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# Sustainable Tax Behavior of MNEs: Effect of International Tax Law Reform

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**Abstract:** As tax is related to the sustainable growth of societies around the world, international tax avoidance by multinational enterprises (MNEs) has gained public attention. The Organization for Economic Co-operation and Development (OECD) introduced the Base Erosion and Profit Shifting (BEPS) Action Plan to promote sustainable tax behavior of MNEs. To guide policymakers and regulators in curbing MNEs' tax schemes utilizing market imperfection, this paper empirically assesses whether the international law reform regarding information disclosures on global operation achieves the intended result of lowering MNEs' tax avoidance. In addition, the conditional effect of family ownership and intangible asset intensity is addressed to find the factors that strengthen the tax avoidance level of MNEs. This study employs propensity score matching and difference-in-differences method to analyze the changes in international tax liabilities of Korean MNEs in response to BEPS Action Plan 13. The empirical results show that the sustainable tax behavior of MNEs increased when international tax law demanded that they reveal critical information on global allocation of income, economic activity, and taxes paid among countries. Furthermore, the results show that there was a higher increase in the international tax liabilities of MNEs with higher intangible asset intensity. The results suggest to policymakers that the private information disclosure of MNEs' global operation and sharing such information is essential in tackling MNEs' BEPS activities, and intangible assets are indeed an important source of tax avoidance.

**Keywords:** corporate sustainability; tax avoidance; international tax; base erosion and profit shifting; tax collection; natural experiment

## 1. Introduction

The rising complexity of multinational enterprises (MNEs)' global operations creates opportunities to reduce the tax burden as low as possible by reducing or concealing taxable income [1,2]. While the tax avoidance behavior of MNEs provides an economic incentive for firms [3], it also comes with social costs that harm the sustainability of society. For instance, government revenue is one of the important financial sources that promotes economic growth and supports economic stability, but MNE's tax avoidance results in a smaller size of taxable income that does not fully reflect the size of sales in the focal market [4,5]. Scholars have reported the hidden tax losses for societies, e.g., the U.S. treasury losing over 381 billion USD per year [6] and the European Union (EU) member states losing around 160–190 billion EUR per year [7]. Such tax-motivated strategies are available only to MNEs and distort the competition with domestic firms that are without the same possibilities. Harm on the principle that persons with economic interests in a country are liable to taxation [5] led to an unprecedented degree of political salience, and the public has focused on the tax-motivated base erosion and profit shifting (BEPS) practices of MNEs [8]. A recent debate by policymakers around the world led to the Organization for Economic Co-operation and Development (OECD)'s BEPS project. OECD, on behalf

of the G-20 nations, introduced the BEPS Action Plan to control the tax-motivated income shifting activities of MNEs [9].

Among various aspects of new tax policies tackling income shifting, disclosure on the information regarding MNE's worldwide operations has been considered to be an important aspect of international tax policy [10]. From the tax authorities' point of view, obtaining knowledge on MNEs' global allocation of the income, economic activity, and taxes paid among countries is crucial, as the sophistication of international business structuring allows MNEs to conceal the base of the income generated in the host market. To enable countries to collect an appropriate level of tax that reflects the real economic significance of MNEs in their markets, BEPS Action Plan 12 demands the disclosure of aggressive tax planning arrangements to enhance the monitoring activities of tax authorities, and Action 13 requires that large MNEs provide a single universal transfer pricing (TP) report that contains a country-by-country TP report to all host countries [11]. Hence, although MNEs may have reduced their international tax liabilities through BEPS activities, the BEPS Action Plan requires that MNEs review and change their existing international tax-motivated strategy to avoid future tax risks, such as potential tax disputes and fines. Although international tax is vital to MNEs and governments worldwide, there is limited evidence on the relationship between tax policy and the international tax avoidance activities of MNEs, mainly due to the discretionary nature of information on tax avoidance. Moreover, the international tax law reform specifically aimed at BEPS activities was introduced only for a few years; therefore, it is vital to assess the effectiveness of the BEPS Action Plan. This analysis benefits policymakers and regulators as it is important to know the economic effect of the new policy. In order to further devise an appropriate way of achieving the intended results, the effectiveness of the policy and the policy-relevant conditions should be analyzed.

This study uses a natural experiment framework to estimate the change in tax behavior of MNEs after international tax law reform. Mainly, this study assesses the effectiveness of the OECD's BEPS Action Plan 13, which makes it mandatory for MNEs to review and change their existing international tax-motivated strategy to avoid future tax risk, such as TP assessment. There is limited evidence on the effect of private disclosure requirements in increasing the tax authorities' scrutiny of MNEs' global operation. Assessing change in international tax liabilities is based on a central assumption of income shifting in prior research that based on firms' incentives to engage in tax avoidance practices, tax liabilities can be changed flexibly [12]. The change in international tax liabilities of Korean MNEs before and after 2016 is analyzed, the period when the amended International Tax Coordination Law (ITCL) by the Ministry of Economy and Finance of Korea mandated MNEs with annual revenue of over 100 billion KRW (about 91 million USD) and an annual intercompany transaction of over 50 billion KRW (about 45 million USD) to file TP reports, including the master file and local file [13], which is in line with OECD's BEPS Action Plan 13 [11]. In addition, following the recommendation of OECD's BEPS Action Plan 13, the ITCL, which was further amended on 20 December 2016, required MNEs with annual consolidated revenue of over 1 trillion KRW (about 910 million USD) to file a country-by-country report (CbCr) [14]. The documents should contain an MNE's global allocation of income, economic activity, and taxes paid among countries. Although tax authorities could request the submission of similar, but less exhaustive, information before 2016, it was not mandatory to file such documents every year.

Furthermore, this study explores the intended economic effect of the changes in OECD's BEPS initiatives. The moderating effect of business structure, such as concentrated family ownership and intangible asset intensity, is assessed. Regarding family ownership, this study uses the entrenchment hypothesis to predict that before the tax law reform, highly concentrated family ownership was associated with high tax avoidance practices, thus leading to a significant increase in international tax liabilities after the tax reform. Moreover, since accurately assessing the arm's length price of intangible assets, such as royalties, is more difficult than that of tangible assets, it is relatively easy for MNEs to defend their TP for intangible assets in a tax dispute. This suggests that MNEs with higher intangible asset intensity are expected to change their prior tax scheme significantly to react to the tax law reform.

This study uses propensity score matching (PSM) and difference-in-differences (DiD) approaches to identify whether BEPS Action Plan 13 changed the tax behavior of Korean MNEs [15]. Although the new tax rule is an exogenous legal shock to large MNEs whose assets over consolidated sales are over 1 trillion KRW, MNEs that are close to but below the threshold do not face such legal shock. When the change in the international tax liability of large MNEs is significant, it can be interpreted that the large MNEs had pursued a tax avoidance strategy, but BEPS Action Plan 13 successfully curbed such a strategy. The PSM and DiD methods have become increasingly common in the business literature, especially for assessing a causal relationship between environmental change and corporate decisions [16]. In applying the natural experiment, the issue is a potential selection bias as MNEs under the effect of the new tax reform are typically larger and have resources to expand their international business. As the size of MNEs is likely to have a size of international tax liabilities even without consideration of the tax reform, it is important to reduce selection bias and assess the pure effect of the tax law reform. The empirical results show that after the tax reform, the international tax liabilities of MNEs increased. Thus, before the tax reform, MNEs pursued tax planning to reduce their international tax liabilities and OECD's BEPS Action 13 have controlled their incentives for tax avoidance. Moreover, additional analysis shows that the reaction of MNEs with high intangible asset intensity to the tax reform was more than that of MNEs with low intangible asset intensity. The tax avoidance strategy of concentrated family ownership was not more than that of non-concentrated family ownership. Thus, Korean MNEs with high intangible asset intensity were forced to change their prior tax avoidance strategy, and concentrated family ownership of Korean MNEs is not statistically related to tax avoidance.

The findings practically and theoretically contribute to research. First, the economic effect of the tax reform on international tax liabilities is empirically assessed, and it shows that BEPS Action Plan 13 has changed how MNEs operate globally. Worldwide collective efforts are shown to be effective in achieving a sustainable tax behavior of MNEs. Second, this research contributes by providing evidence for policymakers on the positive effect of the disclosure of information regarding MNEs' global operation (country-by-country) and information sharing among nations. As MNEs' operations span multiple countries, a unified action has an advantage in managing loopholes in the tax system. Third, although there are competing arguments on the relationship between family ownership and tax avoidance in the prior literature, concentrated family ownership of Korean MNEs is not related to the level of international tax avoidance. Fourth, the results empirically support and prove that intangible assets are an essential income shifting channel that allows MNEs to reduce their international tax liabilities. Since MNEs with high intangible asset intensity had been associated with higher tax avoidance before the introduction of OECD's BEPS Action, their increase in international tax liabilities is higher than that of the MNEs with low intangible asset intensity. The significant moderating effect of intangible asset intensity provides evidence that MNEs differ on their tax avoidance level based on firm-level characteristics.

The paper is organized as follows. Section 2 discusses and summarizes the issues related to OECD's BEPS Action Plan 13 that have gained considerable interest from practitioners, government officials, and academics. This section also provides the research questions and hypotheses that are addressed in this paper. Section 3 explains the empirical methodology, sample, and variables. Section 4 reports the empirical findings and Section 5 concludes with the implications and contributions of the research.

## 2. Research Background and Hypotheses

To promote MNEs' sustainable tax behavior worldwide, it is essential to understand the interaction of national tax policy and international tax avoidance practices of MNEs. However, the principal challenge of empirical research on international tax management is its observability. One of the factors that directly shows the degree of income shifting activities of MNEs is the additional tax settlement between MNEs and the tax authority of the host market. However, it is mostly confidential. Moreover,

due to its inherently confidential nature, it is difficult to observe how MNEs structure their global operations to achieve their international tax goal. In the existing economic literature, scholars have suggested a conceptual framework for estimating the amount of MNEs' income shifting [17,18]. For instance, affiliate-level data on aggregate profit, capital, and labor inputs were used to predict the counterfactual level of income [8]. Although this approach has its merits, assessing the real economic effect of tax policy or understanding the firm-level factor that determines tax liabilities is limited. Instead of estimating the counterfactual pre-tax income of foreign affiliates, as was done in prior studies, this study uses a natural experiment to investigate the indirect evidence of tax avoidance practices of MNEs. The focus of the natural experiment is to examine the reaction of large Korean MNEs to the tax reform, which reflects the BEPS Action Plan by OECD.

### *2.1. International Tax Law Reform and Sustainable Tax Behavior of MNEs*

International taxation becomes more complicated as MNEs with sophisticated international business structures have the incentive to shift income through devising tax strategies such as transfer pricing regarding goods or services, the affiliates' financing structure, or source location for royalties or intangibles [3,4]. As the MNEs' international tax avoidance behavior is cross-jurisdictional behavior, the prior literature suggests the importance of information disclosure on global operation and earnings results across markets (e.g., [10,19]). While the public disclosure of a firm's information has been frequently suggested to improve on the market's assessment of the firm's business in prior studies [19], there is limited evidence on the effect of private disclosure requirements in increasing tax authorities' scrutiny of MNEs' international business. Providing new useful information strengthens tax authorities' ability to assess a firm's global activities as a whole, and allows the calculation of more accurate associated tax costs of MNEs [20].

To improve the size and quality of the information received by tax authorities, BEPS Action Plan 13 requires the developing of "rules regarding TP documentation to enhance transparency for tax administration, taking into consideration the compliance costs for business. The rules to be developed will include a requirement that MNEs provide all relevant governments with needed information on their global allocation of the income, economic activity and taxes paid among countries according to a common template" [11]. In response to this requirement, a three-tiered standardized approach to TP documentation, under which MNEs are required to submit a master file, local file, and country-by-country report to tax administrations, has been developed. These three documents (master file, local file, and country-by-country report) will require taxpayers to state consistent TP positions and provide tax administrations with useful information to assess their TP risks. Thus, it will be easy for tax administrations to identify whether companies have engaged in TP and other practices that can artificially shift substantial amounts of income into tax-advantaged environments.

The ITCL was amended in 2015 [21], and it was to be effective from the 1 January 2016. One of the amendments introduced a revised TP documentation, as suggested by BEPS Action Plan 13. In the Reasons of Amendment of the ITCL dated 15 December 2015 [21], it notes that "being dependent on the existing Summary of International Transactions, the tax authorities face limitations in determining whether a taxpayer has duly reported its taxable income or has avoided taxes," and anticipates "prevention of cross-border tax avoidance and expansion of taxable base" by making the filing of TP reports, including the master file and local file, mandatory. In addition, the ITCL [14] required MNEs with an annual consolidated revenue of over 1 trillion KRW (about 910 million USD) to file a country-by-country report. Through these amendments, the ITCL fully adopted the recommendation of the OECD's BEPS Action Plan 13.

BEPS Action Plan 13 is primarily aimed at facilitating tax authorities' monitoring through demanding large MNEs to disclose the structure of their international operation and tax planning arrangement. The primary prediction is that large MNEs that are affected by BEPS Action Plan 13 will change their prior tax-motivated global strategy that can result in tax disputes. The mandatory private country-by-country report limits the MNE's tax avoidance as all tax authorities review the

same information on global operation, and it is likely that they will detect the ambiguous international business structures spanning multiple jurisdictions. As tax-motivated income shifting behavior is supported by differences in the application and interpretation of tax laws of countries, the conformity in the tax report by BEPS Action Plan 13 provides the full depiction of a firm's global operation [22]. In assessing the change in international tax liabilities, this study uses the PSM and DiD approaches to compare the level of change in international tax liabilities of MNEs. The international tax liabilities of two groups are compared: (1) MNEs above the threshold and are affected by BEPS Action Plan 13, (2) comparable MNEs slightly below the threshold and are not affected by the BEPS Action 13. PSM is used to match two MNEs that have similar propensity scores but only one is affected by BEPS Action Plan 13. After the matching, using PSM, the DiD shows the statistical differences between MNEs and comparable MNEs.

**Hypothesis 1.** *The increase in international tax liabilities of large MNEs due to the international tax law reform is higher than that of comparable MNEs.*

## 2.2. Business Structure and Sustainable Tax Behavior

In this section, the relationship between business structure and the level of sustainable tax behavior is investigated. Recently, there has been a discussion on the different levels of tax avoidance of firms. For instance, it has been suggested that several firm-level factors, such as firm size, leverage, profitability, and corporate governance level [23–25], affect incentives for tax avoidance. Thus, this study suggests that MNEs may have different levels of international tax avoidance as a certain structure promotes or supports tax-motivated schemes. The effect of concentrated family ownership and intangible asset intensity on international tax liabilities is discussed.

### 2.2.1. Concentrated Family Ownership

In many Asian countries, including Korea, the majority of large publicly traded firms are family-owned and -controlled [26–28]. There are competing arguments on the effect of family ownership on the level of tax avoidance. Desai and Dharmapala [29] argued that high family ownership reduces the level of tax avoidance since tax-related schemes are associated with costs, such as fees of tax experts, efforts and time required for a tax audit, fines, and a tarnished reputation. The alignment hypothesis suggests that families are less opportunistic and are likely to avoid risky activities, including tax avoidance practices [30]. By contrast, the entrenchment hypothesis asserts that family ownership increases the entrenchment effect. The popular argument in the corporate governance literature is that controlling shareholders tend to pursue their private interests [31]. Despite the potential costs associated with tax avoidance, family-owned enterprises pursue income shifting activities to hide losses and cover the details of rent extraction, which misleads minority investors [29,32]. For instance, Korean MNEs are well-known for their pyramid structure or cross-holdings, and such structures allow expropriation through tunneling or related parties transactions [33,34]. Although the firm and its shareholders incur costs in pursuing tax avoidance strategies, such as income shifting, the controlling family can extract additional rent for themselves.

There are a few research works on the effect of family ownership on tax avoidance (e.g., [30,35]). Furthermore, the relationship between family ownership and international tax avoidance has not been investigated. This study adopts the entrenchment hypothesis that proposes that concentrated family ownership is associated with a high degree of tax avoidance. Family owners will pursue tax-saving that allows additional rent extraction at the expense of minority shareholders [30]. Since concentrated family ownership is linked to higher tax avoidance, or lower international tax liabilities, Korean MNEs with concentrated family ownership may have adopted aggressive international tax-motivated strategy before the international tax reform. This implies that they are expected to change their prior aggressive tax avoidance strategy per the BEPS Action Plan; hence the increase in the level of international tax liabilities will be higher.

**Hypothesis 2.** *The DiD in international tax liabilities of large MNEs and comparable MNEs due to the international tax law reform is high in concentrated family ownership MNEs.*

### 2.2.2. Intangible Asset Intensity

Among various BEPS schemes, TP is one of the vital channels that MNEs can use to shift income. The key issue for tax authorities is whether the transfer price reflects the arm's length price for intercompany sales, but the market value of intangible assets (e.g., intellectual property, goodwill, or patents) is difficult to assess accurately compared to common goods or services [36,37]. The lack of active market and difficulty in finding comparability to determine the appropriate market price for unique intangible assets are the reason why tax authorities find it difficult to precisely evaluate the economic substance of transactions involving intangible assets [37]. The inherent subjectivity in the valuations for intangible assets provides MNEs with the opportunity to locate intangibles assets in a jurisdiction with tax benefits [24]. Therefore, during TP assessment, it is relatively easier for MNEs to defend TP for intangible assets than to defend TP for tangible assets. Grubert [38] asserts that the intangible assets promote income shifting by providing two channels. One is by increasing the volume of intercompany transactions, and the other is by increasing the range of uncertainty in defining an arm's length price. Moreover, it is relatively convenient to relocate the ownership of intangible assets to achieve a corporate structure that reduces international tax liabilities. For instance, the U.S. IT giants frequently transfer intellectual property rights to their foreign affiliates outside the U.S.; this helps them to meet their tax goals. Dyreng, Hanlon, and Maydew [39] show that intangible related transfer pricing strategies are positively related to tax avoidance. This suggests that MNEs with a high intangible asset intensity were more sensitive to the tax reform than MNEs with a low intangible asset intensity, and expected to change their prior aggressive tax avoidance strategy

**Hypothesis 3.** *The DiD in international tax liabilities of large MNEs and comparable MNEs due to the international tax law reform is high in MNEs with high intangible asset intensity.*

## 3. Research Design

### 3.1. Sample

This study focused on Korean MNEs listed on the Korean Stock Exchange. The industry was limited to the manufacturing industry to ensure that there was a similarity in business operation that determines income shifting. The data were from the KIS-VALUE database, which offers broad financial data of firms in the Korean market. The threshold for BEPS Action Plan 13 is consolidated sales of over 1 trillion KRW (about 830 million USD), and only MNEs that have (and have not) consistently met the threshold for 2015, 2016, 2017, and 2018 were included. MNEs that were affected by the new tax policy of BEPS Action Plan 13 were the treatment group. The control group were firms that were not required to submit the comprehensive country-by-country TP report under BEPS Action Plan 13 but were slightly below the 1 trillion KRW threshold. Following Black, Kim, Jang, and Park [40], MNEs in the treatment group whose consolidated sales were within 1 trillion to 4 trillion KRW were matched to comparable MNEs in the control group that were within 0.5 trillion to 1 trillion KRW to obtain a reasonable sample size and match similar treated and control MNEs.

Although OECD introduced BEPS Action Plan 13 in 2015, the first time Korean MNEs submitted the new TP report, which contains the latest information on the reformed business structure per the international tax reform, to the National Tax Service (NTS; the tax authority of Korea) was in 2017. The treatment and control groups were defined based on the sales figures for 2015 and 2016 to collect data. Although NTS checked the 2016 financial data to verify whether the MNEs exceeded the threshold, there is a possibility that MNEs that expected a policy change may "change" their status in advance so that the standard of the new policy adopted will not apply to them. Therefore, the treatment group was restricted to only MNEs that met the policy standard for two consecutive years before the

effective year of the new tax rule to check such an issue. The final sample that was used to match MNEs consisted of 339 firms. Among these, 53 MNEs met the threshold of consolidated sales of over 1 trillion KRW.

### 3.2. Empirical Approach

The use of PSM and DiD involves forming a treatment group (MNEs under BEPS Action Plan 13) and control group (comparable MNEs not under BEPS Action Plan 13) and matching the two groups. The process started with calculating the propensity score, which was the predicted probability of achieving a threshold of BEPS Action Plan 13 (sales figure of 1 trillion KRW) as a function of covariates. I used logistic regression when calculating the propensity score following prior studies (e.g., [41,42]), as it was a binary outcome for MNEs as they become either treated or control MNEs. For example, Graham and Tucker [43] run logistic regression to estimate tax sheltering likelihood in order to match the tax shelter firm with non-tax shelter firms. In this paper, a dependent variable (treated MNE) had a value of 1 if the MNE is under the effect of BEPS Action Plan 13, otherwise 0. The explanatory variables were all one-year lagged firm-level variables on the consolidated financial statements. They included firm size (the natural logarithm of the total asset), age (the number of calendar years that an MNE has been established), leverage (total debt divided by total equity), foreign sales ratio (foreign sales divided by total sales), and intangible assets ratio (intangible assets divided by total assets).

After using a matching estimator from the logistic regression for the PSM [44,45], DiD analysis was conducted. The PSM and DiD provide advantages in assessing the effect of environmental change, as targeted evaluation of causal relationships is available [46]. Hence, a large pool of finance and accounting studies on the effect of policy or regulation change or corporate events adopted the DiD [47]. In this paper, the issue was a potential selection bias as MNEs under the effect of the new tax reform were typically larger and had resources to expand their international business. As the size of MNEs was likely to have a size of international tax liabilities even without the consideration of the tax reform, DiD allows reduction in selection bias and assessment of the pure effect of the tax law reform. DiD tested whether there was a significant difference in international tax liabilities between the treatment and control groups after the new tax rule. The model assumes that if the BEPS Action Plan did not exist, the treatment and control groups would have had the same trend in international tax liabilities. Such an approach provides advantages by reducing omitted variable and endogeneity issue, and it also decreases the risk of including the outlier observation [33]. The average treatment effect on the treated MNEs (ATT) explained the differences in the treatment and control groups. The following formula (Formula (1)) proposed by Arnold and Javorcik [48] was used:

$$ATT_k = \frac{1}{n} \sum (Int'l Tax_{t+k}^{Treated} - Int'l Tax_{t+k}^{Control}) - \frac{1}{n} \sum (Int'l Tax_{t-1}^{Treated} - Int'l Tax_{t-1}^{Control}) \quad (1)$$

In the formula,  $n$  denotes the number of matched firms and  $k$  refers to the number of years that MNEs have adopted the new policy. The "Psmatch2" command was used in STATA 13 to calculate the corresponding standard errors with Formula (2) below [49]. MNEs in the same industry were matched. Since the sample size was small and did not meet the criteria for the treatment group, caliper matching (the maximum propensity score distance) was used for the matching algorithm. To be matched, the treatment and control MNEs should be in the propensity range (caliper). Dehejia and Wahba [50] suggested that this method reduced the risk of bad matches.

$$SE_k = \sqrt{\frac{1}{n} Var(Int'l Tax_{t+k} - Int'l Tax_{t-1} | treatment = 1) + \frac{1}{n} Var(Int'l Tax_{t+k} - Int'l Tax_{t-1} | control = 1)} \quad (2)$$

This research compared the treated MNEs (MNEs that were under BEPS Action Plan 13) and control MNEs (MNEs that were not under BEPS Action Plan 13). The main variable of this study was international tax liabilities, which was the increase in the size of consolidated worldwide tax liabilities

less domestic tax liabilities. The PSM analysis was conducted on 64 matched treated MNEs, with assets from 1 to 4 trillion KRW, and control MNEs, with assets from 0.5 to 1 trillion KRW.

To test Hypotheses 2 and 3, a set of subsamples was created (MNEs with/without concentrated family ownership and MNEs with high or low intangible asset intensity) and PSM and DiD analyses were conducted on each subsample. Concentrated family ownership is when family members own more than 50 percent of the MNE. Intangible asset intensity is the book value of intangible assets divided by total assets. The industry-level median value of intangible assets intensity was used to determine the level of intangible assets intensity.

Table 1 displays the descriptive statistics for treated and control MNEs. It shows that similar MNEs in the two groups were matched. Table 2 shows correlations among variables use in the empirical analysis.

**Table 1.** Summary statistics.

Variable	Treated MNEs ( <i>n</i> = 32)				Control MNEs ( <i>n</i> = 32)			
	Mean	St.d.	Min	Max	Mean	St.d.	Min	Max
Δ Int'l Tax Liabilities (billion)	16.910	31.383	−9.841	167.628	12.462	19.231	−0.672	47.340
Firm Size (log)	27.344	1.004	25.616	30.499	27.263	0.726	25.445	27.985
Age	40.656	20.085	7	93	46.781	19.472	15	73
Leverage	59.043	48.681	1.490	179.480	49.940	43.894	1.490	189.320
Foreign Sales Ratio	5.930	11.830	0.005	42.053	6.446	19.686	0.004	76.391
Intangible Assets Intensity	0.059	0.058	0.003	0.190	0.037	0.059	0.003	0.265
Concentrated Family Ownership	0.156	0.369	0	1	0.125	0.336	0	1

**Table 2.** Correlation matrix.

	1	2	3	4	5	6	7
1 Δ Int'l Tax Liabilities (billion)	1						
2 Firm Size (log)	−0.49 *	1					
3 Age	−0.02 *	0.04	1				
4 Leverage	−0.35	0.47 *	−0.12	1			
5 Foreign Sales Ratio	0.17	−0.62 *	0.01	−0.22	1		
6 Intangible Assets Intensity	0.02	0.25	−0.34	0.36 *	−0.14	1	
7 Concentrated Family Ownership	−0.01	0.45 *	−0.25	0.09	−0.23	0.43 *	1

Note: \*  $p < 0.05$ .

#### 4. Empirical Results

Table 3 shows the results of DiD estimates used to test Hypothesis 1. It shows the differences between the international tax liabilities of treated MNEs affected by BEPS Action Plan 13 and control MNEs that were not affected by BEPS Action Plan 13. The increase in international tax liabilities for treated MNEs was higher than that of the control MNEs by 0.683 percentage points in year  $t$  (2016), and 2.277 in the year  $t + 1$  (2017), respectively, after the introduction of BEPS Action Plan 13. These estimates are significant at the 10% level. The results support Hypothesis 1 and suggest that the new tax rules have changed the international tax management of MNEs.

Table 4 shows the results of DiD estimates used to test Hypothesis 2. It shows the differences between international tax liabilities of treated and control MNEs for those “with concentrated family ownership” and “without concentrated family ownership”. The results show that the international tax liabilities of both MNEs with and without a concentration of family ownership increased; thus, it does not support Hypothesis 2. This implies that although the relation between family ownership and tax avoidance has been predicted in prior studies, strong family control over a firm is not associated with international tax avoidance.

**Table 3.** International tax liabilities of MNEs.

Year	<i>t</i> − 1	<i>t</i>	<i>t</i> + 1	<i>t</i> + 2	<i>t</i> + 3
Treated MNEs	10.083	1.893	2.658	−1.478	1.134
Control MNEs	2.686	1.209	0.381	−0.641	−0.416
ATT		0.684 **	2.277 **	−0.837	1.550
S.E.		3.126	1.921	3.499	2.336
<i>t</i> -value		1.920	2.270	−1.23	0.14

Note: \*\* indicates statistical significance at the 5% level; “Treated MNEs” are MNEs affected by the BEPS Action Plan 13 and “Control MNEs” are MNEs not affected by BEPS Action Plan 13.

**Table 4.** International tax liabilities of MNEs by family ownership.

Year	With Concentrated Family Ownership					Without Concentrated Family Ownership				
	<i>t</i> − 1	<i>t</i>	<i>t</i> + 1	<i>t</i> + 2	<i>t</i> + 3	<i>t</i> − 1	<i>t</i>	<i>t</i> + 1	<i>t</i> + 2	<i>t</i> + 3
Treated	8.609	1.576	1.157	−1.240	1.266	9.539	1.853	2.594	−0.908	2.088
Control	1.042	0.728	0.647	−0.877	−0.523	2.799	1.623	0.644	−0.554	1.018
ATT		0.848 *	0.510 **	−0.363	1.789		0.230 **	1.950	−0.354 *	1.070
S.E.		2.052	3.164	2.329	5.970		3.910	2.433	5.599	6.267
<i>t</i> -value		1.92	2.12	−0.91	1.07		2.23	1.25	−1.80	0.89

Note: \* and \*\* indicate statistical significance at the 10% and 5% levels, respectively.

Table 5 reports the DiD estimates used to test Hypothesis 3. It shows the differences between the international tax liabilities of treated and control MNEs for “high intangible asset intensity” and “low intangible asset intensity” groups. The results show that the increase in the international tax liabilities of MNEs with high intangible asset intensity was more than that of MNEs with low intangible asset intensity. This supports Hypothesis 3 and implies that MNEs based more on intangible assets had tax avoidance strategy that violates the new tax rules.

**Table 5.** International tax liabilities of MNEs by intangible asset intensity.

Year	High Intangible Asset Intensity					Low Intangible Asset Intensity				
	<i>t</i> − 1	<i>t</i>	<i>t</i> + 1	<i>t</i> + 2	<i>t</i> + 3	<i>t</i> − 1	<i>t</i>	<i>t</i> + 1	<i>t</i> + 2	<i>t</i> + 3
Treated	13.856	4.722	5.293	3.460	−1.089	4.883	−3.439	1.572	−2.501	−1.127
Control	1.327	1.818	2.055	0.388	−0.502	1.297	0.396	0.524	0.886	1.013
ATT		2.904	3.237 **	3.071 *	−0.587		−3.835	1.048	−3.387 **	−2.140
S.E.		5.390	3.156	5.308	2.884		2.544	1.862	1.359	2.036
<i>t</i> -value		1.13	2.18	1.69	−0.58		−1.47	0.93	−2.30	−1.05

Note: \* and \*\* indicate statistical significance at the 10% and 5% levels, respectively.

Table 6 shows the results of a balancing test of the main result. The balancing test was conducted to check the similarity between the variables in the treatment and control groups [48,51]. The results show that the differences in variables in the samples were not significant, except intangible assets intensity. Despite these exceptions, the Hotelling T2 ( $T2 = 0.384$ ,  $p > F = 0.384$ ) test did not reject the null hypothesis, which states that collectively, the means of the variables of the treatment and control groups are not different from each other. This suggests that the sample is well balanced in the year before the new tax law reform.

**Table 6.** Balancing tests of the sample.

Variable (t – 1)	Treated	Control	t	p > t
Δ Int'l Tax Liabilities (billion)	16.910	12.462	0.680	0.497
Firm Size (log)	27.344	27.263	0.370	0.714
Age	40.656	46.781	−1.240	0.220
Leverage	59.043	49.940	0.790	0.435
Foreign Sales Ratio	5.930	6.446	−0.130	0.899
Intangible Assets Intensity	0.056	0.032	2.030	0.046
Concentrated Family Ownership	0.156	0.125	0.350	0.724
	T2	F-stat	p > F	N
	7.069	1.083	0.384	64

## 5. Discussion and Conclusions

The two main research goals of this study are as follows. First, it examines the effect of the new tax law reform, especially the introduction of BEPS Action Plan 13 on the sustainable tax behavior of Korean MNEs. Second, it explores the conditional effect of concentrated family ownership and intangible asset intensity. The empirical findings firstly show that BEPS Action Plan 13 increased the international tax liabilities of large MNEs. The mandatory disclosure of a wide array of information regarding global operation is a pressure for MNEs to reduce their tax avoidance-related schemes. While concentrated family ownership of MNEs does not change the level of reaction to BEPS Action Plan 13, the MNEs with higher intangible assets intensity experienced higher increase in international tax liabilities, implying the importance of intangible assets for MNEs in devising tax avoidance schemes.

This study provides meaningful and practical implications for policymakers and theoretical contributions. First, the significant increase in international tax liabilities of MNEs illustrates the vital role of the worldwide collective efforts in increasing sustainable international tax behaviors of MNEs. Collecting international tax that reflects the real economic significance of MNEs in each country is available when governments put efforts together and force MNEs to share the same information for all countries. The empirical test of the effect of BEPS Action Plan 13, which aims to provide one universal TP report to all host countries' tax authorities, shows that information sharing among nations is an efficient means to control the tax avoidance strategy of MNEs based on market or legal friction. The OECD's initiatives have changed tax policies around the world and MNEs reacted by assessing their prior international business structure that ultimately reduced the possibility of tax avoidance. Second, the application of PSM and DiD enhances the analysis by providing a statistically sound way of assessing the effect of change in policy. Such a natural experiment setting improves the empirical assessment by providing a means of controlling causality and omitted variable issues. Third, by showing how business structure (intangible assets intensity) is related to the international tax liabilities of MNEs, this study indicates that firm-level characteristics of MNEs are vital factors in international tax research. The empirical results show that concentrated family ownership of Korean MNEs is not an influential factor in tax avoidance. Moreover, the results prove that intangible assets are an essential channel that enables MNEs to reduce their international tax liabilities, and the OECD's initiatives curved the motivation of using tax avoidance strategies.

This study is not without limitations. First, although it focused on BEPS Action Plan 13, the general effect of the BEPS Action Plan on the strategy and international tax liabilities of MNEs was not analyzed. The research utilized BEPS Action Plan 13 to divide MNEs into two groups explicitly, and allows effective comparison, using the PSM and DiD approaches. Since OECD is introducing various measures to control BEPS activities of MNEs, extending the analysis to other BEPS Action Plans will help in understanding the overall effect of the new tax law reform. Second, an important limitation of this study is the modest number of MNEs affected by BEPS Action Plan 13. Furthermore, in constructing a matched sample, I limit the bandwidth to have matches with similar attributes of MNEs. This issue also lies in other studies that utilize the PSM method to assess the effect of policy change for a small

group of firms (e.g., [40,43]). Third, further research can be conducted by utilizing foreign affiliate-level data. Due to the limited access to the secondary data of foreign affiliates of Korean MNEs, this study used group-level consolidated tax liabilities. If a separate analysis can be made for each foreign affiliate, using affiliate-level data and the host market's tax rate, it will improve the research on the different effects of the BEPS Action Plan's on different markets.

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