonse	7,389	443	84	67	7,983
Monthly rent with deposit	7,938	2,846	288	42	11,114
Monthly rent without deposit	917	10	0	2	929
Rent paid in advance/yearly rent	349	0	0	8	357
Daily rent	1	0	0	0	1
Total	16,594	3,299	372	119	20,384

Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Overall, 92.4% of the households living in private rental housing units were living either on jeonse or monthly rent with a deposit. Among the 16,594 households living in private rental

housing units, 7,389 households (44.5%) were living on jeonse, and 7,938 households (47.8%) were living on monthly rent with a deposit. Among the 3,299 households living in public rental housing units, 2,846 households (86.3%) were living on monthly rent with a deposit. Notably, more than 90% of the households living in Permanent Rental Housing, National Rental Housing, and Happiness Housing units were living on monthly rent with a deposit. Among the 164 households living in Long-Term Jeonse Housing units, 134 households (81.7%) were living on jeonse. Only 10 households living in public rental housing units were living on monthly rent without a deposit, all of whom were living in Government-Purchased/Leased Rental Housing units.

Table 4_Number of Units by Public Rental Housing Type and Lease Type

(Unit: no. of households)

Public rental housing type	Lease type			Total
	Jeonse	Monthly rent with deposit	Monthly rent without deposit	
Permanent Rental Housing	97	931	0	1,028
National Rental Housing	112	1,528	0	1,640
Happiness Housing	3	142	0	145
Long-Term Jeonse Housing	134	30	0	164
Government-Purchased/ Leased Rental Housing	95	213	10	318
Others	2	2	0	4
Total	443	2,846	10	3,299

Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

By housing type, among the 3,299 households living in public rental housing units, 2,925 households (88.7%) were living in apartments. Among households living in private rental housing units, 6,075 households (36.6%) were living in multi-household detached houses, and 5,084 households (30.6%) were living in apartments. In other cases, 1,534 and 1,168 private rental housing households were living in multi-household houses and standard detached houses, respectively. All 372 households living in public rental housing with first right of purchase were living in apartments. In addition, all of the households living in detached houses that were public rental housing were living in Government-Purchased/Leased Rental Housing units. Among these households, 13 households were living in standard detached houses, 199 households were living in multi-household detached houses, and two households were living in detached houses that were also used for business.

Table 5_Number of Units by Housing Type and Rental Housing Type

(Unit: no. of households)

Housing type	Rental housing type				Total
	Private rental	Public rental	Public rental with purchase right	Other rental	
Standard detached house	1,168	13	0	0	1,181
Multi-household detached house	6,075	199	0	0	6,274
Detached house for dwelling and business	724	2	0	0	726
Apartment	5,084	2,925	372	106	8,487
Row house	564	48	0	0	612
Multi-household house	1,534	112	0	3	1,649
Housing in non-residential building (commercial building, factory, inn, etc.)	174	0	0	0	174
Office-tel[1)]	790	0	0	0	790
Gosiwon[2)]	356	0	0	0	356
Shack, vinyl greenhouse, container, hut	37	0	0	3	40
Others	88	0	0	7	95
Total	16,594	3,299	372	119	20,384

Notes: 1. In Korea, 'office-tel' refers to a multi-purpose building with both residential and commercial units.
2. 'Gosiwon' refers to a type of residential facility in Korea that is characterized by their small unit size and cheap rent.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Table 6_Number of Units by Public Rental Housing Type and Lease Type

(Unit: no. of households)

Public rental housing type	Housing type						Total
	Standard detached house	Multi-household detached house	Business/ dwelling detached house	Apartment	Row house	Multi-household house	
Permanent Rental Housing	0	0	0	1,004	9	15	1,028
National Rental Housing	0	0	0	1,592	15	33	1,640
Happiness Housing	0	0	0	138	2	5	145
Long-Term Jeonse Housing	0	0	0	154	1	9	164
Government-Purchased/ Leased Rental Housing	13	199	2	35	19	50	318
Others	0	0	0	2	2	0	4
Total	13	199	2	2,925	48	112	3,299

Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

By specific type of public rental housing, among the total 3,299 households, 2,596 households (78.6%) were living in apartments rented as either Permanent Rental Housing or

National Rental Housing units. Therefore, in this study, we limited our analysis to these apartment units. Similarly, we also limited the scope of private rental housing units to apartment for comparability with public rental housing for the benefit estimation. All households living in Permanent Rental Housing and National Rental Housing units were found to live on jeonse or monthly rent with a deposit. Therefore, we only analyzed private rental housing units in which residents were living on jeonse or monthly rent with a deposit. We also excluded households with no rent or building age data, because these are the main variables of our rent determinant model. Ultimately, we analyzed a total of 7,343 households, of which 5,027 were living in private rental housing units, 954 were living in Permanent Rental Housing units, and 1,552 were living in National Rental Housing units.

Table 7_Number of Observations Used in the Analysis

(Unit: no. of households)

Housing type		Lease type		Total
		Jeonse	Monthly rent with deposit	
Private Rental Housing		3,397	1,440	5,027
Public Rental Housing	Permanent Rental Housing	85	869	954
	National Rental Housing	95	1,457	1,552
	Subtotal	180	2,326	2,506
Total		3,577	3,766	7,343

Note: All housing units are apartment units.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

2. Distribution of Tenants' Current Income and Rent

The rent consists of deposit and monthly rent. As proposed by Oh, Kim, and Gwon (2019), we used the deposit-monthly rent conversion rate to convert deposits to monthly rates, as shown in Equation (1). In Equation (1), $Rent_j$ is the household rent converted to the monthly rent, DP_j is the deposit, CR is the deposit-monthly rent conversion rate, and $MonRent_j$ is the monthly rent paid by the household. As for the deposit-monthly rent conversion rate, we used the average rates of apartments across different regions and sizes from July to November of 2018, when the 2018 Korea Housing Survey was conducted. The details are presented in Table 8.

$$Rent_j = \frac{DP_j \times CR}{12} + MonRent_j \qquad \text{Equation (1)}$$

Table 8_Deposit-Monthly Rent Conversion Rates

(Unit: %)

Region	Size		
	60㎡ or smaller	60~85㎡	Larger than 85㎡
Nationwide	5.18	4.40	4.30
Seoul	4.30	3.80	4.00
Busan	5.12	4.32	4.28
Daegu	4.92	4.20	4.22
Incheon	5.22	4.52	4.68
Gwangju	5.54	4.84	4.48
Daejeon	6.00	4.30	4.36
Ulsan	5.32	4.38	4.10
Sejong	5.24	4.94	4.86
Gyeonggi	4.96	4.50	4.40
Gangwon	7.20	5.38	4.74
North Chungcheong	6.66	4.96	4.50
South Chungcheong	6.84	4.84	4.86
North Jeolla	6.70	5.06	4.90
South Jeolla	8.98	4.68	4.20
North Gyeongsang	6.52	4.98	4.42
South Gyeongsang	5.56	4.66	4.42
Jeju	5.04	4.70	4.30

Note: Average from July to November 2018

Source: Korea Appraisal Board, Deposit-Monthly Rent Conversion Rate by Housing Size: https://www.r-one.co.kr/rone/resis/statistics/statisticsViewer.do, accessed on January 20, 2020

In the following paragraphs, we summarize basic statistics regarding the current income and rent of the rental housing households that are included in our rent determinant analysis. To control for the number of household members, we equivalized income and rent with the square root of the number of household members.

The average of equivalized monthly current income of the rental housing households analyzed in this study was KRW 1,902 thousand. The monthly current income of rental housing households living on jeonse was KRW 2,346 thousand, which is higher than the monthly current income of rental housing households living on monthly rent with a deposit.

By rental housing type, the average of monthly current income of households living in private rental housing units was the highest (KRW 2,299 thousand), followed by households living in National Rental Housing units (KRW 1,285 thousand), and those living in Permanent Rental Housing units (KRW 901 thousand). This order of monthly current income did not change when we narrowed the scope of analysis to households living on jeonse or monthly rent with a deposit.

The income gap among different rental housing types can be attributed to the fact that, as shown in Chapter II, Permanent Rental Housing units are supplied to welfare recipients and other lowest-income groups, and National Rental Housing units are supplied to low income groups under or on the fourth income deciles. However, the data show that some households living in

Permanent Rental Housing or National Rental Housing units reported equivalized current income exceeding KRW 4 million. These households seem to have satisfied the income requirements for public rental housing at the time of moving in, but increased their income in later years.

Table 9_Basic Statistics of Rental Housing Households: Equivalized Monthly Current Income

(Unit: no. of households; KRW 1,000)

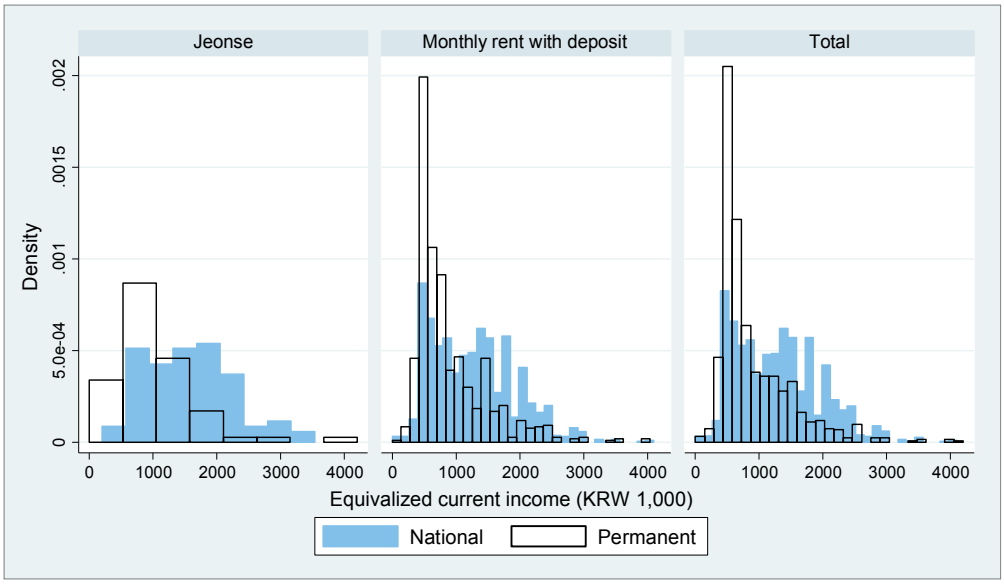
Items	No. of Obs.	Average	Standard deviation	Min	Max
All	7,273	1,902.1	1,192.6	0.0	15,588.5
Private rental	4,781	2,299.3	1,216.3	0.0	15,588.5
Permanent rental	943	901.2	570.3	0.0	4,200.0
National rental	1,549	1,285.3	661.5	0.0	4,099.2
Jeonse	3,530	2,346.1	1,233.8	0.0	15,588.5
Private rental	3,356	2,400.0	1,231.3	0.0	15,588.5
Permanent rental	79	1,003.0	619.6	0.0	4,200.0
National rental	95	1,559.3	687.9	200.0	3,535.5
Monthly rent with deposit	3,743	1,483.3	983.4	0.0	10,606.6
Private rental	1,425	2,062.0	1,146.3	0.0	10,606.6
Permanent rental	864	891.9	565.0	0.0	4,041.5
National rental	1,454	1,267.4	656.0	0.0	4,099.2

Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Figure 1_Distribution of Equivalized Monthly Current Income of Households Living in Private and Public Rental Housing

Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Figure 2_Distribution of Equivalized Monthly Current Income of Households Living in National and Permanent Rental Housing



Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

The average of equivalized monthly rental housing rent was KRW 358 thousand. The average of converted monthly rent of households living on jeonse was KRW 471 thousand, which is higher than the monthly rent of households living on monthly rent with a deposit, KRW 252 thousand.

The monthly rent of households living in private rental housing units was KRW 462 thousand, which is higher than the monthly rent of households living in public rental housing units. In addition, the monthly rate of National Rental Housing households was KRW 187 thousand, which is higher than the monthly rent of Permanent Rental Housing units, KRW 109 thousand.

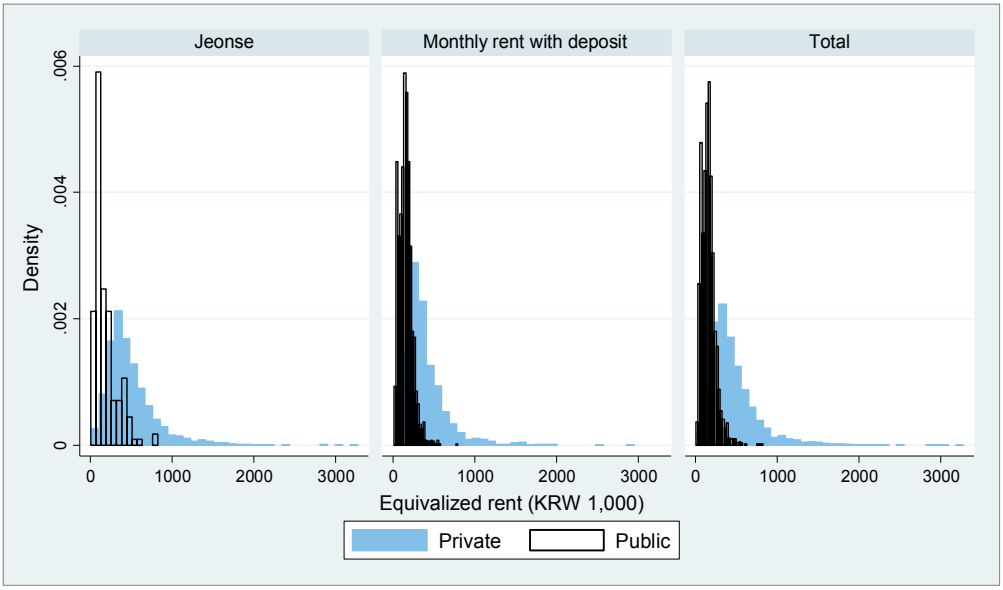
Table 10_Basic Statistics of Rental Housing Households: Equivalized Monthly Rent

(Unit: no. of households; KRW 1,000)

	No. of samples	Average	Standard deviation	Min	Max
All	7,343	358.3	285.9	3.8	3,271.7
Private rental	4,837	462.3	297.5	14.3	3,271.7
Permanent rental	954	108.9	69.3	3.8	492.5
National rental	1,552	187.3	81.7	17.7	823.2
Jeonse	3,577	470.6	308.4	3.8	3,271.7
Private rental	3,397	486.0	307.2	14.3	3,271.7
Permanent rental	85	94.2	43.6	3.8	247.3
National rental	95	258.1	151.4	17.7	823.2
Monthly rent with deposit	3,766	251.5	213.8	14.0	2,950.0
Private rental	1,440	406.5	265.2	29.1	2,950.0
Permanent rental	869	110.3	71.1	14.0	492.5
National rental	1,457	182.7	72.7	40.4	794.0

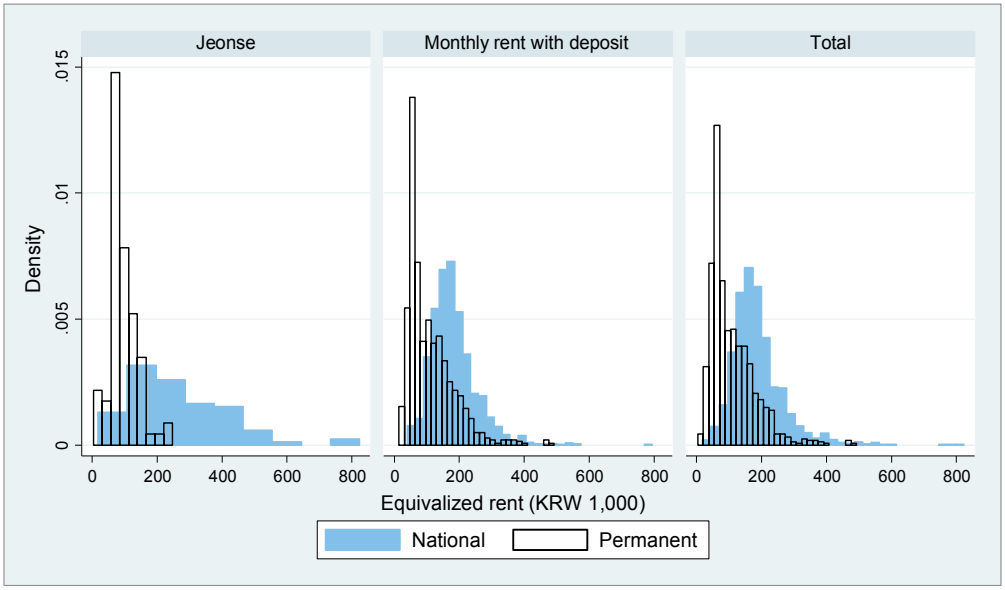
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Figure 3_Distribution of Equivalized Monthly Rent of Households Living in Private and Public Rental Housing



Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Figure 4_Distribution of Equivalized Monthly Rent of Households Living in National and Permanent Rental Housing



Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

By region, the average monthly rent of private rental housing units was the highest in Seoul at KRW 819 thousand, followed by Gyeonggi Province at KRW 529 thousand and Jeju at KRW 497 thousand. The average monthly rent was the lowest in North Gyeongsang Province, at KRW 288 thousand. North Chungcheong and South Jeolla Province also reported relatively low monthly rent at KRW 299 thousand and KRW 307 thousand, respectively. The region with the highest National Rental Housing rent was Sejong, at KRW 277 thousand, though South Jeolla Province was a close second with a monthly rent of KRW 267 thousand. In contrast, South Chungcheong and North Chungcheong Province reported relatively low National Rental Housing rents at KRW 143 thousand and KRW 150 thousand, respectively. Gyeonggi and South Chungcheong Province reported a relatively high Permanent Rental Housing rent at KRW 182 thousand and KRW 181 thousand, respectively, whereas the rents in Jeju and Incheon were lower than other regions at KRW 55 thousand and KRW 59 thousand, respectively.

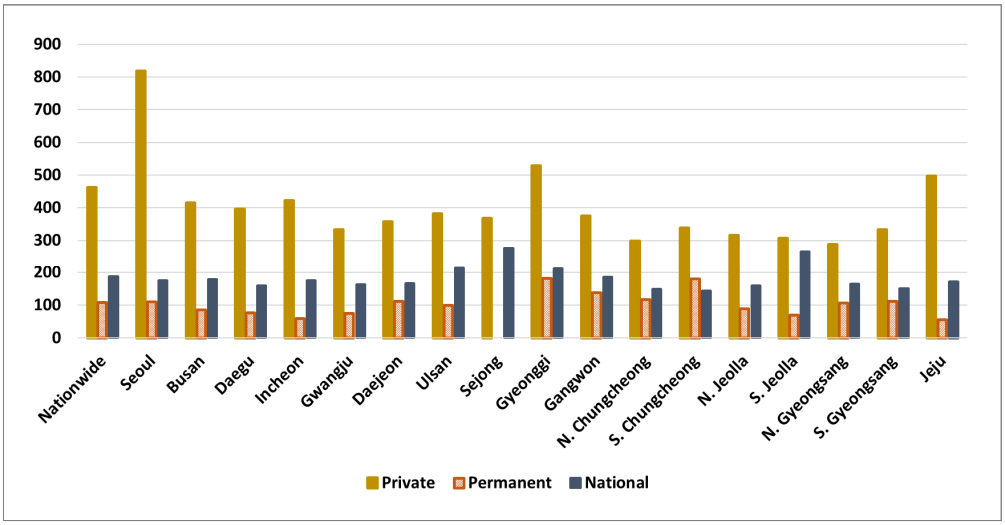
Overall, the rental gap between private rental housing and public rental housing greatly varied depending on the region. The region with the highest rent gap turned out to be Seoul.

In Seoul, the average Permanent Rental Housing rent and the average National Rental Housing rent were lower than the average rent for private rental housing by KRW 709 thousand and KRW 644 thousand, respectively. On the other hand, the average National Rental Housing rent in South Jeolla Province was lower by KRW 41 thousand than the average private rental housing rent in the region.

This high regional discrepancy of rent gap suggests the potential for a regional discrepancy in benefits, because the benefits in this study are defined by the rent gap between private and public rental housing. However, the discrepancy also includes gaps caused by differences in housing unit size, building age, residential environment, and so on. Therefore, to estimate the benefit from public rental housing, we need to concurrently consider various other factors determining rent. These factors are discussed in detail in the next chapter.

Figure 5_Equivalized Monthly Rent by Region

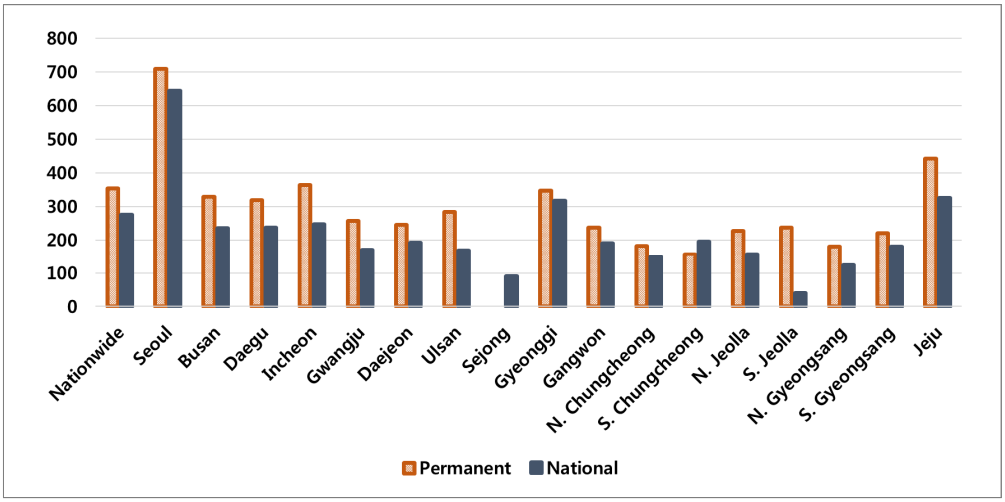
(Unit: KRW 1,000)



Note: There was no Permanent Rental Housing sample in Sejong.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Figure 6_Equivalized Rent Gap between Public and Private Rental Housing by Region

(Unit: KRW 1,000)



Note: There was no Permanent Rental Housing sample in Sejong.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Table 11_Rental Housing Households: Equivalized Monthly Rent

(Unit: KRW 1,000)

Items	Average rent				Public-private gap	
	All	Private (A)	Permanent (B)	National (C)	Permanent (A-B)	National (A-C)
Nationwide	358.3	462.3	108.9	187.3	353.4	275.0
Seoul	584.9	818.5	109.7	174.6	708.8	643.9
Busan	303.7	414.5	85.5	178.6	329.0	235.9
Daegu	291.6	395.8	77.4	158.7	318.4	237.1
Incheon	348.7	422.2	58.7	175.1	363.5	247.1
Gwangju	239.2	332.5	75.6	163.0	256.9	169.5
Daejeon	308.6	357.5	112.0	166.2	245.5	191.3
Ulsan	352.6	382.1	99.1	213.3	283.0	168.8
Sejong	350.5	367.5	-	277.2	-	90.3
Gyeonggi	425.7	528.9	182.3	211.5	346.6	317.4
Gangwon	290.2	375.0	138.7	185.0	236.3	190.0
North Chungcheong	237.9	298.8	116.4	149.6	182.4	149.2
South Chungcheong	281.2	337.7	180.6	143.4	157.1	194.3
North Jeolla	242.1	316.4	88.6	159.6	227.8	156.8
South Jeolla	272.1	307.4	70.8	266.8	236.6	40.6
North Gyeongsang	227.8	287.7	106.6	164.1	181.1	123.6
South Gyeongsang	278.2	332.4	111.5	151.5	220.9	180.9
Jeju	320.6	496.8	55.3	170.9	441.5	325.9

Note: There was no Permanent Rental Housing sample in Sejong.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

IV. Estimation of Benefit from Public Rental Housing

1. Overview

We measured the benefit from public rental housing by estimating the "rent ratio," here defined as the ratio between the rent paid by a household living in a public rental housing unit and the rent for an equivalent private rental housing unit. The benefit of a household living in a public rental housing unit can be expressed as Equation (2), where $Benefit_j$ is the benefit of the household, $BeneRatio_j$ is the rent ratio of the household, and $Rent_j$ is the rent paid by the household, which is calculated using Equation (1). As can be seen from Equation (2), the estimation of benefit comes down to estimation of rent ratio.

$$Benefit_j = \frac{1 - BeneRatio_j}{BeneRatio_j} \times Rent_j \qquad \text{Equation (2)}$$

The rent ratio is estimated using a regression equation that considers the determinants of rent. To develop and estimate the rent determinant model, we started with the approaches proposed by You and Kim (2017) and Oh, Kim, and Gwon (2019), and then adapted them to fit the purpose of this study.

In the following paragraphs, to help readers understand the interpretation of the rent determinant model and the estimation of rent ratio, we start with a simpler version of the model and then move on to the extended model that was actually used for the benefit estimation.

2. Simple Rent Determinant Model and Estimation Results

Housing rent is determined by various factors: the physical characteristics of the housing unit including its size and building age, residential environment including commercial facilities, cultural facilities, public transportation, and educational environment, and the region where the unit is located, and so on. Rent can also vary depending on the specific type of rental housing. In Equation (3), we include dummy variables for rental housing types, to explicitly consider the rent difference between National/Permanent Rental Housing and equivalent private rental housing.

$$\log(Rent_j) = \beta X_j + \gamma_1 D_{1,j} + \gamma_2 D_{2,j} + \varepsilon_j, \quad \varepsilon_j \sim N(0, \sigma^2) \qquad \text{Equation (3)}$$

X_j : Explanatory variables that affect the rent of a rental housing unit; consisting of the unit's physical characteristics (size and building age dummies), residential environment (commercial facilities, cultural facilities, public transportation, and educational environment), region dummy, and constant terms.

$D_{1,j}$: Permanent Rental Housing dummy (Permanent Rental Housing=1 and otherwise=0)

$D_{2,j}$: National Rental Housing dummy (National Rental Housing=1 and otherwise=0)

ε_j : Residual

Unlike You and Kim (2017) but similarly with the model proposed by Oh, Kim, and Gwon (2019), we did not consider household income as a determinant factor. This exclusion can be justified by the fact that, despite the evidently high correlation between rent and household income, the latter does not directly determine housing rent. As far as the interpretation of the high correlation between the two variables goes, it would be more reasonable to conclude that a household chooses a rental housing unit of which rent is within their price range, rather than to say that rent is affected by household income. In other words, rent can be used to explain household income, but not vice versa. For this reason, we did not consider household income as a determinant factor for housing rent.

Unlike Oh, Kim and Gwon (2019), however, who did not consider sub-types of long-term rental housing in their rent determinant model, we did consider sub-types of public rental housing as a determinant factor. However, as mentioned in Chapter II, public rental housing types are different from each other in terms of income and asset requirements, as well as rent ratio. Oh, Kim, and Gwon (2019) did not consider the sub-types because they analyzed all public rental housing included in their data, and there were simply not enough samples for certain types of rental housing. In this study, we focused our analysis on Permanent Rental Housing and National Rental Housing, because our public rental housing data included sufficient samples of these housing types. We ultimately deemed that it would be more appropriate to distinguish between these two types in our analysis.

In addition, Oh, Kim, and Gwon (2019) did not consider residential environment as a determinant factor. To overcome this limitation, we included variables regarding residents' satisfaction with their residential environment, as obtained from the 2018 Korea Housing Survey data. The residential environment consists of commercial facilities, cultural facilities, public transportation, and educational environment. Each element of the residential

environment was represented by a variable on a four-point scale, where 1 means "highly unsatisfied," and 4 means "highly satisfied." However, these variables have some limitations. These variables are highly subjective, and their objectiveness cannot be guaranteed. In addition, it is difficult to clearly justify assigning the same value to all intervals in the scale.

Other than the factors analyzed in this study, there are other numerous other factors that affect housing rent. For example, we analyzed regional differences on the level of metropolitan cities and provinces. However, even within a single city or province, housing rent significantly varies from area to area. However, such differences cannot be considered because the data does not provide information regarding specific areas. Likewise, numerous residential environment factors may also affect housing rent, other than those already considered in this study, including medical facilities, green areas, parking facilities, and crime rate. In addition, a housing unit's heating, insulation, lighting, and soundproofing may affect housing rent. However, our analysis showed that these factors do not significantly impact housing rent. For this reason, we limited our analysis to the variables found to have significant effect on housing rent.

Terms of lease $BeneRatio_j$ includes the ratio between the rent paid by a household living in a public rental housing unit j and the rent for an equivalent private rental housing unit, determined as shown in Equation (4). In the equation, $\widehat{\gamma_i}$ is an estimate for the public rental housing type dummy variable in Equation (3). If the household j lives in a Permanent Rental Housing unit, the value is $\widehat{\gamma_1}$, and if the household j lives in a National Rental Housing, the value is $\widehat{\gamma_2}$.

$$BeneRatio_j = \begin{cases} e^{\widehat{\gamma_1}}(D_{1,j} = 1) \\ e^{\widehat{\gamma_2}}(D_{2,j} = 1) \end{cases} \qquad \text{Equation (4)}$$

The simple model shows that the rent for public rental housing is lower than the rent for private rental housing, and the rent for Permanent Rental Housing is lower than the rent for National Rental Housing. In Equation (4), supposing that housing rent is determined by the simple model represented by Equation (3), the rent ratio of public rental housing is determined only by the dummy variable for public rental housing type, and not affected by other housing unit characteristic variables such as size, residential environment, region, and building age. In Table 12, the estimates for Permanent Rental Housing and National Rental Housing dummy variables are statistically significantly negative.

The results in Table 12 indicate that an average rent for a Permanent Rental Housing unit and a National Rental Housing unit is at 33.4%[5] and 51.5%[6] of an equivalent private rental housing unit. These findings are consistent with the explanation in Chapter II that the rent for Permanent Rental Housing is around 30% of the market rate, and that National Rental Housing rent is higher than Permanent Rental Housing rent. However, it should be noted that, while the government set the rent for National Rental Housing units at 60% to 80% of the market rate, Equation (3) showed the actual portion to be around 51.5%. In other words, the actual rent was lower than the rent intended by the policymakers.

Table 12_Results of the Simple Rent Determinant Model

Variables		Coefficient	Std. error
Constant		0.636***	(0.073)
Permanent Rental Housing dummy		-1.098***	(0.018)
National Rental Housing dummy		-0.663***	(0.015)
ln (size (m^2))		0.886***	(0.015)
Satisfaction with residential environment	Accessibility to commercial facilities	0.030***	(0.009)
	Accessibility to cultural facilities	0.042***	(0.008)
	Accessibility to public transportation	0.026***	(0.009)
	Educational environment	0.056***	(0.010)
Region dummy (reference: Seoul)	Busan	-0.600***	(0.020)
	Daegu	-0.633***	(0.026)
	Incheon	-0.482***	(0.023)
	Gwangju	-0.645***	(0.024)
	Daejeon	-0.594***	(0.026)
	Ulsan	-0.587***	(0.032)
	Sejong	-0.756***	(0.028)
	Gyeonggi	-0.273***	(0.017)
	Gangwon	-0.544***	(0.028)
	North Chungcheong	-0.742***	(0.026)
	South Chungcheong	-0.644***	(0.024)
	North Jeolla	-0.759***	(0.028)
	South Jeolla	-0.715***	(0.024)
	North Gyeongsang	-0.785***	(0.026)
	South Gyeongsang	-0.726***	(0.023)
	Jeju	-0.508***	(0.030)

5 exp(-1.098) = 0.334

6 exp(-0.663) = 0.515

Table 12_Results of the Simple Rent Determinant Model(continued)

Variables		Coefficient	Std. error
Building age dummy (reference: under 3 years)	3~5 years	0.036*	(0.019)
	6~10 years	-0.063***	(0.018)
	11~15 years	-0.146***	(0.019)
	16~20 years	-0.266***	(0.019)
	21~25 years	-0.296***	(0.018)
	26~30 years	-0.477***	(0.020)
	Above 30	-0.412***	(0.023)
Observations	7,343	R-squared	0.792

Note: ***, **, * are significance levels of 1%, 5%, and 10%, respectively.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

A housing unit's size, residential environment, region, and building age were also found to have a significant effect on rent. According to the estimation represented in Table 12, a 10% increase in housing unit size raised the rent by an average of 8.86%. Given the average size of housing unit, 61.6 m2, in the sample, and average monthly rent, KRW 578 thousand, the result implies that a 6㎡ increase in size raised the rent by around KRW 50 thousand.

As for residents' satisfaction with residential environment, commercial facilities, cultural facilities, public transportation, and educational environment, all had a significant impact on the housing rent. In particular, the estimate for educational environment was higher than for the other elements of the residential environment.

By region, Seoul reported the highest housing rent, followed by Gyeonggi, Incheon, and Jeju. North Gyeongsang, North Jeolla, and Sejong reported lower rents compared to the other regions. The average rent in North Gyeongsang Province was particularly low, at 45.6% of the rent in Seoul.

As for building age, an older building was estimated to be correlated with lower rent. The average rent for 26~30 year-old apartments was around 62.1% of newer apartments built less than two years before. However, the relationship between the two variables was not completely linear; the rent for 3~5 year-old apartments was 3.7% higher than the rent for newer apartments, and the rent for apartments older than 30 years was higher than the rent for 26~30-year old apartments.

3. Extended Rent Determinant Model and Estimation Results

The rent ratios are affected by the characteristics of rental housing units, such as their size,

residential environment, region, and building age. For example, the rate of rent increase due to an increase in size may vary between private rental housing and different types of public rental housing. In addition, residential environment, region, and building age may have different effects on the rent ratio depending on the specific rental housing type. However, the simple model does not consider the possibility that rental housing characteristics may directly affect the rent ratio. Therefore, we extended the rent determinant model in Equation (3) to the model represented by Equation (5). Unlike Equation (3), Equation (5) includes cross-terms between the Permanent/National Rental Housing dummy variables and other variables such as housing unit size, residential environment, region, and building age. By extending the rent determinant model, we are able to incorporate various housing unit characteristics into our analysis of the rent ratio for public rental housing, which is represented in Equation (6).

$$\log(Rent_j) = \beta X_j + \gamma_1 (X_j \times D_{1,j}) + \gamma_2 (X_j \times D_{2,j}) + \varepsilon_j, \quad \varepsilon_j \sim N(0, \sigma^2) \quad \text{Equation (5)}$$

$$BeneRatio_j = \begin{cases} e^{\hat{\gamma_1} X_j} (D_{1,j} = 1) \\ e^{\hat{\gamma_2} X_j} (D_{2,j} = 1) \end{cases} \quad \text{Equation (6)}$$

Table 13 presents the results regarding the rent determinants obtained using Equation (5). In the table, the "Single term" column represents β in Equation (5), the "Cross-term with Permanent Rental Housing Dummy" column represents estimates for γ_1, and the "Cross-term with National Rental Housing Dummy" column represents estimates for γ_2.

The extended model confirms that housing unit characteristics significantly affect the public rental housing rent ratio. Most estimates in the columns containing cross-terms with National/Permanent Rental Housing dummy variables were statistically significant.

However, the estimates are difficult to interpret separately because multiple variables affect the rent ratio at the same time. For example, the dummy variables for Permanent Rental Housing and National Rental Housing were estimated to be -0.775 and -2.971, respectively. However, this does not necessarily mean that the rent ratio of National Rental Housing is lower than the rent ratio of Permanent Rental Housing. If we further consider unit size, residential environment, region, and building age, these factors may produce different results. For example, the estimates for the cross-term between housing unit size and the Permanent Rental Housing/National Rental Housing dummy variables showed that, per 1% increase in housing unit size, the rent for Permanent Rental Housing increases at a rate similar to the rent

for private rental housing. However, the rent for National Rental Housing was found to increase 0.548%p faster than for private rental housing. We also found that, in older apartments, the rent for Permanent Rental Housing declines faster than the rent for National Rental Housing and private rental housing. These estimates indicate that, when the other conditions are the same, the rent ratio for National Rental Housing may be higher than the rent ratio for Permanent Rental Housing. As explained above, due to the complexity of factors affecting the rent ratios of Permanent Rental Housing and National Rental Housing, it is not easy to directly compare the rent ratios of the two public rental housing types based solely on a specific estimate.

In addition, as shown in Table 13, all estimates for the cross-terms between the region dummy variables and the public rental housing dummy variable have positive values. In contrast, all estimates for the region dummy variables have negative values. The negative values for the region dummy variables suggest that Seoul is the region with the highest rent. On the other hand, the positive value of the cross-terms between the region and public rental housing dummy variables indicates that the rent gap between Seoul and the other regions is lower for public rental housing, and that the public rental housing rent of certain regions may be higher than for Seoul.

Table 13_Results of the Extended Rent Determinant Model

Variables		Single term		Cross-term with Permanent Rental Housing Dummy		Cross-term with National Rental Housing Dummy	
		Coefficient	Std. error	Coefficient	Std. error	Coefficient	Std. error
Constant		1.436***	(0.077)	-0.775***	(0.300)	-2.971***	(0.180)
ln (size (m^2))		0.723***	(0.016)	0.097	(0.062)	0.548***	(0.045)
Satisfaction with residential environment	Commercial facilities	0.030***	(0.011)	-0.060**	(0.027)	-0.036*	(0.021)
	Cultural facilities	0.053***	(0.009)	0.006	(0.022)	-0.040**	(0.019)
	Public transportation	0.049***	(0.010)	-0.093***	(0.027)	-0.047**	(0.020)
	Educational environment	0.050***	(0.011)	-0.039	(0.032)	0.029	(0.024)
Region dummy (reference: Seoul)	Busan	-0.787***	(0.023)	0.540***	(0.053)	0.611***	(0.052)
	Daegu	-0.858***	(0.029)	0.711***	(0.059)	0.703***	(0.074)
	Incheon	-0.633***	(0.025)	0.383***	(0.075)	0.559***	(0.060)
	Gwangju	-0.870***	(0.029)	0.695***	(0.061)	0.701***	(0.060)
	Daejeon	-0.837***	(0.027)	0.860***	(0.066)	0.878***	(0.211)
	Ulsan	-0.799***	(0.032)	0.802***	(0.112)	0.742***	(0.120)
	Sejong	-0.999***	(0.029)	-	-	0.911***	(0.080)
	Gyeonggi	-0.435***	(0.018)	0.436***	(0.055)	0.432***	(0.045)
	Gangwon	-0.819***	(0.033)	0.826***	(0.077)	0.638***	(0.069)

Table 13_Results of the Extended Rent Determinant Model(continued)

Variables		Single term		Cross-term with Permanent Rental Housing Dummy		Cross-term with National Rental Housing Dummy	
		Coefficient	Std. error	Coefficient	Std. error	Coefficient	Std. error
Region dummy (reference: Seoul)	North Chungcheong	-1.028***	(0.029)	0.711***	(0.065)	0.681***	(0.067)
	South Chungcheong	-0.884***	(0.026)	0.909***	(0.085)	0.515***	(0.059)
	North Jeolla	-1.048***	(0.033)	0.648***	(0.079)	0.810***	(0.064)
	South Jeolla	-1.070***	(0.028)	0.806***	(0.073)	0.934***	(0.058)
	North Gyeongsang	-1.086***	(0.031)	1.239***	(0.095)	0.789***	(0.058)
	South Gyeongsang	-0.958***	(0.025)	0.692***	(0.060)	0.651***	(0.073)
	Jeju	-0.662***	(0.039)	0.444***	(0.125)	0.454***	(0.064)
Building age dummy (reference: under 3 years)	3~5 years	-0.015	(0.021)	-0.339***	(0.119)	-0.055	(0.051)
	6~10 years	-0.086***	(0.022)	-0.487***	(0.100)	-0.160***	(0.046)
	11~15 years	-0.154***	(0.021)	-0.493***	(0.107)	-0.172***	(0.050)
	16~20 years	-0.255***	(0.019)	-0.609***	(0.106)	-0.094	(0.057)
	21~25 years	-0.270***	(0.019)	-0.937***	(0.107)	-0.156**	(0.068)
	26~30 years	-0.435***	(0.021)	-0.900***	(0.108)	-0.190*	(0.112)
	Above 30 years	-0.491***	(0.022)	-0.632***	(0.143)	0.677***	(0.211)
Observations		7,343		R-squared		0.831	

Notes: 1. There was no Permanent Rental Housing sample in Sejong.
2. ***, **, * are significance levels of 1%, 5%, and 10%, respectively.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Table 14 presents the overall and regional averages of the rent ratios estimated for each public rental housing household obtained using Equation (6). The private rental housing rent estimated with the extended model was around 44.1% of the rent for equivalent private rental housing. The rent ratio of Permanent Rental Housing was 31.4%, and that of National Rental Housing was 51.9%. These findings are similar to the estimates obtained using the simple model. Under the simple model, the rent for Permanent Rental Housing was estimated to be 33.5% of the market rate, and the rent for National Rental Housing was estimated to be 51.5% of the market rate.

By region, the private rental housing rent in Seoul was estimated to be 20.8% of the private rental housing rent, indicating a much lower rent ratio in the region. The rent ratio of Permanent Rental Housing in Seoul is particularly low at 18.2%, which can be attributed to the fact that the private rental housing rent is considerably higher in Seoul than in the other cities and provinces. In Sejong, the rent for National Rental Housing was around 78.1% of the rent for equivalent private rental housing, recording the highest rent ratio in Korea.

Table 14_Rent Ratio between Public and Private Rental Housing by Region

(Unit: no. of households, %)

Items	All public rental housing		Permanent Rental Housing		National Rental Housing		Difference (B-A)
	Obs.	Average	Obs.	Average (A)	Obs.	Average (B)	
All	2,506	44.10	954	31.40	1,552	51.91	20.51
Seoul	382	20.83	258	18.19	124	26.33	8.15
Busan	261	43.62	87	26.75	174	52.06	25.32
Daegu	109	40.09	69	32.02	40	54.00	21.98
Incheon	108	37.38	31	21.30	77	43.86	22.55
Gwangju	163	45.12	67	29.88	96	55.75	25.87
Daejeon	59	39.48	56	38.55	3	56.77	18.22
Ulsan	23	48.57	12	34.35	11	64.09	29.74
Sejong	50	78.11	0	-	50	78.11	-
Gyeonggi	416	41.86	88	36.39	328	43.33	6.95
Gangwon	98	49.61	39	44.77	59	52.81	8.05
North Chungcheong	113	49.77	57	43.80	56	55.85	12.05
South Chungcheong	119	49.76	30	58.86	89	46.69	-12.17
North Jeolla	103	54.76	30	37.17	73	61.98	24.82
South Jeolla	150	71.38	38	34.36	112	83.94	49.58
North Gyeongsang	138	59.27	20	50.72	118	60.72	9.99
South Gyeongsang	104	47.17	62	42.23	42	54.47	12.24
Jeju	110	43.62	10	22.50	100	45.74	23.23

Note: There was no Permanent Rental Housing sample in Sejong.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

Table 15 presents the total and regional averages of benefits enjoyed by public rental housing households. The benefits were calculated by applying the rent ratio estimates from Equation (6) to Equation (2). The average benefit of all public rental housing was estimated to be KRW 297 thousand. The average benefit of households living in Permanent Rental Housing was KRW 335 thousand, which exceeds the benefit of National Rental Housing households, KRW 273 thousand, by KRW 62 thousand.

By region, higher benefits were found in Seoul, Incheon, and Gyeonggi Province (all located within the Seoul Capital Area, or SCA) and Jeju. The average benefit from public rental housing in Seoul was the highest in Korea at KRW 646 thousand. The benefit in the city was KRW 245 thousand higher than the benefit enjoyed by public rental housing households in Gyeonggi Province, KRW 401 thousand, which ranked second in the list. These findings indicate sizable gaps between Seoul and the other regions. The average benefit from National Rental Housing in Seoul was the highest in Korea at KRW 691 thousand. On the other hand, the public rental housing benefit in South Jeolla Province was the lowest in Korea at KRW 79 thousand, which is a mere 12.3% of the benefit in Seoul. Sejong is the region with the second lowest benefit of KRW 86 thousand.

Table 15_Benefit from Public Rental Housing by Region

(Unit: no. of households; KRW 1,000)

Items	All public rental housing		Permanent Rental Housing		National Rental Housing		Difference (A-B)
	Obs.	Average	Obs.	Average (A)	Obs.	Average (B)	
All	2,506	297.0	954	335.4	1,552	273.3	62.0
Seoul	382	645.7	258	624.0	124	691.0	-67.0
Busan	261	229.3	87	245.3	174	221.2	24.1
Daegu	109	177.0	69	173.1	40	183.7	-10.6
Incheon	108	293.3	31	265.2	77	304.7	-39.5
Gwangju	163	190.5	67	196.5	96	186.2	10.3
Daejeon	59	211.5	56	211.8	3	206.9	4.9
Ulsan	23	185.2	12	216.9	11	150.5	66.5
Sejong	50	86.0	0	-	50	86.0	-
Gyeonggi	416	400.6	88	422.2	328	394.8	27.5
Gangwon	98	223.8	39	234.1	59	216.9	17.2
North Chungcheong	113	174.1	57	180.2	56	168.0	12.2
South Chungcheong	119	223.9	30	182.8	89	237.8	-55.0
North Jeolla	103	142.3	30	171.4	73	130.3	41.1
South Jeolla	150	79.4	38	139.6	112	58.9	80.6
North Gyeongsang	138	143.7	20	151.0	118	142.5	8.5
South Gyeongsang	104	185.2	62	194.4	42	171.5	22.8
Jeju	110	309.6	10	223.9	100	318.1	-94.2

Note: There was no Permanent Rental Housing sample in Sejong.
Source: present study, based on Ministry of Land, Infrastructure and Transport (2019), *2018 Korea Housing Survey*.

The high benefits in the SCA and Jeju can be explained by the higher private rental housing rent in these regions. The benefit is determined by the rent gap between private rental housing and public rental housing. The regional gap in public rental housing rent is smaller than the regional gap for private rental housing rent. Therefore, the regional gap in the benefit is greatly affected by the regional gap for private rental housing rent.

From the benefit perspective, for the public rental housing policy to be effective, public rental housing should be supplied in regions having high private rental housing rent. Given the purpose of public rental housing, which is to provide people with residential security, it would not be particularly beneficial to supply public rental housing to a region in which private rental housing units are already available at low and stable rates. Conversely, in regions with high and unstable rent, relying solely on the market would seriously undermine the residential security of local tenants. Therefore, we can expect great improvement in residential security and benefits by supplying public rental housing in regions having unstable rental housing markets.

We also analyzed benefits by income level. The benefits from Permanent Rental Housing and National Rental Housing were found to increase in lower income brackets. The average

monthly benefit was KRW 19 thousand in the first income decile, and KRW 300 in the tenth income decile. The portion of monthly benefit in current income also decreased from 3.3% in the first income decile to 0.01% in the tenth income decile. The findings indicate the positive role that public rental housing can play in income redistribution.

The income redistribution seems to be the result of supporting specific low-income groups by applying income requirements to the selection process. The average benefit of each income decile can be divided into two elements: the portion of households living in public rental housing in the decile, and the benefit enjoyed by the households living in public rental housing. The decomposition shows that low-income groups enjoy higher benefits from public rental housing because the portions of public rental housing households in those groups are higher than in high-income groups. Overall, 7.4% of the households in the first income decile live in public rental housing units, whereas the portion drops to 0.2% in the tenth income decile. Notably, the benefit enjoyed by public rental housing households did not increase or decrease depending on the income level.

Table 16_Benefit from Public Rental Housing by Income Decile

Income decile	Monthly average current income (A, KRW 1,000)	Monthly average benefit (B, KRW 1,000)	Portion (B/A, %)	Portion of public rental housing households (%)			Benefit of public rental housing households (KRW 1,000)		
				Total	Permanent	National	Total	Permanent	National
All	2,094.4	6.8	0.33	2.75	0.96	1.79	248	293	224
1st decile	576.0	19.3	3.34	7.43	4.30	3.14	259	292	214
2nd decile	1,070.5	15.5	1.45	6.21	2.15	4.05	250	295	226
3rd decile	1,427.3	10.6	0.74	4.16	1.21	2.95	254	283	242
4th decile	1,676.5	5.5	0.33	2.69	0.49	2.20	203	270	188
5th decile	1,913.6	5.4	0.28	1.98	0.38	1.60	272	373	248
6th decile	2,077.5	4.9	0.24	2.05	0.26	1.79	239	228	241
7th decile	2,312.1	2.5	0.11	1.10	0.23	0.87	224	282	209
8th decile	2,609.2	2.1	0.08	0.87	0.15	0.72	244	302	231
9th decile	3,074.0	1.1	0.04	0.47	0.08	0.39	229	234	228
10th decile	4,429.3	0.3	0.01	0.16	0.09	0.07	217	332	51

Note: The total average of benefit in this table is different from the average presented in Table 13 because, unlike Table 13, the average in this table was calculated based on weighted values.
Source: Present study, based on Ministry of Land, Infrastructure, and Transport (2019), *2018 Korea Housing Survey*.

V. Conclusion

In this study, we used data from the 2018 Korea Housing Survey to estimate the benefit

from public rental housing, especially Permanent Rental Housing and National Rental Housing. The average rent for public rental housing was estimated to be around 44.1% of the average rent for private rental housing. By sub-type of public rental housing, the rents for Permanent Rental Housing and National Rental Housing were 31.4% and 51.9% of the rent for private rental housing, respectively. We converted these ratios to an equivalized monthly benefit, and the overall average benefit from public rental housing analyzed in this study was KRW 297 thousand. The benefit specific to Permanent Rental Housing was KRW 335 thousand, and the benefit of National Rental Housing was KRW 273 thousand.

Benefits from public rental housing were found to vary greatly depending on the region. Seoul reported the highest benefit, and the benefits in SCA and Jeju were higher than in the other regions, due to the high private rental housing rents in those regions. The findings in this study suggest that, by supplying public rental housing to regions having high market rent, we can expect to improve the benefits enjoyed by public rental housing residents and the overall residential security.

We also analyzed the benefits enjoyed by different income groups. The benefits from public rental housing were found to increase in lower income brackets, which can be explained by the supply of public rental housing to low-income groups. In other words, the public rental housing policy played a positive role in income redistribution by selectively supplying low-rent public rental housing units to low-income earners.

In recent years, spikes in property prices have been destabilizing the real estate market. In response, the government has taken various measures to stabilize the market, including the application of stricter regulations on loans related to property transactions, higher real estate holdings tax, and heavier capital gains tax on property. Moving forward, the primary purpose of all real estate market policies should be to provide people with residential security. To achieve this goal, we cannot simply rely on the market to stabilize housing prices and rent. Actions should be actively taken to stabilize market prices.

However, the government can only directly control market prices to a certain extent, because these prices are primarily determined by supply and demand. In this context, public rental housing represents a crucial policy instrument for residential security. In particular, when supplied in regions having highly unstable real estate markets, public rental housing will greatly contribute to improving people's residential security by offering an attractive alternative to people's residential life.

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Proposals for Clearance System for Low Value Personal Trading

Cheung Jaeho*

I. Introduction

Electronic commerce (e-commerce) is rapidly spreading across the world. People can use a variety of electronic platforms to conveniently search for information about various products, order what they want, and make payments.

As more low value goods purchased through e-commerce pass through customs, the spread of e-commerce is affecting the international trade structure. In the past, international trade mostly consisted of large-scale container trading by large corporations, which is being gradually replaced by the e-commerce trading of low value goods by individuals.[1] The emergence of global online companies such as Amazon and eBay, along with the increased use of online platforms and smartphones, will increase the number of individuals who order and purchase products they want across borders.

McKinsey & Company (2016) predicted that the total worth of the global e-commerce market would increase from USD 1.9 trillion in 2015 to USD 3.4 trillion in 2020. According

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1 Here, international trade refers to the purchase and sale of goods between different countries. In this study, we use the term "low value personal trading" to refer to the practice in which individual consumers purchase goods from overseas, and the goods are shipped across national borders. We use this term to distinguish the practice from the existing large-scale goods trading by corporations.

to the report, the volume of transborder trading of goods through e-commerce is expected to increase from USD 300 billion in 2015 to USD 1 trillion in 2020. Accordingly, the number of consumers using e-commerce for transborder trading will increase from around 400 million to 900 million.[2]

The same trend can be found in Korea's e-commerce market. The number of imports passing through the Korean border due to e-commerce was 32.3 million in 2018, with a total worth at USD 2,750 million. This value represents a ten-fold increase from 2010, when the total number of e-commerce imports was 3.5 million and the total worth stood at USD 270 million.

Despite the rapid growth of low value personal trading, Korea's import clearance system is having difficulty catching up with the new trend. As with many other countries, Korea's customs clearance system was built around large-scale trading by corporations. Under the traditional system, an importer places an order for a large quantity of goods, and pays for the goods with a letter of credit upon the delivery or sale of the goods. In contrast to traditional goods trading, in low value personal trading through e-commerce, a consumer orders a small quantity of goods and makes payment in advance using credit cards or other online methods. For this reason, it is difficult to apply the traditional import clearance system to low value personal trading.

Therefore, the customs service needs to consider distinguishing between the traditional way of trading goods across borders and low value personal trading, and then develop a customs clearance system tailored to the low value personal goods imported through e-commerce.

II. Low value Personal Trading in Korea

1. Customs Clearance for Low value Personal Trading

A. Declaration Methods for Low value Personal Trading

E-commerce goods can be cleared in two ways: list clearance and import declaration. The import declaration system can be further divided into simplified import declaration and an

2 McKinsey & Company, "Digital Globalization: The new era of global flows," 2016, p. 35.

import declaration.

1) List Clearance

In cases in which an individual imports certain goods for personal use, and the worth of the goods does not exceed USD 150 (or USD 200 for goods originating from the United States, under Article 7.7 of the Korea-US Free Trade Agreement), the express carriers can forego the import declaration by sending the list of items to be cleared to the customs service. The list should be prepared using Attached Form No. 4 in the Public Announcement on the Import Clearance of Express Cargo. However, certain products are not eligible for list clearance, and must be cleared through an import declaration. However, certain products are not eligible for list clearance, and must be cleared through a general import declaration.

Table 1_Goods Not Eligible for List Clearance

Goods	Example
Pharmaceutical products	medicated patches, bandages, gauze, dressings, antibiotics, aspirin, digestive medicine, headache pills, fever medicine, cold medicine, etc.
Korean medical products	ginseng, red ginseng, etc.
Wild animal products	tusk products, crocodile leather products, snakeskin products, etc.
Agricultural/livestock products and others subject to quarantine	coffee, tea, nuts, seeds, wood, powdered formulas, feline/canine food, ham, cheeses, etc.
Health products	vitamin products, omega3 products, propolis products, glucosamine products, folic acid products, royal jelly, etc.
Goods suspected of intellectual property right infringement	imitation bags, shoes, clothing, accessories, etc.
Food/beverages, alcohol beverages, tobacco products	biscuits, bakery products, processed coffee/tea, processed fruit/nuts, sugar snacks, chocolate products, sauce/seasonings, tobacco, alcohol beverages, etc.
Cosmetic products	functional cosmetic products, placental cosmetic products, cosmetic products containing steroids, harmful cosmetic products with unknown ingredients, etc.
Others	firearms, blades, gunpowder, illegal drugs, etc.

Source: Korea Customs Service, *Customs Clearance Guide for Direct Overseas Purchase,* 2018

2) Simplified Import Declaration

Goods worth over USD 150 (or USD 200 for products originating from the United States) and USD 2,000 or less can be imported under a simplified import declaration process. Specifically, the eligible products can be declared using electronic documents such as an electronic data interchange (EDI), without the need to send attachments. However, some goods are not eligible for simplified declaration, even when satisfying the price requirement.

Table 2_Goods Not Eligible for Simplified Declaration

Goods	Note
Goods not eligible for list clearance	-
Goods subject to advance taxation audit	Goods deemed inappropriate for taxation audit after import declaration, including goods for which tariff/national tax reduction is requested under the relevant law or treaty, or goods of which prices are paid in installments
Goods requested for application of agreed tariff	In the case of importing goods having varying tax rates, the highest of the tax rates requested by the declarant will apply to the goods.
Goods subject to certificate of origin requirement	-
Goods altered by disassembly, cutting, damage, or decomposition	-
Goods for move-in	-
Goods for which application of the FTA tariff is requested	-
Goods subject to distribution history declaration requirement	-
Other goods deemed not eligible for simplified declaration by the customs service	-

Source: National Law Information Center, Public Announcement on the Import Clearance of Express Cargo, http://www.law.go.kr/%ED%96%89%EC%A0%95%EA%B7%9C%EC%B9%99/%ED%8A%B9%EC%86%A1%EB%AC%BC%ED%92%88%EC%88%98%EC%9E%85%ED%86%B5%EA%B4%80%EC%82%AC%EB%AC%B4%EC%B2%98%EB%A6%AC%EC%97%90%EA%B4%80%ED%95%9C%EA%B3%A0%EC%8B%9C, accessed on June 12, 2019

3) Import Declaration

E-commerce goods worth more than USD 2,000, or goods not eligible for list clearance or simplified import declaration are subject to an import declaration. An import declaration

is to be filed in accordance with Article 241 (1) of the Customs Act. According to the article, each person who intends to export, import, or return goods should declare the names, standards, quantities, and values of the relevant goods, and any other requested items to the customs service.

Table 3_Key Items of Import Declaration

Key declaration items	Note
Type and number of packages	-
Destination, origin, and place of shipment	-
In the case of goods requiring origin labeling, the existence, method, and form of the label	-
Trademark	-
Name, business registration number, or Personal customs code of taxpayer or shipper, and overseas supplier number or overseas buyer number	-
Other	including product models, weights, and item numbers under the Item Classification Table

B. Shipping methods

The majority of low value personal goods purchased through e-commerce are shipped to Korea in two ways: international mail or express carriers.

1) Import clearance of international mail

Korea is a member of the Universal Postal Union, and clears international mail in accordance with the Universal Postal Convention. International mail other than letters goes through x-ray examinations at designated customs clearance post offices, and suspicious mails are opened for physical examination.

Upon receiving mail, the customs clearance post office prepares an electronic document regarding the mail and submits it to the customs service. The customs service reviews the document and classifies the mail into mail subject to tax exemption on the spot, on-site taxation, and/or audit. Then, the customs service notifies the result to the customs clearance

post office. Mail subject to onsite taxation has a simplified duty rate applied. The customs clearance post office collects the duty from the recipient before delivering the mail.

Mail not subject to tax exemption on the spot or onsite taxation is classified as mail subject to audit. The recipient of such a product is required to file an import declaration for the mail. Mail subject to audit can be further categorized into two groups: mail subject to simplified customs clearance, and mail subject to an import declaration.

2) Import Clearance of Express Cargo

Express cargo refers to goods transported by businesses registered with the customs service as express carriers. Traditionally, express cargo consisted mostly of commercial documents, samples, and other corporate goods requiring rapid shipment. However, the percentage of e-commerce express cargo has rapidly increased.

There are three customs clearance procedures for goods transported by registered express carriers, depending on the price of the goods. First, goods for personal use and tax-exempted commercial samples worth below USD 150 (or USD 200, if originating from the United States) are eligible for list clearance. Goods worth over USD 150 (or USD 200, if originating from the United States) and USD 2,000 or less can be imported under a simplified import declaration process. Last, goods worth over USD 2,000 are subject to an import declaration.

2. Imported E-Commerce Goods

A. Amount of Imported E-Commerce Goods

The number of e-commerce imports cleared through customs in 2010 was 3.6 million, which stands at only a third of the number of total imports (around 9.1 million). However, the number of e-commerce imports rapidly increased and in 2015 surpassed the number of total import declarations. In 2018, e-commerce imports numbered 32.3 million, accounting for 59.9% of the total number of imports (around 53.8 million). However, the total value of e-commerce imports comprises only a small percentage of the total value of imports. This discrepancy is attributable to the fact that traditional imports involve large quantities of goods ordered by corporations, whereas e-commerce goods mostly consist of small-quantity goods purchased by individuals. The total value of goods imported through e-commerce stands at USD 2,760 million, which is only 0.5% of the total of imported goods.

Table 4_Total Imports and E-Commerce Imports

(Unit: 1,000 imports, %, USD million)

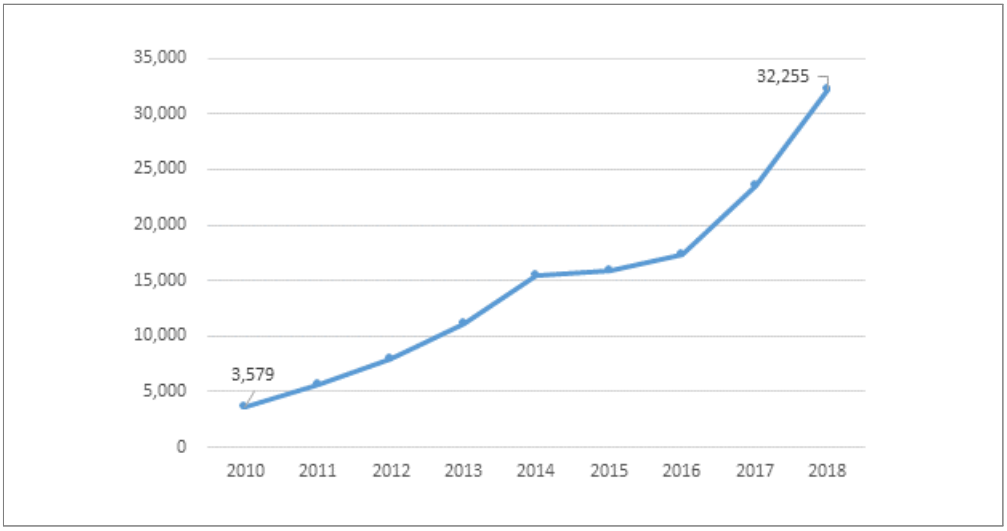
Year	No. of imports			Total worth		
	Total imports	E-commerce	Percentage	Total import	E-commerce	Percentage
2010	9,143	3,579	28.1	425,212	274	0.1
2011	10,611	5,602	34.6	524,413	472	0.1
2012	11,842	7,944	40.1	519,584	707	0.1
2013	14,344	11,159	43.8	515,586	1,040	0.2
2014	16,303	15,530	48.8	525,515	1,545	0.3
2015	14,460	15,842	52.3	436,499	1,521	0.3
2016	15,517	17,395	52.9	406,193	1,635	0.4
2017	18,691	23,592	55.8	478,478	2,110	0.4
2018	21,560	32,255	59.9	535,202	2,755	0.5

Source: e-National Index, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2457, accessed on September 19, 2019
Unipass, https://unipass.customs.go.kr/ets/index.do, accessed on September 19, 2019

The number of e-commerce imports into Korea increased from 3.6 million in 2010 to 10 million in 2013, and to 32.3 million in 2018. Despite slight setbacks in 2015 and 2016, the growth rate remained above 30%. Accordingly, the total worth of goods imported through e-commerce increased from below USD 300 million in 2010 to above USD 1,000 million in 2013, and reached USD 2,760 million in 2018, for a growth rate of above 30%.

Figure 1_Number of E-Commerce Imports

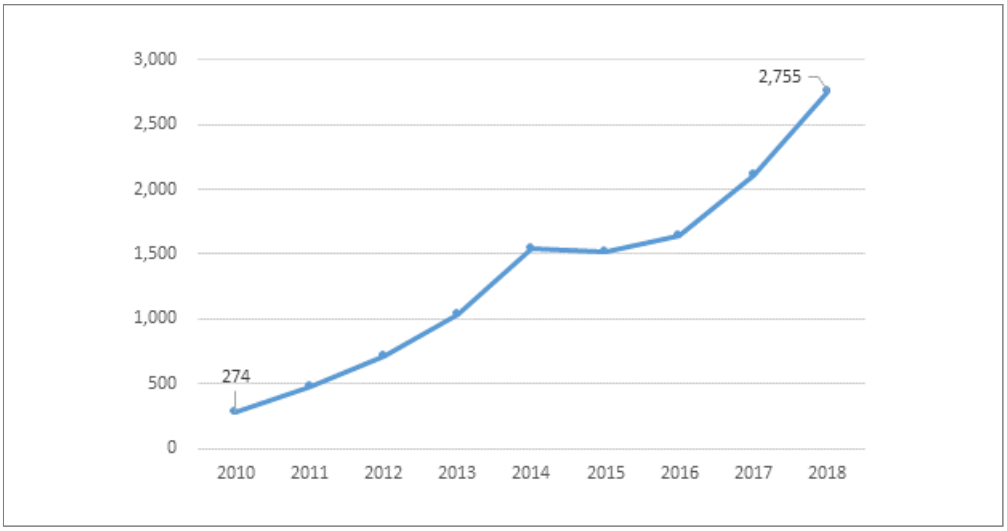
(Unit: 1,000 imports)



Source: e-National Index, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2457, accessed on July 4, 2019

Figure 2_Total Value of Imported E-Commerce Goods

(Unit: USD million)



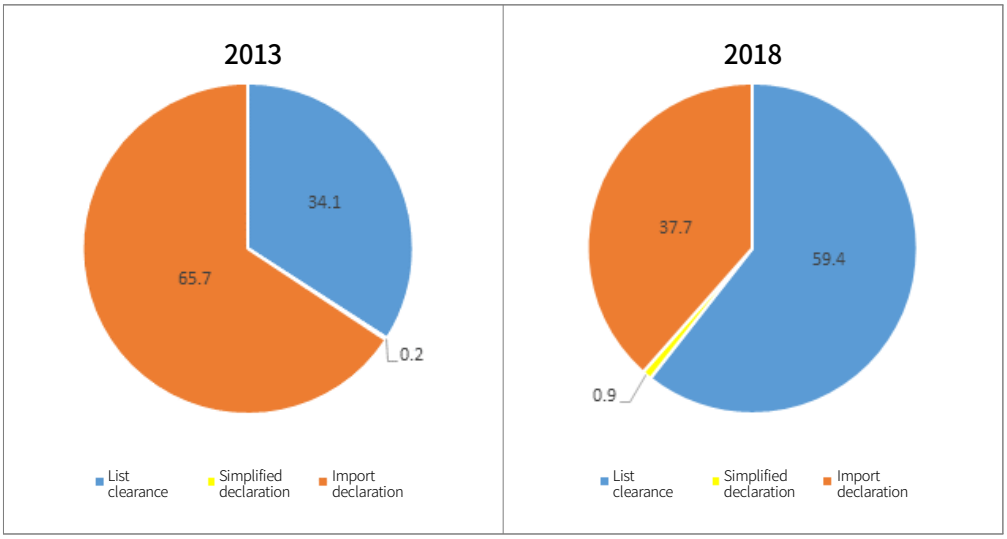
Source: e-National Index, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2457, accessed on July 4, 2019

B. Imported E-Commerce Goods by Declaration Method

In 2018, a total of 19.2 million e-commerce imports were cleared through the list clearance system, which comprises around 59.4% of the total e-commerce imports. Overall, 37.7% of the e-commerce imports were cleared through import declarations, and less than 1% were cleared through simplified declarations. The majority of e-commerce items were cleared through customs under either the list clearance or import declaration system.

Figure 3_Number of E-Commerce Imports Cleared by Declaration Method

(Unit: %)

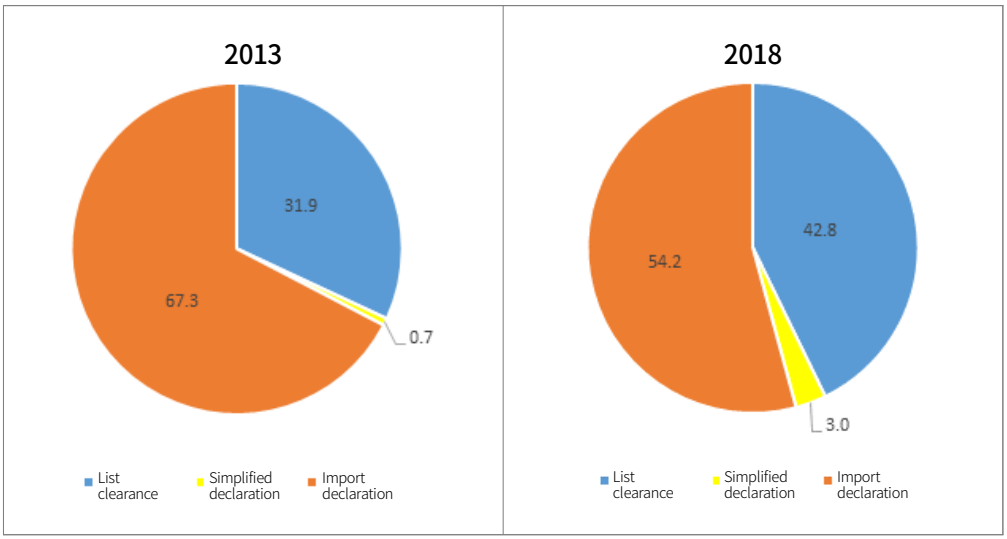


Source: Korea Customs Service Press Release, "Total Worth of Direct Overseas Purchase Sets a New Record in 2017 by Exceeding USD 2 Billion," March 20, 2018 Korea Customs Service Press Release, "Direct Overseas Purchase in 1st Half Increased by 42% YoY," September 17, 2019

For imported e-commerce goods, the value of goods imported through import declarations in 2018 was USD 1,490 million, or 54.2% of the total import value. Goods imported through list clearance were USD 1,180 million in total. However, the percentage of goods cleared through import declarations were in decline, whereas the percentage of list-cleared goods increased.

Figure 4_Value of Imported E-Commerce Goods by Declaration Method

(Unit: %)



Source: Korea Customs Service Press Release, "Total Worth of Direct Overseas Purchase Sets a New Record in 2017 by Exceeding USD 2 Billion," March 20, 2018 Korea Customs Service Press Release, "Direct Overseas Purchase in 1st Half Increased by 42% YoY," September 17, 2019

C. Imported E-Commerce Goods by Item

Goods imported through e-commerce include health products, clothing, cosmetic products, electronic products, footwear, toys and dolls, handbags and bags, books, watches, and sports equipment, among others.

Health products has been leading the import of e-commerce goods since 2009, before the full-fledged growth of e-commerce. Other items high on the list include clothing, cosmetic products, and foods. The amount of clothing, cosmetic products, and electronic products imported through e-commerce has been increasing since 2016.

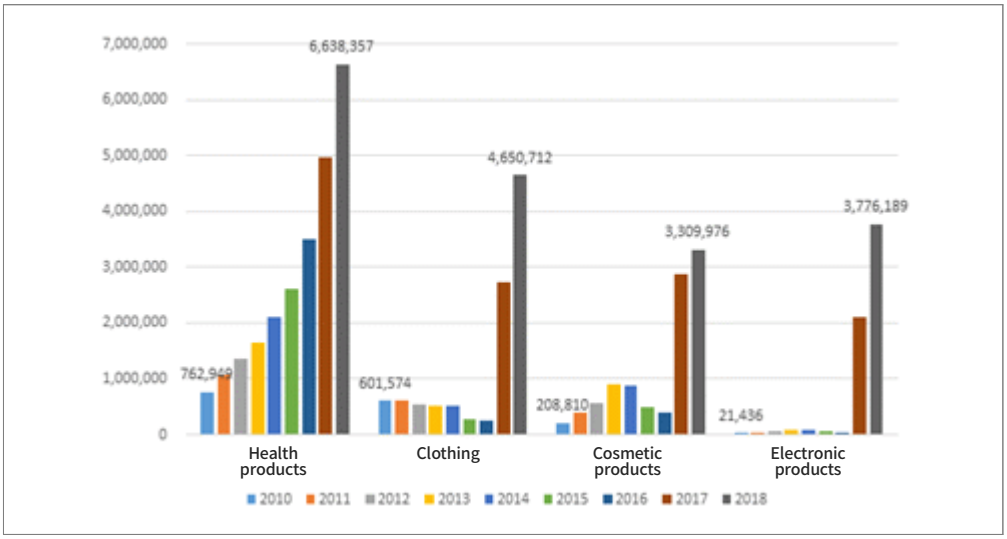
Health products are mainly imported from the United States. According to the Korea Customs Service, health products from the United States are the single-most imported item in Korea, marking a 43% year-over-year growth rate in the first half of 2019. The number of health products imported from the United States increased from 3.1 million in 2016 to 4.2 million in 2017, and then to 5.6 million in 2018.[3]

In addition, the number of electronic products imported through e-commerce has also rapidly increased since 2016. Electronic products accounted for only 3% of all imported

e-commerce products in 2015. However, the percentage rapidly increased to 9% in 2017 and 12% in 2018. A rapidly increasing number of Chinese electronic products are being imported into Korea, possibly due to their good value for money. For example, according to the Korea Customs Service, the number of wireless vacuum cleaner imported through e-commerce increased from around 3,000 in 2016 to around 230,000 in 2018, and the number of air purifier imports from China exponentially increased from around 13,000 in 2016 to around 290,000 in 2018.[4] The most imported items from China in the first half of 2019 were wireless earphones (546,000 imports) and air purifiers (182,000 imports).[5]

Figure 5_Number of Four Major Imported E-Commerce Items

(Unit: no. of imports, %)



Source: e-National Index, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2457, accessed on September 25, 2019

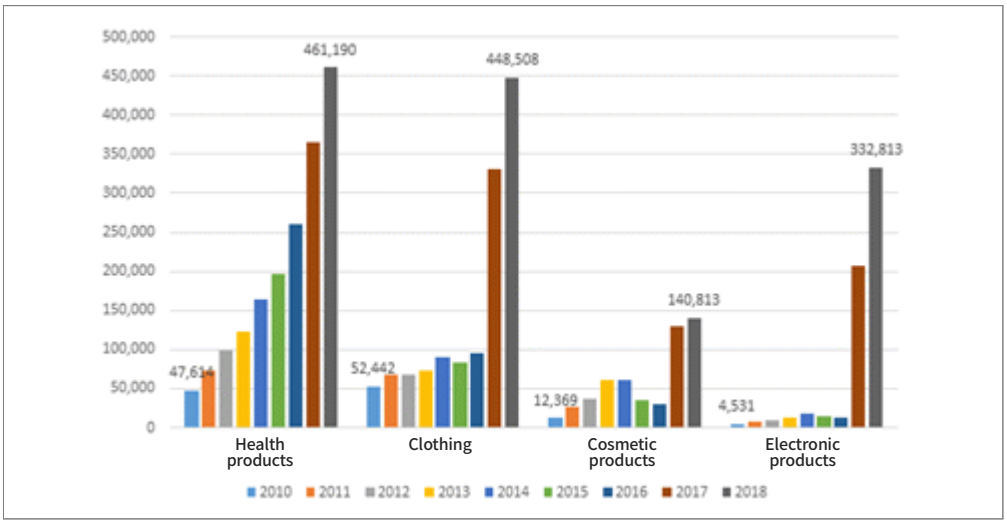
3 Korea Customs Service Press Release, "Direct Overseas Purchase in 1st Half Increased by 42% YoY," September 17, 2019.

4 Korea Customs Service Press Release, "The Age of E-Commerce International Trading Is Here: Number of Exports/Imports Exceeded 40 Million," February 25, 2019.

5 Korea Customs Service Press Release, "Direct Overseas Purchase in 1st Half Increased by 42% YoY," September 17, 2019.

Figure 6_Total Value of Four Major Imported E-Commerce Items

(Unit: USD 1,000)



Source: e-National Index, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2457, accessed on September 25, 2019

D. E-Commerce Imports by Country

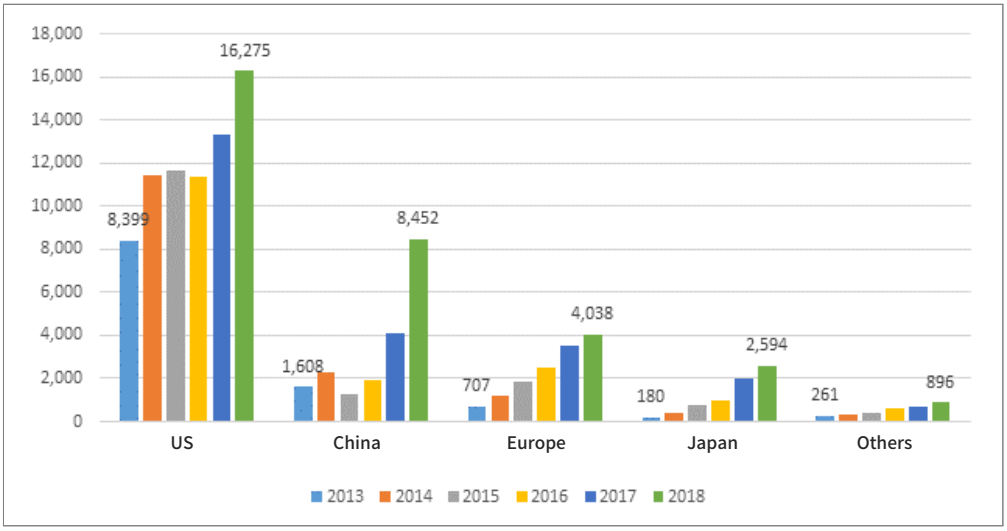
The majority of imported e-commerce goods in Korea originate from the United States. However, this country's percentage is dwindling every year. In 2013, e-commerce goods imported from the United States accounted for around 75% of both the total number and value of e-commerce imports. However, in 2018, the percentage decreased to 51% and 53%, respectively.

With the decline in the percentage of e-commerce goods from the United States, the percentages of China, Europe, and Japan have grown, with a rapid increase in the number of e-commerce goods from China. China accounted for 14% of the number of e-commerce imports in 2013, and rose to 26% in 2018. However, the country's percentage of the total value of imported e-commerce goods only rose from 13% in 2013 to 17% in 2018. This discrepancy indicates that the majority of goods imported from China are low-value items.

On the other hand, Europe comprises a larger percentage than China in terms of total value of imported e-commerce goods (20%), despite having 13% of the total number of e-commerce imports. This finding seems to be attributable to the rapid growth of imported clothing since 2016.

Figure 7_Number of E-Commerce Imports by Country

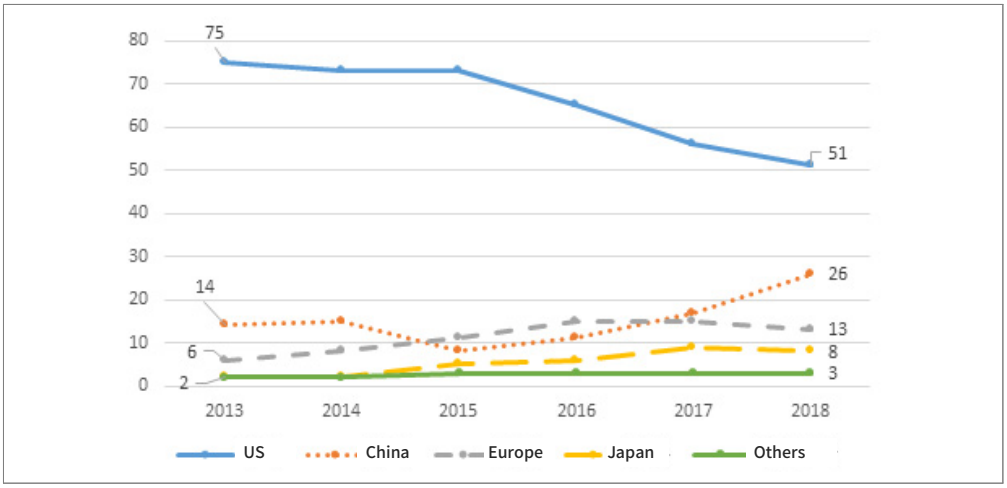
(Unit: 1,000 imports)



Source: Present study, based on Korea Customs Service Press Release, "Total Worth of Direct Overseas Purchase Sets a New Record in 2017 by Exceeding USD 2 Billion," March 20, 2018; Korea Customs Service Press Release, "The Age of E-Commerce International Trading Is Here: Number of Exports/Imports Exceeded 40 Million," February 25, 2019

Figure 8_Percentage of Total E-Commerce Imports by Country

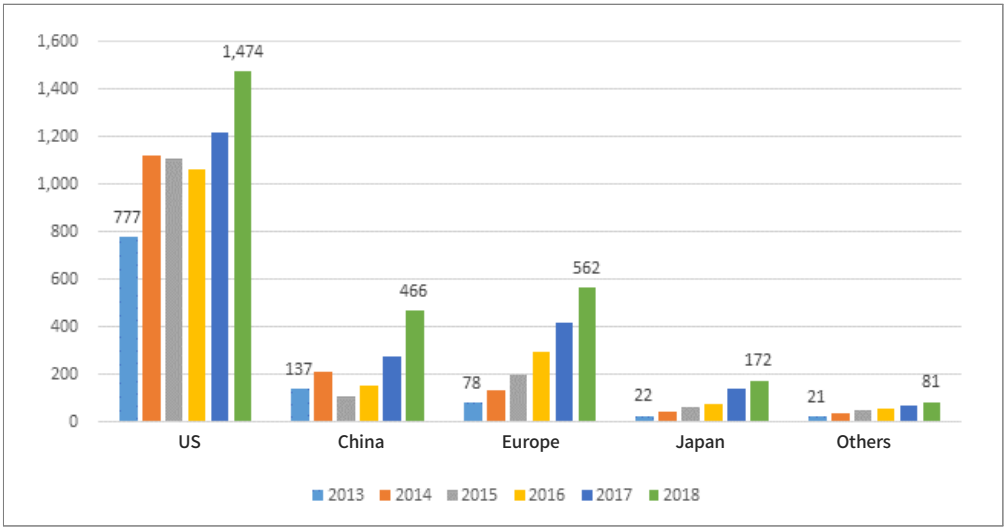
(Unit: %)



Source: Present study, based on Korea Customs Service Press Release, "Total Worth of Direct Overseas Purchase Sets a New Record in 2017 by Exceeding USD 2 Billion," March 20, 2018; Korea Customs Service Press Release, "The Age of E-Commerce International Trading Is Here: Number of Exports/Imports Exceeded 40 Million," February 25, 2019

Figure 9_Total Value of E-Commerce Imports by Country

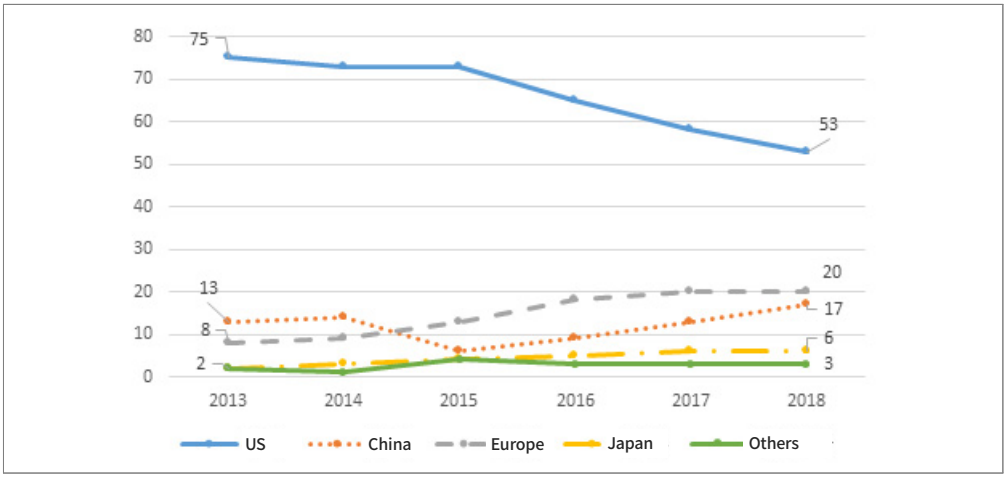
(Unit: USD million)



Source: Present study, based on Korea Customs Service Press Release, "Total Worth of Direct Overseas Purchase Sets a New Record in 2017 by Exceeding USD 2 Billion," March 20, 2018; Korea Customs Service Press Release, "The Age of E-Commerce International Trading Is Here: Number of Exports/Imports Exceeded 40 Million," February 25, 2019

Figure 10_Percentage of Total Value of E-Commerce Imports by Country

(Unit: %)



Source: Present study, based on Korea Customs Service Press Release, "Total Worth of Direct Overseas Purchase Sets a New Record in 2017 by Exceeding USD 2 Billion," March 20, 2018; Korea Customs Service Press Release, "The Age of E-Commerce International Trading Is Here: Number of Exports/Imports Exceeded 40 Million," February 25, 2019

III. Discussions at WCO on Cross Border E-Commerce Framework

Many countries, including Korea, clear low value goods based on the Guidelines for the Immediate Release of Consignments by Customs of the World Customs Organization (WCO).

The WCO recently formed the Working Group on E-Commerce, to discuss the establishment of the Cross Border E-Commerce Framework of Standards. The group is discussing the types of e-commerce businesses and purchases, e-commerce procedures and return procedures, collection methods, roles of stakeholders, and international standardization of electronic information and data on e-commerce.

International standardization is required in order to facilitate the exchange of e-commerce information between stakeholders and customs services. For example, in the case of providing purchase history from Amazon to customs services in multiple countries, the relevant cost can be greatly reduced by using a standardized format. If the international standardization of data leads to the establishment of a mutual verification system, we can expect significant reductions in the costs of tax compliance and tax administration, compared with the costs associated with the traditional form of international trade.

In fact, the United States, the European Union (EU), Canada, China, Australia, and many other countries are actively taking actions to have their own systems selected as international standards for e-commerce customs clearance procedures.

However, the member countries have yet to reach a consensus, with no visible outcomes currently available. Korea also needs to develop systems tailored to the country's circumstances, and to make efforts to have the systems reflected in the relevant standards.

IV. Proposals for Customs Clearance System for Low Value Personal Trading

1. Issues with the Application of Traditional Import Declaration Systems

A. Difference between Traditional Trading and E-Commerce

Traditional trading and e-commerce also require customs clearance when goods cross borders. However, there exists a wide range of differences between the two practices. In

traditional international trade, corporations import goods in large quantities, and the customers for the imported goods are finalized when selling the imported goods. Therefore, international trade poses risks of failing to sell imported goods to customers. However, in low value personal trading through e-commerce, customers are finalized when they order the goods on e-commerce platforms.

In addition, in traditional international trade, the prices of imported goods are paid at the time of delivering or selling the goods, mostly with letters of credit. As previously mentioned, as corporations import goods in large quantities, actual payments are made when the customers are finalized, after the delivery or customs clearance of the goods. In contrast, in low value personal trading, prices are paid in full at the time of ordering the goods, mostly with credit cards. Customers willingly make the payments in advance, despite the risk of not receiving the goods.

Table 5_Traditional International Trade and E-Commerce International Trade

	Traditional	E-commerce
Customers finalized:	at the time of sales after import clearance (earlier for consigned imports)	at the time of placing orders at online marketplace (before the delivery of goods in the target country)
Payments made:	at the time of delivery or sales	in advance
Payment method:	letter of credit	direct payment by credit card, etc.
Type of purchase contract:	individual sales agreement	standard terms and conditions (published at online marketplace)
Type of order:	in large quantities by importers	in small quantities by consumers
Parties to import contract:	importer/seller	consumer
Risk distribution:	risk of import and sales borne by importer/seller	risk of import borne by importer/seller (damage, error, delay, etc.)

Source: Adapted from Choi, 2006, p. 85, Table 24

B. Import Declaration of Low value Exempted Goods

As discussed above, traditional international trade is clearly distinguished from low value personal trading through e-commerce. For this reason, an import declaration is not readily applicable to low value personal trading, because the latter include terms of transaction tailored to large-scale trading.

However, around 40% of low value personal goods traded through e-commerce pass through customs under the import declaration system. The other 60% are cleared under the list clearance system. Low value personal trading items subject to an import declaration are those worth over USD 150 (or USD 200, if from the United States) or are not eligible for list clearance, such as health products. Health products comprise the largest percentage of low value personal goods imported each year. Health products are deemed not eligible for list clearance because they can potentially threaten the health of the public. Health products imported for personal use do not have to be verified for requirement compliance, nor require an ingredient analysis or safety inspection by expert institutions.

Import declaration forms have 69 items, which are mainly designed for traditional international trade and not related to e-commerce, whereas list clearance forms have 28 items. Therefore, many of the items in the import declaration form do not readily apply to health products imported as express cargo.

Kim and Kim (2019) identified core issues caused by declaring low value e-commerce goods under the import declaration system. They also proposed lowering the threshold for express cargo eligible for a notice of imposition to USD 150, so that health products can be eligible for a notice of imposition by the customs service.[6] In addition, they propose abolishing the mandatory five-year retention period of import declaration documents, because it is unreasonable to require five-year document retention for the purpose of a post-import audit of low value items.[7]

As previously mentioned, around 60% of low value personal goods imported through e-commerce go through list clearance. However, the system was originally designed to ensure the rapid clearance of documents or samples requested by corporations. A total of 32.3 million low value goods was imported as express cargo in 2018, comprising 76.6% of the total number of express cargo imports (42.1 million). The number of corporation documents or samples, which the system was originally designed for, stood at a mere 9.85 million (23.4%). The system is being used primarily for a purpose different from its intended purpose.

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6 Kim & Kim, 2019, pp. 200~201.

7 Kim & Kim, 2019, pp. 203~204.

Table 6_Percentage of Direct Overseas Purchase Goods as Express Cargo

(Unit: 1,000, %)

Year	Transaction in general		Direct overseas purchase		Total
	No. of imports	Percentage	No. of imports	Percentage	
2010	5,458	62.2	3,319	37.8	8,777
2011	5,910	51.4	5,598	48.6	11,508
2012	6,200	43.8	7,941	56.2	14,141
2013	6,566	37.1	11,155	62.9	17,721
2014	7,058	31.2	15,531	68.8	22,589
2015	7,659	32.6	15,842	67.4	23,501
2016	9,552	35.5	17,377	64.5	26,929
2017	9,749	29.2	23,592	70.8	33,341
2018	9,852	23.4	32,255	76.6	42,107

Source: Present study, based on e-National Index, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2457, accessed on September 25, 2019

2. Proposals for Low value Personal Trading

A. Use of Personal Customs Code

Korea has a "personal customs code" system in place. The use of a personal customs code allows the customs service to improve the transparency of customs clearance administration. Previously, customs clearance relied on resident registration numbers. However, the use of the registration numbers posed issues including personal data protection, possible theft of personal information, and difficulty in verifying the recipient of the e-commerce goods. On the other hand, personal customs code allows authorities to verify the recipients of the goods, and make it difficult for consumers to use others' personal customs code because each individual's purchase history is analyzed based on his/her personal customs code.

The use of a personal customs code also makes it easier to verify whether an individual purchases certain items for personal use, or for the purpose of illegally evading VATs and duty applied to the sale of goods. If an individual frequently purchases the same items for personal use, they would purchase them in reasonable quantities. Using personal customs code, authorities can identify individuals who repeatedly import low value personal goods in excessive quantities.

B. Mandatory Provision of Individual Item and Product Codes

Currently, list clearance requires the provision of only a single item name. In other words, even when multiple items are imported, the customs service only requires the name of a representative item, because the items are non-taxable, and the customs service do not have much to benefit from subjecting them to administrative control.

However, for more accurate customs clearance and tax base identification, list-cleared items should be individually indicated, along with their Harmonized System (HS) codes. When a consumer purchases goods from overseas through e-commerce, the e-commerce company can assign HS codes to each item, without requiring the consumer to search for the HS code of the respective item. HS codes use a universal six-digit form, which would not pose significant difficulties on the companies required to provide them.

C. Use of E-Commerce Seller and Transporter Information

E-commerce is characterized by the use of electronic information throughout the transaction process, and the possibility of electronically managing most information. If the customs services automatically collect and analyze such electronic information, it will greatly reduce the cost of risk management and administration for low value personal trading. Using electronic information to verify import declarations would decrease the need for opening packages for inspection, and make it easier to identify tax amounts. At the same time, the customs service can focus their administrative capabilities on reinforcing risk management for import declarations not currently identifiable with electronic information, and identifying illegally traded items such as illegal drugs.

1) Use of E-commerce Seller Information

E-commerce sellers hold information on customers who ordered the goods, including their names, addresses (place of shipment), and telephone numbers. Sellers also hold detailed information regarding the goods sold, including their names, unit prices, and country of origin.

Sellers also hold information related to taxation, such as prices, lists of goods, currencies used for payment, total amounts, shipping costs, and payment methods. Other information held by sellers includes order management numbers and dates, sellers' trade names, and website addresses.

Table 7_Information Regarding E-Commerce Sales (Sellers)

Order	Seller	Customer	Product	Price
order number	trade name	name	product name(HS)	currency
order date	website address	address	management code	unit price
		telephone number	country of origin	total amount
			quantity	shipping cost
			weight	

2) Use of E-commerce Transporter Information

Transporters consigned with goods transportation from e-commerce sellers hold information regarding transportation, including parcel numbers, transportation numbers, and the dates (start dates/end dates) and places (countries of departure/arrival) of transportation. Transporters also hold information regarding the goods to be transported, as provided by the sellers (or intermediaries), including the product names, country of origin, quantities, weights, and list of goods They also hold information regarding consignees for the transported goods, including the names, addresses (places of transportation), and telephone numbers provided by the sellers. Other information includes information regarding transportation method and packaging. Information regarding consignees and products are provided by the e-commerce sellers.

Table 8_Transportation Information (Transporters)

Transportation	Date/time	Transporter	Consignee	Product	Fee
parcel number	start date	trade name	name	product name(HS)	currency
transportation number	arrival date		address	country of origin	shipping cost
			telephone number	packaging type	other fees
departure				packaged quantity	
destination				quantity	
				total weight	
				net weight	

3) New import declaration form for low value personal trading

The customs service can combine sellers' and transporters' information to electronically secure information for customs clearance and the taxation of e-commerce goods. The Korea Customs Service recently announced the development of a blockchain- based platform for real-time sharing of information on goods, orders, and transportation from e-commerce companies and transporters. It is expected that the use of blockchain technology will prevent the falsification of customs clearance data and facilitate the clearance process.[8] For reference, under the current process, transporters manually receive goods information from e-commerce companies, and the customs service also manually collects the relevant information.

By collecting all electronic information held by sellers and transporters, the authorities can secure the following information.

Table 9_Information Available to Tax Authorities

Reference number	Date/time	Seller/transporter/consignee	Transportation	Product	Price/fee
order number	start date	(trade) name	transportation method	product name (HS)	currency
parcel number	arrival date	address	ship name (number)	country of origin	unit price
transportation number	port entry date	telephone number		package type	total amount
	declaration date		departure	packaged quantity	shipping cost
				quantity	other fees
				total weight	
				net weight	

Using this information, the Korean Customs Service can also consider adopting a separate import declaration form for low value personal trading. The new declaration form needs to include the following items: basic information regarding the seller/transporter/consignee (names, addresses, and telephone numbers; product information (product names, six-digit HS codes, country of origin, quantities, and weights); price information (currency, unit prices, total amounts, shipping costs, and other fees); transportation information and dates (methods, ship names, countries of departure, departure dates, arrival dates, port entry dates, and

8 Korea Customs Service Press Release, "KCS to Consider Blockchain and AI Technology for Application to Direct Overseas Purchase," December 26, 2018.

declaration dates); and reference numbers (order numbers, parcel numbers, and transportation numbers). As previously mentioned, the form should also require personal customs code. Unlike the existing list clearance forms, however, the new import declaration form should include product information (product names, six-digit HS codes, country of origin, quantities, and weights) and price information (currency, unit prices, total amounts, shipping costs, and other fees) for each item. Having a six-digit HS code for each product is needed in order to allow the customs service to accurately identify product names.

Lastly, when developing the new declaration form, the customs service needs to use a format that facilitates the tax amount calculation by declarants. Such a format will also allow the customs service to efficiently review the declarations for possible errors, thereby reducing administrative costs.

V. Summary and Conclusions

E-commerce is rapidly spreading both inside and outside of Korea. In Korean, an ever-increasing number of consumers are purchasing products from overseas through e-commerce. Consumers can easily access information regarding various products using the internet and smartphones, and Amazon and other global online marketplaces and shipping companies allow individuals to order and pay for products they want, from any country.

The number of e-commerce imports in 2010 in Korea was around 3.6 million, which stood at only a third of imports. However, this number rapidly grew to over 10 million in 2013, and actually surpassed the number of import declarations in 2015. In 2018, e-commerce imports numbered 32.3 million, accounting for 59.9% of the total number of imports (around 53.8 million).

As a rapidly growing number of low value e-commerce goods pass through customs, the customs services are faced with an urgent call for change. In most countries, import clearance systems are designed for an international trade structure that is led by large corporations. However, countries are currently faced with the need to develop customs clearance systems that are more tailored to low value personal trading. For this task, the WCO has established an e-commerce working group in an attempt to develop international standards for e-commerce customs clearance. Korea needs to actively engage itself in this process, so as to ensure that the standardization of systems remains suitable for their circumstances.

First, when developing customs clearance systems for low value personal trading, the

customs service needs to utilize personal customs code. The use of a personal customs code will allow the government to address issues related to low value personal trading, making it easier to identify purchasers who falsely declare items for personal use, potentially as an attempt to evade tariffs and VATs.

Second, for a more accurate customs clearance and tax base identification, list-cleared items should be individually indicated on the new declaration form for low value personal goods, along with their HS codes. If this change is implemented, the e-commerce company would assign the appropriate HS code to each item, without requiring the input of the consumer.

Third, the customs service needs to use the electronic information held by sellers and transporters to reduce the costs of risk management and tax administration for low value personal trading. By electronically collecting and analyzing such information, the customs service can reinforce risk management and identify tax amounts easily. In this study, we listed the core information to be held by e-commerce sellers (information regarding customers and products, such as addresses and prices) and transporters (information regarding transportation) that can be electronically collected by the customs service, and have proposed using this information to adopt a separate import declaration form for low value personal trading.

In conclusion, given the emergence of low value personal trading as a new form of international trade—and its rapid growth—the customs service needs to make it a priority to build a new customs clearance system that is tailored to low value personal trading. Such a system would also enable the customs service to improve its fairness of taxation.

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Tax Challenges of Digital Platform Economy and Economic Effect of Alternative Tax Schemes

Bitmaro Kim and Kyung Geun Lee*

I. Introduction

Rapid advances in digital technologies in recent years have had a broad impact on society in general. These advances have drastically reduced the cost of storing, computing, and transmitting data and goods, and have led to the emergence of new business models based on online platforms, which have taken on increasingly greater significance. The world has also witnessed the spread of new forms of intangible digital goods, as well as an increase in the transactions of traditional digital goods. Going forward, advances in digital technologies are expected to propel these trends even further.

The creation of new digital technology business models, and the increasing exchange of new goods and services, has significantly affected the structure of competition in the market. The Organisation for Economic Cooperation and Development (OECD) listed internet search engines, social network services, and sharing economy platforms as key examples of digital platform business models. These business models are rapidly expanding their presence in the market. In fact, according to the European Commission (EC),[1] only 1 of the world's top

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1 European Commission (2017), "A Fair and Efficient Tax System in the European Union for the Digital Single Market."

20 companies was a digital company in 2016. In 2017, 9 of the top 20 companies were digital companies.

Digital advances also have caused various difficulties in terms of taxation. Under the current tax system, direct corporate taxes are imposed based on permanent establishments (PEs). However, digital technologies and new business types have enabled businesses to generate profit without relying on physical presence. Many businesses can generate profit without having a permanent establishment in the country where they earn their income, which seriously threatens the country's taxation rights.

To address this issue, the OECD has discussed tax issues in the digital economy as a part of their Base Erosion and Profit Sharing (BEPS) project. In 2020, the OECD plans to announce taxation principles based on member consensus in the final report. Two drafts of consensus-based proposals have been announced to date (Pillar 1 and Pillar 2), and the OECD is currently gathering opinions and carrying out other tasks to add detail to the proposals. The European Commission (EC) responded to advances in digital technologies by proposing a fundamental reform of the corporate tax regime, and has taken temporary measures to impose taxes on the revenues of certain digital companies (Digital Service Tax DST) to ensure fair taxation. Other countries have accepted parts of the recommendations from the OECD and the EC, and have taken corresponding measures to address tax issues of the digital economy. In addition, academics are currently discussing alternative approaches to the taxation of digital transactions, including the Digital Service Tax, the ad valorem tax, and the unit tax. These alternative taxes have caught the attention of countries seeking to increase their tax revenues by expanding their taxation prior to the implementation of the internationally agreed upon taxation schemes. Indeed, a number of European countries have been taking active steps to adopt the Digital Service Tax.

Implementing the OECD proposals for tax issues arising from digital technologies requires a consensus among multiple countries with conflicting interests, which is why the OECD's final taxation proposals are expected to take considerable time to institutionalize and implement.

In the interim, countries are likely to adopt a Digital Service Tax and other temporary alternatives until the full implementation of the OECD proposals occurs. These taxes may directly affect Korean businesses and the tax revenue of the Korean government. As such, the situation warrants a preemptive analysis on the economic effect of these alternative tax schemes.

In this study, we used a simple structural model to analyze the effects of the alternative

tax schemes currently being discussed. Most digital businesses operate on online platforms characterized by a two-sided market structure. In a two-sided market, taxation schemes may have different consequences compared to a traditional market. For this reason, we explicitly consider the network effect when analyzing the effects of the taxation schemes.

It would be ideal to create a model for each business type targeted by the alternative tax schemes, and then analyze their effects on taxation using market share and firm-level data. However, access to the data required for such an analysis is limited. Therefore, in this study, we analyze the search engine market of the United States, because the search engine business is a core archetype of digital businesses, and sufficient data is available for the purpose of our research. Given the restricted scope of this study, however, it should be noted that a comprehensive examination of the effects of the alternative tax schemes seems to require further research on other types of digital businesses. In addition, after the adoption of the taxation schemes, it would be possible to analyze the economic effects of these taxes by taking a reduced-form approach, using data before and after the adoption of the tax scheme.

We also summarize changes arising from economic digitalization and their characteristics. We then review the changes adopted by individual countries in attempts to address tax issues brought on by advances in digital technologies and the latest discussions at international organizations such as the OECD and the EU, and discuss their implications.

This report consists of the following chapters. Chapter II discusses the characteristics of the digital economy, and Chapter III provides a summary of tax issues of the digital platform economy, related legislation in each country, and key discussions by the OECD and the EU. Chapter IV offers an empirical analysis of the effects of the taxation schemes that are currently being discussed as temporary measures, and Chapter V concludes.

II. Characteristics and Current Status of the Digital Economy

1. Characteristics of the Digital Economy and the Roles of Platforms[2]

The term "digital economy" was reportedly first mentioned in Don Tapscott's *The Digital*

2 Discussions in this section are based on Kim (2018) and OECD (2018), "Tax Challenges Arising from Digitalisation –Interim Report" and OECD (2019), "The Sharing and Gig Economy: Effective Taxation of Platform Sellers."

Economy: Promise and Peril in the Age of Networked Intelligence. It is widely defined as "an economy based on digital technology," even though specific definitions may differ. Some propose narrower definitions of the digital economy, emphasizing that the sources of values created by digital firms are quite different from those of more traditional businesses. The issue of where digital businesses create their value is closely related to tax issues in the digital economy, which will be covered in the latter parts of this report.

A. Changes in Economic Costs Arising from Advances in Digital Technology

Advances in digital technologies have pushed down core economic costs. Goldfarb and Tucker (2017) emphasized the reduction of costs in the digital economy: search cost, replication cost, transportation cost, tracking cost, and verification cost.

First, advances in digital technologies have greatly reduced the search cost required for searching and comparing information. For example, by connecting to the internet consumers can easily access and compare the prices and characteristics of products. This reduced search cost has facilitated the matching between consumers and suppliers. Digital technologies enable economic agents to overcome restrictions imposed by physical distance and to then engage in transactions. The reduced search cost has subsequently led to the emergence of new business models that generate profit by either facilitating supplier-consumer matching or improving the quality of matching, such as eBay, Uber, and Airbnb.

Second, the replication cost is very low in the digital economy. The production of digital goods and services is characterized by high fixed costs and low variable costs. In particular, software, e-books, audio/video files, and other nonrival consumer goods can be reproduced at a zero effective marginal cost. For this reason, businesses cannot generate profit from digital goods without legal or technical mechanisms in place to prevent unauthorized reproductions. This characteristic is primarily concerned with the issue of intellectual property rights, but also affects the pricing, sales, and profit-maximizing strategies of firms.

Third, digital technologies can be used to reduce the transportation cost. It costs almost zero to transmit digital goods or digitized information. Digital technologies can also reduce the transportation costs of traditional goods. Advances in digital technologies have helped businesses increase the efficiency of their logistics systems, with some companies now attempting to deploy drone or robot technologies for shipping. These changes are gradually undermining the significance of physical distance.

Fourth, advances in digital technologies have reduced the cost of tracking and recording

individuals' activities. Digital activities can now be easily recorded and preserved. These changes enable businesses to track the activities of individual consumers, and to use this information to maximize profit. For example, businesses can expose consumers to personalized advertisements or propose differentiated prices based on their online activities.[3] Indeed, the ease of tracking detailed information regarding individual consumers has led to new business models that directly generate profit from personal information. Facebook and other social network service platforms use the personal information of their members as their main sources of profit. Search engines such as Google earn profit by exposing individuals to commercial information tailored to their respective search activities. These trends reveal the great significance of user participation and personal information in the digital economy. However, opinions vary regarding whether personal information, user participation, and digital platforms represent a completely different concept from existing intangible assets, and whether they warrant special treatment for taxation purposes. The issue will be discussed in further detail in later sections.

Last, advances in digital technologies have reduced the cost of verifying transactors' identity, credibility, and reputation. The digital economy allows for the mitigation of information asymmetry among potential transactors by attracting the voluntary participation of a vast number of users. For example, eBay's rating and review system has been credited for promoting transactions by successfully ensuring credibility among economic agents who are not expected to form repeated relationships. Such a system not only ensures the credibility of transactors, but also provides easier access to credible information regarding the quality of the relevant products and services.

These cost-reduction effects of digital technologies have significantly changed the patterns of economic activities. The weakening of physical restrictions has promoted forms of transactions that were previously difficult to perform, and raised the importance of personal information and user participation. These changes have ultimately led to new business models that utilize these characteristics, and increased their significance.

3 In reality, personalized advertisements are more commonly observed than differentiated prices, as discussed in Goldfarb and Tucker (2017) on pages 30 to 32.

B. Concept, Characteristics, and Roles of Digital Platforms

In the digital economy, businesses create value through the use of digital platforms. Those who advocate for targeted taxation of specific digital firms use the term "digital platform economy" as a sub-category of the digital economy, which emphasizes the role of digital platforms in value creation.

The issue regarding the significance of digital platforms' roles in value creation is directly related to the taxation of digital businesses. Therefore, before discussing tax issues of the digital platform economy, this section covers the concept, characteristics, and roles of digital platforms.

1) Concept

The term "platform" has a wide range of meanings, depending on its usage. In terms of discussing the digital economy, a platform can be described as "an environment built to allow multiple groups of users, including consumers and suppliers, to engage in transactions in order to trade specific goods or services." Table 1 lists key types of digital platforms, and major businesses falling under each type. The types include: online marketplaces, social media and user-generated content, sharing economy,[4] crowd sourcing, crowd funding, and peer to peer (P2P) lending.

Table 1_Types and Examples of Digital Platforms

Type	Description	Key firms
Online marketplace	Online platforms designed for trading traditional/digital goods and services	Amazon, Apple, eBay, Alibaba, Craigslist, Spotify
Social media and user-generated content	Platforms that provide online spaces where users can post and share content	Facebook, Twitter, YouTube
Sharing economy	Platforms for directly trading unused/ underused assets or services between suppliers and consumers	Uber, Airbnb, Sidecar, RelayRides
Crowd sourcing	Platforms for trading contractual/temporary labor and know-how	Taskrabbit, Upwork, Amazon Mechanical Turk
Crowd funding and P2P lending	Platforms for donating, lending, and leasing	Kickstarter, Indiegogo, Lending Club

Source: Kim (2018)

4 See Lee (2015) and Kim et al. (2016) for a detailed discussion on the sharing economy.

2) Characteristics of Digital Platforms

As discussed above, numerous digital firms have set up platform-based business models. These models are expected to gain greater significance with further advances in digital technologies. This section discusses the characteristics of these digital platforms before analyzing policy issues pertaining to digital platform.

① Two-sided Markets

Digital platforms are mostly characterized as two-sided or multi-sided markets. In a single-sided market, a seller engages with a single customer group. In a multi-sided market, a seller deals with two or more customer (user) groups.

A two-sided market can be defined as an intermediary platform between two groups of users, where one group exerts network effects on the other group.[5] Network effects refer to the value of certain goods or services increasing with the number of users of the goods or services. Network effects can be divided into direct network effects and indirect network effects. There exists a direct network effect if an increase in the number of users in a group positively affects all the users in the group. For example, when the number of telephone users increases, existing telephone users can communicate with more people via the telephone, which raises the utility created by the use of telephone. On the other hand, indirect network effects occur when an increased number of users in one group positively affects another group. For example, when the number of a credit card company's member stores increases, consumers using the company's credit cards enjoy increased utility because they can use the cards in more stores. Likewise, when the number of consumers using the company's credit card increases, the company's member stores are likely to enjoy increased revenues. Thus, an increase in the number of card users positively affects member stores as well.

Given these definitions of two-sided markets, we can see that most of the digital platforms mentioned above can be characterized as two-sided markets or multi-sided markets. For example, in online marketplaces such as eBay, indirect network effects work both ways between suppliers selling goods or services and consumers purchasing them. For consumers,

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5 Different researchers have proposed slightly different definitions of two-sided markets. For example, Rochet and Tirole (2003; 2006) define a two-sided market as a platform where indirect network effects exist, and the price structure between the two sides are affected by the network effects. Other researchers maintain that a platform constitutes a two-sided market only when indirect network effects mutually exist. Therefore, opinions may vary regarding whether social network services and search engines are two-sided markets. Luchetta (2014) covers the relevant discussions in further detail.

a larger number of sellers means more choices. For sellers, a larger number of consumers raises their chance of increasing their revenues. Both sellers and consumers gain increased value from the platform when the number of users in the other group increases. YouTube, a digital platform for user-generated content, can be characterized as a multi-sided market. The platform has multiple groups: users who create and share video content, users who watch the content (viewers), and advertisers seeking to expose viewers to their advertisements. Indirect network effects exist between the content creator group and the viewer group. A larger number of content creators means there will be a wider variety of choices for viewers. A larger number of viewers increases the utility and financial gain of sharing video content. One-way or two-way network effects exist between the advertiser group and the user group. On one hand, a larger number of viewers clearly increases advertisers' financial gain from their advertisements. On the other hand, when the number of advertisers increases, the utility of the viewer group may either increase or decrease. Viewers' utility will increase if a larger number of advertisers translates into more information available from the advertisements. However, if unsolicited advertisements increase, the utility decreases. In sum, mutual indirect network effects exist between viewers and creators, where the network effect between viewers and advertisers can be either one-sided or mutual. YouTube is a platform that mediates between these user groups.

As discussed so far, a large number of digital firms operate digital platforms that can be characterized as two-sided markets. Whether a digital platform constitutes a two-sided market is important because a two-sided market may behave differently from typical businesses. A digital business in a two-sided market may differ from typical businesses and industries in terms of pricing and business structures, which may also translate into differences in the effect of economic and tax policies.

A business in a two-sided market considers network effects when choosing prices to be applied to the two sides. A price determined by a two-sided market business for one of the user groups affects the business' profit from the user group and the profit from the other group. For example, when a newspaper company raises its subscription fee, it drives down the number of subscribers, in which case the profit from subscribers may increase or decline depending on the price elasticity. In addition, changes in newspaper subscription fees also affect a newspaper company's profit from advertisements. When a newspaper company raises its subscription fee, the number of subscribers may decline. The decline in readership may then reduce the value of advertisements in the newspaper for advertisers, which can undermine their willingness to pay for the advertisements. For this reason, in many cases, many

two-sided market platforms offer goods and services to one side for extremely low prices or free of charge. In extreme cases, a company may even pay cash subsidies to one of the user groups. They can maximize their profits by lowering prices for one side of the market, and raising the price on the other side of the market.

The second characteristics of a two-sided market pertains to the increasing scale of returns caused by the network effect. For a large-scale platform having a large number of users, the users' utility from the platform is expanded by the existence of the network effect. Specifically, potential users willingly pay higher prices to join a platform having a large number of users and a high level of network effects. Due to these characteristics, competition among two-sided market platforms often result in the emergence of only a few players dominating the market. In fact, in traditional two-sided markets such as the credit card sector, and digital two-sided markets such as social network services and the sharing economy, a handful of companies may comprise the majority of the market.

② Value Creation by Digital Businesses and the Roles of Platforms[6]

As mentioned above, the development of digital technologies greatly reduced the unit cost for data processing, which radically increased people's use of digital information, and significantly changed business structures and value creation processes. The characteristics of this change are as follows.

First, businesses can generate profit across borders and jurisdictions without the need for permanent establishments (PEs). It is noted that businesses began to set up production sites across multiple countries and approach customers (users) located in far distances even before any advances in digital technologies. However, digital technologies have spurred these trends. As remote technologies and other digital technologies became available, digital businesses began to efficiently engage in economic activities in diverse jurisdictions and to generate profits in regions that they had no physical presence.

The second characteristic of digital businesses is the heavy reliance on intangible assets such as intellectual properties in value creation. The dissemination of digital technologies has been accompanied by the growing importance of intellectual property rights. According to the OECD (2018), applications for industrial designs, patents, trademarks, and utility designs increased by an average annual rate of around 7.1% between 2004 and 2016.[7] This represents

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6 A part of this section consists of a partial summary of Chapter 2, OECD (2018).

7 WIPO (2018), as cited by OECD (2018).

an increase of more than 125% over this period.[8] The OECD (2018) also notes that intangible assets owned by businesses and leased to third parties hold great importance for digitalized businesses, which positively impacts corporate values and productivity. In addition, in many digital businesses, the use of software, algorithms, websites, and other intellectual properties is considered a key element for their business model. The OECD (2018) stresses that, while the heavy reliance on intangible assets is a common characteristic of digitalized business models, it is also gaining significance in the context of other business models.

The third characteristic is the growing importance of data and user participation, and their synergy with intellectual properties. While the level of data concentration varies depending among businesses and business types, the use, collection, and analysis of data have become a crucial part of digital business models. Their significance is also expected to expand in the future. Data, user participation, network effects, and user-generated content are elements heavily featured in the business models of highly digitalized companies. Advances in digital technologies have also facilitated the collection of users' information, which is likely to result in greater opportunities to generate profits using data. The OECD (2018) projects that, if personal information can be extracted from more diverse sources, it will exponentially increase the profits from the data.[9] Firms have traditionally made profit-maximizing decisions by analyzing various data, including that obtained from product sales and inventory. Indeed, the use of information for this purpose is not a new corporate behavior in itself. One of the changes brought on by digitalization is the expansion of users' roles and participation, which has enabled businesses to access a wider range of information regarding the users. In other words, through user participation, businesses can get their hands on previously inaccessible information.

Most members of the Inclusive Framework on BEPS (Inclusive Framework) are aware of these three characteristics. However, countries continue to disagree over whether the elements related to these characteristics play a crucial role in value creation.

Most agree, however, that the first two characteristics are crucial in the value creation of digitalized businesses. However, these characteristics are not confined solely to digital businesses. The third characteristic is mainly associated with digital business models. However, controversy persists regarding whether data and user participation are key elements of value creation by digital firms.

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8 WIPO (2018), as cited by OECD (2018).

9 The OECD (2018) attributes it to the economies of scope in information collection.

Some member states consider user participation to be a crucial and special element for value creation by digital businesses. These countries are of the opinion that user participation and the collection of user data are characteristics unique to digitalized business models, and are sources of profit for these firms. These countries think that digital platforms can play an important role in business growth by collecting information and engaging users, because such activities build trust and reputation, and enhance their network effects by expanding the user base. Even when a digital platform operator is located outside their jurisdiction, these countries maintain that the operator creates value and profit within their jurisdictions because their main source of profit is from user-generated content and user information from within their jurisdictions.

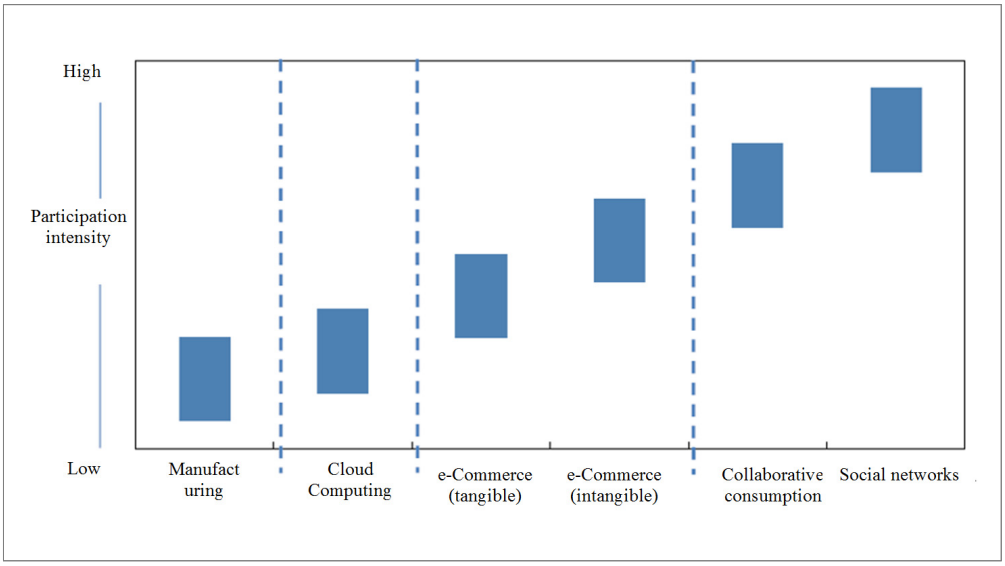
Other member states consider the collection of user data, user participation, and user-generated content as transactions between users (data provider/content creator) and digital firms. Digital firms provide monetary and non-monetary rewards to users in exchange of their personal information and participation. These countries believe that the provision of information and data on a digital platform is not different from other production factors, and that they do not constitute the most crucial element in value creation.

This disagreement over the contributions of data and user participation to value creation is important because the issue is deeply related to tax issues in the digital economy, including whether special international tax rules are required for digital businesses.[10] For this reason, we need to take a closer look into the roles of data and user participation in terms of corporate value creation.

The OECD (2018) discussed the roles and importance of data and user participation across various business types. It should be noted that the level of reliance on data collection and user information is determined to be at the business type level, not at the firm level. Many digital firms operate more than one business, and the level of reliance on user participation may vary depending on the specific business types. For example, Amazon Marketplace's reliance on user participation may be different from that of Amazon e-Commerce. Figure 1 shows the intensity of user participation by business type. The types listed in the figure include: cloud computing, e-commerce (tangible and intangible products), collaborative consumption, and social networks. Cloud computing shows the lowest level of user participation among the digital business types, and social networks are the business type having the highest level of user participation.

10 The issue is covered in further detail in Chapter 3.

Figure 1_Intensity of User Participation by Business Type



Source: Present study, based on OECD (2018), Figure 2

Despite the varying levels of reliance on data and user participation, opinions also vary as to how crucial they are in terms of value creation, and what roles digital platforms actually play in the process. International consensus has yet to be reached on these issues. For this reason, at this point, analyzing whether user participation and digital platforms plays the key roles in value creation, and the corresponding design of international tax rules for digitalized businesses seems to be outside the scope of this study. However, despite a lack of consensus on these issues, the number of digitalized businesses is growing at a rapid pace. In response, many countries have taken unilateral measures to address the situation. In this study, we review relevant discussions and legislations from international organizations and countries, and assess the economic effect of alternative taxes such as the Digital Service Tax, based on actual data. In particular, given how the alternative taxes currently being discussed target specific digital platform businesses, we focus on the digital platform economy as a sub-concept of the digital economy.

III. Tax Issues in Digital Platform Economy and Latest Discussions

1. Tax Issues Raised by the Digital Platform Economy

The digital platform economy forms a central part of the digital economy. Therefore, the tax issues pertaining to the digital platform economy need to be discussed in conjunction with the tax issues of the digital economy. Digitalization of the economy and the spread of digital platforms has distorted the allocation of taxation rights among countries, undermined the value added tax (VAT) principles that should equally apply to all countries, exacerbated the BEPS issue, and caused problems related to tax administrations. In this section, we discuss issues raised by the digital platform economy by focusing on corporate tax and income tax issues.

A. Distortion of the Allocation of Taxation Rights Among Countries

As discussed above, advances in ICT have enabled businesses to operate without having permanent establishments in the countries where they earn business income (or countries where their markets exist). In the past, permanent establishments were required in order to conduct business activities outside their home countries. Therefore, the country where the permanent establishment existed was able to exercise taxation rights on the business. However, in an extreme case of the digital economy, a country where a certain company is located may be able to exercise taxation rights on all of the company's global earnings. This situation represents a significant financial threat to countries where consumers of the company's products reside. Although this is an extreme example, further digitalization is expected to exacerbate the problem.

For a company that has its income based on consumers' purchase of its products (business income), the right of taxation resides in the country where the consumers are located at the time of purchase.[11] However, if we allow all countries to impose taxes on business income generated by purchases made by consumers residing in their country, this situation may result in excessive double taxation and raise businesses' tax burden or their tax compliance costs. For

11 Article 93 (5) of the Corporate Tax Act provides for the taxation of domestic source business income. According to the Act, Korea has the right of taxation on domestic source business income earned by a foreign corporation, regardless of whether its permanent establishment is located in Korea, as long as the income was earned in the country through sales and/or other activities.

this reason, under current international standards, a country can impose taxes on a company's business income only if the company's permanent establishment is located within the country.[12]

However, as mentioned above, under a digitalized economic structure, it becomes highly unreasonable if only the country where the company's permanent establishment is located is allowed to impose taxes on the company, but not the country where the company is earning its income.[13]

Many firms using digital platforms for their businesses (Google, Facebook, etc.) have a large number of users in Korea. However, as those platforms are two-sided markets, these firms provide many platform services to their users for free, and earn profit mostly from advertisements. If the advertiser is a foreign company, the payments made to digital platform providers without permanent establishments in Korea by the foreign company cannot be understood as domestic source income under any tax convention or tax law. However, given the fact that platform providers earn profits from the personal information provided by individual users, some may argue that the country where these individuals reside (country where the data is located) should be able to exercise its right of taxation.

B. Issues Regarding Application of the Arm's Length Principle

Most countries, including Korea, have adopted the OECD's Transfer Pricing Guidelines, which has the "arm's length principle" as one of its core principles. These guidelines provide for taxation criteria for licensing and sales of tangible and intangible properties, and financial transactions between companies within the same group. These principles mostly presuppose global value chains comprised of R&D, materials purchases, production, transportation, marketing and sales, and after-sales services.[14] However, the operation of

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12 The OECD Model Tax Convention and the UN Model Tax Convention stipulate that a country may impose taxes on a company's business income only if the company has a permanent establishment in the country. Therefore, in cases where no tax treaty has been signed, Korea applies a 2% withholding tax to business income earned by a foreign corporation with no permanent establishment in Korea. In cases where a tax treaty has been signed, Korea can exercise its right of taxation only on corporations having permanent establishments in the country.

13 OECD (2015), Addressing the Tax Challenges of the Digital Economy, Action 1 - 2015 Final Report, OECD/G20, Base Erosion and Profit Shifting Project, OECD Publishing, Paris. pp. 102~104. http://dx.doi.org/10.1787/9789264241046-en.

14 Rosenthal, Elizabeth King, Taxing Platform Businesses With Highly Digitalized Business Models, Tax Notes

firms generating income from digital platforms cannot be fully explained using this global value chain model. Instead, their businesses can be better explained using the concept of "value network."[15]

The main components of a value network include: network promotion and contract management, service provisioning, and network infrastructure operation. "Network promotion and contract management" refers to inviting users to networks, engaging them so they participate in the network, managing the contracts required in the process, and charging users and advertisers for the services. "Service provisioning" refers to establishing connections among users/customers, maintaining those networks, and continuously providing the relevant services. "Network infrastructure operation" means maintaining the physical and information infrastructure of the networks to ensure the continued operation of the first two components. Such a digital platform business model does not involve frequent exchanges of goods or services among related firms within a multinational business group. In this model, direct interactions between the platform provider and users have a greater impact on value creation.

Therefore, digital platforms do not readily lend themselves to the application of transfer pricing principles, which allocate taxable income based on the value created by related companies comprising a global value chain. As such, the digital platform model requires a new analytical approach, not the existing comparability analysis.[16]

C. International Tax Evasion

While economic digitalization does not cause tax base erosion in and of itself, it may exacerbate tax evasion by multinational companies.[17] A company may shift its main functions, assets, and risks to its affiliate in a low-tax country while leaving nominal functions, assets, and risks in the source country where its profits are generated, so that the affiliate holds the majority of the firm's global income. However, if the transfer of functions, assets, and risks is not properly priced in accordance with the arm's length principle, such transfers are likely

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International, June 11, 2018, p. 1285.

15 BEPS Action 1 Report: OECD (2018), Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris. pp.32–40. http://dx.doi.org/10.1787/9789264293083-en

16 Elizabeth King Rosenthal(2018), pp. 1291~1294.

17 BEPS Action 1 report, pp. 85~93.

to result in tax base erosion or the overseas transfer of taxable income. Even in cases where a company establishes a permanent establishment or a local corporation in the market country, the company can markedly reduce the income tax (or corporate tax) imposed in the source country by creating a transactional structure that maximizes usage fees, interests, and other costs borne by the permanent establishment.

2. Measures Taken by Countries to Address Tax Issues in the Digital Platform Economy

Countries have taken various measures to address income tax issues raised under the digital platform economy, which mostly target firms using digital platforms for their businesses. Among these measures, this section covers the Equalization Levy in India, and the Diverted Profits Tax in the United Kingdom and Australia, followed by a discussion on the specifics of the Digital Service Tax.

A. Equalization Levy in India

Starting in April 2016, India has imposed a 6% Equalization Levy on payments for online advertisement services offered by foreign corporations. Equalization Levies are only imposed on business-to-business (B2B) transactions for services provided by foreign corporations regarding online advertisements or the provision of places and facilities for online advertising. The levies should be withheld and paid by the recipients of the services. The levies are not imposed on businesses that do not collect more than INR 100,000 (USD 1,500) from residents in India (including their permanent establishments in India) in service prices. The Indian government reported that it collected around INR 3.4 billion (USD 47 million) in Equalization Levies between June 2016 and March 2017.

The Equalization Levy is a transaction tax imposed separately from income tax, and is not subject to double taxation adjustments under tax treaties. Therefore, this levy raises the issue of double taxation. In addition, the levy is likely to be in conflict with the WTO's non-discrimination principle, as it is only imposed on foreign corporations. In the case of providing the same services through Indian corporations or permanent establishments of foreign corporations, India will impose a corporate tax on the permanent establishments rather than the Equalization Levy on advertisement revenues. For this reason, some may argue that the Equalization Levy should be treated as a corporate tax under tax treaties.

B. Diverted Profits Tax

In 2015, the United Kingdom inserted provisions on the Diverted Profits Tax in Part 3 of the Finance Act 2015. Starting in April 2015, the United Kingdom has imposed the Diverted Profits Tax on multinational firms transferring its profits to tax havens outside the country.[18] The Diverted Profits Tax rate is 25%, which is 6%p higher than the general corporate tax rate of 19%.[19] The Diverted Profits Tax is imposed on British corporations using entities or transactions lacking economic substance, and foreign corporations having permanent establishments in the country, insofar as they meet the specified requirements.[20]

Australia finalized their plan to adopt the Diverted Profits Tax on November 29, 2016. The country began to impose the tax on July 1, 2017. Designed based on its British counterpart, the crux of the Australian Diverted Profits Tax is the imposition of a 40% tax on profits transferred out of the country by multinational firms, which is higher than the current corporate tax rate of 30%.[21]

Australia has imposed the Diverted Profits Tax on the headquarters or affiliates of multinational firms having an annual income of AUD 1 billion, Australian-headquartered multinational firms with foreign operations, and Australian subsidiaries of foreign headquartered multinational firms. The Australian Diverted Profits Tax applies when certain requirements are met, including "the principal purpose, or one of the principal purposes, of a person who entered into or carried out the scheme, was to enable the relevant taxpayer to obtain an Australian tax benefit or to obtain both an Australian and foreign tax benefit."[22]

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18 Clifford Chance, "The new UK diverted profits tax: Will it impact your business, and will it survive legal challe nge?", December 12, 2014. https://www.cliffordchance.com/content/dam/cliffordchance/briefings/201 4/12/the-new-uk-diverted-profits-tax-will-it-impact-your-business-and-will-it-survive-legal-challenge-dec ember-2014.pdf (accessed on December 8, 2019).

19 The United Kingdom applies a fixed corporate tax rate, which has been gradually lowered from 23% in 2013 to 19% in 2017. [(2013) 23%→ (2014) 21%→ (2015) 20%→ (2017) 19%].

20 See Clifford Chance (2014) for further details.

21 Park, Hun, "Review of Changes in the Concept of Permanent Establishment and Adoption of Diverted Profits Tax under the Digital Economy," *Journal of IFA*, 35(1), (International Fiscal Association Korea, February 2019), pp. 63~64.

22 Australian Tax Office, https://www.ato.gov.au/Business/International-tax-for-business/In-detail/Doing-business-in-Australia/Diverted-profits-tax/?=redirected_DPT (accessed on December 8, 2019).

C. Digital Service Tax

On March 21, 2018, the EU issued a proposal for two EU guidelines regarding the imposition of corporate taxes on the digital economy at the EU level, one covering fundamental taxation solutions, and the other covering temporary measures.[23] In the proposal, the EU pointed out the issue with the current tax system, in which large-scale digital commerce firms pay lower tax rates than other businesses, and proposed a new taxation solution to ensure fair taxation.

In the proposal, the EU proposed a fundament tax solution for the digital economy, which includes allowing the source countries to impose corporate taxes on businesses with no permanent establishments in the countries, by assuming the existence of digital establishments (or virtual permanent establishments) as long as they meet certain requirements. In addition, the EU proposed the adoption and imposition of the temporary "Digital Service Tax" until the implementation of the OECD taxation scheme is completed. The Digital Service Tax is a 3% tax imposed on revenues generated by digital services provided by a specific company on digital platforms, such as online advertisement, sales of user data, and person-to-person (P2P) platform services. The taxable services listed in the EU guidelines include: services that generate profits using user data, and platform services that enable users to exchange goods and services (P2P platform). The EU proposed imposing the tax on businesses having an annual global revenue over EUR 750 million, and an annual EU revenue over 50 million.

With regard to a possible conflict between existing national tax systems and international norms, the EU took the position that the Digital Service Tax does not violate the World Trade Organization (WTO)'s non-discrimination rule, and that the issue of double taxation can be at least partially resolved. In other words, according to the EU, the Digital Service Tax does not violate the non-discrimination rule because it applies to all countries inside and outside the EU, and that the double taxation issue can be partially resolved by permitting income deductions when imposing the tax.

The two proposals were subsequently submitted to the European Commission (EC) for approval. However, there was no EU-wide consensus on the adoption of the Digital Service Tax achieved. Countries such as Ireland, Sweden, and Denmark opposed the adoption of the tax out of concern about possible tax revenue reductions caused by the withdrawal of

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23 European Commission, Proposal for a COUNCIL DIRECTIVE on the common system of a digital services tax on revenues resulting from the provision of certain digital services, Brussels, 21.3.2018 COM(2018) 148 final.

multinational IT firms, and a trade conflict with the United States. Despite the failure to reach an agreement at the EU level, there have been a number of countries that have adopted the Digital Service Tax as their national tax.

The French government submitted a draft amendment for the Digital Service Tax in May 2019. The amendment was approved and effectuated by the French senate in July. The amendment's retroactive term began on January 1, 2019. The amendment provides for a 3% Digital Service Tax on digital firms having an annual global revenue not less than EUR 750 million, and an annual domestic revenue not less than EUR 25 million. Taxable services consist of digital platform services provided to users in France and online advertisements, as well as the sales of user data in connection with the services. To address the possible double taxation between the Digital Service Tax and the corporate tax, the amendment allows for considering Digital Service Tax payments when calculating corporate taxes. While reviewing the amendment, the French senate inserted a sunset provision that the amendment would expire in 2022.

The Office of the US Trade Representative (USTR) concluded that the French Digital Service Tax constitutes a discriminative measure against US firms,[24] to which the US is expected to respond by imposing up to 100% tariffs on 63 French imports, worth a total of USD 2.4 billion.[25]

In 2018, the British government announced its own digital service tax scheme, which imposes a 2% tax on the UK revenue of businesses having an annual global revenue over GBP 500 million and an annual domestic revenue over GBP 25 million. The proposal is expected to take effect in April 2020, after its approval by Parliament.

The British government listed social media platforms, search engines, and online marketplace services as taxable services. The British Digital Service Tax applies to transactions between businesses over certain sizes and British users. The government is also considering an alternative for less profitable businesses, where the tax rate is determined based on profit rates. The British government is not considering the deduction of Digital Service Tax payments from corporate taxes. However, the tax can be reportedly be deducted as business expenses.

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24 United States Trade Representative, *Report on France's Digital Service Tax Prepared in the Investigation under Section 301 of the Trade Act of 1974,* December 2, 2019, p. 76.

25 The tariffs are scheduled for imposition in mid-January after the opinion hearing process that ends in early January, 2020.

In addition, as listed in Table 2, Austria, Italy, and Spain are currently discussing the implementation of a Digital Service Tax. In contrast, Ireland, the Netherlands, Sweden, Belgium, and Denmark are not as welcoming toward the idea.[26] These countries seem to be concerned about the possibility of double taxation, which is endemic to business revenue taxation, as well as inefficiency, possible distortion of resource distribution in the market, and a possible conflict with the US—where many of the taxable businesses are located.[27]

Table 2_Current Status of Discussions on Digital Service Tax

Country	Status
EU	2019 1H: Finland announced that the EU will continue to discuss the adoption of a digital tax (July 3)
Austria	2019 July: Proposed a 5% tax on annual global and domestic revenues from online advertisements not less than EUR 750 million and EUR 10 million, respectively
Hungary	Adopted a 7.5% tax on annual advertisement revenue exceeding HUF 100 million (around USD 340,000); the EU Court of Justice is currently reviewing the tax for possible legal violations
Czech Republic	Proposed a 75% tax on online target advertisements of companies with annual global revenues exceeding EUR 750 million
Italy	Adopted a 3% tax on digital businesses with an annual global revenue exceeding EUR 750 million and an annual domestic revenue exceeding EUR 25 million (will take effect on January 1, 2021)
Spain	A Digital Service Tax proposal was rejected by the parliament; the government plans to re-submit the proposal
Sweden	Adopted a 6.9% tax on digital advertisements of companies earning not less than SEK 100,000 per year
Slovenia	The government plans to submit a Digital Service Tax proposal to the parliament by April 1, 2020

3. Discussions on the Tax Issues of the Digital Platform Economy in the OECD

The final report for the BEPS Action Plan was published in November 2015. Tax issues of the digital economy were covered by the Action 1 report, which unlike the other Action Plans, did not provide specific recommendations. It only mentioned a plan for an additional report that was scheduled to be completed in 2020. The difference seems to have stemmed from the difficulty in coordinating the different opinions among key participants of the BEPS project, because Action 1 not only covered issues related to BEPS such as double non-taxation, but also touched on possible revisions to existing taxation principles, regarding

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26 Cho, Gyu-beom and 6 others, "The Tax Issues and Challenges of the Digital Economy," Korea Institute of Certified Public Accountants, October 31, 2019, p. 121.

27 Ahn Jong-seok, "The Digital Economy and the Corporate Tax Policy—International Discussions and Policy Implications", *Public Finance Forum,* March 2019, p. 23.

the allocation of taxation rights, including the expansion of the permanent establishment concept.

Frustrated by the poor prospect of revising international taxation principles through the OECD, many countries have announced their own taxation measures, such as the Equalization Levy and the Diverted Profits Tax. In 2017, major European countries laid the tax issues of a Digital Service Tax on the table once again, and the EU officially announced its plan to proceed with the adoption of the Digital Service Tax in March 2018. This announcement fueled the current conflict between the US and Europe, and uncertainties worsened as individual countries came up with their own measures. In response, the OECD decided to include fundamental solutions to the tax challenges of the digital economy agreed upon by the participants of the BEPS Inclusive Framework in the additional report on BEPS Action 1 to be published in 2020.

Then, in March 2018, the OECD published "Tax Challenges Arising from Digitalisation – Interim Report 2018" and, based on this report, set out to develop alternatives regarding the reallocation of taxation rights that countries can agree on. The OECD proposed two approaches: solving issues pertaining to the digital economy by coming up with criteria for allocating taxation rights among countries (Pillar 1), and introducing comprehensive regulations on preventing base erosion (Pillar 2). The OECD plans to announce the final proposal by the end of 2020 after reaching agreements on specific issues. If consensus-based taxation criteria are not in place by the end of 2020, individual countries may then take uncoordinated unilateral tax measures, which may shake the foundation of any proposed international taxation criteria and ultimately have a negative effect on investments and economic growth across the world.

The agreement-based proposal covered by the OECD and the BEPS Inclusive Framework offers a fundamental solution for revising the existing international income taxation system. Even if an agreement is reached between the OECD and companies participating in BEPS Inclusive Framework, European companies are likely to abolish their domestic Digital Service Taxes. However, even if the OECD announces the proposal, it will take a considerable amount of time before it can be implemented as a part of national tax laws and international treaties. Therefore, the Digital Service Tax and other alternative taxes are expected to persist, at least in the short run.[28]

28 As for Korea, the country is negative toward the adoption of the digital service tax, on account of possible double taxation, possible conflict with the United States, and a possible transfer of burden to consumers.

IV. Economic Effects of Alternative Taxes

It will take considerable time before the OECD proposals will take effect. For this reason, many countries have engaged in active discussions on alternative taxes targeting digital businesses. Even if the participants of the OECD Inclusive Framework reach an agreement on the long-term taxation of the digital economy by the end of 2020, it will take more time before the proposals find their way into tax treaties and national tax laws and replace existing taxation schemes.

For this reason, it seems implausible that France, the UK, and other countries imposing or considering Digital Service Taxes will defer the imposition of the tax, which means Korean digital firms operating in those countries are required to pay the Digital Service Tax as long as they meet the specified requirements. As such, it is crucial to study the economic effects of both the Digital Service Tax and other alternative taxes. However, few empirical papers exist on this issue, because some of the alternative taxes, which have been mainly discussed within theoretical research, have never been implemented in any of the countries and countries have only recently begun to adopt the Digital Service Tax. For this reason, it is difficult to empirically analyze their effects through a reduced-form approach. Therefore, in this study, we analyze the effect of alternative tax schemes by developing a simple structural model of a search engine market, a key digital business type targeted by the alternative schemes, and then carrying out counterfactual experiments.

1. Alternative Taxes on Digital Platforms

Countries have been actively discussing temporary taxation schemes in attempts to address the tax issues of the digital economy. These temporary taxes can be understood as countries' attempts at circumventing the permanent establishment issue under the current international tax system, and protecting their taxation rights on profits generated within their jurisdictions. These are most actively discussed in countries in the EU and other regions in which revenues earned by multinational digital firms in their countries are not being sufficiently taxed.

(Ministry of Economy and Finance, "[Press Release] Briefing on the Imposition of the Corporate Tax (the so-called Google Tax) on Multinational IT Businesses in the EU and Other Regions," February 14, 2019, p. 4)."

A Digital Service Tax (revenue tax on digital firms) is one of the most actively discussed options. The Digital Service Tax is a fixed-rate tax on revenues generated by digital services such as online advertisements, sales of user data, and P2P platform services. The EU lists the taxable services as follows: 1) services that generate profits using user data, and 2) platform services that enable exchanges of goods and services among users. The tax rate proposed by the EU is 3% of the total revenues created from those services. The EU also proposed imposing the tax only on large digital firms having an annual global revenue exceeding EUR 750 million and an annual EU revenue exceeding EUR 50 million.

The digital transaction tax is imposed based on either the number of digital transactions (e.g., successful transactions on Airbnb) or the total value of transactions. It is mostly discussed as an alternative tax scheme for industries in which user-provided information plays a crucial role in profit generation. The digital transaction tax has been mostly discussed in academic research. For example, Belleflamme and Toulemonde (2018) theoretically analyzed the imposition of a specific tax or an ad valorem tax on platform usage, and the economic effects of the imposition of a unit tax on these transactions. Kind et al. (2008) theoretically analyzed the economic effects of the taxation of revenues from a monopolized two-sided market that generates profits through advertisements, and the imposition of a unit tax on outputs. Bourreau et al. (2018) compared the effects of various tax schemes, including a unit tax on transactions on digital platforms generating profits using subscriber information (taxation of advertisement revenues or subscription revenues), a unit tax based on transactions (number of advertisements or subscribers), and a unit tax on data. In particular, they developed a theoretical model aimed at testing the conclusions of Collin and Colin (2013), who stated that the national taxation of personal information may be the second best solution. The taxation of data, which has been proposed by Collin and Colin (2013) and others, is based on the view that some digital platforms (search engines, social network services, etc.) rely on data collected from users for profits, which is similar to the view held by the EU.

The literature mentioned above proposed taxation approaches that target businesses and platforms themselves, rather than the traditional approach of taxing corporate profits. As explained above, it is highly unlikely that these approaches will find permanent applications and become international norms. However, many countries are likely to impose temporary taxes (which includes Digital Service Tax) in order to address tax issues raised by digitalization. Therefore, we need to further analyze the effects of these taxation schemes separately from taxation based on the OECD proposals.

2. Model[29]

In this study, we developed a search engine market model to analyze the effects of the alternative tax schemes. We study the search engine market because search engines are one of the businesses where data and user participation having the greatest contribution to value creation. Search engines are also one of the digital business types listed by the OECD, and targeted by the temporary taxation schemes recently adopted by India and some European countries. In addition, the search engine market is a typical two-sided digital market, with indirect network effects.

To estimate the model, we made a number of assumptions for simplicity. First, we assumed that all revenues, transactions, and number of users in a jurisdiction are identified by the tax authorities, and that companies do not attempt international tax evasion when having alternative taxes imposed. All alternative tax schemes discussed here are designed as countermeasures to possible tax evasion by multinational digital firms, and taxes are imposed on tax revenue sources having limited cross-border mobility as a proxy for corporate income.

For this reason, we assume here a closed economy in which resources do not move between countries. We also assume that users on both sides of the market exclusively choose only a single platform (single-homing). Some researchers who have analyzed two-sided digital platforms (Rysman, 2004; Choi, 2016) assumed single-homing for users and multi-homing for advertisers. Argentesi and Filistrucchi (2007), however, assumed that both sides choose only a single platform (search engine).

As mentioned above, the search engine market is a typical two-sided digital market with both user-side and advertisement-side network effects. Advertisers enjoy greater utility from their advertisements when the user base grows. Indirect network effects also exist for users. However, the signs of these effects are unclear. If advertisements mostly convey valuable information, more advertisements result in a greater utility for users. On the other hand, if users gain negative utility from advertisements (i.e., advertisements are a "nuisance,") advertisements may have a negative indirect network effect on users. To account for these, we specifically considered indirect network effects when setting the demand function for each side.

Specifically, we used a nested logit model for the user-side demand function. A nested logit

29 The model used in this study is a modified version of the newspaper market model proposed by Argentesi and Filistrucchi (2007).

model offers the benefit of having a more realistic cross-price elasticity relative to standard logit models. The indirect utility function was then defined as follows.

$$u_{ijt}^{U} = X_{jt}^{U}\beta^{U} + A_{jt}\gamma^{U} + \xi_{j}^{U} + \zeta_{igt} + (1-\rho)\varepsilon_{ijt}^{U}$$

where X_{jt} are the observable characteristics of the search engine j. In a positivist analysis, these characteristics include the search quality and the total revenues of the search engine, excluding advertisement revenues. A_{jt} is the number of advertisements on the search engine j. This variable is included in the model in order to reflect the indirect network effect on users. We can verify whether the indirect network effect is positive or negative by looking at the sign of $\hat{\gamma}^{U}$. In addition, ξ_{j}^{U} are the unique characteristics of the search engine, ζ_{igt} refers to the utility experienced by consumers i for choosing a option in the g group, and ρ denotes the correlation between options within the group. A user first determines whether to use a search engine. Then, the user determines which search engine to use. Under the single-homing assumption, a user only selects a single search engine that provides the highest utility.

If we normalize the mean utility of outside options as 0, assume that error terms follow the type-1 extreme value distribution, and define $X_{jt}\beta^{U} + A_{jt}\gamma^{U} + \xi_{j}^{U}$ in the user utility function as the mean utility, and express it as δ_{jt}^{U}, the following equation is derived.

$$ln(S_{jt}^{U}) - ln(S_{ot}^{U}) = \delta_{jt}^{U} = X_{jt}^{U}\beta^{U} + A_{jt}\gamma^{U} + \rho ln(S_{jt}^{U}/S_{gt}^{U}) + \xi_{j}^{U}$$

In other words, the mean utility of each search engine can be calculated using the market share data.

Next, the advertiser-side indirect utility function is defined using a simple logit model,

$$u_{ijt}^{A} = \alpha^{A}p_{jt} + X_{jt}^{A}\beta^{A} + U_{jt}\gamma^{A} + \xi_{j}^{A} + \varepsilon_{ijt}^{A}$$

where p_{jt} is the advertisement price for a search engine j, X_{jt}^{A} are the observable characteristics of the search engine j, and U_{jt} are the number of employers on the search engine j. This variable is included in the model to reflect the indirect network effect from users to advertisers. In addition, ξ_{j}^{A} are the unique characteristics of the search engine that may affect the utility for advertisers. If we assume the distribution of error terms, and assume that

each advertiser only chooses a single platform in a given period, their probabilities of being chosen can be expressed as follows.

$$prob_{ijt} = \frac{\exp(\alpha^A p_{jt} + X_{jt}^A \beta^A + U_{jt}\gamma^A + \xi_j^A}{\sum_{k=0}^{J}(\alpha^A p_{kt} + X_{kt}^A \beta^A + U_{kt}\gamma^A + \xi_k^A)}$$

The mean utility of advertisers can be calculated using their market share data.

$$ln(S_{jt}^A) - ln(S_{ot}^A) = \delta_{jt}^A = \alpha^A p_{jt} + X_{jt}^A \beta^A + U_{jt}\gamma^A + \xi_j^A$$

Lastly, a search engine platform maximizes the following profit function.[30]

$$\Pi(p_j^A, p_j^U) = p_j^U y_j^U(P^U, Y^A(P^A)) + p_j^A y_j^A(p^A, Y^U(P^U)) - c_j^U y_j^U(.) - c_j^A y_j^A(.) - F_j]$$

The profits earned by a search engine consist of user-side profits and advertiser-side profits, where p_j^U is the price on the user side and p_j^A is the price on the advertiser side. In data, as all search engines provide services to their users free of charge, p_j^U is 0 and the direct revenue from users is also 0. However, to allow the possibility of search engines changing user-side prices after taxation (a negative value means paying subsidies to users), we expressed the profit function as above. User demand refers to the function of the user-side price vector and the advertiser-side demand vector (indirect network effect). Likewise, advertiser-side demand is the function of the advertiser-side price vector and the user-side demand vector (indirect network effect). In this case, c_j^U and c_j^A are the marginal costs of the respective sides (assumed to have constant values), and F_j is the total fixed cost of the search engine.

The first-order conditions derived from the profit maximization issue of search engines j are as follows.

$$FOC: (p^U): \quad p_j^U - c_i^U = -\frac{y_j^U}{\frac{\partial y_j^U}{\partial p_j^U}} - (p_j^A - c_j^A)\frac{\partial y_j^A}{\partial y_j^U} - \frac{(p_j^A - c_j^A)}{\frac{\partial y_j^U}{\partial p_j^U}} \sum_{i \neq j} \frac{\partial y_j^A}{\partial y_i^U}\frac{\partial y_i^U}{\partial p_j^U} \qquad \text{Equation (1)}$$

30 We omitted *t*, which represents time, for a simpler expression.

$$FOC:\ (p^A):\quad p_j^A - c_j^A = -\frac{y_j^A}{\frac{\partial y_j^A}{\partial p_j^A}} - (p_j^U - c_j^U)\frac{\partial y_j^U}{\partial y_j^A} - \frac{(p_j^U - c_j^U)}{\frac{\partial y_j^A}{\partial p_j^A}}\sum_{i \neq j}\frac{\partial y_j^U}{\partial y_i^A}\frac{\partial y_i^A}{\partial p_j^A} \qquad \text{Equation (2)}$$

The second and third terms of the first-order conditions for user prices denote the indirect network effects. The second term represents the effects of changes in demand for on-demand advertisements, and the third term represents the effect of increasing the user-side price pertaining to the demand for the competitive platform and the users' demand for advertisements. The second and third terms of the first-order conditions for advertisement prices also represent indirect network effects.

3. Data

We mainly collected data from Statista (statista.com).[31] Specifically, we used the market share of search engines in the US search engine market (quarterly data, 2013 1Q–2019 2Q, desktop PCs), and the advertisement prices of GoogleAds and BingAds (Microsoft Advertising) (cost-per-click, CPC), and median values. Google and Bing charge users every time they click on advertisements. As it is impossible to ascertain the CPC for each advertiser, so we set the median CPC as the advertisement price for each quarter.

Estimating an advertiser-side demand model requires calculating market shares using the advertising quantity of each search engine. However, this data is not publicly available. Instead, we calculated the advertising quantity using the quarterly advertisement revenues and media CPC of each search engine.

As observable characteristics for the search engine, we used the quality scores of each search engine and their revenues, excluding revenue from advertisements. Quality scores are not announced for each quarter; the resulting missing data were filled with scores from the closest period. We considered Google and Microsoft revenues, excluding advertisement revenues, as users' utility from content other than search functions. Here, a larger revenue implies that the platform is a more attractive option for users.

In the model, we considered only two search engine providers: Google and Bing; we

31 Statista provides national, corporate, and personal survey data regarding e-commerce, digital advertisements, digital media, and other digital markets.

included the use of other search engine platforms and not using search engines at all in the outside option category. A look at the market share trends of search engines shows that Google comprises the absolute majority of the markets, with Bing and Yahoo reporting similar market shares. However, we excluded Yahoo from the analysis due to the lack of CPC data between 2013 and 2019.

Table 3_Summary Statistics

	Mean	Median	Min	Max	Standard deviation
No. of users (million)	581.06	364.00	24.00	1520.00	535.42
CPC ($)	1.78	1.60	0.23	4.56	2.54
Search Engine Market Share (%)	46.58	46.29	3.19	90.47	42.50
Advertisement revenue (billion)	13.84	10.05	0.61	32.50	11.73
Revenue excluding advertisement revenue (billion)	12.23	12.71	1.65	32.47	10.28

Note: Market share represents shares in the search engine market. When estimating the model, we re-calculated the market share including the outside options.
Source: Present study

4. Estimation and Findings

We estimated the model using the method proposed by Argentesi and Filistrucchi (2007). We set the outside options for the user side and the advertiser side as follows. First, for the user side, we adjusted the search engine market share by including the percentage of non-usage based on the search engine use survey findings. However, the surveys used for non-usage were not conducted quarterly during the analysis period; we filled in the missing data using findings from the survey closest to the relevant quarter. As for the advertiser side, we considered all ads including offline advertisements. The quantity of offline advertisements was calculated using the ratio of online advertiser revenue against the total advertisement revenue in the US. That is, we calculated market shares by defining the total advertisement quantity as the sum of online advertisements and offline advertisements.

In general, as the price is endogenously determined in the demand system, if we do not account for the endogeneity problem, the estimated regression coefficients will be biased. To address this issue, Berry (1994) and Berry et al. (1995) proposed controlling for the endogeneity of prices by using the observed characteristics of competitors. Google's observed characteristics do not affect the utility that consumers get from Bing. However, they can affect Bing's prices through a competition between the two firms. In such a case, the

observed characteristics of the competitor will be a valid instrument for prices. However, in this study, the user side demand model does not explicitly consider prices, because the search engine platforms included in the data provide users with services for free. Previous studies on digital platforms, suggest that advertisement quantity plays the role of "effective price." In other words, digital platform users are negatively affected by advertisements (i.e., "advertisements are a considered a nuisance"). Hence, we estimated the demand model by instrumenting for the user side variable of advertisement quantity and the advertiser side variable of advertisement prices.[32]

Table 4_Demand Model Estimation (User side)

	OLS logit (1)	IV logit (2)	IV nested logit (3)
Search quality	0.107**	0.198**	0.084**
Revenues excluding advertisement	0.072***	0.091***	0.206*
No. of advertisements	0.008	-0.019*	-0.062**
Constant variables	2.573***	2.519***	1.077**
ρ	-	-	0.309*
Quarterly fixed effect	Y	Y	Y

Note: *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study

Table 4 shows the findings of the user-side demand model estimation. We used three models: a simple logit model, a simple logit model with IV, and a nested logit model with IV. A comparison of the estimates from the three models shows that, while the regression coefficient for the number of advertisements has a negative value in models using instrumental variables, the first model shows positive values. As explained above, previous studies suggested that digital platform users gain negative utility from advertisements. Estimation results from the first model indicate that the endogeneity problem was not properly controlled in the model. In contrast, the second and third models display findings

32 We excluded Yahoo in the outside option on account of the lack of data regarding its advertisement prices. However, when estimating the demand model by generating instrumental variables with using the characteristics of the competitor other than Yahoo (Bing for Google, and Google for Bing), the signs of the estimated coefficient variables were somewhat non-intuitive in some cases. For this reason, we generated the instrumental variables using Yahoo's observable characteristics (revenues excluding advertisements, and search quality).

that are consistent with those of previous literature. That is, when the number of advertisements increases, the utility for platform users declines. The findings can be read as indicating negative network effects from the advertiser side to the user side. Estimations of the other explanatory variables were similar between the second and the third models. These findings thus suggest a positive effect of the search quality and "revenues excluding advertisements" on users' utility. In addition, which is the coefficient for preference correlation within the search engine group in the nested logit model (third model), was estimated to have a significantly positive value.

Table 5_Demand Model Estimation (Advertiser side)

	OLS logit (1)	IV logit (2)
Search quality	0.059**	0.156*
Revenue excluding advertisements	0.034*	0.048
Advertisement price	-0.103**	-0.577**
No. of users	0.005**	0.006***
Constant variables	1.546*	0.871
Quarterly fixed effect	Y	Y

Note: *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study

The estimation of the advertiser side demand model showed that an increase in the advertisement price reduced the utility for advertisers more in the second model which uses IV, than in the first model. In addition, the regression coefficient for the number of users had a significantly positive value, which confirms the existence of positive network effect, in which an increase in the number of users raises the utility for advertisers.

Lastly, the marginal costs for the respective sides of the search engine market were calculated by applying the demand model estimates and data to Equations (1) and (2) above. Note that the marginal costs on the user side cannot be calculated using a single value, because the regression coefficient and price elasticity for "user side prices" were not estimated in the user side demand model. Hence, we calculated the marginal costs imposing specific values for the user side price elasticity.

Before presenting the findings on taxation effect, we first discuss the limitations of the models considered in this study. First, due to the limited availability of data, the models over-simplified the market. We excluded Yahoo, one of the main players in the US search

engine market, from users' choice set. We also considered a very limited lists of observed characteristics for each search engine. In addition, even though users and advertisers typically use more than one search engine (multi-homing), we imposed a single-homing assumption for both sides. As such, the consumer demand model failed to explicitly consider the heterogeneity of consumer preference, which resulted in rather unrealistic price elasticities. In addition, as no user side prices were observed, we had to conduct our analysis by assuming that the given user price elasticity falls within the reasonable range.

5. Effects of Alternative Taxation Schemes

In this section, we use the model estimates to analyze the potential economic effects of alternative tax schemes via counterfactual experiments. It should be noted, however, that the aforementioned limitations of the model restrict the significance of the quantitative results of this analysis. For this reason, we only present the results of a "relative" comparison between the alternative tax schemes analyzed in this study.

Specifically, we considered three options: 1) taxation of a platform's total revenues (Digital Service Tax); 2) an ad valorem tax on advertisement transactions (taxation based on the total worth of advertisement transactions), and; 3) a unit tax on advertisement transactions (taxation based on the number of advertisements). We assume that no other tax is imposed in the benchmark economy. Even though there exist corporate taxes in real-world situations, we can consider as firms have no corporate taxes imposed because they do not operate permanent establishments in the region. We also assumed that the Digital Service Tax is imposed on the total revenues of a platform. We then considered imposing an ad valorem tax on advertisement transactions, where the worth of user side transactions is not subject to taxation. In other words, even when a digital platform changes its behavior by applying a positive price on the user side, we assumed that transactions among users are not taxed. In cases where it is not permitted to apply an explicit price on the user side ($P^U = 0$), the ad valorem tax on national transactions will have the same effect as the Digital Service Tax. Lastly, we considered a unit tax based on the number of advertisement transactions. As was the case above, user-side transactions are not taxed.

The profit function of each search engine perform under the three options are expressed as follows.

Table 6_Platform Profit Function by Tax Scheme

Taxation of platform revenues (Digital Service Tax)
$\Pi(p_j^A, p_j^U) = (1-\tau)p_j^U y_j^U(P^U, Y^A(P^A)) + (1-\tau)p_j^A y_j^A(p^A, Y^U(P^U)) - c_j^U y_j^U(.) - c_j^A y_j^A(.) - F_j$
Taxation based on advertisement transaction values (ad valorem tax)
$\Pi(p_j^A, p_j^U) = p_j^U, y_j^U(P^U, Y^A(P^A)) + (1-\tau)p_j^A y_j^A(P^A, Y^U(P^U)) - c_j^U y_j^U(.) - c_j^A y_j^A(.) - F_j$
Taxation based on number of advertisement transactions (unit tax)
$\Pi(p_j^A, p_j^U) = p_j^U, y_j^U(P^U, Y^A(P^A)) + (p_j^A - \tau)y_j^A(P^A, Y^U(P^U)) - c_j^U y_j^U(.) - c_j^A y_j^A(.) - F_j$

Source: Present study

The counterfactual experiments were conducted as follows. First, we re-calculated the first-order conditions of the search engine profit function for each scheme, i.e., we calculated the equilibrium price after fixing the demands on both sides at the pre-taxation levels. To calculate the equilibrium price, we fixed the values of the tax rates of the respective schemes and the user side price elasticity. We then calculated and applied the items included in the first-order conditions, directly from the demand model estimates on both sides.[33] Thus, we re-calculated the demands under the new equilibrium price, which we subsequently used to calculate consumer welfare, advertiser welfare, platform profits, and tax revenues.[34]

We next explain the criteria for comparing the three tax schemes. To assess the economic effect of alternative tax schemes, we compare "decrease in welfare to achieve the given amount of tax revenue." The alternative tax schemes analyzed in this study are designed to impose taxes on profits generated within the relevant country. They can be understood as measures used to prevent international tax evasion. For this reason, a comparison of tax revenues among the alternative tax schemes does not seem to be relevant. A more interesting approach would be to compare the welfare costs of achieve the same amount of tax revenues.

Results of the social welfare comparison are presented in Table 7. The user (consumer) welfare was the highest when adopting a unit tax on advertisement transactions, followed by

33 We used the estimates from the third model for user side demand and the second model for the advertise side demand.

34 Under a logit (simple and nested logit) model, calculations for the monetary value of user-side consumer welfare requires a regression coefficient for the user price estimated from the demand model. As we did not consider explicit prices in the demand models, we measured changes in user side welfare using the regression coefficient for assumed user prices derived from the user side price elasticity.

a unit tax on advertisement transactions, and the Digital Service Tax. As the demand estimation results suggest, users gain negative utility from advertisements. The counterfactual experiment shows that the quantity of advertisements declined the most under the unit tax scheme. The Digital Service Tax and the ad valorem tax schemes showed the same level of user welfare when high value of user side price elasticity was assumed. When low value of elasticity was given, the user price under the Digital Service Tax scheme was greater than zero, resulting in lower user welfare. The ranking for advertiser welfare was the exact opposite. With sufficiently low user price elasticity, the Digital Service Tax resulted in positive user side prices, which reduced the number of users. These findings indicate a decline in advertiser welfare because, for advertisers' welfare increases with the number of users. However, the advertisement price under the Digital Service Tax scheme was lower than the ad valorem tax scheme, which increased the advertiser welfare.

Our analysis showed that the absolute value of the increase in advertiser welfare exceeds that of the decrease in advertiser welfare, which indicates a higher level of advertiser welfare under the Digital Service Tax scheme. Platform (search engine) profits were the highest under the Digital Service Tax scheme, followed by the ad valorem tax scheme and the unit tax scheme. Lastly, the total social welfare (user welfare, advertiser welfare, and platform profits combined) was also the highest under the Digital Service Tax scheme, followed by the ad valorem tax scheme and the unit tax scheme. These findings indicate that the Digital Service Tax is the most effective option for minimizing the overall social cost for achieving a certain level of tax revenue. However, the level of platform user welfare was the lowest under the Digital Service Tax scheme, which indicates the shifts of tax burden from the digital platform to consumers were the largest.

Table 7_Effects on Social Welfare by Tax Scheme

Item	Findings
User welfare	Unit tax > ad valorem tax > Digital Service Tax
Advertiser welfare	Digital Service Tax > ad valorem tax > unit tax
Platform profits	Digital Service Tax > ad valorem tax > unit tax
Total social welfare	Digital Service Tax > ad valorem tax > unit tax

Notes: 1. A calculation of each welfare item assuming all possible combinations of own-price elasticity of platform use (-1, -1), (-1.5, -1.5), (-2, -2) and cross-price elasticity (1.25, 1.25), (1.75, 1.75), (2.25, 2.25) showed the same relative ranking.
2. Each number represents the welfare (profit) rank among the three schemes, with 1 indicating the highest rank in the relevant welfare item.

Source: Present study

V. Conclusion and Implications

In this study, we summarized the tax issues and economic changes caused by advances in digital technologies, and discussed tax measures to address these issues. In particular, we looked at an overview of the actions taken by individual countries and international organizations, and then analyzed the economic effects of the alternative tax schemes.

The OECD and the BEPS Inclusive Framework are currently working on a fundamental solution for the tax issues arising from digitalization, with a target year of 2020. However, as considerable time remains prior to the actual implementation of these potential tax schemes, various countries have been pursuing alternative tax schemes, led by European countries that are net importers of digital services such as social network services and search engine services. For this reason, analyzing the economic effects of these alternative tax schemes is of great importance.

Despite the necessity, however, this study is limited by the small number of countries currently adopting alternative tax schemes, the short history of the schemes, and the limited access to data required for a structural model analysis. Nevertheless, the significance of this study lies in the fact that it is one of the early efforts to empirically understand the effects of alternative tax schemes. Here, we developed a model for the US search engine market, and empirically analyzed the effects of the Digital Service Tax, the ad valorem tax on advertisement transactions, and the unit tax on advertisement transactions.

According to our findings, the unit tax incurred the highest social cost required to achieve the given amount of tax revenue, followed by the ad valorem tax and the Digital Service Tax. In other words, among the three schemes, the Digital Service Tax incurred the lowest economic costs. But at the same time, the welfare of search engine users was the lowest under the Digital Service Tax scheme implying that significant part of tax burden is shifted from digital platforms to users.

Caution is advised when interpreting these findings, however, because the results are based on rather strong assumptions. We imposed single-homing assumption on both sides of the market and due to the data limitations, we could not explicitly consider the heterogeneity of users or advertiser preferences when estimating the demand functions of the two sides, or consider various observable characteristics of the search engine platforms. Lastly, as the analysis is for the US search engine market, one should note that the findings may be different for other business types or countries.

As many countries are expected to consider alternative tax schemes in the near future,

research on their economic effects should be further studied. As some countries such as France has adopted a Digital Service Tax, it may be possible to empirically study the effect of Digital Service Tax via reduced form approach after sufficient time has passed. Also, when the long-term solutions by the OECD are specified, further study will be needed. We leave these issues for future studies.

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Understanding the Relationship between Household Income and Youth Economic and Non-Economics Outcomes

Moon Jung Kim*

I. Introduction

Youth unemployment is emerging as a critical issue in many countries, including European countries that are currently recording unprecedented unemployment rates. Korea is no exception.[1, 2] Notably, the majority of unemployed youths in Korea are highly educated. As such, the youth unemployment in Korea is not an issue that can be simply solved by boosting the labor supply. In addition, the issue is closely related to other social issues such as low fertility rate and the deterioration of local communities outside the Seoul Capital Area (SCA). To

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1 According to the Organisation for Economic Co-operation and Development (OECD), after reaching a peak during the Global Financial Crisis in 2008 and 2009, the global youth unemployment rate has been showing signs of recovery since 2015. However, as of 2018, the youth unemployment rate among OECD members is still above the pre-Global Financial Crisis level. The average rate among OECD member states was 11.7% in 2018, which is similar to the rate in Korea (11.07%). Germany and Japan reported below-average rates at 7.10% and 4.11%, while the Italy and Spain showed the highest rates at 30.40% and 35.27%. (Source: OECD Statistics Youth unemployment rate)
OECD Statistics Youth unemployment rate) doi: 10.1787/c3634df7-en (Accessed on August 12, 2020)

2 Even though the United States has seen fairly low youth unemployment rates in recent years, the federal government implemented numerous policies to reduce youth unemployment in the past, including the Youth Employment and Demonstration Projects Act of 1977.

ensure sustainable growth, Korea needs to make addressing youth unemployment its top priority.

To this end, Korea's central and local governments have implemented a wide range of policies for youth workers. A recent trend in these policies is an increase in financial support. For example, under the Tomorrow Mutual Aid for Young Employees, the central government provides cash subsidies to young workers who work at small and medium enterprises (SMEs) for a specified duration. The program is aimed at encouraging young workers to seek jobs, and narrowing the wage gap between large enterprises and SMEs. Local governments also provide sizable cash subsidies to young workers. The difference in local government subsidies is that many are unconditionally granted as long as the applicants meet certain requirements. For example, the Youth Dividend policy in Seongnam provides KRW 1 million each year to each Seongnam resident aged 26 or older.

There are numerous issues that need to be cleared before these cash subsidy policies spread further. The core issues include:

- What effects can young workers, their families, local communities, and the nation as a whole expect from the cash subsidy policies?
- Do actual data substantiate such effects?
- How should we assess the effectiveness of cash subsidy policies?
- What is the right way to secure financial resources for the cash subsidy policies?
- Is it right to provide cash regardless of recipients' income or assets? If not, what conditions should be imposed?
- Is it right to provide young workers with cash subsidies rather than subsidies in kind or services? What is the appropriate percentage of cash subsidies?
- What are the roles of the central and local governments with regard to the cash subsidy policies?[3]

Unfortunately, there are not many sources that may serve as references for the above issues. These lack of references can be attributed to the fact that cash subsidy policies are relatively new additions to employment policies, and there has simply not been enough time and data for appropriate policy evaluation.

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3 Rees (1986) and Ashton et al. (2016) provide good insights into the youth employment market issue.

Despite these limitations, in this study we attempt to answer some of the questions posed toward unconditional cash subsidy policies for young workers at the local government level. The ideal approach would be to directly assess the effects of these unconditional cash subsidy policies. However, in this study, we first look into whether cash subsidies can affect the economic and non-economic outcomes for young workers.

Specifically, we examine whether household income levels affect young workers' success in the labor market. If household income levels do not affect young workers' employment, we can infer that a cash subsidy policy would have a low effect on young workers' success in the labor market.

II. Background

1. Youth Employment Policies Under Previous Administrations

Table 1 highlights youth employment policies under past administrations. Each administration proposed at least one or two youth employment initiatives every year, which suggests that youth unemployment has been a key economic issue for all administrations.

The youth employment policies are not significantly different from each other, however. For example, attempts to reduce youth unemployment through overseas employment have been made under the Rho Mu-hyun administration (Overseas Employment Promotion Initiative), the Lee Myung-bak administration (Global Youth Leader Fostering Plan), and the Park Geun-hye administration (Overseas Youth Employment Promotion Plan). The Job Creation Initiative for Young Workers announced by the Moon Jae-in administration on March 15, 2018 also included a plan for fostering overseas local experts as a means to help young Koreans find employment outside the country (Ministry of Economy and Finance, 2018).[4]

Another noteworthy aspect found in many of the policies across all administrations has been the focus on a "mismatch" between young workers and SMEs. The Lee Myung-bak administration announced its plan to alleviate workforce mismatch between young workers and SMEs, as did the Park Geun-hye administration with its Initiative for the Alleviation of Labor Supply-Demand Incongruence for SMEs. Similar items can be found in the Youth

4 Ministry of Economy and Finance, "Job Creation Initiative for Young Workers," Press Release, March 15, 2018.

Employment Promotion Initiative (January 2005)[5] and the Employment Promotion Initiative for Young Workers Without a College Diploma (April 2006)[6] of the Rho Mu-hyun

Table 1_Youth Employment Policies by Administration

Year/month		Title	Scope
Rho Mu-hyun	Sep. 2003	Comprehensive Youth Unemployment Initiative	Comprehensive
	Mar. 2004	Enacted Special Act on the Mitigation of Youth Unemployment	
	Jan. 2005	Youth Employment Promotion Initiative	Comprehensive
	Mar. 2016	Overseas Employment Promotion Initiative	Limited
	Apr. 2006	Employment Promotion Initiative for Young Workers Without College Diploma	Limited
	Apr. 2007	Status of Youth Unemployment Initiative and Future Plans	Comprehensive
Lee Myung-bak	Apr. 2008	Young Global Leader Fostering Plan	Limited
	Aug. 2008	Youth Employment Promotion Initiative	Comprehensive
	Mar. 2009	Supplementary Youth Employment Initiative	Comprehensive
	Oct. 2009	Act revised to Special Act on the Promotion of Youth Employment	
	Dec. 2009	Initiative for Alleviation of Workforce Mismatch Between Young Workers and SMEs	Limited
	Oct. 2010	1st Create Tomorrow for Young Workers Project	Comprehensive
	May 2011	2nd Create Tomorrow for Young Workers Project	Comprehensive
Park Geun-hye	Oct. 2013	Initiative for Alleviation of Labor Supply-Demand Incongruence for SMEs	Limited
	Dec. 2013	Job Creation Initiative for Young Workers	Comprehensive
	Apr. 2014	Phased Youth Employment Initiative	Comprehensive
	Nov. 2014	Plan for Promotion of Overseas Youth Employment	Limited
	Jul. 2015	Initiative for Alleviation of Employment Cliff for Young Workers	Comprehensive
	Nov. 2015	Initiative for Promotion of Overseas Youth Employment	Limited
	Apr. 2016	Plan for Reinforced Linkage Between Youth and Women Employment	Limited
Hwang Kyo-ahn (Acting President)	Mar. 2017	Review and Improvement of Youth Employment Initiative	Comprehensive
Moon Jae-in	Oct. 2017	Five-Year Job Creation Policy Roadmap	Comprehensive
	Mar. 2018	Job Creation Initiative for Young Workers	Comprehensive

Source: Based on Han (2017), p. 95, Table 6-1; added the latest policies.
Ministry of Employment and Labor (January 2005; December 2015; December 2018); Relevant Government Bodies (March 22, 2017; March 15, 2018; December 2017); National Law Information Center, http://law.go.kr/main.html, accessed on September 30, 2019.[7]

5 Ministry of Employment and Labor, "Youth Employment Promotion Initiative - Focused on the Facilitation of Implementation at Schools and in the Labor Market," January 2005.

6 Ministry of Employment and Labor, "Employment Promotion Initiative for Young Workers Without College Diploma (Finalized Draft of 7th Party-Government Special Committee on Job Creation)," June 13, 2006.

administration. The Moon Jae-in administration, after its inauguration, launched the Tomorrow Mutual Aid for Young Employees to encourage young workers to remain at SMEs, and greatly expanded the Youth Employment Incentives provided to SMEs and middle-standing enterprises hiring young workers.

The Moon Jae-in administration stressed one solution to job creation issue was through the public sector, as exemplified by one of its key campaign pledges, "810,000 Jobs in the Public Sector." However, creating more jobs for young workers in the public sector was already proposed under the Lee Myung-bak administration. The 1st Creating Tomorrow for Young Workers Project included the preemptive creation of jobs for young workers at public institutions.

Other noteworthy job creation policies for young workers included the improvement of public employment service to alleviate mismatches in the labor market, provisions of employment information, and promotions of startups by young entrepreneurs.[8]

Granted, each administration added its unique flavor to the policies. The Rho Mu-hyun administration proposed a reform for its national employment support services, which involved: emphasizing services tailored to beneficiaries, dispatching government employees to employment support centers, and filling customer counselling positions with government employees in professional service (Kim and Jung, 2013). The administration also launched one-stop services at employment support centers, and attempted to decentralize employment governance.

The Rho administration also proposed numerous bills to resolve the youth employment

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7 Ministry of Employment and Labor, "Youth Employment Promotion Initiative - Focused on Facilitation of Implementation at Schools and in the Labor Market," January 2005.
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8 Korea SMEs and Startups Agency, https://start.kosmes.or.kr/yh_ysi020_001.do, accessed on June 13, 2019.

issue. In June 2004, the Special Act on the Mitigation of Youth Unemployment (short form: Youth Employment Act) was enacted. The purpose of the Act was to expand the employment of young workers and help them develop vocational skills through training programs in and outside of Korea, thereby mitigating youth unemployment and ultimately contributing to sustainable economic growth and social stability (Article 1 (Purpose)). The key provisions of the Special Act included: Article 3 (Duties of the State and Local Governments for the Promotion of Youth Employment); Article 4 (Duties of Government-Invested Institutions and Business Entities in the Private Sector); Article 6 (Expansion of Employment in the Public Sector, etc.); Article 7 (Support for SMEs Hiring Young Workers); Chapter 3 (Vocational Skill Development Training for Unemployds, etc.); and Chapter 4 (Announcement of Youth Unemployment Administrative Support System. The Rho Mu-hyun administration also set up the Special Presidential Committee on Youth Unemployment, which was abolished in 2008, during the Lee Myung-bak administration (February 29, 2008).

The effective term of the Special Act on the Mitigation of Youth Unemployment was scheduled to end on December 31, 2008. However, to mitigate youth unemployment during the Global Financial Crisis, the term was extended by five years, to December 31, 2013.

In October 2009, the Act was renamed to the Special Act on the Promotion of Youth Employment, to emphasize the positive role of the Act in attracting young workers to the labor market. At the same time, the government established the Special Committee for the Promotion of Youth Employment under the Ministry of Employment and Labor (MOEL). Unlike the Rho administration, which established a similar organization as a presidential committee, the Lee administration built its system to focus on the implementation of youth employment policies under the MOEL.

In 2014, under the Park Geun-hye administration, an amendment to the Special Act on the Promotion of Youth Employment was enacted, which "required" public institutions and local public corporations to hire unemployed young workers. Under the amended Act, public institutions and local public corporations were required to fill at least 3% of their positions with unemployed young workers each year, and youth employment results were included as an item for evaluating the management of public institutions and local public corporations. The amendment was originally set to expire on December 31, 2016. However, on January 1, 2017, the term was extended to December 31, 2018. On December 31, 2018, during the Moon Jae-in administration, the effective terms of Article 5 (Mandatory Hiring of Young Workers by Public Institutions) and the Act itself were again extended—by five years and three years, respectively.

2. Overview of Recent Youth Employment Policies

The Moon Jae-in administration put forward job creation as one of its main missions. In fact, the budget for job creation policies has significantly increased under the current administration. For example, the annual budget of the MOEL increased to KRW 19 trillion in 2018, and KRW 23 trillion in 2019. One of the iconic youth employment policies of the Moon Jae-in administration is the Government-Wide Job Creation Plan for Young Workers, which was announced on March 15, 2018 (MOEL, December 2018). In addition, numerous youth employment policies have been adopted on the local government level. This section examines the latest youth employment policies of the central and local governments.

A. Job Creation Policies for Young Workers at the Central Government

Most of the youth employment policies pursued by the Moon Jae-in administration are found in the Government-Wide Job Creation Plan for Young Workers, which was announced on March 15, 2018. Two of the most prominent examples are the Youth Employment Incentive and the Tomorrow Mutual Aid for Young Employees. The Youth Employment Incentive program grants employment incentives to businesses for each young worker employed. Under the program, the government initially planned to pay for the wages of every third young workers employed by a business entity. However, due to low participation, the government removed the requirement to hire two young workers first, but decided to grant incentives for each new young worker employed.

The Tomorrow Mutual Aid for Young Employees was created by redesigning the former Tomorrow Mutual Aid under the Ministry of Startups and SMEs (MSS) to shift its focus to young workers. The Tomorrow Mutual Aid for Young Employees was aimed at matching SMEs with job-seeking young workers on a continuous basis. After two or three years of employment, a young employee at an SME could deposit their contributions into the Mutual Aid. Specifically, when a young full-time employee at an SME deposited KRW 3 million over two years, the government and the enterprise would match it with KRW 6 million and KRW 3 million, respectively. In the end, after two years of employment, the employee would receive KRW 12 million. Owing to the supplementary budget in 2017, the government raised the target amount of the fund to KRW 16 million. After the approval of the supplementary budget in May 2018, a three-year mutual aid plan was added to the existing two-year plan.

Tomorrow Mutual Aid for Young Employees shared a similar framework to the SME Internship Program for Young Workers. The difference is that the latter had the government

provide financial support to business establishments hiring young interns, whereas the former provided benefits to young workers rather than businesses. The Youth Intern program expired in 2017.

Another noteworthy policy was the Job Seeking Promotion Allowance for Young Workers. As part of its job creation pledge, the Moon Jae-in administration announced a plan to develop the program into a Korean version of unemployment aid.[9] In keeping with this pledge, the administration included it in its Employment Success Package under the supplementary budget plan in 2017. Later, the government decided to implement the program as an independent program, separate from the Employment Success Package.

In other programs, the government directly employed young workers. However, these "direct employment" programs were found to be largely ineffective. However, unlike similar programs under the previous administrations, which did not specify the target percentage of employees in certain age groups, the Moon Jae-in administration defined the target percentage of young workers among the employees hired under the programs. Table 2 lists direct employment programs in which the target percentage of young workers is 50% or higher.

Table 2_Central Government Direct Employment Programs for Young Workers (2018~2019)

Ministry		Title	Launched in	
			2018	2019
1	MOEL	SME Internship for Young Workers	√	-
2	MOE	Global On-the-Job Learning Program	√	-
3	MOLIT	Overseas Infrastructure Market Development (young global leader fostering)	√	-
4	MOLIT	Aviation Expert Training (support for aviation internship)	√	-
5	MAFRA	Support for Agricultural/Rural Education/Training (support for overseas agriculture/food internship)	√	-
	MAFRA	Support for Agricultural/Rural Education/Training (support for employment at agricultural corporations)	-	√
6	RDA	Support for Agricultural Technology Development Overseas (ODA)	√	√
7	MCST	Support for Museum Promotion (employment at registered private museums)	√	√
8	MCST	Artistic Human Resource Fostering 2 (re-education of artistic human resource; training of culture and art organization trainees)	√	√
9	MCST	Culture and Art Education Promotion (support for art teachers at schools and welfare facilities)	√	√
10	MCST	Promotion of people's right to cultural enjoyment	√	-

9 Online Youth Center, https://www.youthcenter.go.kr, accessed on September 30, 2019.

Table 2_Central Government Direct Employment Programs for Young Workers (2018~2019) (continued)

Ministry		Title	Launched in	
			2018	2019
11	MCST	Support for Life Sports Programs (support for life sports instructor activities)	√	√
12	MCST	Support for Life Sports Promotion for the Disabled (life sports support for the disabled)	√	-
13	MCST	Support for sports instructors at primary schools	√	√
14	MSIT	Operating expense support for national science/technology research societies (R&D; human resource development program tailored to government-invested institutes)	√	√
15	KFS	International cooperation in forestry (support for overseas forestry internship)	√	√
16	MOFA	Human resource development for overseas volunteer groups and ODAs	√	-
17	MOIS	Support for volunteer work promotion (Gyeongsang) (support program for volunteer coordinators)	√	√
18	MAFRA	Diversification of Agriculture/Food Export Markets (Agrifood Frontier Leader Organization)	-	√
19	MOWH	Investment in Local Social Services and Job Creation (Youth Local Community Service Group)	-	√
20	MOF	Overseas Fishery Market Development Program (Youth Export Frontier Group)	-	√
21	MOIS	Youth Internship Using Big Data at Public Institutions (support for public provision of public data and expansion of user base)	-	√
22	MOIS	Local Job Creation Programs for Young Workers (support for local policies; linkage to employment in private sector)	-	√

Note: Listed programs in which the target percentage of young participants is 50% or higher.
Source: National Assembly Bill Information System, Government Budget Plan, likms.assembly.go.kr/bill/main.do, accessed on September 30, 2019. Present study, based on action plans from each government body attached to each annual plan.

B. Youth Employment Policies at the Local Government Level

Youth unemployment is also an important issue at the local government level. An increasing number of local governments are launching allowance programs for young workers, starting with Seoul's Youth Allowance and Seongnam's Youth Dividend. Table 3 lists support policies for young workers at the local government level in 2019. These programs share two characteristics. First, local governments tend to grant allowances based on the level of difficulty in finding jobs, rather than being based on income levels, whereas the central government grants allowances based on income levels. Second, a good number of these programs provide young workers with local currency. This approach is aimed at revitalizing local economies through the youth employment programs.

Table 3_Youth Employment Support Policies at the Local Government Level (as of 2019)

Local Government and title	Type of support	Amount	Length	Scale (no. of beneficiaries)	Eligibility or selection criteria
Seoul, Youth Allowance[1)]	Debit card (submit 4 self activity reports per month)	KRW 500,000 /month	Three months –Six months	Around 4,000	Aged 19~34; lives in Seoul (as of the announcement date); unemployed; more than two years after graduation (below 150% of median income)
Busan, Job-Seeking Activity Allowance for Young Workers (Youth Stepping Stone Card)	Debit card (submit monthly job-seeking activity reports)	KRW 500,000 /month	Six months	600	Aged 18~34 as of the announcement date; lives in Busan; unemployed; more than two years after graduation /dropout (120% of median income or lower)
Incheon, Dream Check Card	Debit card (submit monthly job-seeking plans and result reports)	KRW 500,000 /month	Up to six months	Around 250	Aged 19~39 as of the announcement date; lives in Incheon (during the program period); more than two years after graduation (150% of median income or lower)
Daejeon Youth Employment Hope Card	Welfare points	KRW 500,000 /month	Six months	2,500	Aged 18~34 as of the announcement date; lives in Daejeon for 6 moth or longer; more than two years after graduation/dropout or senior at university/graduate school (including students on leave) (below 150% of median income)
Gyeonggi-do Youth Basic Income (Youth Dividend)	Local currency	KRW 250,000 per quarter (1 million per year)		175,000	Aged 24; lived in Gyeonggi-do for at least 3 years as of the application date (no income requirement)
Gyeongsangbuk-do Young Worker Happiness Card	Welfare points	KRW 1 million per year		1,360	Aged 15~39; lives in Gyeongsangbuk -do as of the application date; worked at an SME in Gyeongsangbuk-do for at least 3 months (average monthly age: KRW 2.5 million (KRW 30 million yearly))
Seongnam, Youth Basic Income (Youth Dividend)	Local currency	KRW 250,000 per quarter (1 million per year)		12,986	Aged 24; lived in Gyeonggi-do for at least 3 years as of the application date (no income requirement)
Jeollanam-do Job Seeking Activity Allowance for Young Workers	Debit card (submit monthly job-seeking activity report)	KRW 500,000 /month	Six months	376	Aged 18~34 as of the announcement date; lives in Jeollanam-do; more than two years after graduation/ dropout (150% of median income or lower)

Note: 1) At the time of (1st) young worker allowance program announcement in 2019.

Source: Han (2017), p. 117, Table 6-6, supplemented with the data from the following sources.
Gyeonggi-do (March 27, 2019); Seoul (March 15, 2019a; March 15, 2019b); Busan (March 13, 2019); Incheon (May 8, 2019); Daejeon (March 15, 2019); Gyeongsangbuk-do (April 1, 2019); Seongnam (April 9, 2019); Jeollanam-do (May 3, 2019).

3. Chapter Conclusion

In this chapter, we reviewed the notable youth employment policies of previous administrations, in addition to the latest policies of the current administration and local governments. The youth employment policies of the previous administrations and the Moon Jae-in administration show the following traits.

First, the content of many of the youth employment policies have overlapped across the administrations. Most administrations have attempted to resolve the youth unemployment issue using internship programs or overseas employment. Other common features of youth employment policies between 2004 and 2018 include increasing jobs for young workers in the public sector, and the enactment, revision, and extension of the Youth Employment Act, including the mandatory hiring of young workers at public corporations and public institutions.

Second, the administrations addressed the "mismatch" issue in the labor market, where SMEs complain about a workforce shortage and the tendency for young workers to avoid working at SMEs. However, while the previous administrations focused on providing subsidies to SMEs to make them preferable for young workers, the current administration (at least on the level of MOEL policies) has been expanding support for young employees at SMEs, as is the case with the Tomorrow Mutual Aid for Young Employees. Despite this difference, all administrations have supported both SMEs and young workers, which indicates that government authorities consider both SMEs and young workers as vulnerable groups on the supply side and the demand side, respectively.

Third, it has not been long since policies began to take young workers' preference for high quality jobs into account. Many policies now focus on creating jobs, without distinguishing between full-time (regular) jobs and temporary (non-regular) jobs. The "internship" approach found in many youth employment policies hints at the administrations' intention to lower the youth unemployment rate by creating temporary jobs. The Moon Jae-in administration recognized the importance of high quality jobs, however, and considered the fact that low wages are one reason why young job-seekers are reluctant to take employment at SMEs. This consideration resulted in the Tomorrow Mutual Aid for Young Employees, which directly subsidizes wages paid to young workers. In addition, the Youth Employment Incentive program targeted both SMEs as well as middle-standing companies, which had not been identified as a vulnerable group. The inclusion of the latter group indicates that the current administration focused on providing "high quality jobs" for young workers. This shift in focus suggests a departure from the previous system that provided support on only two fronts: SMEs and young workers.

Fourth, in recent years, local governments are increasingly also attempting to advance this initiative by designing and adopting youth employment policies. Youth employment policies on the local level mostly consist of cash subsidy programs, for the following reasons: cash subsidies are popular among recipients, they cost less to design, and they are easier to implement. These efforts are positive in that local governments are taking action to address the situation. However, these initiatives may inadvertently result in conflict between the central government and local governments. For example, the two sides may disagree on the general direction of the policies, or implement similar policies that result in double benefits. The current situation thus necessitates a review of the roles of the central and local governments in youth employment policies.

III. Purpose and Method

1. Purpose

Cash subsidies may affect the lives of young workers in diverse ways. Before examining the effects of cash subsidies on young workers, this chapter looks into how they are affected by their economic circumstances.

The specific research themes are as follows. First, we analyzed the effect of young workers' family backgrounds on their employment outcomes. Family background includes household employment income, parents' educational attainment, and their employment status. We examined whether family background directly affects employment outcomes, employment outcomes being measured based on whether a young worker is working as an employee at the age of 27, and whether they are paid more than KRW 25 million in annual salary. Another element of the employment outcome is how long it took to find employment from the time of graduation. We also reviewed the correlation between family background and monthly and hourly wages.

Cash subsidies to young workers may not directly affect their employment outcomes in the short term, all the more so because some cash subsidy programs do not require the subsidies to be directly used for job-seeking activities. However, cash subsidies may allow young workers to feel more secure about their livelihood, and to thus increase their expenditure. For example, young workers who relied on cheaper foods to save money may now choose more expensive options.

Unfortunately, there is no detailed data available on how young workers spent their time

or money. Therefore, in this paper, we identify these "non-economic outcomes" by analyzing their correlation with "health status," "stress level," and family relations.

Last, we analyzed the correlation between financial support and employment status. A cash allowance for young workers may allow their parents to spend less on financially supporting their children. It is possible that a cash allowance would ultimately lessen the financial burden on parents of young workers. If there exists a statistically meaningful correlation between the financial support for young workers and their employment status, such a possibility may actually exist.

2. Method

In the following paragraphs, we will briefly summarize the analysis techniques used in this chapter.

A. Employment Outcomes for Young Workers: Employment Status and Time Until Employment[10]

We considered two dependent variables to measure employment outcomes for young workers: whether they were working as employees at the age of 27, and whether they were being paid KRW 25 million or more in annual salary at the same age. We analyzed the employment outcome at 27 because most youths focus on obtaining college diplomas until they turn 25, and analyzing the employment outcomes after the age of 27 would excessively increase the sample size.[11]

Some may question whether it is appropriate to apply the same age criteria to both men and women, because most Korean men are required to serve in the military. An alternative approach might be to analyze female young workers' employment outcomes at the age of 25, and male young workers' employment outcomes at the age of 27. However, remains difficult to find grounds to justify the two-year gap. Therefore, in this study, we included a gender

10 Many researchers have analyzed the effect of household income on educational attainment. However, little research has been conducted on the effect of household income on the employment outcomes of young workers having a high educational attainment. To cite a few studies, Rosenzweig and Wolpin (1993) showed that parents' provision of living space or financial support may be as important as the government's transfer payment for young workers. Freeman and Wise (1982) reported that young workers from lower-income households tend to experience a lower availability of jobs than young workers from affluent families.

11 See the paragraphs on analysis data in the next section.

dummy variable in the explanatory variables. Then, if men are less likely to be employed at 27 than women, we may be able to attribute the finding to the mandatory military service.

Explanatory variables for employment outcomes first include variables related to family background: household employment income, parents' educational attainment, and parent's employment status. We also considered young workers' highest educational attainments at 27, and whether they attended high schools within the Seoul Capital Area (SCA). The latter variable was included to verify whether an individual's area of residence affects employment outcomes.

If the employment outcome is represented by a value of either 1 or 0, we might be able to rely on a linear probability estimation using ordinary least squares (OLS). While using OLS allows for a simpler estimation, we would not be able to take into account the fact that dependent variables can only have values between 0 and 1. To account for such limitation in dependent variables, we can use either the probit model or the logit model. These models analyze the probability of a dependent variable taking a value of 1 (or 0) using cumulative distribution functions.

In addition, if we distinguish between high-paying jobs and other jobs, and define the former as "better jobs" than the other, we can perform an ordered probit analysis. Specifically, given the explanatory variable values of a certain young worker, we can assign the young worker into a certain category based on where the value of the cumulative distribution function is located between the thresholds. An ordered probit analysis estimates the coefficients for the explanatory variables as well as the coefficients for thresholds between ordinal variables.

It should be noted that the dependent variables in this study are employment status at 27 and employment at high-paying jobs at 27. In other words, the regression analysis in this study only utilizes information at a specific time point. For example, if we analyze a worker's employment status at t, the information regarding employment status at t+1 or t-2 is either unavailable or not used in the quantitative analysis.

For these reasons, panel statistics data for periods before or after 27 are not used in the quantitative analysis. We can make better use of panel statistics data by performing a duration analysis. A duration analysis models the duration of time until a certain event occurs, and then estimates parameters related to the model.

In this study, we focused on the duration of time from high school graduation until employment or the duration of time from high school graduation until employment at high-paying jobs. Some may suggest analyzing the duration of time from college graduation

until employment, instead of setting high school graduation as the initial time point. However, it should be noted that college graduation may often be postponed, and a youth's decision on the timing of their graduation partially depends on whether they find employment. Therefore, it would be inappropriate to set college graduation as an exogenous "initial time point."

The probit model assumes that young workers need to find employment before they reach a certain age. Likewise, the duration analysis method assumes that it is desirable to find employment as fast as possible.

A duration analysis is used in a diverse range of disciplines, including economics. It is also referred to as a survival analysis, event history analysis, failure-time analysis, or hazard analysis, depending on the field. There exist a vast amount of literature regarding duration analyses. According to Cameron and Trivedi (2005), there are a few core reasons. First, researchers are highly interested in distribution functions capable of explaining objects, and a survival analysis allows them to model durations and transition probabilities. Second, samples can be taken in various ways, and statistical significance varies depending on the sampling method and the duration model used. For example, the flow sampling method and the stock sampling method can be used to separate workers who lost their jobs in a specific month or a specific year, respectively, whereas the population sampling method includes all workers regardless of their employment status. Third, spell duration data are often censored. In the case of centered data, it is more appropriate to model the status transition than the average duration. Fourth, in most cases, transition data may consist of highly diverse statuses.

For a specific analysis, we can use the accelerated failure-time (AFT) model or the proportional hazards (PH) model. Unlike the AFT model, the PH model offers the benefit of a direct interpretation of estimation results. For the PH model, the effect of an explanatory variable is expressed as a multiplication of the hazard function, shown by $h(t_j) = h_0(t)g(x_j)$. In such cases, the $g(x_j)$ function is a non-negative function for the explanatory variable, and can generally be defined as $g(x_j) = \exp(x_j\beta)$.

In addition, regarding the initial status, in the case of the $h_0(t)$ function we may either define or not define a specific function. Defining a specific function allows for easier estimation. However, if the function defined by the researcher is not a "true" function, the estimates from the regressive analysis become inconsistent estimators.

However, it would not be easy to estimate the $g(\cdot)$ function or the $h_0(\cdot)$ function using a non-parametric estimation. Therefore, we consider performing the duration analysis using the semi-parametric method. One well-known example is an estimation using the Cox Proportional Hazards Model. This method estimates only the parametric $g(\cdot)$ function,

without assuming a specific form for the $h_0(\cdot)$ function.

In this study, we used the Cox PH Model to analyze the duration data. When performing the analysis, in consideration of censored data, it was necessary to set specific periods for the analyzed cases. In this chapter, we used the data from the Youth Panel survey findings between 2007 (Year 1) and 2017 (Year 11). As the last survey was conducted in 2017, we set the values to exclude high school graduation in 2017 as the values taken by the censored dependent variables.

B. Employment Outcomes of Young Workers: Hourly Wage and Monthly Wage

Labor market outcomes, particularly hourly wage and monthly wage, can also form a correlation with family background. For example, young workers from families having better economic circumstances are likely to earn higher hourly or monthly wages, because they are simply better at finding jobs or are more productive.

We used logs of hourly and monthly wages as dependent variables, and used the Heckman's two-step estimator to remove selection bias. Selection bias may occur because hourly and monthly wages are only observed in young workers who have already entered the labor market. To identify parameters, variables affecting entry into the labor market that are not included in the main regression equation should be included in the selection regression equation. For these variables, we considered marital status and number of children. In other words, while the two variables are correlated with entry into the labor market, they are not directly correlated with labor market outcomes such as hourly wages and monthly wages. For consistency, as explanatory variables, marital status and the number of children should be included in the regression equation for employment status. However, we did not include marital status and the number of children because this study is only aimed at analyzing the correlation between family background and employment status.

When analyzing hourly wages and monthly wages, correlations between explanatory variables and dependent variables may vary depending on young workers' hourly wage/monthly wage brackets. For example, the effect of parents' educational attainment on young workers' hourly wage may be different between young workers in the bottom 10% and those in the top 10%. To identify such differences, we performed a quantile regression analysis. In the context of this study, the regression shows how employment increases when the income level increases by a single unit. The resulting coefficient represents the average of the effect. However, the actual marginal effect may also vary depending on the income level. A quantile regression is then useful in identifying such marginal effects.

C. Health Status and Stress Levels

We used non-economic indicators to understand the effect of family background on young workers' outcomes. Specifically, we used two variables: responses to a question regarding "current health status" and responses to a question regarding "daily stress levels." Responses to the health status questions are distributed on a five-point scale: very good, good, fair, bad, and very bad. We grouped very good and good into the "good health" group. A young worker was assigned a value of 1 if they were included in this group, and a value of 0 if they were not. The purpose of this analysis was to identify factors affecting the probability of being aware of one's own good health through a probit analysis. We also performed an ordered probit analysis using the different levels of health status as dependent variables. The value for "very bad" was set at 1, "bad" at 2, "fair" at 3, "good" at 4, and "very good" at five. A higher value indicated better health. As for stress levels, we grouped "high" and "very high" into the "high stress" category. A worker was assigned a value of 1 if they were in this category, and a value of 0 if they were not. We assigned values to each stress level so that a higher value indicates a higher stress level.

D. Financial Support

We analyzed the financial support received by young workers as of the age of 27. The first dependent variable was a dummy variable having a value of 1 if a young worker received financial support, and 0 if they did not. Some young workers who received financial support reported the specific amount. We also analyzed unmarried or divorced young workers without spouses, to identify the correlation between the amounts of financial support received and family background.

IV. Data and Basic Statistics

1. Youth Panel Survey

A. Data - Youth Panel Survey

The Youth Panel Survey was conducted by the Korea Employment Information System. The survey data are available at the Employment Survey Analysis System page, along with data

from the Graduates Occupational Survey (GOMS) and the Korean Longitudinal Study of Ageing (KLoSA). The Youth Panel Survey began with the purpose of performing an in-depth analysis into the complex issue of youth unemployment. The questionnaire includes questions on school life, social and economic activities, and the family background of young workers. The findings of this survey allow us to understand young workers' life paths from school to the labor market. Two Youth Panel Surveys have been conducted to date. The first Youth Panel Survey was conducted over six years from 2001 to 2006. The second Youth Panel Survey is ongoing, with samples consisting of young workers aged between 15 and 29. The second survey was designed based on sample households from the 2006 Industry and Occupation Employment Survey. The original sample includes 10,206 persons. This study uses the data from the second Youth Panel Survey (YP).

The currently available data are from the surveys between year 1 and year 11, and the ages of the respondents range from 14 to 39 (see Table 4).

Table 4_Birth Years of Respondents

(unit: years old)

Year of birth	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1978	29	30	31	32	33	34	35	36	37	38	39
1979	28	29	30	31	32	33	34	35	36	37	38
1980	27	28	29	30	31	32	33	34	35	36	37
1981	26	27	28	29	30	31	32	33	34	35	36
1982	25	26	27	28	29	30	31	32	33	34	35
1983	24	25	26	27	28	29	30	31	32	33	34
1984	23	24	25	26	27	28	29	30	31	32	33
1985	22	23	24	25	26	27	28	29	30	31	32
1986	21	22	23	24	25	26	27	28	29	30	31
1987	20	21	22	23	24	25	26	27	28	29	30
1988	19	20	21	22	23	24	25	26	27	28	29
1989	18	19	20	21	22	23	24	25	26	27	28
1990	17	18	19	20	21	22	23	24	25	26	27
1991	16	17	18	19	20	21	22	23	24	25	26
1992	15	16	17	18	19	20	21	22	23	24	25
1993	14	15	16	17	18	19	20	21	22	23	24
1994	-	14	15	16	17	18	19	20	21	22	23

Source: Present study

Table 5_Basic Statistics of YP Samples

(unit: no. of persons)

Category	1988	1989	1990	1991	1992	All samples
All observations	719	802	864	895	887	4,167
Responded to all	243	272	304	325	337	1,481
Responded 6~10 times	290	343	384	403	398	1,818
Responded 1~5 times	186	187	176	167	152	868

Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 5 presents the basic statistics of the YP samples. Overall, 4,167 respondents were born between 1988 and 1992, 1,481 (35.54%) responded to all eleven YP surveys, 1,818 (43.62%) of the respondents responded to six or more of the surveys, and 868 (29.83%) responded to five surveys or less.

B. Basic Statistics

Table 6 presents basic statistics from the YP samples used in this study. The variables in the table include gender, age, household employment income at 22, highest educational attainment at 27, and parents' educational attainment and employment status at 14. We derived variables based either on the age of the respondent (young worker) or the survey year.

From these statistics, we selected the following variables based on survey year: age, educational attainment, economic activity, marital status, number of children, number of household members, financial support, and amount of financial support. The variables derived based on young workers' ages were parent's educational attainment (at 14), parent's employment status (at 14), household employment income (at 22), employment status (at 27), and employment at high-paying positions (at 27).

Table 6_Youth Panel Survey: Basic Statistics

(unit: %, years old)

Category	b. 1985	b. 1986	b. 1987	b. 1988	b. 1989	b. 1990	b. 1991	b. 1992	b. 1993	All[3]
Female	55.08	75.75	77.64	53.89	52.68	54.87	54.40	52.68	57.63	58.24
Age (Year 10)	31.00	30.00	29.00	28.00	27.00	26.00	25.00	24.00	23.00	27.08
Household employment income (age 22)	4,135	4,166	4,398	4,660	4,880	5,086	5,157	5,418	6,102	4,831
Junior college (Year 10)	9.32	13.81	24.47	20.21	21.21	19.47	22.49	17.63	16.95	18.87
Four-year college (Year 10)	43.50	45.90	44.71	46.11	47.09	50.66	49.49	39.96	35.59	45.90
Father: junior college (age 14)	5.65	6.34	4.53	8.81	5.36	5.75	4.91	4.46	6.78	5.69
Father: 4-year college or higher (age 14)	21.19	25.37	26.28	27.98	25.64	31.19	35.17	33.71	40.68	29.10
Mother: junior college (age 14)	3.67	1.87	5.14	2.85	3.96	3.76	4.09	3.13	11.86	3.76
Mother: 4-year college or higher (age 14)	9.60	9.70	11.48	14.51	13.52	13.27	20.45	18.97	20.34	14.58
Father: full-time employee (age 14)	54.24	61.19	51.96	52.85	52.45	58.41	54.60	58.48	64.41	55.60
Mother: full-time employee (age 14)	15.54	20.52	18.43	21.50	25.17	29.20	29.24	31.47	28.81	24.72
Economic activity: self-employed (Year 10)	0.80	0.50	2.29	1.47	2.65	6.75	13.63	29.29	40.74	9.35
Economic activity: unpaid family labor (Year 10)	0.80	0.50	3.05	3.54	1.85	4.00	2.86	3.10	1.85	2.65
Economic activity: wage labor (Year 10)	76.71	79.21	70.99	74.93	74.87	69.00	60.88	52.14	42.59	67.74
No spouse (never married; divorced) (Year 10)	41.24	48.51	58.01	73.58	79.49	83.19	91.21	92.41	89.83	74.07
No. of children[1] (including 0) (Year 10)	1.35	1.18	1.28	1.44	1.27	1.08	1.29	1.00	1.00	1.29
Household size (Year 10)	3.14	3.23	3.44	3.41	3.52	3.60	3.69	3.73	4.02	3.52
Employment status (age 27)	71.80	72.46	74.26	72.19	74.87	72.77	0.00	0.00	0.00	47.58
High-paying job (age 27)	21.31	20.14	24.49	20.25	18.75	21.48	0.00	0.00	0.00	11.88

Table 6_Youth Panel Survey: Basic Statistics(continued)

(unit: %, years old)

Category	b. 1985	b. 1986	b. 1987	b. 1988	b. 1989	b. 1990	b. 1991	b. 1992	b. 1993	All[3]
High school graduate-employment period[2]	8.40	7.03	6.70	6.63	6.41	6.76	6.10	5.34	4.97	6.56
High school graduate-high-paying employment period[2]	12.90	12.13	11.36	10.60	9.84	9.59	8.37	7.02	6.37	9.90
High stress (Year 9)	19.14	20.79	22.30	31.07	25.52	23.93	27.23	22.84	20.34	24.49
Financial support (Year 10)	5.22	3.47	9.16	12.09	12.43	19.50	24.18	31.67	38.89	17.18
Amount of financial support[1] (Year 10)	32.69	67.86	44.58	43.54	41.91	48.40	37.01	42.38	48.81	42.68
Sample size	354	268	331	386	429	452	489	448	59	3,216

Notes: 1) Includes cases where the value is 0.
2) Includes cases with termination. In such cases, the gaps between the termination (2017) and high school graduation were calculated.
3) Only considered samples born between 1985~1993.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

V. Findings

1. Labor Market Outcomes

A. Employment Outcomes Regarding Entry into the Labor Market: Probit, OLS, and FE

In this study, we examined whether young workers found employment at 27, and whether they found employment at jobs paying KRW 25 million or more. For explanatory variables, we considered educational attainment, household employment income, parents' educational attainment and employment status, and whether their high schools are located in the SCA. Table 7 highlights the findings from the OLS analysis, which suggest that there is no effect of household employment income on employment status. It seems that young workers with parents having four-year college diplomas are less likely to find employment, and other family background variables seem to have no effect.

Table 7_Financial Circumstances and Employment Status at 27 (OLS)

Explanatory variable	ols1	ols2	ols3	ols4	ols5	ols6
Female	0.0327**	0.0221	0.0221	0.0223	0.0222	0.0222
Education: Junior college	-	0.1061***	0.1061***	0.1038***	0.1034***	0.1033***
Education: Four-year college or higher	-	0.0387**	0.0387**	0.0421**	0.0415**	0.0415**
Household employment income (age 22)	-	-	0.0000	0.0001	0.0001	0.0001
Father: Junior college	-	-	-	-0.0222	-0.0236	-0.0236
Father: Four-year college or higher	-	-	-	-0.0350*	-0.0372**	-0.0372**
Mother: Junior college	-	-	-	0.0204	0.0209	0.0209
Mother: Four-year college or higher	-	-	-	0.0042	0.0051	0.0051
Father: Full-time employee	-	-	-	-	0.0093	0.0093
Mother: Full-time employee	-	-	-	-	-0.0145	-0.0144
High school in SCA	-	-	-	-		-0.0009
Sample size	2,973	2,973	2,973	2,973	2,973	2,973

Notes: 1. The dependent variable has a value of 1 if the young worker was employed as of 27, and 0 if not.
2. All regression equations include constant terms.
3. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

The findings in Table 7 may seem to be difficult to understand at first, because common sense states that the likelihood of finding educational attainment increases with parents' educational attainment. However, it is difficult to properly understand young workers' employment outcomes without first considering the quality of the job. In the findings above, it was difficult to produce estimates using only employment status as a dependent variable.

Table 8 presents the analysis that considers the quality of job, that is, the probability of finding employment at jobs paying KRW 25 million or more in annual salary. The linear probability function is also assumed for this analysis. Notably, the coefficient for "Father: Four-year college" had negative values in Table 7. In Table 8, the values became positive; however, variables related with household employment income and other family background factors still did not correlate well with the dependent variables.

Table 8_Financial Circumstances and High-Paying Employment Status at 27 (OLS)

Explanatory variable	ols1	ols2	ols3	ols4	ols5	ols6
Female	-0.0386***	-0.0487***	-0.0495***	-0.0503***	-0.0498***	-0.0514***
Education: Junior college	-	-0.0182	-0.0182	-0.0122	-0.0123	-0.0106
Education: Four-year college or higher	-	0.0853***	0.0845***	0.0801***	0.0806***	0.0834***
Household employment income (age 22)	-	-	0.0003	0.0001	0.0001	0.0001
Father: Junior college	-	-	-	0.0095	0.0104	0.0095
Father: Four-year college or higher	-	-	-	0.0437**	0.0466***	0.0462***
Mother: Junior college	-	-	-	0.0119	0.0116	0.0096
Mother: Four-year college or higher	-	-	-	0.0332	0.0325	0.0306
Father: Full-time employee	-	-	-	-	-0.0149	-0.0128
Mother: Full-time employee	-	-	-	-	0.0117	0.0117
High school in SCA	-	-	-	-	-	0.0451***
Sample size	2,383	2,383	2,383	2,383	2,383	2,383

Notes: 1. The dependent variable has a value of 1 if the young worker was employed as of 27, and 0 if not.
2. All regression equations include constant terms.
3. *, **, *** indicate statistical significance at 10 %, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Tables 9 and Tables 10 show the probit analysis regarding "employment status" and "high-paying employment status." The coefficient for "Father: Junior college" was negative in the probit analysis for "employment status," and positive for "high-paying employment status." These findings are similar to those of the OLS analyses. However, in the case of the analysis for "high-paying employment status" (see Tables 10), the coefficient for "Mother: Four-year college" had statistically significant positive values. In contrast, the OLS analysis findings did not produce a statistically significant correlation between mother-related variables and "employment status" or "high-paying employment status." Given these findings, it seems that the result was achieved by analyzing binary dependent variables using a more appropriate analysis method. The difference in sample sizes between OLS and probit analyses seems to arise from differences in the analysis methods. A probit analysis strictly distinguishes

Table 9_Financial Circumstances and High-Paying Employment Status at 27 (Probit)

Explanatory variable	ols1	ols2	ols3	ols4	ols5	ols6
Female	-0.0689***	-0.0784***	-0.0790***	-0.0824***	-0.0818***	-0.0843***
Education: Junior college	-	-0.0157	-0.0161	-0.0098	-0.0091	-0.0145
Education: Four-year college or higher	-	0.1518***	0.1503***	0.1362***	0.1377***	0.1334***
Household employment income (age 22)	-	-	0.0004	0.0000	0.0001	0.0000
Father: Junior college	-	-		0.0171	0.0188	0.0130
Father: Four-year college or higher	-	-	-	0.0734**	0.0810***	0.0803***
Mother: Junior college	-	-	-	0.0174	0.0166	0.0137
Mother: Four-year college or higher	-	-	-	0.0622*	0.0613*	0.0608*
Father: Full-time employee	-	-	-	-	-0.0300	-0.0280
Mother: Full-time employee	-	-	-	-	0.0251	0.0233
High school in SCA	-	-	-	-	-	0.1154***
Sample size	1,374	1,374	1,374	1,374	1,374	1,374

Notes: 1. The dependent variable has a value of 1 if the young worker was employed as of 27, and 0 otherwise.
2. All regression equations include a constant term.
3. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

only variations between 1 and 0. An OLS analysis, despite the term "linear probability model," allows for values outside the 0–1 range. In the case of a probit analysis, values for variables without sufficient variation are unlikely to be used in the regression analysis.[12]

The finding that household income does not significantly affect young workers' employment status is similar to the findings of Freeman and Wise (1982). The authors reported that, despite the common expectation that family environment affects young

12 The sample size difference between OLS and probit estimates seems to arise from differences in the estimation. A probit analysis only considers variations between 1 and 0. An OLS analysis, despite the term "linear probability model," allows for values outside the 0–1 range. In the case of a probit analysis, values for variables without sufficient variation are unlikely to be used in the regression analysis.

workers' employment, the correlation between family environment measured as household income and young workers' employment was very weak.

B. Employment Outcomes Regarding Entry into the Labor Market: Duration Analysis

This section summarizes the findings of the duration analysis for the period between high school graduation and employment. Table 11 shows the findings on the period between high school graduation and first employment. Table 12 shows the findings on the period between high school graduation and employment at jobs paying KRW 25 million or more. Samples in which the young worker did not graduate from high school were excluded for the duration of this analysis.

Table 10_Duration Analysis on Period between High School Graduation and Employment

Explanatory variable	e1	e2	e3	e4	e5
Female	0.050	0.065	0.086	0.087	0.108
Education: Junior college	-0.491**	-0.500**	-0.454**	-0.451**	-0.605***
Education: Four-year college or higher	-0.320***	-0.371***	-0.352***	-0.358***	-0.377***
Education: MA or higher	-0.648***	-0.698***	-0.767***	-0.766***	-0.643**
Household employment income (age 22)	-	0.009***	0.008***	0.008***	0.007***
Father: Junior college	-	-	0.001	-0.001	-0.135
Father: Four-year college or higher	-	-	0.056	0.053	0.041
Mother: Junior college	-	-	0.033	0.035	0.035
Mother: Four-year college or higher	-	-	0.385***	0.371***	0.315***
Father: Full-time employee	-	-	-	0.009	0.051
Mother: Full-time employee	-	-	-	0.144	0.108
High school in SCA	-	-	-	-	1.039***
Sample size	3,216	3,216	3,216	3,216	3,216

Notes: 1. Samples who did not graduate from high school were excluded from this analysis. All regression equations include a constant term. Values represent coefficients.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 11_Duration Analysis on Period between High School Graduation and High-Paying Employment

Explanatory variable	e1	e2	e3	e4	e5
Female	-0.021	-0.021	-0.007	-0.008	0.054
Education: Junior college	0.183***	0.192***	0.218***	0.227***	0.182***
Education: Four-year college or higher	0.018	0.004	-0.001	0.005	0.010
Education: MA or higher	-0.356***	-0.377***	-0.428***	-0.427***	-0.354***
Household employment income (age 22)	-	0.006***	0.005***	0.005***	0.004***
Father: Junior college	-	-	-0.112	-0.098	-0.113
Father: Four-year college or higher	-	-	0.110**	0.119**	0.106**
Mother: Junior college	-	-	0.009	-0.010	-0.003
Mother: Four-year college or higher	-	-	0.182***	0.160**	0.141**
Father: Full-time employee	-	-	-	-0.028	-0.005
Mother: Full-time employee	-	-	-	0.213***	0.150***
High school in SCA	-	-	-	-	1.019***
Sample size	3,219	3,219	3,219	3,219	3,219

Notes: 1. Samples who did not graduate from high school were excluded from this analysis. All regression equations include a constant term. Values represent coefficients.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

In addition, samples without events related to employment were defined as right-censored cases, and the 2017 values less the years of high school graduation were defined as dependent variables.

According to Table 12, a junior college graduate is more likely to escape the situation in which they cannot get a high-paying job than a high school graduate. A young worker with higher household employment income, a young worker with parents having four-year college diplomas, and a young worker in which the mother is employed full-time is likely to find employment earlier. This duration analysis more clearly shows the correlation between family background and employment outcome. We also need to only analyze college graduates.

In contrast, in Table 11, a junior college graduate is more likely to find employment later than a high school graduate. When controlling for other explanatory variables, a young worker is more likely to find employment when their household employment income is higher, their mother's educational attainment is higher, or their high school is located in the SCA.

C. Wages After Entry into the Labor Market: OLS and Heckman Two-Step Estimation

Tables 13 to Tables 15 present findings on the following question: Does family background

directly affect the hourly wages or monthly wages of young employees? The findings of this analysis are as follows, with a focus on the 8th regression equation of each case. If we do not consider selection bias, a young worker is more likely to earn higher wages if their household employment income is higher, or their mother has a four-year college diploma or higher (see Table 13). In contrast, if we consider selection bias (see Table 13), the two variables are not significantly correlated. A positive correlation is only observed when the mother is a full-time employee.

As for monthly wage, when we do not consider selection bias, a significantly positive correlation with the dependent variables was observed only when the mother has a four-year college diploma or higher (see Table 14). However, this correlation disappears when we consider selection bias, and a negative correlation with the dependent variables was observed when the father has a four-year college diploma or higher (see Table 15).

Table 12_Factors Affecting Young Workers' Hourly Wages (OLS)

Explanatory variable	Olswage1	Olswage2	Olswage3	Olswage4	Olswage5	Olswage6	Olswage7	Olswage8
Education: Junior college	0.2742***	0.2901***	0.2706***	0.2739***	0.2749***	0.2871***	0.2911***	0.2917***
Education: Four-year college or higher	0.6376***	0.6306***	0.6305***	0.6170***	0.6185***	0.6247***	0.6241***	0.6248***
Education: MA or higher	0.9896***	0.9217***	0.9806***	0.9477***	0.9507***	0.9149***	0.9011***	0.9024***
Age	0.3047***	0.2824***	0.3310***	0.3326***	0.3345***	0.3040***	0.3065***	0.3073***
Age squared	-0.0045***	-0.0041***	-0.0047***	-0.0047***	-0.0048***	-0.0043***	-0.0043***	-0.0044***
Female	-0.3074***	-0.2899***	-0.3172***	-0.3157***	-0.3153***	-0.2978***	-0.2966***	-0.2965***
Household employment income (age 22)	-	-	0.0025**	0.0022**	0.0022**	0.0020*	0.0019*	0.0019*
Father: Junior college	-	-	-	0.0493	0.0523	-	-0.0046	-0.0034
Father: Four-year college or higher	-	-	-	-0.0362	-0.0314	-	-0.0969	-0.0952
Mother: Junior college	-	-	-	0.0610	0.0587	-	0.0714	0.0704
Mother: Four-year college or higher	-	-	-	0.2504***	0.2480***	-	0.2190**	0.2177**
Father: Full-time employee	-	-	-		-0.0179	-	-	-0.0039
Mother: Full-time employee	-	-	-		0.0289	-	-	0.0164
Sample size	3,574	3,571	3,574	3,574	3,574	3,571	3,571	3,571

Notes: 1. All regression equations include constant terms and workplace location variables.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 13_Factors Affecting Young Workers' Hourly Wages (Heckman 2SLS)

Explanatory variable	HK_1	HK_2	HK_3	HK_4	HK_5	HK_6	HK_7	HK_8
Main Equation								
Education: Junior college	0.3600***	0.3844***	0.3589***	0.3616***	0.3771***	0.3838***	0.3875***	0.4025***
Education: Four-year college or higher	0.7024***	0.7018***	0.7058***	0.6985***	0.7020***	0.7042***	0.7156***	0.7202***
Education: MA or higher	0.7244***	0.6073***	0.7233***	0.7053***	0.7055***	0.6068***	0.6062***	0.6087***
Age	0.2919	0.2891	0.3928	0.3896	0.3962	0.3523	0.3550	0.3641
Age squared	-0.0043	-0.0042	-0.0056	-0.0056	-0.0056	-0.005	-0.0051	-0.0052
Female	0.2783	-0.0847	0.2428	0.2385	0.1924	-0.1066	-0.0875	-0.1343
Household employment income (age 22)	-	-	0.0026	0.0023	0.0025	0.0017	0.0012	0.0015
Father: Junior college	-	-	-	0.0156	0.0199		-0.0322	-0.0252
Father: Four-year college or higher	-	-	-	-0.1546	-0.1626	-	-0.2267	-0.2319
Mother: Junior college	-	-	-	0.0906	0.0362	-	0.1617	0.1045
Mother: Four-year college or higher	-	-	-	0.3978*	0.3794*	-	0.3167	0.2981
Father: Full-time employee	-	-	-	-	0.0736	-	-	0.0610
Mother: Full-time employee	-	-	-	-	0.1793	-	-	0.1909*
Selection Equation								
Marital status: Never married	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464
Marital status: Divorced	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**
No. of children	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**
Household size	0.1014	0.1014	0.1014	0.1014	0.1014	0.1014	0.1014	0.1014
Education: Junior college	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169
Education: Four-year college or higher	0.0835	0.0835	0.0835	0.0835	0.0835	0.0835	0.0835	0.0835
Education: MA or higher	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437

Table 13_Factors Affecting Young Workers' Hourly Wages (Heckman 2SLS)(continued)

Explanatory variable	HK_1	HK_2	HK_3	HK_4	HK_5	HK_6	HK_7	HK_8
Age	0.2545	0.2545	0.2545	0.2545	0.2545	0.2545	0.2545	0.2545
Age squared	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035
Female	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***
Sample size	1,792	1,792	1,792	1,792	1,792	1,792	1,792	1,792
Unobserved sample size	870	870	870	870	870	870	870	870
lambda(λ)	-0.8354	-0.2892	-0.7923	-0.7802	-0.73	-0.2626	-0.2787	-0.2271
rho(ρ)	-0.5900	-0.2291	-0.5648	-0.5584	-0.5287	-0.2086	-0.2214	-0.1816
chi2(X^2)	44.85	107.71	45.71	49.0	53.24	108.00	111.32	115.73

Notes: 1. The main and selection regression equations include constant terms and workplace location variables.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 14_Factors Affecting Young Workers' Wages (OLS)

Explanatory variable	Olswage2_1	Olswage2_2	Olswage2_3	Olswage2_4	Olswage2_5	Olswage2_6	Olswage2_7	Olswage2_8
Education: junior college	0.2644***	0.2789***	0.2611***	0.2646***	0.2657***	0.2762***	0.2805***	0.2812***
Education: four-year college or higher	0.5806***	0.5738***	0.5741***	0.5600***	0.5619***	0.5685***	0.5675***	0.5686***
Education: MA or higher	0.9046***	0.8363***	0.8963***	0.8621***	0.8663***	0.8301***	0.8153***	0.8178***
Age	0.2931***	0.2716***	0.3173***	0.3190***	0.3214***	0.2910***	0.2936***	0.2948***
Age squared	-0.0043***	-0.0039***	-0.0045***	-0.0045***	-0.0045***	-0.0041***	-0.0041***	-0.0041***
Female	-0.3496***	-0.3329***	-0.3586***	-0.3571***	-0.3563***	-0.3399***	-0.3388***	-0.3384***
Household employment income (age 22)	-	-	0.0023**	0.0020*	0.0020*	0.0018*	0.0017	0.0017
Father: junior college	-	-	-	0.0571	0.0613	-	0.002	0.0045
Father: four-year college or higher	-	-	-	-0.0352	-0.0277	-	-0.0972	-0.0928
Mother: junior college	-	-	-	0.0437	0.0413	-	0.0525	0.0514
Mother: four-year college or higher	-	-	-	0.2570***	0.2544***	-	0.2265***	0.2249***
Father: full-time employee	-	-	-	-	-0.0322	-	-	-0.0174
Mother: full-time employee	-	-	-	-	0.0313	-	-	0.0183
Sample size	3,574	3,571	3,574	3,574	3,574	3,571	3,571	3,571

Notes: 1. All regression equations include constant terms and workplace location variables.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 15_Factors Affecting Young Workers' Wages (Heckman 2SLS)

Explanatory variable	HK_1	HK_2	HK_3	HK_4	HK_5	HK_6	HK_7	HK_8
Main Equation								
Education: Junior college	0.3460***	0.3699***	0.3452***	0.3476***	0.3625***	0.3695***	0.3732***	0.3879***
Education: Four-year college or higher	0.6459***	0.6469***	0.6486***	0.6418***	0.6472***	0.6485***	0.6607***	0.6672***
Education: MA or higher	0.6604***	0.5455**	0.6595***	0.6407***	0.6484***	0.5452**	0.5440**	0.5534**
Age	0.1685	0.1711	0.2477	0.2443	0.2532	0.2134	0.2169	0.228
Age squared	-0.0025	-0.0024	-0.0035	-0.0035	-0.0036	-0.003	-0.0031	-0.0032
Female	0.2785	-0.0801	0.2506	0.2494	0.2042	-0.0948	-0.0723	-0.1203
Household employment income (age 22)	-	-	0.0021	0.0017	0.0019	0.0011	0.0007	0.0009
Father: Junior college	-	-	-	0.0391	0.0497	-	-0.0083	0.0051
Father: Four-year college or higher	-	-	-	-0.1753	-0.1749	-	-0.2481*	-0.2451*
Mother: Junior college	-	-	-	0.0979	0.048	-	0.1555	0.1028
Mother: Four-year college or higher	-	-	-	0.4295*	0.4110*	-	0.3502	0.3313
Father: Full-time employee	-	-	-	-	0.0394	-	-	0.0279
Mother: Full-time employee	-	-	-	-	0.1938*	-	-	0.2058*
Selection Equation								
Marital status: Never married	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464	-6.7464
Marital status: Divorced	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**	0.7123**
No. of children	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**	-0.1764**
Household size	0.1014	0.1014	0.1014	0.1014	0.1014	0.1014	0.1014	0.1014
Education: Junior college	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169
Education: Four-year college or higher	0.0835	0.0835	0.0835	0.0835	0.0835	0.0835	0.0835	0.0835
Education: MA or higher	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437	-0.2437
Age	0.2545	0.2545	0.2545	0.2545	0.2545	0.2545	0.2545	0.2545
Age squared	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035
Female	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***	-1.3550***
Sample size	1792	1127	1792	1792	1792	1127	1127	1127
Unobserved sample size	870	205	870	870	870	205	205	205
lambda(λ)	-0.9167	-1.8112	-0.8888	-0.8693	-0.7576	-1.8161	-1.8175	-1.7183
rho(ρ)	-0.6402	-1	-0.6247	-0.6149	-0.5497	-1	-1	-1
chi2(X^2)	36.5743	71.122	37.1903	40.7117	44.9432	70.8398	73.1058	84.3242

Notes: 1. The main and selection regression equations include constant terms and workplace location variables.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

The finding that household income does not significantly affect young workers' hourly wages is different from the findings of Freeman and Wise (1982). Freeman and Wise (1982) reported that, even though family environment displayed a statistically significant effect on the likelihood of employment, young workers from wealthier families earned higher hourly wages than other young workers.

D. Family Background and Hourly Wage/Monthly Wage Brackets: Quantile Regression

We used the quantile regression method to examine changes in the relationship between family background variables and the dependent variables in different hourly wage/monthly wage brackets.

Table 16 presents the results of the coefficient analysis for each quantile. The OLS analysis focused on the average of the dependent variables, whereas the quantile regression analysis focuses on specific quantiles of the dependent variables. The table shows the findings for the 25 quantile, 50 quantile, and 75 quantile.

A young worker who reports a higher educational attainment, is older, and a male earns higher hourly wages in all three quantiles. A similar effect is observed when a worker's workplace is located in Seoul or Gyeonggi-do.

The variables' effect on each quantile persist even when we add family background variables. Then, how do family background factors affect wage levels in each quantile? A higher level of household employment income does not affect hourly wages in the 50 quantile, though there was a positive impact on hourly wage in both the 25 quantile and the 75 quantile. Father's educational attainment did not display a significant effect in any quantile. In contrast, mother's educational attainment was found to be statistically significant in some quantiles. In the 25 quantile, a young worker with a mother having a junior college diploma or higher was likely to earn a higher hourly wage. In the 50 quantile, a similar effect was found with young workers having mothers with four-year college diplomas or higher. On the other hand, in the 75 quantile, the educational attainment of either parent did not show significant effect on hourly wages. Instead, household employment income had a greater effect on hourly wages. Specifically, the coefficient value of household employment income was 0.0007 in the 25 quantile and 0.0004 in the 50 quantile. The same value was 0.0024 in the 75 quantile, which is three times higher than the 25 quantile and six times higher than the 50 quantile.

Table 17 verifies whether the differences in coefficient values among the three quantile are statistically significant. The results can be grouped into three categories: differences between the 25 quantile and the 50 quantile, differences between the 25 quantile and the 75 quantile,

and differences between the 50 quantile and the 75 quantile. In the case of household employment income, no significant difference was observed between the 25 quantile and the 50 quantile, nor between the 25 quantile and the 75 quantile. However, significant differences did exist between the 50 quantile and the 75 quantile. In other words, the effect of household employment income on hourly wage was not significantly different between the 75 quantile and the 25 quantile, but significantly different between the 75 quantile and the 50 quantile.

It was difficult to calculate the interval of confidence for these findings, because the coefficients were not estimated by considering the hourly wage levels in all of the three quantiles. Figure 1 shows the confidence intervals calculated by estimating the effect of the explanatory variables on the hourly wages in the 25 quantile, 50 quantile, and 75 quantile. The effect of household employment income was not found to be statistically significant in the 25 quantile or the 50 quantile; it only had a significant impact in the 75 quantile. If a young worker having a higher level of household employment income earns a higher hourly wage,

Table 16_Quantile Regression 1

Variable		25 quantile	50 quantile	75 quantile	25 quantile	50 quantile	75 quantile
Education[1)]	Junior college	0.0774***	0.1329***	0.2709***	0.0890***	0.1355***	0.2619***
	Four-year college	0.2570***	0.4055***	0.5085***	0.2565***	0.4036***	0.4883***
	MA or higher	0.4655***	2.0486***	0.6570***	0.4504***	1.8334***	0.6184***
Age		0.1109***	0.1925**	0.1786***	0.1153***	0.2030***	0.2224***
Age squared		-0.0015***	-0.0027**	-0.0025***	-0.0015***	-0.0028***	-0.0029***
Female		-0.1784***	-0.2487***	-0.1926***	-0.1815***	-0.2429***	-0.2019***
Place of employment[2)]	Seoul	0.1228***	0.3083	0.1788***	0.1142***	0.3128	0.1582***
	Busan	-0.0348	-0.0452	-0.2864	-0.0376	-0.0348	-0.2608
	Daegu	-0.0839***	-0.1354***	-2.0798***	-0.0915**	-0.1217**	-2.0764***
	Incheon	0.0262	0.0762	-0.0967	0.0107	0.0871**	-0.0923
	Gwangju	-0.0812***	-0.1610**	-2.1133***	-0.0841***	-0.1625***	-2.1233***
	Daejeon	0.0415	0.6301	0.1357***	0.0408	0.8082	0.1119**
	Ulsan	-0.0414	-0.0939	0.0076	-0.0616*	-0.0775	-0.0342
	Gyeonggi	0.1383***	0.3090*	0.0885*	0.1363***	0.3179*	0.0841*
Household employment income		-	-	-	0.0007**	0.0004	0.0024***
Father: Junior college[3)]		-	-	-	-0.0333	-0.0538	0.0965

Notes: 1. The table shows the regression equation analysis findings for the 25 quantile, 50 quantile, and 75 quantile.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
1) The reference group for educational attainment consists of high school graduates or lower.
2) The reference group for workplace location consists of locations outside the SCA.
3) The reference group for parents' educational attainment consists of high school graduates or lower.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

the effect may only be restricted to higher-income brackets. In addition, due to the large confidence intervals, it was difficult to identify the statistical significance of parents' educational attainment and employment status on hourly wages.

Table 17_Quantile Regression 2

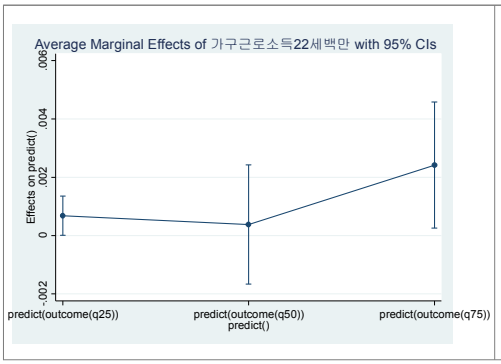
Variable		25 quantile vs 50 quantile A	25 quantile vs 75 quantile A	50 quantile vs 75 quantile A	25 quantile vs 50 quantile B	25 quantile vs 75 quantile B	50 quantile vs 75 quantile B
Education[1)]	Junior college	0.0555	0.1935***	0.138	0.0465	0.1729*	0.1264*
	Four-year college	0.1485**	0.2514***	0.103	0.1471***	0.2319**	0.0848
	MA or higher	1.5831**	0.1914**	-1.3917**	1.3830**	0.168	-1.2150*
Age		0.0816*	0.0677	-0.0139	0.0877*	0.1071	0.0194
Age squared		-0.0012	-0.001	0.0002	-0.0013	-0.0015	-0.0002
Female		-0.0703*	-0.0142	0.0561	-0.0614*	-0.0203	0.041
Place of employment[2)]	Seoul	0.1855**	0.056	-0.1295*	0.1986***	0.0441	-0.1545***
	Busan	-0.0104	-0.2516	-0.2412	0.0028	-0.2233	-0.2261
	Daegu	-0.0515	-1.9959***	-1.9444***	-0.0302	-1.9849***	-1.9547***
	Incheon	0.050	-0.1229	-0.1729	0.0764	-0.103	-0.1794
	Gwangju	-0.0798	-2.0321***	-1.9523***	-0.0784	-2.0391***	-1.9608***
	Daejeon	0.5886	0.0941	-0.4945	0.7673	0.0711	-0.6962
	Ulsan	-0.0525	0.0489	0.1014	-0.0158	0.0274	0.0432
	Gyeonggi	0.1707**	-0.0498	-0.2205***	0.1817***	-0.0522	-0.2339***
Household employment income (age 22)		-	-	-	-0.0003	0.0017	0.0020**
Father: Junior college[3)]		-	-	-	-0.0205	0.1298***	0.1503
Father: Four-year college[3)]		-	-	-	-0.0594**	0.0395	0.0990*
Mother: College[3)]		-	-	-	-0.0211	-0.095	-0.0739
Mother: Four-year college[3)]		-	-	-	0.2257**	-0.0547	-0.2803
Father: Full-time employee		-	-	-	0.0178	-0.0135	-0.0313
Mother: Full-time employee		-	-	-	-0.0023	0.0282	0.0305
Constant		-1.1339	1.2161	2.3501**	-1.2325*	0.4515	1.6840*
Sample size		3,571	3,571	3,571	3,571	3,571	3,571

Notes: 1. Table 16 shows findings from the analysis on whether the differences in regression equation coefficients among the 25 quantile, 50 quantile, and 75 quantile are significant.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
1) The reference group for educational attainment consists of high school graduates or lower.
2) The reference group for workplace location consists of locations outside the SCA.
3) The reference group for parents' educational attainment consists of high school graduates or lower.

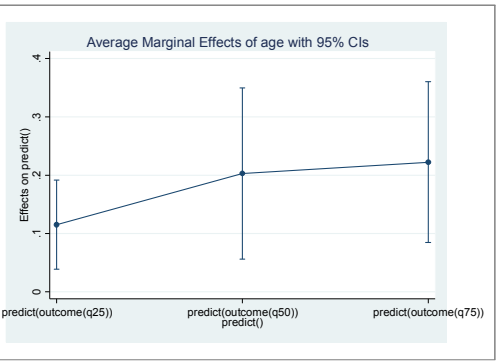
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Figure 1_Quantile regression analysis: Estimates and confidence intervals

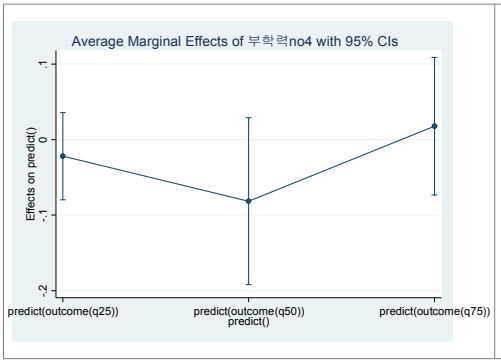
(A) Household employment income (age 22)



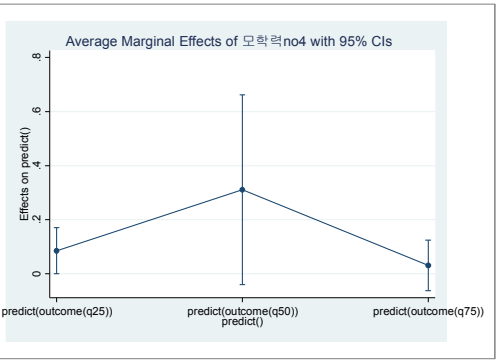
(B) Age



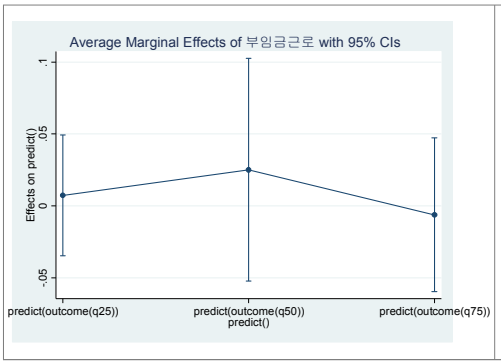
(C) Father = four-year college or higher



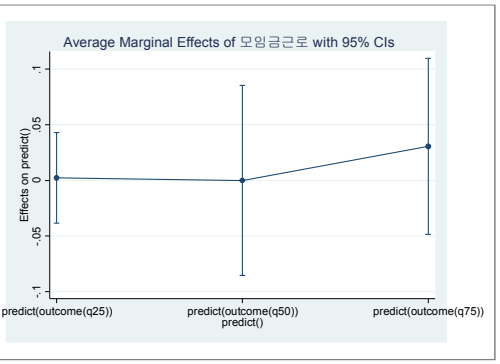
(D) Mother = four-year college



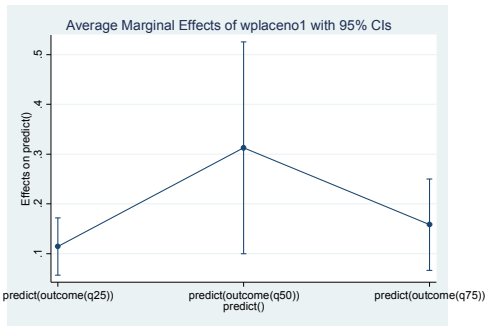
(E) Father = wage worker



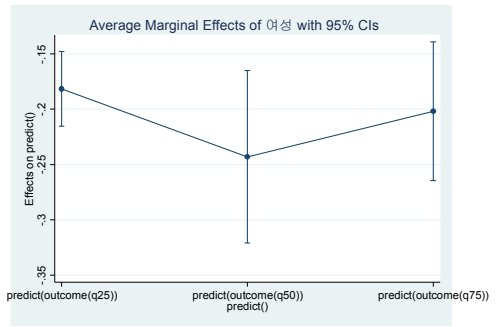
(F) Mother = wage worker



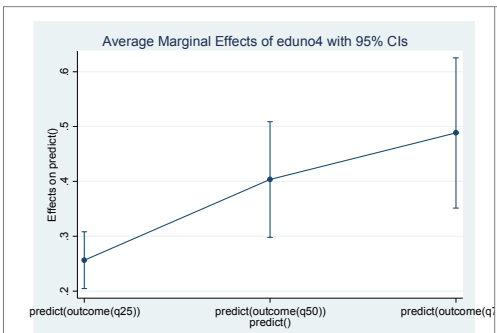
(G) Place of employment = Seoul



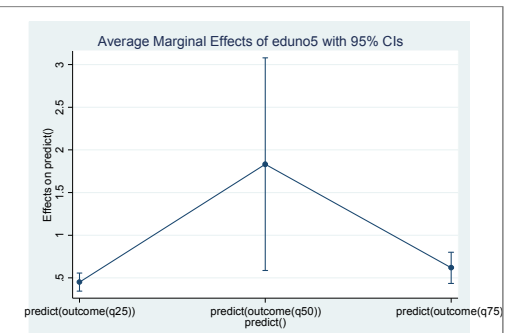
(H) Female



(I) Education = four-year college



(J) Education = MA or higher



Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11).

2. Young Workers' Health Status

A. Self-Reported Health Status: Probit Analysis

This section summarizes the regression equation results pertaining to young workers' health status (see Table 18).[13] "Good" and "very good" were assigned a value of 1, and the other responses were assigned a value of 0. Explanatory variables used in the analysis include:

13 A large number of researchers, such as Mark et al. (2012), analyzed the relationship between children's or teenagers' health status and household income. However, the relationship between youths' health status and household income has been rarely analyzed.

educational attainment, age, gender, household employment income, parents' educational attainment and employment status, and economic activities. The following paragraphs summarize the results focused on the 10th regression equation (Hpb_10).

First, a four-year college graduate is more likely to be in good health than a high school graduate. No statistically significant difference was observed between junior college graduates and young workers having a master's degree or higher. In addition, an older respondent was less likely to be in good health (age coefficient = 0). However, the effect of age decreased among older respondents (age squared). Women were more likely to report a low health status than men. These effects of education and age are observed in all regression equations that include the relevant variables.

Household employment income and father's educational attainment were found to have no significant effect on young workers' health status in Hpb_10. The findings for father's educational attainment were the same for all regression equations that include the variable. A higher level of household employment income was found to raise the likelihood of being in good health when education, age, and gender variables were not controlled. However, after controlling for the personal trait variables, the household employment income did not illustrate a statistically significant correlation with the dependent variables.

It is worth noting that, a worker with a mother having a four-year college diploma or higher was less likely to report being in good health. This effect is observed for all regression equations that include the relevant variables.

Last, we examined how young workers' economic activities are related to their probability of reporting good health. It turned out that a young worker who is self-employed or engaged in unpaid family labor was significantly more likely to report good health. The "wage worker" variable was found to be statistically significant in Hpb_8 and Hpb_9, which do not include parents' employment status. On the other hand, in Hpb_10, which includes parents' employment status, the wage worker variable is not seen to be statistically significant.

In the YP survey, responses regarding self-reported health status are distributed on a five-point scale: "very bad," "bad," "fair," "good," and "very good." We used the variables as dependent variables, by assigning higher values to those with a better health status. An ordered probit analysis could then be applied to the data as there are more than two different response items, and the items can be ordered (see Table 19).

The chi square value, which indicates the fit of the model, is the highest in Hopb_10. In Table 18, Hpb_3 and Hpb_4 displayed high values, at 300 or higher. In Table 21, Hpb_3 and Hpb_4 had much lower levels, at 50 or lower. The numbers in the table indicate there are only average marginal effects.

As controlling for personal traits may be deemed reasonable for this study, it might be more appropriate to use the ordered probit method rather than the standard probit method.

The following paragraphs summarize the findings from Hopb_10. A four-year college graduate is likely to report being in better health than a high school graduate. The likelihood

Table 18_Factors Determining Health Status (probit/marginal effects)

Explanatory variable	Hpb_1	Hpb_2	Hpb_3	Hpb_4	Hpb_5	Hpb_6	Hpb_7	Hpb_8	Hpb_9	Hpb_10
Junior college	0.0212	-	-	-	0.0208	0.0193	0.0186	0.0154	0.0144	0.0139
Four-year college	0.0349***	-	-	-	0.0340***	0.0361***	0.0358***	0.0252*	0.0278**	0.0276**
MA or higher	0.0235	-	-	-	0.0223	0.0275	0.0284	0.0089	0.0146	0.0154
Age	-0.0396**	-	-	-	-0.0357*	-0.0378*	-0.0376*	-0.0368*	-0.0381*	-0.0379*
Age squared	0.0005*	-	-	-	0.0005	0.0005*	0.0005*	0.0005	0.0005*	0.0005*
Female	-0.0504***	-	-	-	-0.0513***	-0.0520***	-0.0519***	-0.0344***	-0.0350***	-0.0350***
Household employment income (age 22)	-	0.0038***	0.0040***	0.0040***	0.0003	0.0004	0.0004	0.0003	0.0003	0.0003
Father: Junior college	-	-	-0.0073	-0.0053	-	0.0152	0.0159	-	0.0115	0.0120
Father: Four-year college	-	-	-0.0256	-0.0222	-	-0.0031	-0.0006	-	-0.0021	0.0000
Mother: Junior college	-	-	-0.0093	-0.0083	-	0.0133	0.0138	-	0.0156	0.0161
Mother: Four-year college	-	-	-0.0482**	-0.0482**	-	-0.0352*	-0.0341*	-	-0.0351*	-0.0340*
Father: Full-time employee	-	-	-	-0.0179	-	-	-0.0162	-	-	-0.0140
Mother: Full-time employee	-	-	-	0.0031	-	-	-0.0094	-	-	-0.0097
Economic activity: Self-employed	-	-	-	-	-	-	-	0.0461	0.0499*	0.0501*
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	0.1500***	0.1508***	0.1490***
Economic activity: Wage labor	-	-	-	-	-	-	-	0.0663***	0.0659***	0.0000
Sample size	5,747	7,829	7,829	7,829	5,747	5,747	5,747	5,747	5,747	5,747
Chi-squared(X^2)	71.38	303.38	318.58	321.13	72.64	78.09	81.19	113.11	117.61	119.62

Notes: 1. The coefficient represents the marginal effect on each variable. "Good" and "very good" are assigned a value of 1, and the other responses are assigned a value of 0. *, **,
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 19_Factors Determining Health Status (ordered probit)

Explanatory variable	Hopb_1	Hopb_2	Hopb_3	Hopb_4	Hopb_5	Hopb_6	Hopb_7	Hopb_8	Hopb_9	Hopb_10
Junior college	0.0355	-	-	-	0.0345	0.0351	0.0343	0.0311	0.0323	0.0322
Four-year college	0.1470***	-	-	-	0.1442***	0.1470***	0.1477***	0.1302***	0.1339***	0.1354***
MA or higher	0.1533*	-	-	-	0.1495*	0.1549*	0.1591*	0.1175	0.1240	0.1289
Age	-0.1424**	-	-	-	-0.1320**	-0.1316**	-0.1297**	-0.1243**	-0.1232**	-0.1209**
Age squared	0.0019**	-	-	-	0.0018*	0.0018*	0.0017*	0.0017*	0.0017*	0.0016*
Female	-0.2412***	-	-	-	-0.2444***	-0.2444***	-0.2441***	-0.1932***	-0.1929***	-0.1929***
Household employment income (age 22)	-	0.0033***	0.0033***	0.0033***	0.0010	0.0010	0.0011	0.0009	0.0009	0.0010
Father: Junior college	-	-	-0.0372	-0.0308	-	-0.0452	-0.0396	-	-0.0566	-0.0512
Father: Four-year college	-	-	0.0274	0.0397	-	-0.0090	0.003	-	-0.0096	0.0015
Mother: Junior college	-	-	-0.0337	-0.0338	-	-0.0346	-0.0341	-	-0.0306	-0.0303
Mother: Four-year college	-	-	0.0113	0.0108	-	-0.0106	-0.0103	-	-0.0125	-0.0124
Father: Full-time employee	-	-	-	-0.0624**	-	-	-0.0644**	-	-	-0.0599*
Mother: Full-time employee	-	-	-	0.0206	-	-	0.0089	-	-	0.0090
Economic activity: Self-employed	-	-	-	-	-	-	-	0.2324**	0.2369**	0.2391***
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	0.4866***	0.4869***	0.4805***
Economic activity: Wage labor	-	-	-	-	-	-	-	0.2029***	0.2034***	0.2019***
Articulation point 1 (very poor, poor)	-5.4954***	-2.7692***	-2.7661***	-2.7912***	-5.2410***	-5.2416***	-5.2432***	-4.9274***	-4.9154***	-4.9093***
Articulation point 2 (poor, fair)	-4.5941***	-1.8628***	-1.8597***	-1.8851***	-4.3393***	-4.3398***	-4.3420***	-4.0203***	-4.0082***	-4.0027***
Articulation point 3 (fair, good)	-3.5965***	-0.8692***	-0.8662***	-0.8916***	-3.3415***	-3.3419***	-3.3441***	-3.0166***	-3.0044***	-2.9989***
Articulation point 4 (good, very good)	-1.5582*	1.1440***	1.1473***	1.1230***	-1.3029	-1.3031	-1.3041	-0.9697	-0.9573	-0.9508
Sample size	5747	5747	5747	5747	5747	5747	5747	5747	5747	5747
Chi square(X^2)	139.66	40.65	42.20	45.99	141.20	141.51	147.00	184.89	185.60	190.51

Notes: 1. The coefficient represents the marginal effect on each variable. "Good" and "very good" are assigned a value of 1, and the other responses are assigned a value of 0. *, **.

2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: Present study, based on Youth Panel Surveys (Year 1 to Year Year 11)

of reporting good health is lower in older groups and among women. These findings are consistent with the probit analysis findings.

Household employment income and parent's educational attainment do not show a statistically significant correlation with the dependent variables. In the ordered probit analysis, mother's educational attainment is not negatively correlated with health status. However, a young worker with a father who is a full-time employee is more likely to be in poor health.

As for the dummy variable coefficients regarding economic activities, the probit analysis showed that only being self-employed or engaged in unpaid family labor contributes to the workers' health. However, in the ordered probit analysis, being employed contributed more to the workers' health.

B. Stress Levels: Probit Analysis

In this section, we analyze the findings on self-reported stress in daily situations. The dependent variable has a value of 1 if the young worker experiences high stress, and 0 if not. The findings are presented in Table 20, and can be summarized as follows, with a focus on Spb_10, the equation with the highest chi square (X^2) value.

A four-year college graduate is likely to experience lower stress than a high school graduate, and a woman is more likely to experience low stress than a man. Among the family background variables, mother's educational attainment was found to be significant. Specifically, a worker with a mother who is a junior college graduate is likely to report lower stress than a worker with a mother who graduated from high school. Last, across different economic activity statuses, self-employed young workers and young workers providing unpaid family labor reported lower stress than economically inactive youths. On the other hand, young workers who are wage workers report higher stress levels than their economically inactive counterparts.

There are two more response options to the question regarding stress that can be ordered. The four response options are: "little to no stress," "low stress," "high stress," and "very high stress." Table 21 presents the results of the ordered probit analysis. The 10th regression equation (Sopb_10) shows high values in Table 21 as well. Therefore, the following paragraphs focus on Sopb_10.

Women reported lower levels of daily stress than men, and young workers having junior college or four-year college diplomas reported lower stress than high school graduates. However, the stress levels reported by young workers having a master's degree or higher are not significantly different from those reported by high school graduates. When compared with the probit analysis findings (see Table 21), the findings of the ordered probit analysis show

the statistical significance of the "junior college graduate" dummy variable.

In addition, a young worker with a mother who is a junior college graduate is likely to report low stress. A young worker who is self-employed or providing unpaid family labor reports lower stress than an economically inactive youth, and a wage workers reports higher stress than an economically inactive youth. These are consistent with the findings of the probit analysis.

Table 20_Factors Determining Daily Stress (probit/marginal effects)

Explanatory variable	Spb_1	Spb_2	Spb_3	Spb_4	Spb_5	Spb_6	Spb_7	Spb_8	Spb_9	Spb_10
Junior college	-0.0031	-	-	-	-0.0023	-0.0031	-0.0034	-0.0193	-0.0190	-0.0195
Four-year college	-0.0204	-	-	-	-0.0182	-0.0171	-0.0175	-0.0393**	-0.0385**	-0.0391**
MA or higher	-0.0199	-	-	-	-0.0174	-0.0132	-0.0138	-0.0363	-0.0333	-0.0343
Age	-0.0048	-	-	-	-0.0117	-0.013	-0.0138	-0.0261	-0.0259	-0.027
Age squared	0.0001	-	-	-	0.0002	0.0002	0.0002	0.0004	0.0004	0.0004
Female	-0.0402***	-0.0402***	-0.0402***	-	-0.0382***	-0.0385***	-0.0385***	-0.0347***	-0.0349***	-0.0348***
Household employment income (age 22)	-	-0.0004**	-0.0003	-0.0003	-0.0006**	-0.0006*	-0.0006*	-0.0005*	-0.0005	-0.0005
Father: Junior college	-	-	0.0074	0.0061	-	0.0114	0.0099	-	-0.0013	-0.0034
Father: Four-year college	-	-	-0.0035	-0.0050	-	-0.0006	-0.0022	-	0.0045	0.0023
Mother: Junior college	-	-	-0.0622	-0.0618	-	-0.0625	-0.0620	-	-0.0760*	-0.0752*
Mother: Four-year college	-	-	-0.0208	-0.0200	-	-0.0232	-0.0223	-	-0.0156	-0.0142
Father: Full-time employee	-	-	-	0.0066	-	-	0.0073	-	-	0.0098
Mother: Full-time employee	-	-	-	-0.0121	-	-	-0.0147	-	-	-0.0201
Economic activity: Self-employed	-	-	-	-	-	-	-	-0.0861**	-0.0839**	-0.0845**
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	-0.0505	-0.0519	-0.0502
Economic activity: Wage labor	-	-	-	-	-	-	-	0.0381***	0.0378**	0.0380***
Sample size	5,806	5,806	5,806	5,806	5,806	5,806	5,806	5,604	5,604	5,604
Chi square (X^2)	16.26	4.05	8.01	8.85	19.92	24.10	25.17	39.94	43.93	46.05

Notes: 1. The dependent variable has a value of 1 if the young worker experiences high stress, and 0 if not. The coefficient represents the marginal effect on each variable.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 21_Factors Determining Daily Stress (ordered probit)

Explanatory variable	Sopb_1	Sopb_2	Sopb_3	Sopb_4	Sopb_5	Sopb_6	Sopb_7	Sopb_8	Sopb_9	Sopb_10
Junior college	-0.0215	-	-	-	-0.0199	-0.024	-0.0239	-0.0771*	-0.0783*	-0.0784*
Four-year college	-0.0453	-	-	-	-0.0411	-0.0381	-0.0386	-0.1126***	-0.1107**	-0.1115***
MA or higher	-0.0036	-	-	-	0.0013	0.0151	0.0134	-0.0625	-0.0527	-0.0555
Age	-0.0194	-	-	-	-0.0335	-0.0382	-0.0391	-0.0946	-0.0953	-0.0967
Age squared	0.0003	-	-	-	0.0004	0.0005	0.0005	0.0014	0.0014	0.0014
Female	-0.1059***	-	-	-	-0.1017***	-0.1030***	-0.1032***	-0.0866***	-0.0873***	-0.0873***
Household employment income (age 22)	-	-0.0005	-0.0003	-0.0003	-0.0013*	-0.0011	-0.0011	-0.0012	-0.0011	-0.0011
Father: Junior college	-	-	0.0317	0.0290	-	0.0387	0.0356	-	0.0084	0.0048
Father: Four-year college	-	-	0.0025	-0.0018	-	0.0045	0.0000	-	0.0216	0.0161
Mother: Junior college	-	-	-0.1253	-0.126	-	-0.1245	-0.1249	-	-0.1545*	-0.1546*
Mother: Four-year college	-	-	-0.0873	-0.0875	-	-0.0973	-0.0969	-	-0.0821	-0.0812
Father: Full-time employee	-	-	-	0.0240	-	-	0.0253	-	-	0.0296
Mother:Full-time employee	-	-	-	-0.0029	-	-	-0.0109	-	-	-0.0152
Economic activity: Self-employed	-	-	-	-	-	-	-	-0.2476***	-0.2414***	-0.2424***
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	-0.0922	-0.0938	-0.0905
Economic activity: Wage labor	-	-	-	-	-	-	-	0.1605***	0.1599***	0.1607***
Articulation point 1 (next to none, low)	-1.9197**	-1.5390***	-1.5447***	-1.5344***	-2.2614**	-2.3451***	-2.3509***	-3.1853***	-3.2031***	-3.2142***
Articulation point 2 (low, high)	0.2861	0.6632***	0.6587***	0.6692***	-0.0548	-0.1372	-0.1429	-0.9611	-0.9779	-0.9887
Articulation point 3 (high, very high)	1.5404*	1.9159***	1.9119***	1.9224***	1.1997	1.1179	1.1124	0.2969	0.2807	0.2701
Sample size	5,806	5,806	5,806	5,806	5,806	5,806	5,806	5,604	5,604	5,604
Chi square (X^2)	14.86	1.19	5.58	6.14	17.70	22.59	23.44	53.32	58.09	59.44

Note: *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

3. Family Financial Support for Young Workers

A. Financial Support: Probit Analysis

When analyzing the effects of cash subsidies on young workers, it could also be important to analyze the parents who are financially supporting the workers. If a worker's parents provide them with an allowance or other living expenses, cash subsidies from the government may reduce the financial support required from parents. To verify this effect, we analyzed variables regarding whether young workers receive financial support from their parents. The findings are presented in Tables 22 and Tables 23. The dependent variable has a value of 1 if the young worker receives financial support, and 0 if not. Table 22 shows the findings in which the existence of a spouse was not considered, and Table 23 reports the findings in which the existence of a spouse was considered.

The analysis will focus on the 10th regression equation (ESpb_10), which involves the largest number of control variables.

A young worker having a four-year college diploma is more likely to receive financial support than a young worker who is a high school graduate or lower. Older respondents and female respondents were less likely to receive financial support than younger respondents and male respondents, respectively. On the other hand, a young worker whose father has a four-year college diploma tend to receive financial support than a young worker with a father who is a high school graduate or lower. In addition, a young worker who is self-employed or providing unpaid family labor was more inclined to receive financial support than an economically inactive youth, whereas a young worker who is a wage worker was less inclined to receive financial support than an economically inactive youth.

Now, let us move on to Table 23, which presents findings from the probit analysis of marginal effects. In this analysis, we also considered whether the young workers have spouses.[14] The findings of the analysis are as follows, with focus on the 10th regression equation (ESpb_10).

Overall, none of the education-related variables were found to be statistically significant. Junior college graduates, graduates, and master's degree holders were neither less nor more likely to receive financial support than high school graduates. Older respondents and female respondents were less likely to receive financial support than younger respondents and male respondents, respectively. This finding is consistent with the findings in Table 22, which do

14 Female respondents were less likely to receive financial support than male respondents, which may be attributable to the fact that the former is likely to get married and form a separate family.

not include the "no spouse" dummy variable. It is particularly interesting that women were less likely to receive financial support than men, even when considering the existence of a spouse, age, and educational attainment.

As can be easily expected, a young worker with no spouse was more likely to receive financial support than a young worker with a spouse. And a young worker with a father who is a four-year college graduate was more likely to receive financial support than a young worker with a father who is a high school graduate. On the other hand, a young worker whose father is a full-time employee was less likely to receive financial support than a young worker whose father is not a full-time employee.

Last, with regards to economic activity, a young worker who is self-employed or providing unpaid family labor was more likely to receive financial support than an economically inactive youth, and a wage earner was less likely to receive financial support than an economically inactive youth.

Table 22_Determinant Factors for Financial Support (Probit)

Variable	ESpb_1	ESpb_2	ESpb_3	ESpb_4	ESpb_5	ESpb_6	ESpb_7	ESpb_8	ESpb_9	ESpb_10
Junior college	-0.6199***	-	-	-	-0.6216***	-0.6059***	-0.6073***	-0.1000	-0.0963	-0.0969
Four-year college	-0.3021***	-	-	-	-0.3105***	-0.3489***	-0.3492***	0.2423***	0.2080**	0.2095**
MA or higher	-0.3799***	-	-	-	-0.3921***	-0.4639***	-0.4601***	-0.1102	-0.1624	-0.1551
Age	-0.6403***	-	-	-	-0.6326***	-0.6071***	-0.6066***	-0.3852***	-0.3640***	-0.3606***
Age squared	0.0089***	-	-	-	0.0089***	0.0086***	0.0085***	0.0053**	0.0049**	0.0049**
Female	-0.1531***	-	-	-	-0.1601***	-0.1574***	-0.1578***	-0.3400***	-0.3420***	-0.3471***
Household employment income (age 22)	-	0.0109***	0.0099***	0.0098***	0.0024**	0.0015	0.0016	0.0016	0.0009	0.0010
Father: Junior college	-	-	-0.1604	-0.1526	-	-0.1165	-0.1116	-	-0.1192	-0.1047
Father: Four-year college	-	-	0.2369***	0.2471***	-	0.2447***	0.2546***	-	0.1524*	0.1743**
Mother: Junior college	-	-	0.1567	0.153	-	0.1722	0.1728	-	0.2161	0.2240
Mother: Four-year college	-	-	0.1688**	0.1609**	-	0.1022	0.1014	-	0.1043	0.1042
Father: Full-time employee	-	-	-	-0.0445	-	-	-0.0545	-	-	-0.1293**
Mother: Full-time employee	-	-	-	0.1130**	-	-	-0.0003	-	-	0.0102
Economic activity: Self-employed	-	-	-	-	-	-	-	0.8848***	0.8550***	0.8601***
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	0.7006***	0.7043***	0.6931***

Table 22_Determinant Factors for Financial Support (Probit)(continued)

Variable	ESpb_1	ESpb_2	ESpb_3	ESpb_4	ESpb_5	ESpb_6	ESpb_7	ESpb_8	ESpb_9	ESpb_10
Economic activity: Wage labor	-	-	-	-	-	-	-	-1.7428***	-1.7423***	-1.7488***
Sample size	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750
Chi square (X^2)	475.65	74.427	169.19	178.30	471.83	493.72	494.04	911.50	906.94	904.10

Notes: 1. The dependent variable has a value of 1 if the young worker receives financial support, and 0 if not.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

Table 23_Determinant Factors for Financial Support 2 (Probit/Marginal Effects)

Explanatory variable	ESpb_1	ESpb_2	ESpb_3	ESpb_4	ESpb_5	ESpb_6	ESpb_7	ESpb_8	ESpb_9	ESpb_10
Junior college	-0.0957***	-0.0957***	-0.0957***	-	-0.0958***	-0.0926***	-0.0928***	-0.0106	-0.0103	-0.0102
Four-year college	-0.0495***	-0.0495***	-0.0495***	-	-0.0507***	-0.0555***	-0.0556***	0.0162*	0.0136	0.0137
MA or higher	-0.0583***	-0.0583***	-0.0583***	-	-0.0602***	-0.0699***	-0.0693***	-0.0114	-0.0153	-0.0147
Age	-0.1000***	-0.1000***	-0.1000***	-	-0.0987***	-0.0940***	-0.0939***	-0.0339***	-0.0318**	-0.0315**
Age squared	0.0015***	-	-	-	0.0015***	0.0014***	0.0014***	0.0005**	0.0005**	0.0005**
Female	-0.0159**	-	-	-	-0.0170**	-0.0166**	-0.0167**	-0.0128*	-0.0131*	-0.0135*
No spouse	0.0704***	0.1135***	0.1099***	0.1095***	0.0700***	0.0676***	0.0678***	0.0852***	0.0841***	0.0841***
Household employment income (age 22)	-	0.0012***	0.0011***	0.0011***	0.0003**	0.0002	0.0002	0.0001	0.0001	0.0001
Father: Junior college	-	-	-0.0292	-0.028	-	-0.0178	-0.0170	-	-0.0165	-0.0150
Father: Four-year college	-	-	0.0341***	0.0361***	-	0.0354***	0.0370***	-	0.0122	0.0143*
Mother: Junior college	-	-	0.0251	0.0247	-	0.0256	0.0256	-	0.0215	0.0221
Mother: Four-year college	-	-	0.0253**	0.0242*	-	0.015	0.0148	-	0.0084	0.0082
Father: Full-time employee	-	-	-	-0.0091	-	-	-0.0090	-	-	-0.0125**
Mother: Full-time employee	-	-	-	0.0143	-	-	0.0000	-	-	0.0015
Economic activity: Self-employed	-	-	-	-	-	-	-	0.0796***	0.0771***	0.0774***
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	0.0605***	0.0608***	0.0597***
Economic activity: Wage labor	-	-	-	-	-	-	-	-0.1776***	-0.1768***	-0.1771***
Sample size	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750
Chi square (X^2)	487.01	254.27	289.34	291.80	483.24	496.89	496.86	910.87	909.95	910.51

Notes: 1. The dependent variable has a value of 1 if the young worker receives financial support, and 0 if not. The values represent marginal effects.
2. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.
Source: Present study, based on Youth Panel Surveys (Year 1 to Year 11)

B. Income Level and Amount of Financial Support (Young Workers With No Spouse)

The YP survey includes a question about the amount of financial support received by young workers. Even though the response rate to the question was relatively low, resulting in a decreased sample size, we decided to include the data in our analysis because analyzing determinants for the amount of financial support is meaningful.

For young workers with spouses or children, it is difficult to interpret the survey data pertaining to financial support because the support received may not be for the workers themselves. For this reason, for the quantitative analysis of financial support in this section, we reduced the samples to young workers with no spouse. Table 24 presents the findings of our least square analysis, where the explanatory variables include educational attainment, age, gender, family background, economic activity, and others.

The findings can be summarized as follows, with a focus on the 10th equation as it has the highest chi square (X^2) value. Educational attainment was not found to be significant in the analysis on the existence of financial support. However, the variable was seen to be highly significant in the quantitative analysis of the amount of financial support. An average four-year college graduate received KRW 80,000 more financial support than a young worker who was a high school graduate or lower. A young worker with a master's degree received KRW 260,000 more financial support than a young worker who was a high school graduate or lower. No significant difference in financial support was observed between young workers across different genders or ages. As for family background, young workers with mothers who were four-year college graduates or higher received more financial support. Last, with regards to economic activity, a young worker who is self-employed or providing unpaid family labor received more financial support than an economically inactive youth; KRW 110,000 and KRW 150,000, respectively. The amounts of financial support received by wage workers and economically inactive youths were not significantly different.

Discrepancies between the findings on the existence and amount of family financial support can be attributed to three factors. First, the variables were analyzed using different samples, and the amount of financial support was analyzed using only responses from young workers who received the financial support. Second, as many young workers who received the financial support did not specifically report how much the financial support they received, there may be an endogenous bias caused by this reporting behavior. Third, we only analyzed the "amount of family financial support" using data from young workers with no spouse, which led to a discrepancy with our analysis on the "existence of financial support," which

subsequently encompassed all young workers with or without a spouse. As such, additional analysis is required in order to take these selection and reporting biases into account.

Table 24_Determinant Factors of Amount of Financial Support (OLS)

Explanatory variable	ESmpb_1	ESmpb_2	ESmpb_3	ESmpb_4	ESmpb_5	ESmpb_6	ESmpb_7	ESmpb_8	ESmpb_9	ESmpb_10
Junior college	-3.9936	-	-	-	-3.4877	-3.1630	-2.9606	2.0509	2.3543	2.8057
Four-year college	5.0318**	-	-	-	4.6163**	4.7521**	4.7880**	8.1910***	8.5669***	8.8365***
MA or higher	28.2131*	-	-	-	27.7601*	27.6467*	27.4460*	25.8569*	26.2252*	26.1412*
Age	-7.9603	-	-	-	-8.4548	-6.8839	-6.2551	-5.8349	-4.4619	-3.5912
Age squared	0.1297	-	-	-	0.1466	0.1183	0.1082	0.1072	0.0824	0.0684
Female	-1.2163	-		-	-1.2880	-1.5290	-1.4459	0.7761	0.4435	0.5959
Household employment income (age 22)	-	0.0799*	0.0484	0.0398	0.0995*	0.0629	0.0587	0.0605	0.0299	0.0238
Father: Junior college	-	-	-3.049	-3.4066	-	-3.9422	-4.3190	-	-2.5287	-2.9759
Father: Four-year college	-	-	1.098	0.8167	-	0.7385	0.4605	-	0.4449	0.0881
Mother: Junior college	-	-	1.9807	2.2170	-	2.7445	3.0184	-	3.2576	3.6039
Mother: Four-year college	-	-	7.6183**	7.7727**	-	7.1977**	7.3741**	-	6.5070**	6.7229**
Father: Full-time employee	-	-	-	0.8009	-	-	0.6370	-	-	0.8545
Mother: Full-time employee	-	-	-	3.2506	-	-	2.8978	-	-	3.5504
Economic activity: Self-employed	-	-	-	-	-	-	-	10.8165***	10.8451***	11.1997***
Economic activity: Unpaid family labor	-	-	-	-	-	-	-	15.8011***	14.9494***	15.0460***
Economic activity: Wage labor	-	-	-	-	-	-	-	-6.0328	-5.4232	-5.6704
Sample size	529	529	529	529	529	529	529	529	529	529
Coefficient of determination (R^2)	0.04	0.008	0.03	0.03	0.05	0.07	0.07	0.11	0.12	0.13

Notes: 1. The analysis is confined to young workers without a spouse (never married or divorced).
2. *, **, *** indicates statistical significance at 10 percent, 5 percent, and 1 percent, respectively.
Source: present study, based on Youth Panel Surveys (Year 1 to Year 11)

VI. Conclusion

Cash allowances have multiple potential effects on young workers. They may affect young workers' employment outcomes, as well as non-economic outcomes such as health status or stress levels. In addition, if cash allowances reduce the financial burden on young workers' parents, the policies ultimately affect both young workers and their parents. When analyzing these diverse aspects, it would be ideal to directly compare a group that receives cash allowances and a group that do not receive cash allowances. However, as it is difficult to obtain such microdata at an individual level, we decided to use available microdata to analyze the effect of "family background" variables on various dependent variables regarding young workers.

The "family background" variables included household employment income, parents' educational attainment, and parents' employment status. It would be ideal to accurately measure the employment income and long/short-term assets of each household, and to identify how much liquid assets (cash) they can spend. However, it is difficult to derive such information from the YP survey data. For this reason, we vicariously measured household income levels based on their household employment income, parents' educational attainment, and their employment status.

In this study, we assumed that "household employment income" corresponds to "cash subsidy policies." By analyzing the effect of increased household employment income, we attempted to derive the implication for the effect of cash subsidies on youth's outcomes. For example, if outcomes for young workers positively correlate with their household employment income, the finding would at least suggest the possibility that cash allowances from the government may improve economic outcomes for young workers.

The overall findings of this study can be summarized as follows.

Household employment income did not have a significant effect on young workers' employment at 27 or their employment at high-paying jobs (KRW 25 million or higher) at 27. The same results were observed when considering the quality of jobs.

Parents' educational attainment displayed different effects depending on whether the job quality variable was controlled. Mothers' educational attainment was found to have a positive effect on high-paying employment status. In addition, our duration analysis of the period between high school graduation and the first employment showed that parents' educational attainment correlates with young workers' likelihood of finding employment faster. When corrected for selection bias, young workers with mothers who are full-time employees were

found to receive higher monthly wages and hourly wages. Young workers with parents who are four-year college graduates did not earn significantly higher hourly wages. However, they earned higher monthly wages.

We also considered the effect of explanatory variables in different wage brackets, and found that household employment income and parents' educational attainment displayed different effects in different brackets. In this study, we considered the 25 quantile, the 50 quantile, and the 75 quantile, and found that estimates were outside the 95% confidence interval in only the 75 quantile. In other words, household employment income only had a significantly positive effect on the hourly wages earned by young workers in the 75 quantile. This finding was not consistent with our expectation that the outcomes for young workers from a lower-income households would respond more sensitively to household income. However, these findings are confined to hourly wages, and do not apply to the other outcome variables. As such, the results are also likely to be different for other variables, including the likelihood of finding employment.

In terms of non-economic outcomes, we considered the self-reported health status and daily stress levels. As these are ordered multi-type dependent variables, an ordered probit analysis would be more suitable for these variables. The actual findings confirmed our expectation. Young workers who are four-year college graduates were more likely to report good health status. Women were less likely to report good health than men. Economically active young workers were significantly more likely to report good health than economically inactive youths. Family background variables did not display a statistically significant effect on health status, except for mothers' full-time employee status. Young workers whose mothers are full-time employees were found to be less likely to report good health. However, the specific mechanisms behind this result cannot be analyzed using the findings of this study alone.

Findings regarding high daily stress levels can be summarized as follows. Educational attainment (junior college graduate or four-year college graduate), gender (woman), mothers' educational attainment (junior college graduate), and household employment income were found to lower the likelihood of reporting high stress levels. With regards to economic activity, young workers who are self-employed or providing unpaid family labor were less likely to report high stress levels than economically inactive youths. On the other hand, wage workers were less likely to report high stress levels than economically inactive youths.

Last, we analyzed the effects of variables on whether young workers receive financial support from their parents. Young workers who are older and young workers who are women

were less likely to receive financial support than their older or male counterparts. Young workers with no spouse and young workers whose fathers are four-year college graduates were more likely to receive financial support. In addition, wage workers were less likely to receive financial support than economically inactive youths. On the other hand, young workers who are self-employed or providing unpaid family labor were more likely to receive financial support than economically inactive youths.

Household employment income did not have a statistically significant effect on employment at high-paying jobs by young workers who are four-year college graduates. However, mothers' educational attainment did display a statistically significant effect. Given the fact that most cash subsidies for young workers are granted to college students, these findings suggest that it may be difficult to directly improve the employment outcomes of college graduates under current policies.

In this study, we found that household income does not greatly affect the economic outcomes of young workers. To understand these findings, we need to further consider the fact that the findings were obtained only when controlling for young workers' educational attainment or parents' educational attainment.

For these reasons, we can understand the aforementioned findings in two ways, by focusing on the relationship between young workers' educational attainment and household income. First, the findings may be the result of inclusion of household income data in the data on young workers' educational attainment. Second, only young workers' educational attainment was found to have a positive effect on their economic outcomes, despite the close relationship between their educational attainment and household income. This finding suggests that household income seem to play a limited role in young workers' labor market entry.

We also need to note the fact that parents' educational attainment, not young workers' household income, had a positive effect on their economic outcomes. This finding potentially implies that non-financial factors may have determinant effect on young workers' economic outcomes. The specific paths through which parents' educational attainment affects young workers' economic outcomes lie outside the scope of this study. However, we can speculate that parents with high educational attainment are more likely to actively intervene when their children experience difficulties with school work or career decisions, rather than leaving them on their own. Parents with high educational attainment are also likely to assist with their children's career decisions or provide opportunities for various employment-related experiences, because parents with higher educational attainment are likely to have a higher

social and economic status and better access to various networks.

Given these scenarios, in order to improve young workers' economic outcomes in meaningful ways, the government may need to focus on providing high quality employment services to young workers with parents having low educational attainment, rather than simply providing cash subsidies.

Furthermore, when designing specific employment services, the government needs to carry out an in-depth analysis of the static and dynamic paths through which parents' educational attainment affects young workers' economic outcomes. The government's employment services may not have the same level of effect on young workers as parents' educational attainment. However, the government can consider various policy options, including improvement of access to employment services, support tailored to young workers having different characteristics, and the expansion of financial support for vulnerable groups and areas.

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