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Profit Shifting by Japanese Multinational Corporations

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Profit Shifting by Japanese Multinational Corporations[†]

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Abstract: The recent integrated economy has left behind the legal framework for international taxation. The circumvention of laws enables multinational corporations to shift their profits to jurisdictions with lower tax rates, eroding the tax base of nations with higher tax rates where the multinationals substantially operate. To properly regulate such practices, tax agencies should first identify the magnitude of profit shifting. Therefore, this paper examines the extent of profit shifting by Japanese-owned foreign subsidiaries. The results can be summarized into three parts: First, if a foreign jurisdiction lowers its tax rate by 1 percentage point, a subsidiary there increases the pre-tax profits by 2%; Second, the relationship between profit shifting and a tax rate is non-linear. The sensitivity of the reported profits to a tax rate is larger in lower-tax jurisdictions; Third, tax rates for the other subsidiaries in the same multinational groups are also influential for the profit shifting of each subsidiary. Those findings give one clue for tax agencies to know the current practice of profit shifting by Japanese multinational corporations.

Key words: Tax, Profit Shifting, BEPS, Multinational Corporations
JEL: H26; F23

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1. Introduction

Multinational corporations are profit seekers and tax minimization is one of the ways to maximize their profits. To avoid a higher tax rate, they can shift their profits by locating their subsidiaries in jurisdictions with a significantly lower tax rate. Such jurisdictions can benefit from attracting giant multinationals. Such a lower tax rate, however, can harm the tax bases of the other jurisdictions with a higher tax rate where the multinational substantially serves and is supposed to pay a tax in.[1] As the problem of profit shifting can be observed in the dynamics of each tax policy, the issue cannot be easily answered by neither yes nor no. To keep debates precise and productive, we need to identify the current extent of profit shifting. This is the first-step to formulate a tax policy corresponding to the final report released by the Base Erosion and Profit Shifting (BEPS) project (OECD, 2015).

The issue of profit shifting has been mainly addressed by the Organization for Economic Co-operation and Development (OECD). The OECD, in 2015, reported that the current tax framework designed more than a century ago provides loopholes for BEPS. Corresponding to the release of this report, the Japanese Minister of Finance also stated that globalization has left the international tax law behind, which created the disparity between substantial economic activity and the scope for which the current framework covers (Ministry of Finance, 2015). Tax agencies are now continuously required to formulate the latest tax rule for the changing international transactions and practices. To update the rule, knowing the practice of profit shifting is the first step.

This paper estimates the tax semi-elasticity with respect to the reported-profits (i.e., how much profit is shifted in response to a 1 percentage point change of a tax rate). The tax semi-elasticity is estimated with a unique micro database of a survey conducted by the Ministry of Economy, Trade

[1] Clausing (2016b) analyzes Forbes Global 2000 list of the world's largest corporation. Her findings indicate that profit shifting to low-tax countries may cost approximately $280 billion in revenue loss in the world annually although, as she noted, we should be aware that that her analysis is based on many uncertain assumptions. She mainly analyzes the effects on the US and uses the model to expand her original analysis to the other countries for calculating the total loss.

and Industry of Japan (METI), the *Survey of Overseas Business Activities*. I use the datasets providing information on the financial and operating characteristics of Japanese-owned foreign affiliates. In addition, I use the reported pre-tax profits at subsidiaries as a dependent variable, the statutory tax rate at subsidiary-locating jurisdictions as the main independent variable, and estimate its coefficient by ordinary least squares (OLS) regressions.

In this field, there is a certain accumulation of research mainly in the western nations, which has used the OLS model to show how much profit is shifted to a subsidiary when a tax rate is decreased by 1 percentage point.[2] For instance, Hines and Rice (1994) find that 2.25% of a subsidiary's pre-tax profits are shifted in response to a tax rate decrease by 1 percentage point They analyze the datasets of US multinational corporations, which is aggregated in the country level. Lohse, Rindel, and Hofmann (2015) demonstrate that 0.4% of the pre-tax profits are shifted in response to a tax rate decrease by 1 percentage point by analyzing the affiliate-level panel data on European multinational corporations.[3]

As noted above, these studies obtain quite different estimates of the tax semi-elasticity of the reported profits, ranging from 0.4 to 2.25. The difference might be brought by varying jurisdictions, eras, tax policy systems, and endowments of each dataset, which could not be certainly concluded. This uncertainty provokes a doubt that the results in other jurisdictions can be directly applicable to the analyses of the Japanese multinational corporations. Thus, for the Japanese agency, it is necessary to conduct a Japanese version of the regression and analyze the results.

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[2] Although previous research reveals that the act of profit shifting clearly exists, the scale of profit shifting is not achieved by consensus. *Also see* Heckemeyer and Overesch (2017) (they analyze meta-data and concluded that the tax semi-elasticity is 0.8).

[3] The estimated tax semi-elasticity is getting smaller and smaller. Dharmapala (2014) states that the profit shifting is recently estimated lower compared to the estimation of the earlier studies. He also infers that the trend might be attributable to the inconsistency of the data used in a series of research. In this regard, Clausing (2016b) argues that the diminishing tax semi-elasticity is not only due to the financial/Orbis data, but also owing to the nature of profit shifting; The information on the affiliate's operation seldom appears in the dataset. Gravelle (2015) finds that profit shifting to the jurisdictions listed as a tax heaven was overly increasing between 2004 and 2010 by examining the share of U.S. foreign corporation profits to relative GDP. Those findings indicate that although the estimated tax semi-elasticity is decreasing, it does not automatically mean the activity of the profit shifting is diminishing.

There are other reasons why the analysis of Japanese multinationals can provide a unique implication. Subsidiaries of Japanese multinationals are located more in Asia than in other regions, which can cause a different result from the previous US-European research.[4] As their culture, Japanese multinationals are reported to emphasize tax compliance over avoiding taxation.[5] If it is true, Japanese multinationals may not shift as many profits as the western multinationals do. Moreover, profit shifting by multinationals can be more serious in Japan as a share of the revenue from a corporate tax base in the total revenue is relatively high among the OECD countries, which highlights the importance of addressing profit shifting by Japanese multinationals.[6] These unique features affirm the importance of analyzing Japanese multinationals in this paper.

For Japanese multinationals' profit shifting, Hasegawa (2019) reports that if a foreign jurisdiction lowers its tax rate by 1 percentage point, a subsidiary there increases the pre-tax profits by 0.28%. He conducts the panel data analyses on the datasets of Orbis from 2004 to 2016. The dataset is the main difference between his paper and this paper. Orbis mainly covers European multinationals' subsidiaries, while many of the Japanese subsidiaries are located in Asia.[7] Here, I use the data given by *Survey on Overseas Business Activities* in 2004 conducted by METI. This survey asks all the Japanese multinationals about their foreign affiliates no matter where they are located. According to the dataset, 9,170 subsidiaries are located in Asia among 16,432 subsidiaries in total. I can use these datasets in my analysis, which is one of the unique contributions in this paper.

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[4] Although Huizinga and Laeven (2008) mainly analyze corporation-level data, they aggregate it to make country-level data in order to compare the estimation of Hines and Rice (1994) whose paper dealt with country-level data. The estimation of Huizinga and Laeven (2008) reveals the lower tax semi-elasticity than that of Hines and Rice (1994). According to Huizinga and Laeven (2008), one of the reasons for the disparity is portfolio of the multinationals' subsidiaries. As European nations regulate profit shifting more strictly than the US does, the profit shifting within European nations is not as frequent as within the US multinational group. Thus, the geographical location of the subsidiary is an important factor to be considered.

[5] Altshuler, Shay, and Toder (2015) cite a testimony that Japanese multinationals' in-house tax divisions are "devoted mostly to tax compliance" and note that this is "a notable feature of the Japanese tax environment."

[6] *See* Table 3.9 in OECD (2018). In 2016, the share of corporation tax revenue in Japan was 12.0% while the US was 7.6% and the UK was 8.3%.

[7] Hasegawa (2016) reports that the result of Markle (2016) is not directly applicable to Japan as Markle (2016) used the data mainly covering European subsidiaries. Markle (2016) uses Orbis from 2004 to 2006 and demonstrates the effects of the territorial tax system and the worldwide tax system on profit shifting.

As a result of a series of regressions, this paper finds three points. First, foreign subsidiaries' pre-tax profits are increased by 2% if the subsidiary-located jurisdiction lowers its tax rate by 1 percentage point. Second, I examine both linear and non-linear relationships between the log of profits and a tax rate as Dowd, Landefeld, and Moore (2017) demonstrate. The estimated result indicates the sensitivity of the reported profits to a tax rate is larger if a tax rate is smaller (i.e., the tax semi-elasticity of reported profits depends on a tax rate itself.). Third, I extend the basic OLS model to see whether a tax rate for the other subsidiaries in the same multinational group affects the strategy of profit shifting. The estimation shows that tax rates for the other subsidiary in the same group is determinative to shift profits to each subsidiary even if a tax rate for one subsidiary is constant. In other words, Japanese multinationals consider the disparity of a tax rate between jurisdictions where subsidiaries stand.

This paper reports that there is a clear sign of profit shifting for Japanese multinational corporations. It is an intuitively understandable operation that multinationals want to shift profits to a place where a lower tax rate is applied. There are, however, a couple of things we should be aware of which are as follows. This paper analyzes the data only in 2004 due to the availability. Thus, the unobservable and time-invariant characteristics of each subsidiary cannot be controlled with fixed effects estimation, resulting in the potential overestimation on the magnitude of profit shifting. The analysis merely on 2004 might not be generalize as a conclusive trend, so the scope of this paper may be limited. In this regard, the panel data analyses with a longer time span are more desirable than the cross-section data analyses if the datasets were available. Moreover, this paper only estimates the magnitude of profit shifting or the tax semi-elasticity of the reported profits. It is a different problem how to interpret the magnitude of the tax semi-elasticity for the purpose of policy making. In other words, whatever the estimated tax semi-elasticity is, the value can be interpreted as either large or small. In this regard, the scope of this paper is limited.

Albeit the vagueness, this paper includes clear and significant social implications. In addition, it demonstrates the first step to know profit shifting by Japanese multinational corporations based on econometric evidence.[8] The very beginning of the discussion on BEPS was the disparity between the substance and legal framework, thus knowing the current practice in Japan also contributes to discussing domestic and international tax policy which realizes better aligned rights to tax with economic activity (OECD, 2013a).

The remainder of the paper is organized as follows. Section 2 describes what profit shifting means and how we construct the model. Section 3 describes the data, while Section 4 presents the empirical results from a basic regression model. Sections 5 and 6 extend the empirical model in Section 4. Section 5 analyzes a non-linear relationship between the log of reported profits and tax rates. Section 6 analyzes how much a tax rate for the other subsidiaries in the same group affects reported profits in one subsidiary. Section 7 discusses the results through Sections 4 to 6. Section 8 concludes.

2. Profit Shifting

This section reviews backgrounds of the discussion on profit shifting and the famous model presented by Hines and Rice (1994) which we also use in this paper.

Since the 1980's, financial deregulation and progress in communication technology triggered rapid globalization. Increased cross-border transactions created incentives for each jurisdiction to attract more foreign investments or relocations of businesses by their own tax policy called "the race to the bottom." The tax policy here included tax exportation and tax competition.

The harmful tax competition became the target of discussion in the 1990s. The OECD issued the report titled "Harmful Tax Competition – An Emerging Global Issue" and listed features of tax

[8] Especially in Japan, it is pointed out that policies are established on the grounds of individual episodes, rather than emphasizing scientific evidence. (Yamana, 2017)

havens.[9]

In the late 2000s, under the sluggish economy after the financial crisis, critics attacked the tax avoidance by multinational giants. The tax avoidances attracted more and more attention.[10] Then, the OECD launched a project in 2013 to deal with BEPS. The project made efforts to resolve the issue of multinational corporations avoiding taxation by taking advantage of a loophole in the international tax system, while many citizens were bearing the burden of financially supporting governments in the recession.

These backgrounds reveal three factors in defining profit shifting: First, multinationals avail themselves of a loophole in the international tax framework, and there is an unusual disparity of tax rates between jurisdictions; Second, the abuse of a tax rate disparity erodes tax revenues for jurisdictions where multinationals substantially produce value; Third, the profit is shifted outside of a jurisdiction with a higher tax rate.

Under these factors, it is hypothesized that a lower tax rate in jurisdictions where subsidiaries are located incentivizes parent companies to shift their profits, resulting in the increase of the profits at the subsidiary and the decrease of it at the parent company.

To analyze the magnitude of profit shifting, we apply the model used in Hines and Rice (1994). The following describes how Hines and Rice (1994) construct the model.[11] They assume that the pre-tax reported profit (π_i) of subsidiary i is a sum of B_i and S_i. B_i is the profit produced by

[9] It is insightful to start the discussion of BEPS from 1998. Christians and Shay (2017) report that after the OECD harmful tax competition project in 1998, European countries continued to work on the line of the project although the US Bush administration curtailed the project and the project itself disappeared. (OECD, 1998)

[10] Dietsch (2016) states that, after the 2008 crisis, many states with higher debts can no longer forgo the revenue erosion by tax avoidances. The cases of tax avoidance at that time (such as Starbucks and Apple) were also scandalous, which have raised the public attention. Christians and Shay (2017) report that although it is clear that the high profile events caused political pressure, it is also clear that the BEPS project in the OECD started from the perceptions of some jurisdictions that they were suffering from the tax policies of others.

[11] Dharmapala (2014) regards the approach taken by Hines and Rice (1994) as a "dominant approach." This approach is used by subsequent studies, including Huizinga and Laeven (2008), Lotse, Rindel, and Hofmann (2015), Markle (2016) Dowd, Landefeld, and Moore (2017), and Hasegawa (2019).

capital and labor at subsidiary *i*. Then, S_i refers to the shifted profits due to a tax rate at the jurisdiction where subsidiary *i* stands.

$$\pi_i = B_i + S_i - \frac{aS_i^2}{2B_i}$$

$\frac{aS_i^2}{2B_i}$ represents the cost to shift profits as we assume that the marginal cost of profit shifting is increasing in S_i. Multinational corporations are supposed to shift profits for maximizing the after-tax profits of subsidiary *i*. Assuming TAX_{ic} expresses the statutory corporation tax rate of country *c* where subsidiary *i* is located, the above-remarked optimization is expressed as follows.

$$\max_{S_i} \sum_{i=1}^{n} (1 - TAX_{ic})\pi_i = \max_{S_i} \sum_{i=1}^{n} (1 - TAX_{ic})(B_i + S_i - \frac{aS_i^2}{2B_i}) \quad s.t. \sum_{i=1}^{n} S_i \leq 0$$

By the first-order condition with respect to S_i,

$$(1 - TAX_{ic})\left[1 - a\frac{S_i}{B_i}\right] = \lambda$$

in which λ is the Lagrange multiplier. Simplifying the equation,

$$S_i = B_i\left[\frac{1 - TAX_{ic} - \lambda}{a(1 - TAX_{ic})}\right]$$

Substituting this to the first profit function,

$$\pi_i = B_i\left[1 + \frac{1}{2a} - \frac{\lambda^2}{2a(1 - TAX_{ic})^2}\right]$$

Taking the natural logarithm to both sides of the equation,

$$log\pi_i = logB_i + log\left[1 + \frac{1}{2a} - \frac{\lambda^2}{2a(1 - TAX_{ic})^2}\right]$$

Performing Taylor expansion around TAX_{ic},

$$log\pi_i \approx logB_i + \frac{1 - \lambda}{a\lambda} - \frac{TAX_{ic}}{a\lambda}$$

B_i is not directly observable, thus it is inferred by the Cobb-Douglas function. Assuming that Q_i represents the quantity of the output at subsidiary *i*, L_i represents the input of the labor at subsidiary *i*, and K_i represents the input of the capital at subsidiary *i*, Q_i is expressed as follows.

$$Q_i = cA_{ic}^{\varepsilon} L_i^{\alpha} K_i^{\phi} e_i^{u}$$

Each $\varepsilon, \alpha, \phi$ is a parameter. c is a constant term. u is an error term.

Multinational corporations decide the amount of labor to maximize their profits. w_i represents the wage at subsidiary i.

$$Q_i - w_i L_i = (1-\alpha) cA_{ic}^{\varepsilon} L_i^{\alpha} K_i^{\phi} e_i^{u}$$

In the hypothesis where the subsidiary is financed without debt, the equation above is equivalent to the value of B_i. The formula can be expressed as follows after substituting the equation to the value of B_i in the aforementioned approximate equation after the Taylor expansion.

$$log\pi_i \approx \beta_1 + \beta_2 log L_i + \beta_3 log K_i + \beta_4 log A_{ic} + \beta_5 TAX_{ic} + u$$

$$\beta_1 = logc + log(1-\alpha) - \frac{1}{2}a, \qquad \beta_2 = \alpha, \qquad \beta_3 = \phi, \qquad \beta_4 = \varepsilon, \qquad \beta_5 = -\frac{\lambda^2}{2a}$$

This coefficient in this model is interpreted that a 1-percentage-point raise in TAX_{ic} brings a $\beta_5 \times 100\%$ increase of the pre-tax profit, π_i.

According to the hypothesis, multinational corporations are supposed to shift profits from a jurisdiction with a higher tax rate to a jurisdiction with a lower tax rate. Therefore, if a tax rate where a subsidiary is located drops, the multinational is expected to shift its profits to the subsidiary, resulting in the larger reported profits. Applying this to the above model, the coefficient of TAX_{ic} is supposed to be negative.

3. Data

This section explains the datasets used in this paper. I mainly use the unique micro database of the survey conducted by the Ministry of Economy, Trade and Industry of Japan (METI), the *Survey of Overseas Business Activities* in 2004. The survey covers all multinational corporations incorporated in Japan (except those in the finance, insurance, and real estate industries) and its foreign affiliates. A foreign affiliate of a Japanese corporation is defined as a corporation that is located in a foreign country

and which Japanese corporations invest the capital of 10% or more (i.e., subsidiaries),[12] and a foreign affiliate which a subsidiary at least 50% funded by a Japanese parent company owns at least its 50% equity share (i.e., sub-subsidiaries).[13] In the remainder of this paper, I use the term "subsidiary" including a sub-subsidiary.

I use the data on the subsidiaries at the end of March in 2005, which contains the information on the financial characteristics of each subsidiary.[14] From the survey, I collected the financial characteristics of Japanese-owned foreign subsidiaries including the tangible fixed assets, personnel expenses, and pre-tax profits. In a regression analysis, the tangible fixed assets and the personnel expenses are used as the proxies for capital and labor inputs (K_i and L_i), respectively.[15] I use the dataset only in fiscal year 2004 because of the data availability.

I obtained the data on the statutory tax rate from a corporate tax table in 2004 listed in KPMG online. Some of the previous research adapted the effective corporate tax rate in its regression model.[16] It is, however, necessary to note that the effective tax rate is a result of a choice by a multinational corporation, causing a problem of endogeneity.[17] Moreover, there is also a lot of research using the

[12] If two corporations, A and B, both incorporated in Japan invest a foreign affiliate C by 6% and 5% of C's share respectively, the affiliate C is subject to the survey, as the sum of the investment from Japanese parent companies is over 10%.

[13] The case below is also included. An overseas affiliate in which Japanese corporations and a subsidiary funded over 50% by Japanese corporations have invested capital of 50%. If corporation A incorporated in Japan invests overseas affiliate B by 60% of B's share; affiliate B invests other overseas affiliate C by 48% of B's share; and corporation A directly invests affiliate C by 5% of C's share, then affiliate C is subject to this survey, as 48 plus 5 equals more than 50. B is also the target of the survey too.

[14] In Japan, a fiscal year begins on 1 April and ends on 31 March. The end of March in 2005 is the final day of the fiscal year in 2004.

[15] The reason why personnel expenses, not the number of workers, are chosen as the proxy is that it can be possible for the multinational subsidiaries to formulate the contract with workers who are present, even if the subsidiaries do not operate substantially. On the contrary, personnel expenses including salary and wages cannot be counted without economic activity by the subsidiaries. To capture the true profit produced by the input of the subsidiary, we use personnel expenses, not the number of the workers.

[16] Clausing (2003) uses both the effective and the statutory tax rates to analyze profit shifting via transfer pricing. Desai, Foley, and Hines (2004) use the average tax rates to indicate that a subsidiary's leverage (the debt divided by the total assets) and the tax rate is positively correlated.

[17] Dharmapala (2014) argues that it is "typical" to use statutory tax rates as effective tax rates reflect endogenous choices made by the corporation, while the statutory tax rate is determined by the government. In the same article, he also points out that the statutory tax rates can possibly depart from the actual tax rate. Altshuler and Grubert (2006) point out that the effective tax rates and the statutory tax rates are not always positively corelated, as a result of the "check-the-box" and other methods to shift profits.

statutory tax rate.[18] Thus, this paper uses the statutory tax rate and it is substituted to TAX_{ic}.

Other country-level variables, including GDP per capita and population, are acquired from the World Bank database.[19] The resource of each data and basic statistics are expressed in Table 1 and 2.

＜Table 1 and 2 are inserted.＞

4. Basic Regression

4.1. Method

To test the hypothesis in Section 2, a lower tax rate in jurisdictions where subsidiaries are located incentivizes a parent company to shift the profits, I examine how the tax rate affects the profit of the subsidiary. If the hypothesis is true, the lower the tax rate for a subsidiary is, the richer the subsidiary might be as a result of profit shifting. I estimate the following equation:

$$log\pi_i = const + \beta_0 TAX_{ic} + \beta_1 logK_i + \beta_2 logL_i + \beta_3 logA_{ic} + \mu_i + \varepsilon_i$$

- π_i : $pre-tax\ profit\ at\ subsidiary\ i$
- TAX_{ic} : $the\ statutory\ tax\ rate\ at\ country\ c\ where\ subsidiary\ i\ is\ located\ (\%)$
- K_i : $the\ value\ of\ tangible\ fixed\ assets\ at\ subsidiary\ i$
- L_i : $the\ value\ of\ personnel\ expenses\ at\ subsidiary\ i$
- A_{ic} : $the\ variable\ to\ scale\ factor\ for\ country\ c\ where\ subsidiary\ i\ is\ located$
- μ_i: $industry\ dummy\ variable\ (the\ industry\ classification\ for\ subsidiary\ i)$

[18] Huizinga and Laeven (2008) and Lohse, Riedel, and Hofmann (2015) also use the statutory tax rate for their analyses. Dowd, Landefeld, and Moore (2017) point out that the statutory tax rate is widely accepted as a valid index in this field of research.

[19] There is no data on Taiwan at the World Bank database. I use National Statistics Republic of China (Taiwan) for the data on Taiwan.

The dependent variable is a logarithmic value of the pre-tax profit.[20] The independent variable is the statutory corporation tax rate where a subsidiary is located. From the hypothesis, as the multinationals shift their profits to jurisdictions with lower tax rates, the coefficient of the tax rate is expected to be negative ($\beta_0 < 0$).

The absolute value of the coefficient β_0 represents the semi-elasticity of the pre-tax profit with respect to the statutory tax rate of the country in which the subsidiary is located (thereafter referred to as "semi-elasticity" or "tax semi-elasticity"). The semi-elasticity is the percentage change in the pre-tax profit associated with a 1-percentage-point change in the tax rate. For instance, an estimate that the tax semi-elasticity 2 (i.e., $\beta_0 = -0.02$) would imply that a 1-percentage-point increase in the tax rate at the subsidiary's country (for example, the statutory tax rate there changes from 11% to 10%) would increase the pre-tax profit of the subsidiary by 2% (for example, from $100,000 to $102,000).

4.2. Results

Table 3 presents the estimated results.

<Table 3 is inserted.>

Columns (1) and (2) report the coefficients estimated by the basic regression without country scale variables, while columns (3) and (4) report the result with the country scale variables. Columns (2) and (4) show the coefficients when we control for the fixed effects of each industry.[21]

All the estimated coefficients of the tax rate (β_0) through columns (1) to (4) are negative and statistically significant at the 1% level.[22] The tax semi-elasticity is estimated at around 2 (from 1.54

[20] As a logarithmic form is taken, the loss of the profit (i.e., the negative profit) is omitted, which is applicable to the other variables with logarithms.

[21] *Survey on Overseas Business Activities* classifies each industry by four pin codes. The code consists of two parts: The former two pins are for the section of the industry; The latter two pins are for the subsection. In the case only inputting the former two pin codes, the results are overly unchanged: The tax rate coefficient is negative with statistical significance. The four pin codes meet the standard given by Japan Standard Industrial Classification, the public notice created by the Ministry of Internal Affairs and Communications.

[22] For statistical significance, we use the heteroskedasticity-robust standard error. Unless otherwise stated, this paper assumes statistical significance if the estimation is statistically significant at the 10% level or more. Other than the

to 2.33) with statistical significance at the 1% level.

In Table 3, column 4 shows the benchmark analysis. Column (4) involves the variables representing both the industrial effects and country size variables. All the coefficients of those are estimated statistically significant at the 1% level (except for that of the population at column (4)). Comparing column (1) to (3) (or column (2) to (4)), the coefficient of the tax rate ($\hat{\beta}_0$) at column (3) (or (4)) is smaller than that in column (1) (or (2)). This implies that the tax rate coefficients ($\hat{\beta}_0$) without controlling for country scale factors might overly involve the effects of country size variables, resulting in overestimating the semi-elasticity. Similarly, comparing column (3) to (4), the tax semi-elasticity is underestimated in column (3) without controlling for industry fixed effects. To avoid the problem by the omitted variable bias, I assume column (4) shows the base line result to proceed the discussion below.

From column (4), the tax semi-elasticity is estimated at 2. When the statutory tax rate at a subsidiary's country is reduced by 1 percentage point (e.g., from 11% to 10%), the pre-tax profit is likely to increase by 2% (e.g., from $100,000 to $102,000). As the sign of ($\hat{\beta}_0$) is negative, the direction of the change in the tax rate and the profit is opposite. This result is consistent with our hypothesis.

4.3. Robustness Checks

Next, I report several alternative regressions as additional robustness checks in Table 4.

<Table 4 is inserted. >

First, I take a regression with a limited sample; only subsidiaries fully funded from Japanese parent companies. This reduces the sample size from 6,655 to 4,166. If the share of funding (i.e., controllability) does affects profit shifting, the estimated semi-elasticity could be far from the baseline

heteroskedasticity-robust standard error, I used the cluster-robust standard error. The statistical significance was reported at the 1% level for columns (1) and (2), and at the 10% level for column (4).

result, around 2. The result of the estimation with the limited sample is reported in columns (1) (without the industry fixed effects) and (2) (with the industry fixed effects). The estimated semi-elasticities are 2.12 and 2.30, both of which are statistically significant at the 1% level. These are very similar to the benchmark result in column (4) in Table 3.

In column (3), I in turn use sales as a dependent variable instead of the pre-tax profit. If multinational corporations frequently modify their subsidiary's sales and profits in the course of profit shifting, the estimated coefficient in column (3) here might be significantly different from the baseline. It is, however, estimated at -0.0225 with a statistical significance at the 1% level. The tax semi-elasticity is around 2.2, which is close to the baseline result.[23]

In column (4), I take a regression with a new variable, financial leverage. Leverage here is calculated as total debt over total assets. The estimated coefficient of leverage is -0.0215 with a statistical significance at the 1% level. The coefficient is estimated negative, meaning the pre-tax profits are expected to be negatively related to financial leverage. This is intuitive because higher leverage hinders investments to bring profit. Under this case, the estimated tax semi-elasticity is 2.01 with statistical significance at the 1% level. This is also close to the benchmark.

In column (5), I use interest expenses instead of the pre-tax profits as a dependent variable. Under the examined hypothesis, multinationals are supposed to shift profits depending on the tax rate. They are inclined to add up their debt at the subsidiaries with a higher tax rate, on account of the tax deductibility of interest expenses (i.e., interest expenses suppress profits and save more tax payment on it than they do in a lower tax country). We can expect a positive correlation between interest expenses and a tax rate. As expected, the tax coefficient is estimated at 0.0293, clearly positive, with statistical significance at the 1% level. We should, however, note that the interest expenses in *Survey*

[23] This tax semi-elasticity is higher than that of the previous estimation shown in Subsection 2. Again, this is not the difference to break the robustness of the baseline result. The sales are more vulnerable to manipulation via transfer pricing, for instance, and this might make the difference.

on Overseas Business Activities includes expenses for unrelated parties as well as the ones within the multinational group. Therefore, we cannot certainly conclude the estimated coefficient is consistent with our hypothesis as the doubt remains whether the variable, interest expenses, is purely the proxy for profit shifting.

Column (6) adds the Asian dummy variable, and the product of the Asian dummy and tax rates. The Asian dummy is 1 if a subsidiary locates in Asia, otherwise it is zero. The result, with statistical significance at the 10% level, reports that the profit of subsidiaries in Asia increases by 3.7% if the tax rate decreases by 1 percentage point. Compared to the baseline result of 2% where the locations of subsidiaries are not limited to Asia, profit shifting among Asian jurisdictions is more frequent than ones with other areas.[24]

Column (7) adds the index of Control of Corruption constructed by the World Bank (with higher values denoting less corruption) as a control variable to see whether less corruption would lead to higher reported earnings. Indeed, the higher the index is (the less corruption), the higher the profit of the subsidiaries is. This is estimated with statistical significance at the 10% level. The tax rate coefficient is estimated at -0.015 with statistical significance at the 5% level, not exactly identified around -0.02 but not significantly different from it.

These results confirm the robustness of the baseline results showing that the tax semi-elasticity of the reported profits is around 2.[25]

5. Non-Linear Regression

[24] The result implies several possibilities; The quality and quantity of the labor and the capitals are significantly different between Asian and non-Asian nations, which can make the difference in the tax semi-elasticity; The cultural similarity among Asian nations and the geographical closeness of Japan to the other Asian nations can be another reason for the higher likelihood of profit shifting in Asian nations.

[25] The magnitude of the coefficients is relatively large compared to previous research targeting European or US multinational corporations in recent years. *See* Lohse, Riedel, and Hofmann (2015) (estimating 0.8 tax semi-elasticity). Thus, the estimation here could be a result of overestimation. But also *cf.* Clausing (2016b) (indicating speculative revenue loss for the worldwide level and demonstrating that 39.8 billion dollars of Japanese revenue was lost in 2012 due to profit shifting). This point is mainly discussed in Section 7.

5.1. Method

In Section 4, I assume a linear relationship between the log of pre-tax profits and tax rates. It is, however, highly likely that the tax semi-elasticity depends on the value of a tax rate. If that is the case, the relationship between the log of pre-tax profits and tax rates is not linear. Therefore, Section 5 here examines a regression by assuming a non-linear function, adding a square of tax rates as an independent variable. The tested equation is as follows.

$$log\pi_i = const + \beta_0 TAX_{ic} + \beta_1 TAX_{ic}^2 + \beta_2 logK_i + \beta_3 logL_i + \beta_4 logA_{ic} + \mu_i + \varepsilon_i$$

5.2. Results

Table 5 presents the estimated result.

<Table 5 is inserted.>

Columns (1) and (2) report the result estimated by the regression above without the country-scale variables like GDP per capita, while columns (3) and (4) report the estimated coefficients with those controlling variables. Columns (2) and (4) show each result including the industry fixed effects.

All the tax rate coefficients are estimated to be negative, while the coefficients for squared tax rates are estimated to be positive. The tax rate coefficients with statistical significance range from -0.0830 to -0.0606, while the coefficients for the squared tax rates are between 0.00101 and 0.00117.

To interpret the result, let *MSP* refer to marginal shifted profit when tax is changed.

$$MSP = \frac{\partial log\pi_i}{\partial TAX_{ic}} = \beta_0 + 2\beta_1 TAX_{ic}$$

Under the baseline result in column (4), substituting $\hat{\beta}_0 = -0.782$ and $\hat{\beta}_1 = -.00101$

$$MSP = \frac{\partial log\pi_i}{\partial TAX_{ic}} = -0.0782 + 0.00202 \times TAX_{ic}$$

Thus, *MSP* depends on TAX_{ic}. The coefficient of TAX_{ic} in *MSP* is positive so that *MSP* is upward-sloping. As TAX_{ic} approaches 0, *MSP* is closer to -0.0782, implying the tax semi-elasticity

of 7 in profit shifting around a 0% tax rate. If TAX_{ic} is around 30%, *MSP* is around -0.0176, implying the tax semi-elasticity of 1.76.

This result implies that the sensitivity of profit shifting to a tax rate differs depending on the tax rate itself; The lower the tax rate is, the higher the sensitivity to the tax rate is.[26] As this example shows, the tax semi-elasticity depends on the value of TAX_{ic}. The lower the TAX_{ic} is, the larger the tax semi-elasticity is.

5.3. Robustness Checks

I next report several alternative regressions as additional robustness checks in Table 6, which is similar to what I showed in Subsection 4.3.

<Table 6 is inserted.>

First, I took the regression with a limited sample: only subsidiaries fully funded from Japanese parent companies. This reduces the sample size from 6,655 to 4,166. The tax rate coefficients are negative and those for the squared tax rates are positive, which is estimated statistically significant.

In column (3), I in turn use sales as a dependent variable, instead of the pre-tax profits. The coefficient of the tax rate is negative, and the coefficient for the squared tax rate is positive, which is estimated statistically significant.

In column (4), I take a regression with financial leverage. The coefficient of the tax rate is negative with statistical significance. On the other hand, the coefficient for the squared tax rate is estimated negative slightly under statistical significance.

In column (5), I use interest expenses, instead of the pre-tax profits, as a dependent variable. The result indicates that the tax rate coefficient is negative, and the coefficient for the squared tax rate

[26] The result is consistent with the aforementioned previous research. Dowd, Landefeld, and Moore (2017) found a non-linear tax response by analyzing US tax data between 2002 and 2010. They report the semi-elasticities of 4.7 as the corporate tax rate is around 5%, while 0.6 as the tax rate is 30%.

is positive, which is estimated statistically significant.

Even with a variety of variables, the tax rate coefficient is negative and the one for the squared tax rate is positive (vice versa in the case of substituting interest expense). The tax rate coefficients are indicated between -0.0677 and -0.143, while the coefficients for the squared tax rates are demonstrated between 0.00142 and 0.00210. Each estimated value is not diffused. These results confirm the robustness of the estimation shown in Table 5.

6. Expanded analysis with the average tax rate for the other subsidiaries

6.1. Method

If a multinational corporation has many subsidiaries at different jurisdictions, it is natural to choose the best subsidiary to shift profits to. To know the best one, multinationals might compare tax rates of their subsidiary's countries. In the nature of comparison, not only the tax rate where profits are finally shifted, but also the other tax rates where the other subsidiaries stand without shifting profits must be considered.

For example, one Japanese multinational corporation, *P*, owns two subsidiaries in countries *A* and *B*. The other Japanese corporation, *Q*, also owns two subsidiaries in countries *B* and *C*. Suppose that the corporate tax rate of Japan is 42% (the statutory tax rate as of 2004). Also suppose each corporation tax rate of *A*, *B*, and *C* is hypothesized as 30%, 20%, and 10%. For corporation *P*, ignoring other conditions, country *B* is preferable to shift the profits over country *A*, while for corporation *Q*, country *C* is preferable over country *B*. The preference for *B* depends on the locations of the other subsidiaries. In other words, even if a tax rate at country *B* remains constant, whether it is desirable to shift profits to country *B* depends on where the multinational corporation owns its subsidiary and what the tax rates are there.

In the previous sections, I did not take the perspective of the "relative" preference on the tax

rate into the regression model. In this section, I extend the basic model to consider the relativeness.

To compare with the tax rate at the subsidiary where the profit is shifted, first I need to composite a variable that reflects the tax rates faced by the remaining subsidiaries in the same group. The tax rates applied for the other subsidiaries are defined in the following two ways.

$$TAX_{ia}: \textit{average tax rate among subsidiaries funded by the same parent company except for subsidiary } i$$

$$TAX_{ia} = \frac{\sum_{k=1}^{n} \mathrm{TAX}_k - TAX_i}{n-1} \quad (k = 1,2, \dots i \dots n)$$

$$TAX_{iwa}: TAX_{ia} \textit{ weighted by total assets}$$

$$TAX_{iwa} = \frac{\sum_{k=1}^{n} (\mathrm{TAX}_k \times W_k) - TAX_i \times W_i}{\sum_{k=1}^{n} W_k - W_i} \quad (k = 1,2, \dots i \dots n)$$

W_i refers to the total assets of subsidiary *i* and weights the average.[27] TAX_{iwa} means the average tax rate for the remaining subsidiaries in the same group as subsidiary *i*.

The model is as follows.

$$log\pi_i = const + \beta_0 TAX_{iwa} + \beta_1 logK_i + \beta_2 logL_i + \beta_3 logA_{ic} + \mu_i + \varepsilon_i$$

$$log\pi_i = const + \beta_0 TAX_{ic} + \beta_1 TAX_{iwa} + \beta_2 logK_i + \beta_3 logL_i + \beta_4 logA_{ic} + \mu_i + \varepsilon_i$$

If the other country's tax rates are relatively higher, the multinationals are likely to shift the profits to the jurisdiction where subsidiary *i* stands. It is hypothesized that the higher TAX_{iwa} incentivizes the parent company to shift more profits to subsidiary *i*. Therefore, the coefficient of TAX_{iwa} is expected to be positive.

[27] The reason why the simple average is weighted by the amount of the total assets is that the significance of each tax rate can be different depending on its total assets. For example, one hypothetical parent company has two subsidiaries, A and B, in the US (suppose the tax rate is 30% for simplification) and two other subsidiaries, C and D, in the Cayman Islands (suppose the tax rate is 0% for simplification). From the perspective of A, the simple average tax rate (TAX_{ia}) is 10%. (30%+0%+0%)/3=10%. Now, suppose that each A, B, C, and D has assets with a value of 200, 100, 1,700, and 1,000, respectively. In this case, the weighted average tax rate for A is 2%.
(30%*100+0%*1700+0%*1000) / (100+1700+1,000) = 2%. This implies that the change in tax rates in the country where a subsidiary has more assets has a significant influence to shift profits.

As an alternative specification, I use the tax differential between the other subsidiary and subsidiary *i* as an independent variable instead of using these tax rates separately. The regression estimation is formulated as follows.

$$log\pi_i = const + \beta_0(TAX_{iwa} - TAX_{ic}) + \beta_1 logK_i + \beta_2 logL_i + \beta_3 logA_{ic} + \mu_i + \varepsilon_i$$

6.2 Results

Table 7 presents the estimated result.

<Table 7 is inserted.>

Column (1) reports the coefficients estimated by the regression model with TAX_{ia} as an independent variable. Column (2) shows the result by the regression with TAX_{iwa} instead of TAX_{ia}. The coefficient of TAX_{ia} is estimated at 0.0186 with statistical significance at the 10% level. The coefficient of TAX_{iwa} is estimated at 0.0144 with statistical significance at the 5% level. These results imply that a 1-percentage-point increase of the average tax rates of the other subsidiaries increases the profit of subsidiary *i* by approximately 1.5%. This is consistent with our intuition discussed in Subsection 6.1.

Columns (3) and (4) report the coefficients estimated by the regression with TAX_{iwa} and TAX_{ic}. In column (3), the coefficient of TAX_{ia} (the average tax rate for the other subsidiaries) is estimated at 0.0205 with statistical significance at the 5% level. The coefficient of TAX_{ic} (a tax rate for subsidiary *i*) is estimated at -0.0204 with statistical significance at the 1% level. This implies that a 1-percentage-point tax increase for subsidiary *i* decreases the pre-tax profit by 2.04%, and a 1-percentage-point average tax increase for the other remaining subsidiaries increases subsidiary *i*'s pre-tax profits by 2.05%, while the tax rate for subsidiary *i* remains constant.

In column (4), the coefficient of TAX_{iwa} is estimated at 0.0163 with statistical significance

at the 5% level. On the contrary, the coefficient of TAX_{ic} is estimated at -0.0207 with statistical significance at the 1% level. This implies that a 1-percentage-point tax increase for subsidiary *i* decreases the pre-tax profits by 2.07%, while a 1-percentage-point tax increase for the other remaining subsidiaries increases subsidiary *i*'s pre-tax profits by 1.63%.

According to the results in columns (3) and (4), profit shifting depends on not only a tax rate for a subsidiary receiving the profits but also the tax rates for the other subsidiaries in different places. If so, it is expected that the differences between the tax rate for the other remaining subsidiaries in the same group and the one for subsidiary *i* are positively related to subsidiary *i*'s pre-tax profits.

Column (5) uses the difference between TAX_{ia} and TAX_{ic} as an independent variable. The coefficient of the difference is estimated at 0.0204 with statistical significance at the 1% level. This implies that a 1-percentage-point larger disparity of the tax rates increases subsidiary *i*'s pre-tax profits by 2.04%.

Column (6) uses the difference between TAX_{iwa} and TAX_{ic} as an independent variable. The coefficient of this difference is estimated at 0.0190 with statistical significance at the 1% level. This implies that a 1-percentage-point larger disparity of tax rates between subsidiary *i* and the remaining subsidiaries increases subsidiary *i*'s pre-tax profits by 1.90%.

Therefore, tax rates for the other subsidiaries in the same multinational group are also determinative to conduct profit shifting.

7. Discussion

This paper conducts econometric analyses to figure out the practice of profit shifting by Japanese multinational corporations.

The paper mainly reveals three implications; One subsidiary's pre-tax profit is increased by 2% as a statutory corporation tax rate decreases by 1 percentage point at the jurisdiction where the

subsidiary is located; The sensitivity of the reported profits to a tax rate is not linear. The lower a tax rate is, the larger the tax semi-elasticity is; Not only a tax rate where a subsidiary is located but also the tax rates for the remaining subsidiaries in the same group are influential to the plan of profit shifting. These implications are confirmed with statistical significance and robustness checks.

The overall results are consistent with the hypothesis; If a tax rate for one subsidiary is getting higher, its pre-tax profits are lower; If a tax rate at the other subsidiary is getting higher, the pre-tax profits of the first subsidiary are larger. Non-linear correlation between the log of reported profits and tax rates is demonstrated, which is also consistent with previous research (Dowd, Landefeld, and Moore, 2017). In addition, these are also intuitive as it is hard to imagine Japanese multinational corporations not shifting any profits at all in this international era.[28] Therefore, the results here indicating the clear sign of profit shifting by Japanese multinationals are regarded as an intuitive and persuasive conclusion.

On the contrary, the estimate in the baseline result, the tax semi-elasticity of 2, can be a result of overestimation. The result may counter the assumption that Japanese multinational corporations emphasize compliance and are not likely to shift as much profits as the western multinationals do. More significantly, the estimate is relatively high compared to those obtained in previous research,[29] although it is still lower than the estimate of Hines and Rice (1994) at 2.25. Hines and Rice (1994), however, used the data aggregated at the country-level, which tends to estimate the magnitude of profit shifting to be larger. On the contrary, this paper uses the firm-level data so that the tax semi-elasticity is expected to be as low as those estimated in recent research with the firm-level data.

[28] Clausing (2016b) argues that 39.8 billion dollars of Japanese revenue was lost in 2012 due to profit shifting. She firstly defines "excess" profits in low-tax countries, allocates the excess profits to countries depending on the country's share of GDP, and multiplies the effective tax rates. This is a rough sketch, because her main analysis is on the US multinationals and just extends the analysis to the world-wide level with the same assumption.

[29] Dischinger (2007) reports the tax semi-elasticity is 0.7; Huizinga and Laeven (2008): 1.31; and Lohse, Riedel, and Hofmann (2015): 0.4. *Cf.* Heckemeyer and Overesch (2017): 0.8 by a different model.

In this regard, Hasegawa (2019) presents the result consistent with the trend. He analyzed multinationals in Japan and the US by using the firm-level panel data from 2004 to 2016. He reports that the tax semi-elasticity for Japanese multinationals is 0.28, while it is estimated at 0.74 for US multinationals. 0.74 is closer to "consensus semi-elasticity" of 0.8 (Dharmapala, 2014). The estimated tax semi-elasticity of 0.28 for Japanese multinationals is much smaller than that of the US, which is also consistent with the assumption that Japanese multinationals value compliance.

Therefore, compared to the previous work—the baseline result of this paper—the tax semi-elasticity of 2 is relatively large. To identify the further challenge, it is worth considering why it is estimated to be larger. There are three potential answers to this question which are presented as follows.

The first answer is that the paper conducts a cross-section analysis, not a panel data analysis, because of the data availability. Considering recent research mainly conducts panel data analyses and they tend to show smaller tax semi-elasticity, the cross-sectional analysis here can potentially cause overestimation in the following two ways; Firstly, any fixed effect (e.g., unobservable and time-invariant characteristics of each subsidiary) is not controlled for in this analysis. For example, it can be natural to assume that one subsidiary stands in the jurisdiction with a lower tax rate because it is more eager to reduce the loss of tax than other subsidiaries standing in a jurisdiction with a higher tax rate. The subsidiary in a lower tax rate would perform better than the other subsidiaries even if the others would stand in the same place. Such an ability or eagerness to save a loss of tax is an example of the fixed, unobservable, and time-invariant characteristics. In this example, the eagerness to save tax payment can be correlated to the reported profits and the tax rate as well, which can cause overestimation of the tax semi-elasticity.

Secondly, the paper just analyzes the practice in 2004, which does not necessarily represent the general practice for a long time. Thus, the possibility cannot be denied that the practice in 2004 diverges from the general trend and multinationals shifted more profits than usual, which causes the

higher baseline result. It is actually estimated that the tax semi-elasticity does not remain constant all the time. Hasegawa (2019) shows that the tax semi-elasticity has changed during the tested term from 0.45 in 2007 to 2.13 in 2009, attributing it to the effects of the major tax revision moving to a territorial tax system on 95% profit repatriations. There is a possibility that the tax semi-elasticity temporarily reached 2 in 2004, although more information is necessary regarding the amount of and reason behind Japanese multinationals shifting more profits in 2004 than usual.

We also need to be careful to generalize our finding as the current international tax system has changed drastically from that in 2004. The Japanese government has reduced the corporate tax rate while securing revenue by expanding the tax base. For example, a corporate tax rate in 2004 was 30%, while it was 23.2% in 2018. It might be true that the motivation for shifting profits has changed as the tax rate changed. As noted, before 2009, Japan used the so-called worldwide income tax system (i.e., Japan basically taxed foreign income upon repatriation, allowing foreign tax credits for taxes paid to the foreign government). In 2004, Japan used the entity approach for the controlled foreign corporation (CFC) rule, which was revised later in 2010.

To sum up, as the international tax system in Japan has changed drastically since 2004, it is difficult to generalize the estimate in this article. The scope of this paper analyzing only 2004 can be regarded as too narrow to represent the general tendency of Japanese multinational corporation's profit shifting.

The second potential answer is that the previous work underestimates the tax semi-elasticity due to the datasets used. Many of the previous work used the datasets from Orbis and/or Amadeus provided by Bureau van Dijk, the major private publisher of business information, for a firm-level data analysis. Some argue that the information on tax havens are missing. This paper analyzes the datasets, *Survey on Overseas Business Activities*, which is provided by the Japanese government. The target of the survey is Japanese multinational corporations so that the information of subsidiaries in

Asia is broadly covered. The survey is rigorously conducted under the Statistical Law, which requires officers of the government to firmly hold the secret with a power of sanction (TOKEIHO [Statistical Law] 2007, art. 41, 43, 57). Unfortunately, both of the surveys do not contain the complete information on tax heaven's subsidiaries. It might also be impossible to compare the government survey here to the data from Bureau van Dijk regarding which avoids more tax havens as it is *probatio diabolica*. As it is uncertain whether the used datasets cover the necessary information, we cannot deny the possibility that the valuable work underestimated the tax semi-elasticity.

The third potential answer is that the paper here does not include enough control variables. For example, the country-level variables include GDP per capita and population. The other variables like GDP growth rate can be included, although it is not certain how much change it causes. The other aspect which is missed in this paper is regarding tax treaty or the legal aspect. The Japanese government has entered into many treaties,[30] which determine the applicable tax rates and how much information is shared between the authority of the jurisdiction and the Japanese agency. It is reasonable for the one who wants to shift profits to choose the jurisdiction where the Japanese government is less likely to know the activity in the jurisdiction. Therefore, the tax treaties are the important factors in profit shifting and it is clearly desirable to consider the treaties in the regression model.

As discussed, there are several possible explanations why the baseline tax semi-elasticity is reported as 2, higher than the previous work. It is, however, a different matter how we evaluate it for further policy making. In other words, this article does not answer the question "Is the tax semi-elasticity large enough to be regarded problematic?"

There also might be a more interesting question on how to apply the empirical analysis to the policy. Technically, ignoring the incompleteness of the analysis in this article, we can predict how much of a subsidiary's profit is shifted by using the estimated coefficients and the statutory tax rate

[30] On 1st August 2019, Japan signed 74 tax treaties with 131 jurisdictions. Ministry of Finance, "Japan's tax treaty network" (Ministry of Finance in Japan, 2019).

for the subsidiary. If we use this model to determine which income is taxed, this formality enhances the predictability of taxation. However, any empirical analysis may not capture all the activities at the subsidiary. For example, we can use personnel expenses to estimate real profits, but we cannot capture how eager they work and contribute to profits. Thus, we can use the model as a supplement to determine the magnitude of profit shifting.

These “policy questions” are beyond the scope of this paper. This article just shows the first step to update the policy. I expect this to spark or accelerate the debate on this topic. Thus, a series of research to follow this paper is expected, and this paper is welcomed to be discussed either positively or negatively for the purpose of healthy policy making.

8. Conclusion

The paper provides clues to figure out profit shifting by Japanese multinational corporations. It reports a clear sign of profit shifting with a baseline result: the tax semi-elasticity of 2. The paper also shows the detailed aspects of profit shifting by Japanese multinationals; The tax semi-elasticity to the reported profits is larger as the tax rate is lower. In profit shifting, tax rates for the other subsidiaries in the same group are influential even if a tax rate for one subsidiary remains constant.

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Tables

< Table 1 >

Variable	Definition	Resource
Pre-tax Profit	The total amount of the operating and non-operating profits and losses. Sales – Cost of goods sold – Selling, general and administrative expenses + Non-operating income – Non-operating expenses. Profit of loss before tax（10 billion yen）.	Basic Survey on Overseas Business Activities
TAX	Statutory corporation tax rate（%）.	KPMG
Capital	Tangible fixes property（10 billion yen）.	Basic Survey on Overseas Business Activities
Labor	The total salaries and wages paid or obligated to pay.	Basic Survey on Overseas Business Activities
GDP per capita	Gross Domestic Production divided by the country's population（dollar）.	World Bank, National Statistics Republic of China (Taiwan)
Population	The number of residents. This does not consider one's citizenship.	
Leverage	The percentage of debt in total assets.	Basic Survey on Overseas Business Activities
Control of Corruption	Perception of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as capture of the state by elites and private interests.	World Bank

< Table 2 >

Variable	Obs.	Mean	Std. Dev.	Min	Max
Pre-tax Profit	13,892	438	4,806	-86,200	294,589
Tax	16,200	30.34991	5.577366	0	55
Capital	11,978	1,281	6,540	0	291,500
Labor (payroll)	10,266	408	2,241	-672	149,440
Sales	14,292	11,388	82,944	-1	5,413,063
Leverage	13,622	1	33	-10	3,209
Interest Expense	9,164	53	493	-2,581	31,123
GDP per capita	16,377	19,233.68	16,779.91	0	12,3382
Population	16,377	326,000,000	474,000,000	19,804	1,300,000,000

< Table 3>

	Pre-tax Profit (ln)			
	(1)	(2)	(3)	(4)
TAX (%)	-0.0233***	-0.0221***	-0.0154***	-0.0200***
	(0.00327)	(0.00325)	(0.00467)	(0.00465)
Capital (ln)	0.253***	0.260***	0.244***	0.245***
	(0.00906)	(0.0111)	(0.0101)	(0.0117)
Labor (ln)	0.506***	0.485***	0.523***	0.522***
	(0.0136)	(0.0144)	(0.0163)	(0.0167)
GDP per capita (ln)			-0.0559***	-0.0806***
			(0.0163)	(0.0162)
Population (ln)			-0.0453**	-0.0231
			(0.0156)	(0.0153)
_cons	1.497***	1.056***	2.550***	2.062***
	(0.107)	(0.285)	(0.304)	(0.392)
Industry Fixed Effects	No	Yes	No	Yes
N	6,655	6,655	6,655	6,655

Note: The values in parentheses report heteroskedasticity-robust standard error. *, **, and *** denotes significance at the 10%, 5%, and 1% levels, respectively.

< Table 4 >

	Pre-tax profit (ln)		*Sales* (ln)	*Pre-tax Profit* (ln)	*Interest Ex-pense* (ln)	*Pre-tax Profit* (ln)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TAX (%)	-0.0212***	-0.0230***	-0.0225***	-0.0201***	0.0293***	0.00815	-0.0150**
	(0.00534)	(0.00529)	(0.00376)	(0.00459)	(0.00580)	(0.00735)	(0.00487)
Capital (ln)	0.210***	0.219***	0.163***	0.268***	0.303***	0.248***	0.246***
	(0.0126)	(0.0142)	(0.00924)	(0.0117)	(0.0144)	(0.0117)	(0.0120)
Labor (ln)	0.542***	0.544***	0.746***	0.492***	0.323***	0.526***	0.519***
	(0.0207)	(0.0212)	(0.0135)	(0.0166)	(0.0198)	(0.0167)	(0.0171)
GDP per capita (ln)	-0.0175	-0.0543**	-0.0405***	-0.0822***	0.0119	-0.0573*	-0.158***
	(0.0206)	(0.0206)	(0.0117)	(0.0160)	(0.0191)	(0.0256)	(0.0404)
Population (ln)	-0.0356	-0.0292	-0.0468***	-0.00929	-0.0780***	-0.00317	-0.0218
	(0.0187)	(0.0183)	(0.0115)	(0.0151)	(0.0179)	(0.0156)	(0.0153)
Leverage (ln)				-0.215***			
				(0.0162)			
Asia						1.327***	
						(0.309)	
*Asia*TAX*						-0.0370***	
						(0.0107)	
Control of Corruption							0.105*
							(0.0512)
_cons	2.226***	2.083***	3.961***	1.827***	-0.313	0.522	2.514***
	(0.371)	(0.459)	(0.286)	(0.417)	(0.486)	(0.482)	(0.460)
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
N	4,166	4,166	8,524	6,646	4,368	6,655	6,313

Note: The values in parentheses report heteroskedasticity-robust standard error. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

< Table 5>

	Pre-tax Profit (ln)			
	(1)	(2)	(3)	(4)
TAX (%)	-0.0830***	-0.0606*	-0.0827**	-0.0782**
	(0.0240)	(0.0235)	(0.0254)	(0.0256)
TAX^2 (%)	0.00107*	0.000685	0.00117**	0.00101*
	(0.000425)	(0.000419)	(0.000436)	(0.000441)
Capital (ln)	0.257***	0.263***	0.246***	0.246***
	(0.00935)	(0.0112)	(0.0102)	(0.0116)
Labor (ln)	0.500***	0.482***	0.523***	0.523***
	(0.0138)	(0.0145)	(0.0163)	(0.0167)
GDP per capita (ln)			-0.0625***	-0.0860***
			(0.0165)	(0.0165)
Population (ln)			-0.0374*	-0.0162
			(0.0152)	(0.0149)
_cons	2.304***	1.582***	3.394***	2.805***
	(0.338)	(0.425)	(0.453)	(0.526)
Industry Fixed Effects	No	Yes	No	Yes
N	6,655	6,655	6,655	6,655

Note: The values in parentheses report heteroskedasticity-robust standard error. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

< Table 6 >

	Pre-tax Profit (ln)		*Sales* (ln)	*Pre-tax Profit* (ln)	*Interest Expense* (ln)
	(1)	(2)	(3)	(4)	(5)
TAX (%)	-0.110***	-0.105***	-0.143***	-0.0677**	0.0922**
	(0.0284)	(0.0293)	(0.0208)	(0.0252)	(0.0288)
TAX^2 (%)	0.00155***	0.00142**	0.00210***	0.000823	-0.00109*
	(0.000470)	(0.000485)	(0.000351)	(0.000434)	(0.000486)
Capital (ln)	0.213***	0.221***	0.164***	0.269***	0.302***
	(0.0127)	(0.0142)	(0.00921)	(0.0117)	(0.0145)
Labor (ln)	0.541***	0.544***	0.747***	0.492***	0.322***
	(0.0207)	(0.0212)	(0.0135)	(0.0166)	(0.0198)
GDP per capita (ln)	-0.0244	-0.0610**	-0.0528***	-0.0866***	0.0183
	(0.0205)	(0.0207)	(0.0118)	(0.0163)	(0.0194)
Population (ln)	-0.0235	-0.0179	-0.0358***	-0.00373	-0.0839***
	(0.0185)	(0.0182)	(0.0108)	(0.0148)	(0.0179)
Leverage (ln)				-0.214***	
				(0.0162)	
_cons	3.292***	3.083***	5.542***	2.435***	-1.149
	(0.479)	(0.568)	(0.400)	(0.543)	(0.622)
Industry Fixed Effects	No	Yes	Yes	Yes	Yes
N	4,166	4,166	8,524	6,646	4,368

Note: The values in parentheses report heteroskedasticity-robust standard error. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

< Table 7 >

	Pre-tax Profit (ln)					
	(1)	(2)	(3)	(4)	(5)	(6)
TAX (%)			-0.0204***	-0.0207***		
			(0.00457)	(0.00457)		
Average TAX (%)	0.0186*		0.0205**			
	(0.00745)		(0.00743)			
Weighted Average TAX (%)		0.0144**		0.0163**		
		(0.00551)		(0.00550)		
Average TAX – TAX (%)					0.0204***	
					(0.00396)	
Weighted Average TAX – TAX (%)						0.0190***
						(0.00362)
Capital (ln)	0.244***	0.244***	0.243***	0.243***	0.243***	0.243***
	(0.0121)	(0.0121)	(0.0121)	(0.0121)	(0.0121)	(0.0121)
Labor (ln)	0.508***	0.508***	0.516***	0.515***	0.516***	0.514***
	(0.0173)	(0.0174)	(0.0174)	(0.0175)	(0.0174)	(0.0174)
GDP per capita (ln)	0.0990***	0.0991***	0.0818***	0.0816***	0.0817***	0.0833***
	(0.0165)	(0.0165)	(0.0168)	(0.0168)	(0.0166)	(0.0166)
Population (ln)	0.0719***	0.0717***	-0.0256	-0.0246	-0.0255	-0.0283*
	(0.0113)	(0.0113)	(0.0155)	(0.0155)	(0.0145)	(0.0142)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
_cons	1.954***	2.082***	1.535***	1.655***	1.536***	1.604***
	(0.449)	(0.430)	(0.453)	(0.435)	(0.430)	(0.426)
N	6,233	6,210	6,233	6,210	6,233	6,210

Note: The values in parentheses report heteroskedasticity-robust standard error. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.