What Determines Japanese Corporate Effective Tax Rates?
Evidence from Firms Listed on the Tokyo Stock Exchange

Hiroyasu Nomura[1]
Dokkyo University, Faculty of Economics
June 2017

Abstract

This paper investigates determinants of effective corporate tax rates in Japan using the latest financial data from listed companies. This study is the first to estimate Japanese average effective corporate income tax rates (ETR) based on firm-level panel data. We define two ETR measures. One is the ratio of corporate income tax liabilities to cash flow from operations (ETR1). The other is the ratio of tax liabilities to pretax income (ETR2). With these two measures we examine the relationships between ETR and various firm-level characteristics including firm size, capital structure, research and development expenditure (R&D), profitability and foreign operations. We also control for firms' losses carried forward from previous years, which might not be fully taken into consideration in previous studies. Following a model selection procedure, we adopt a GLS (generalized least square) fixed effects model with cross-section weights.

The estimated results indicate that larger firms face higher ETRs, which supports political cost theory. Further, more leveraged firms have lower ETRs, as predicted, presumably by deductibility of interest expenses. Firms with larger losses carried forward from their past operations have lower ETRs, as also reasonably expected. As for R&D and foreign operations, however, we find no significant effects on ETRs. On the other hand, firms' ROA (return on total assets) as a measure of profitability is positively associated with ETR1 although it has a negative impact on ETR2. These seemingly contradictory results may be explained by the fact that the more profitable firms have higher shares of taxable profits to cash flow (leading to higher ETR1) while having lower proportions of tax liability to taxable income or lower proportions of taxable income to pretax income (leading to lower ETR2) by taking advantage of more deductions or tax credits.

[1] Contacts: k03480@dokkyo.ac.jp

1. Introduction

Since the middle of the 1980s a trend of corporate tax reform, characterized by rate-reductions and base-broadening, has been observed in many developed countries. While top statutory corporate income tax rates in the 1980s were more than 45% in most countries, the OECD average rate in 2016 was below 25%[2]. Japanese corporate taxation has followed this trend to a degree with a view to enhancing the international competitiveness of domestic firms as well as incentivizing foreign firms to maintain operations therein. The Japanese statutory corporate tax rate actually declined to below 30% in 2016 from around 50% in the middle of the 1990s, but its tax base has yet to fully broaden mainly due to the introduction of new special preferences and tax incentives.

According to the Government Tax Commission, the aim of recent corporate tax reform in Japan has, fundamentally, been to improve neutrality and fairness of taxation so that it will not distort companies' decisions[3]. Under these goals, if "fairness and neutrality in taxation" means that "there is no difference in the effective tax rates among firms no matter what kind of behavior they pursue," two questions would inevitably arise. Firstly, how variant are those actual tax levels across Japanese firms? Secondly, and more importantly, what are the determinants of the variability in effective tax rates for those firms?

This paper attempts to investigate these two questions by using the latest financial data of listed companies in Japan. More specifically we explore what firm-level characteristics and factors affect their actual tax burdens under the assumption that the tax levels disparity among firms would be generated as a result of various behaviors and decisions by each firm.

2. Literature review

Various empirical analyses have been conducted concerning the actual tax burden of Japanese firms from the perspective of specific industries, firm size, time period, international comparison and so on. In most cases they use aggregate data collected by the National Tax Agency or micro financial data of individual firms. However, there have scarcely been empirical analyses on "ex-post" average effective corporate tax rates (ETR) using firm-level financial panel data; a notable exception being Kitamura (2002), where tax rates are defined based on all taxes firms may pay including not just income tax but also local property tax etc. In this sense our study may be the first to estimate

[2] Brys et al (2011),p.3. OECD Tax Database.
[3] Government Tax Commission (2014), p.2.

Japanese “average effective corporate income tax rates” based on firm-level panel data, and would thus contribute to the extant empirical research in this domain.

By contrast, numerous studies have examined the relationship between various firm characteristics and ETR in other countries. While most of the them are based on U.S. corporations (e.g., Stickney & McGee 1982, Zimmerman 1983, Gupta & Newberry 1997, Manzon and Plesko 2002, Rego 2003), more recent investigations have used financial data from Australia (Harris & Feeny 1999, Richard & Lanis 2007), Germany (Suleth et al 2009, Kraft 2014), the U.K. (Ribeiro 2015), the Netherlands (Janssen & Buijink 2000), Malaysia (Noor et al 2010, Mhenthiran & Kasipillai 2011), and China (Liu & Cao 2007). These studies adopted various empirical methods and procedures, considering similar influential factors, yet they did not necessarily find similar results (as discussed further in the next section).

Particularly regarding the explanatory variables for ETR, these studies do not explicitly take account of firms' net operating loss (NOL) or negative income, which could considerably reduce the following years' taxable income through the loss carry-forward measure built in a common corporate income tax system. Janssen & Buijink (2000) admit NOL should be considered; they do not use the NOL levels themselves but instead simply incorporate dummy variables representing firms with negative income due to data unavailability. Kitamura (2002), the only previous empirical study on corporate ETR in this field, does not take NOL into consideration either. Thus we attempt to consider the level of each firm's negative income, which would be the second contribution to this field.

3. Potential determinants of the burden of Corporate Income Taxation

Some hypotheses have been presented concerning what determines the burden of corporate income taxation. The background behind such discussion lies in the basic idea that companies' activities that seek to maximize their shareholders' returns should be influenced by corporate taxation since it forms a major component of costs for them[4]. In other words, the actual level of corporate taxation would be determined not just by various behaviors and characteristics of the company but also by the company's intentional tax avoiding activities under the current domestic and foreign corporate tax system.

Based on this background this section reviews assumed relations between various factors, which might affect the corporate tax burden and resulting effective tax rates.

[4] Avi-Yonah (2006), pp.19-20.

Through this we specify the explanatory variables in the estimation model to be used in the following section.

3-1. Firm size

The question of how the burden of corporate taxation varies depending on firm size (commonly measured by "total assets" held by a company) is one of the crucial topics that have been discussed vigorously in this field. As for the relationship between firms' ETR and their size, two hypotheses have been presented and tested in many empirical studies.

One is political cost theory, claiming that larger firms bear more tax burdens because they are more likely to be monitored or inspected by government authorities. Larger firms are also expected to actively fulfill corporate social responsibility, which will make it difficult for them to broadly curtail their tax burdens. The second is political power theory which argues that larger firms bear less tax burdens since their substantial economic resources allow them to not only engage in efficient tax avoidance activity but also affect political processes so that they could harness more tax preferences and advantages.

Previous research did not necessarily find consistent results as to whether there was ever a significant effect of firm size on ETR and, further, which of these two hypotheses accords better with empirical realities. The results of these studies suggest that the relationship between these two factors would be determined by (1) the specific period covered by sample data used in the analysis, which are also associated with the structure of the underlying tax system, (2) what kind of industry the sampled firms belong to, (3) how firm size and ETR are defined. For these reasons it would be hard to predict what relationship will be established between firms' size and their ETR in the context of Japanese listed firms.

3-2. Capital structure and other attributes

Leverage

It is also expected that corporate capital structure and the type of assets held would have a significant influence on ETR. Under the typical corporate income tax system, like in the case of Japan, interest costs are, as a rule, deductible. Therefore, a firm's higher leverage (e.g., debt-equity ratio) generally reduces its taxable income through the increase in interest expenses, leading to lower ETR. In this respect we basically assume a negative relationship between the degree of leverage and ETR. Moreover, this negative relationship may be justified from the viewpoint of agency theory that stronger

business constraints through debt contracts with lenders induce managers to run their own firm more efficiently, which might diminish their ETR[5].

Fixed assets

Firms with a high capital intensity (or proportion of tangible fixed assets to total assets) tend to reduce their tax burden through an allowable basic depreciation deduction. Additionally in Japan there exist some special deduction systems such as accelerated depreciation, enabling firms to deduct large amounts of capital costs in a shorter period of time. The aim of these special provisions is, naturally, to promote the acquisition of specific fixed assets (e.g., environmentally friendly assets) by firms. For this reason we assume a negative relationship between capital intensity and ETR.

Profitability

It may be reasonable to assume a positive relationship between ROA (return on total assets as a measure of firms' profitability) and ETR if more profitable firms tend to earn more 'taxable' income (Gupta & Newberry 1997, Richard & Lanis 2007). On the other side, we can imagine a negative relationship thereof if more profitable firms are apt at minimizing their tax payments by making better use of various special provisions including income deduction and tax credits (Manzon and Plesko 2002, Noor et al 2010). Thus we cannot confidently predict the sign of this relationship.

Growth potential

A higher PBR (price book-value ratio as a measure of firms' growth potential) indicates that the firm has acquired a better reputation from the stock market. In this respect, firms with high growth potential may not necessarily have strong incentives to reduce their tax burden simply because they give higher priority to maintaining the stock price of their own firm (Kraft 2014). However, judging from the fact that corporate tax payments are also reflected in firms' stock prices, firms with high growth potential may be actively trying to minimize tax outgoings as much as possible in order to keep their stock price high (Rego 2003). Therefore, the relationship between PBR and ETR is also uncertain.

R&D expenses

Firms with higher research and development (R&D) expenses may be able to reduce their tax burden through certain tax provisions related to these expenses. In

[5] Kraft(2014), p.4.

Japan several reforms have been implemented regarding these provisions since 2000s to create the current 'R&D tax system' framework, which mainly consists of tax credits determined by the total amount of R&D expenditure and annual additional expenses thereof. Thus it is naturally assumed that firms with a higher ratio of R&D expenses to total assets have lower ETR.

Foreign operations

Companies expanding into foreign markets may have more opportunities to engage in some international tax avoidance measures such as transfer-pricing and thin capitalization. In this sense we reasonably expect that the ratio of foreign sales to total sales, as a proxy for the extent of firms' foreign operations, will have a negative impact on ETR.

Moreover, as for dividends paid from foreign subsidiaries, a new 'exemption system' in lieu of the conventional indirect foreign tax credit has been applied to the foreign income of Japanese parent companies since 2009[6]. This change meant the nature of the Japanese international tax system shifted significantly away from 'the residence tax principle' toward 'the source tax principle' at the corporate level. Companies that have subsidiaries in a country with a lower corporate tax rate than Japan may be able to curtail their total tax burdens including foreign tax payments.

3-3. Loss carried forward

As mentioned earlier, NOL or negative income incurred in one fiscal year may significantly reduce the following years' taxable income through the loss carry-forward system. In Japan, it is possible to deduct negative taxable income that has accumulated within the preceding 9 years up to a certain percentage of the taxable income. In order to take this factor into account, we estimate the losses that should have been carried forward to the following year by assuming that a negative sign of ROA from 2007 to 2011 indicates an occurrence of negative taxable income in that year. Possible losses in this target period are induced by the selected sample period (2012–2015) in our analysis as explained in the next section.

The loss carry-forward deduction was allowed up to 100% of taxable income until 2010, but this has since gradually lowered; it was 80% of taxable income in 2011, 65% in 2016 and 50% in 2017. Therefore we calculate the level of loss (negative income) carried

[6] If a domestic corporation in Japan receives dividends from a foreign subsidiary with a holding ratio of the parent company of 25% or more and with a holding period of not less than 6 months, 95% of the dividends received may be non-taxable, except as stipulated in the Tax treaty (according to the Ministry of Finance, Japan).

forward as follows. For example, if a firm's ROA was −0.5 in 2008 but it has been the 0.1 in each and every subsequent year, the loss carried forward from previous years which qualifies to be deducted for 2012 would be 0.22 (= 0.5 − (0.1 × 1) − (0.1 × 1) − (0.1 × 0.8)) assuming the 100% allowable deduction against taxable income until 2010 and 80% thereafter. Similarly, the loss carry-over to be deducted for each following year will be 0.14(= 0.22 − (0.1 × 0.8) for 2013 and 0.06(= 0.14 − (0.1 × 0.8) for 2014. Finally for 2015 it will be 0 (according to −0.02 = 0.06 − (0.1 × 0.8)) since previous year's loss had been completely offset in 2014. We obviously assume an inverse relation between the level of loss carried forward from previous years and ETR.

4. Methodology and data

4-1. Definition of ETR

The ETR or corporate effective tax rate to be analyzed here is the "backward-looking" average corporate income tax rate, which is determined as a consequence of firm-level business activity through the relevant year. It should be "the ratio of the total amount of all tax liabilities" in a certain fiscal year to "the true economic income" of the corresponding year. However, of course, it's extremely hard to capture the true economic income of a firm, so we need to seek a practical measure to better approximate this.

Following Janssen & Buijink (2000) and Richardson & Lanis (2007), for example, we use both 'cash flow (funds of operation or CF)' and 'pre-tax income (PTI)' as the denominator of ETR. Although the concept of CF has an advantage of being free of the biases emanating from differences in the accounting standard adopted by each firm, it can substantially deviate from the true economic income since amortization of fixed capital, a non-negligible part of business costs, is generally included in this measure[7]. PTI, on the other hand, can converge toward true economic income because it is based on the EBIT (earnings before interests and taxes) excluding interest payments. But it may be subject to differences in accounting methods employed across firms.

Considering these caveats we define two measures of ETR as (1)ETR1 = T／CF, (2) ETR2 ＝ T／PTI, where T as the numerator denotes all corporate income tax liabilities including national, local, and foreign taxes levied in a certain fiscal year.

[7] There are three types of accounting standards adopted by Japanese firms: Japanese Accounting Standards, Generally Accepted Accounting Principles (U.S. GAAP), and International Financial Reporting Standards (IFRS). Among these, 118 listed firms adopt IFRS as July 15 of 2016, comprising 21.5% of the market capitalization by all listed firms in Japan, according to Financial Services Agency Japan ("Current status surrounding IFRS (in Japanese)" July 22, 2016).

4-2. Sample selection

We use the corporate financial data provided by Datastream of Thomson Reuters Markets. Specific sample data for our analysis are those for firms listed on the First Section of the Tokyo Stock Exchange during 2012–15. As of the end of 2015, there were 1934 listed companies, from which we remove 150 financial institutions and 21 electricity and gas firms[8]. The final sample size is made up of 525 firms (2,100 balanced panels) after excluding those that fall into the following categories[9].

① Firms whose key financial data are missing in one or more of the four years

② Firms with negative ETR

③ Firms with ETR exceeding 1

Table 1. Industry sector composition

Industrial Classification	Number of firms	% of total firms
Manufacturing	357	68.0%
Agriculture, forestry and fisheries	1	0.2%
Mining	2	0.4%
Construction	14	2.7%
Retail and wholesale trade	71	13.5%
Real estate	6	1.1%
Transportation and warehousing	24	4.6%
Information and communication	23	4.4%
Services	27	5.1%
total	525	100.0%

＊Classification is according to Datastream, and so is Table 2.

Table 2. Breakdown of manufacturing

Detailed classification of manufacturing	Number of firms	% of total manufacturing
Food and beverages	27	7.6%
Chemical products	66	18.5%
Medicine	15	4.2%
Ceramic	15	4.2%
General-purpose machinery	58	16.2%
Precision machinery	14	3.9%
Electrical machinery	56	15.7%
Transportation equipment	38	10.6%
Iron and steel	13	3.6%
Metal products	12	3.4%
Non-ferrous metals and products	7	2.0%
Pulp and paper	2	0.6%
Rubber products	7	2.0%
Petroleum and coal products	1	0.3%
Texile mill products	12	3.4%
Miscellaneous manufacturing	14	3.9%
total	357	100.0%

[8] Electricity and gas firms are subject to local business tax targeting their "revenue" instead of the "income" applied for firms in other industries.

[9] Richardson & Lanis (2007), p.692.

Table.1 shows the industry sector composition for the sample data. While two-thirds of the total number of firms are engaged in are consisted of manufacturing, the remaining non-manufacturing firms belong mainly to retail & wholesale trade, services, transportation & warehousing and information & communication. According to Table 2 that shows the breakdown of manufacturing, three sectors namely chemical products, general-purpose and electrical machinery account for the majority of the manufacturing industry as a whole.

4-3. Regression model

Fixed effects models and random effects models are two main approaches to empirical research based on panel data since both models can control for unobserved time-invariant heterogeneity peculiar to economic agents. Fixed effects models assume that the heterogeneity is correlated with the explanatory variables while random effects models suppose the individual specific effects are uncorrelated with the explanatory variables. The result of a Hasuman test, conducted to determine which model would be appropriate in this context, showed the null hypothesis that the specific effects and explanatory variables were uncorrelated was rejected at the 1% significance level. Further, we detected cross-sectional heteroscedasticity through a Breusch-Pagan test. Accordingly, we adopt the fixed effects model implemented by GLS (generalized least squares) with cross-section weights including year dummies to control for time-specific effects. The basic estimation equation is as follows:

$$ETR_{it} = \alpha + \beta_1 * SIZE_{it} + \beta_2 * DER_{it} + \beta_3 * FIXA_{it} + \beta_4 * ROA_{it} + \beta_5 * PBR_{it} + \beta_6 * RDE_{it} + \beta_7 * FSR_{it} + \beta_8 * LOSS_{it} + \varepsilon_{it}$$

Where ETR_{it} is the corporate effective income tax rate for firm i in year t. The explanatory variables (with subscripts omitted) include firm size (SIZE), debt-equity ratio (DER), capital intensity (FIXA), return on total assets (ROA), price book-value ratio (PBR), R&D expenditure (RDE), foreign sales (FSR), and loss carried forward (LOSS).

4-4. Descriptive statistics

Descriptive statistics and a correlation matrix for each of these variables are reported in Table 3 and Table 4 respectively. The mean values for the two dependent variables indicate ETR2 > ETR1. This derives from our variable definition that the

denominator of ETR1 including firms' depreciation is normally larger than that of ETR2, which is also consistent with the positive correlation coefficient between the two variables.

While each value for SIZE is based on a logarithmic transformation, the actual mean value of firms' assets is 51.8 billion yen, ranging from 0.4 billion yen to 4 trillion yen. Table 3 indicates a negative correlation coefficient between SIZE and either proxy for ETR, suggesting that the political power theory holds in Japan.

Every coefficient for RDE, FSR, and LOSS with ETR1 or ETR2 is negative as predicted, showing firms with higher foreign sales, bigger R&D spending, or more loss carried forward are likely to have less ETR[10].

Table 3. Descriptive statistics

	ETR1	ETR2	SIZE	DER	FIXA	ROA	PBR	RDE	FSR	LOSS
Mean	0.317	0.373	18.789	0.265	0.300	0.045	1.185	0.021	0.280	0.005
Median	0.294	0.371	18.631	0.111	0.289	0.039	0.942	0.014	0.237	0.000
Maximum	0.999	0.982	24.444	7.364	0.928	0.321	17.709	0.133	1.000	0.295
Minimum	0.001	0.006	15.304	0.000	0.004	−0.004	0.216	0.000	0.000	0.000
Standar Deviation	0.154	0.110	1.407	0.457	0.157	0.029	1.121	0.024	0.266	0.024
Sample size	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100

＊Definitions of each variable are as follows. ETR1t ＝ Tt／CFt, ETR2t＝Tt／PTIt, SIZEt ＝ ln(total asset)t-1, DERt ＝ (long-term debt)t-1／(equity capital)t-1, FIXAt ＝ (fixed capital)t-1／(total asset)t-1、ROAt ＝ (return on total asset)t, PBRt ＝ (price book-value ratio)t-1、RDEt ＝ (expenditure for R&D)t／(total asset)t-1、FSRt ＝ (foreign sales)t／(total sales)t, LOSSt ＝ negative ROA (represented as absolute value) carried forward to t year

Table 4. Correlation matrix

	ETR1	ETR2	SIZE	DER	FIXA	ROA	PBR	RDE	FSR	LOSS
ETR1	1.000									
ETR2	0.349	1.000								
SIZE	−0.207	−0.065	1.000							
DER	−0.216	0.021	0.312	1.000						
FIXA	−0.371	0.066	0.125	0.371	1.000					
ROA	0.287	−0.309	−0.143	−0.240	−0.220	1.000				
PBR	0.145	−0.015	0.005	0.021	−0.158	0.514	1.000			
RDE	−0.140	−0.180	0.142	−0.137	−0.169	0.136	0.021	1.000		
FSR	−0.225	−0.249	0.279	−0.079	−0.160	0.119	0.025	0.433	1.000	
LOSS	−0.143	−0.171	−0.046	0.130	−0.060	−0.035	−0.020	0.166	0.103	1.000

As for DER, FIXA, ROA, PBR, however, correlation coefficient signs (vis-à-vis ETR)

[10] These three variables differ from the remainder in that they take the value 0 unless the condition for each variable applies. The number of firms that are not applied to each condition is 484 for Loss, 101 for RDE and 160 for FSR.

vary depending on the alternative proxy for tax rate. These findings might be attributed to the different definitions of the two dependent variables as pointed out earlier.

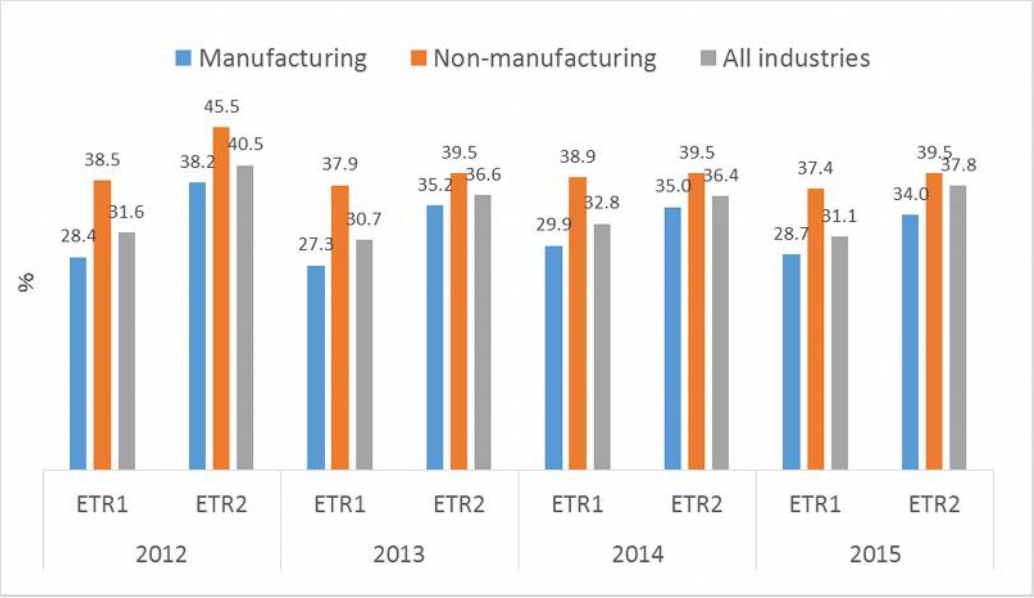
Judging from the statistics, correlation coefficients among the explanatory variables never suggest more than a moderate correlation (ROA and PBR being the highest at 0.51), thus multicollinearity may not be problematic when fitting our model and interpreting the results.

4-5. Trend in Japanese ETR

Figure 1 shows the actual trend in Japanese ETR during 2012–15. We can see the level of ETR for manufacturing firms are higher than that for non-manufacturing firms in every year. The overall feature of ETR1 > ETR2, which was noted earlier, also applies when disaggregated by industry category and year.

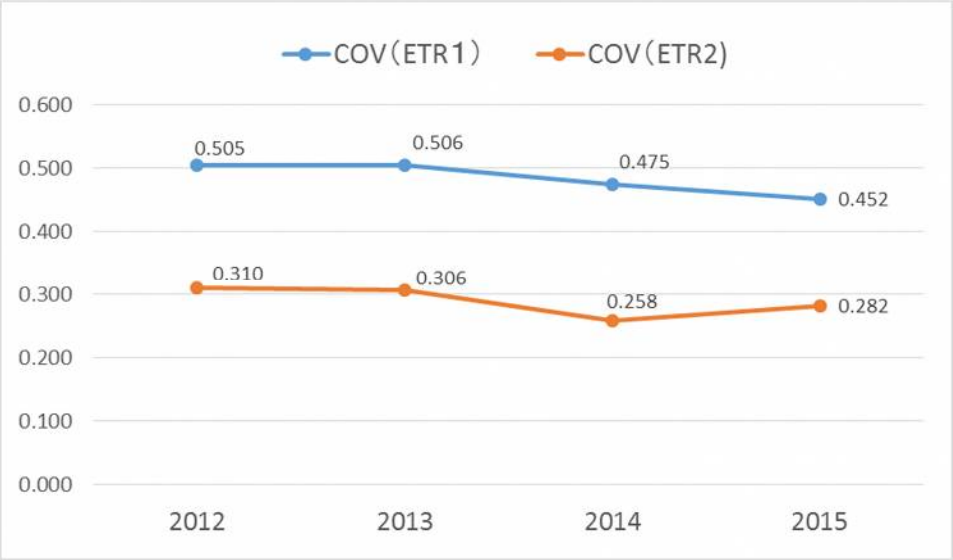
Focusing on the movement of ETR for all firms reveals that ETR1 is stable at 31% to 33%, but ETR2 has been slightly more volatile: 41% in 2012, 37% in 2013, 36% in 2014, and 38% in 2015. Given that the standard statutory corporate effective tax rate including local taxes has been reduced from 37% in 2012–13 to 34.62% in 2014 and further to 32.11% in 2015, we cannot necessarily identify a proportional relationship between the statutory rate and ETR. These findings suggest that the level of ETR for an individual firm may be more influenced by the structure of tax deductions or credit systems that actually determine its taxable income.

Figure 1. Trend in ETR by each category of industry



Through Figure 2, showing the coefficient of variation for each ETR, we can capture the degree of variability for ETR among different firms and how it has changed during the sample period. The coefficients of variation for ETR1 are higher than those for ETR2. This reasonably indicates that CF, the denominator of ETR1, varies more than PTI used to generate ETR2. The time-series trends indicate that the ETR disparities among firms tend to shrink in accordance with the reduction of the statutory tax rate in these periods except that the coefficient of variation for ETR2 slightly increased from 2014 to 2015.

Figure 2. Coefficient of variation for ETR



5. Results

The regression results with both dependent variables ETR1 and ETR2 are reported in Table 5 to observe determinants of Japanese corporate tax burdens. The regression coefficient for the SIZE variable indicates a positive association with both ETR1 and ETR2 at the 1% significance level. This supports the political cost hypothesis asserting that a firm with larger assets faces higher ETR, which seems to be inconsistent with the negative correlation coefficient between ETR and SIZE shown in Table 4. These results, however, are not necessarily illogical, simply suggesting that a firm with larger assets has a tendency to get lower ETR as a whole but that a positive relation is also formed between the two variables by stratigraphic comparison once other influential factors are controlled for.

In order to elaborate on this point we estimated both ETR1 and ETR2 with the same explanatory variables by pooled OLS instead of the fixed effects model. The regression generated a negative coefficient for SIZE at the 10% and 1% significance levels in ETR1 and ETR2 respectively, with substantial reduction in the coefficient of determination compared to our basic result[11]. These results imply that larger firms are still prone to have higher ETR when unobservable firm-specific effects such as management resources and skills are controlled for. Thus it can be said that the political cost theory would more likely explain the relationship between firm size and ETR at least among Japanese listed companies in recent years.

Table 5. Estimation results

Firm Attributes	ETR1	ETR2
C	−1.281	−0.578
	(0.276)***	(0.172)***
SIZE	0.089	0.055
	(0.015)***	(0.009)***
DER	−0.016	−0.014
	(0.009)*	(0.006)**
FIXA	−0.405	0.031
	(0.043)***	(0.032)
ROA	0.494	−2.234
	(0.070)***	(0.073)***
PBR	0.005	0.003
	(0.001)***	(0.002)
RDE	0.290	0.061
	(0.225)	(0.157)
FSR	0.014	−0.010
	(0.015)	(0.009)
LOSS	−0.402	−0.726
	(0.156)***	(0.160)***
Year Dummies	YES	YES
R-squared(Adjusted)	0.921(0.895)	0.886(0.847)
S.E. of regression	0.100	0.076
F-statistic	34.276	22.702
***, ** and * indicate 1%, 5% and 10% siginificance level respectively.		
Numbers in parentheses are standard errors of the regression coefficients.		

[11] In the case of regression by pooled OLS, the estimated coefficient of SIZE is −0.0041 (0.0023)* for ETR1 and −0.0045 (0.0017)*** for ETR2; numbers in parentheses indicate standard errors. While the adjusted coefficient of determination is 0.304 for ETR1 and 0.217 for ETR2. The coefficient of SIZE is still positive at the 1 % significance level when regressed excluding all the other explanatory variables under our basic fixed effects model.

The regression coefficient of DER is, as predicted, negative at the 10% significance level for ETR1 and the 5% significance level for ETR2. This suggests that a firm with more debt is liable to have lower ETR because it could reduce its tax burden simply through the deduction of interest expenses or possibly by the management discipline assumed by agency theory.

As for FIXA (fixed asset ratio) the regression coefficient is negative at the 1% significance level for ETR1, which is to be reasonably expected since the denominator of ETR1, CF, includes firms' depreciation or amortization of their fixed assets so that a firm with larger fixed assets could reduce its tax liabilities through some sort of depreciation deduction system. Conversely, the regression coefficient of FIXA for ETR2 is not statistically significant, as reasonably anticipated, because the depreciation component is generally excluded from the denominator of ETR2 or PTI.

Although the regression coefficient of ROA for ETR1 is positive the coefficient for ETR2 is found to be negative at the 1% significance level in both cases. This is consistent with the correlation coefficient signs between ROA and ETR1 or ETR2 as shown in Table 4. Such seemingly incomprehensible results can be explained by the following decomposition formula of ETR1.

$$\underbrace{\frac{T}{CF}}_{\text{ETR1}} = \frac{PTI}{CF} + \underbrace{\frac{TI}{PTI} + \frac{T}{TI}}_{\text{ETR2}}$$

Firstly, the negative coefficient of ROA for ETR 2 may be attributable to the fact that a firm with higher ROA would have a lower ratio of PTI to taxable income (TI / PTI) or a lower ratio of tax liabilities to taxable income (T / TI). In other words, it can be seen that firms with higher profitability are more likely to bring down their T / PTI by utilizing more income deductions or/and tax credits. This effect seems to be rather strong since the absolute value of the coefficient (2.2) is higher than those for all other explanatory variables. Secondly, we find that firms with higher profitability would also have higher ratios of pretax income to cash flow (PTI / CF). This suggests that those profitable firms would incur less depreciation costs from their fixed assets, which is consistent with the negative correlation coefficient between ROA and FIXA shown in Table 4. After all, firms with higher ROA mostly have lower ETR2 owing to smaller TI / PTI or smaller T / TI or both but overall T / CF might become higher since Δ(PTI / CF) / ΔROA generally

exceeds Δ(T / PTI) / ΔROA in absolute terms.

Regarding the relationship between PBR and ETR, the relevant coefficient is positive at the 1% significance level for ETR1 but not significant for ETR2. Considering the correlation coefficient (0.51) between ROA and PBR as noted above, we re-estimated our model by removing ROA from the explanatory variables' set. The results show that while the regression coefficient of PBR for ETR1 is positive (0.007), it is negative in terms of ERT2 (−0.005), at the 1% significance level in both cases[12]. Thus the association of ROA with two different ETR metrics would also apply to that of PBR. Specifically we may assume that firms with higher growth potential, which tend to have higher profitability but less fixed assets (as would be recognized by the negative correlation coefficient between PBR and FIXA), are implementing aggressive tax avoidance schemes to some degree.

As expected, the coefficient of LOSS, reflecting the negative taxable income carried forward from previous years, is negative at the 1% significance level in both ETR cases. The loss carry-forward system could significantly reduce the ETR for a firm even if its accounting profit for the current year is a large surplus since the amount of deficit carried-over could directly reduce its taxable income. Shirota (2015), based on annual securities reports of different companies, clarifies the fact that Japan's three major megabanks have compressed their taxable income over the long term through the loss carry-forward system. In this respect our results suggest that similar events have occurred among the non-financial listed corporations analyzed herein.

Lastly no significant results were obtained in all cases for research & development (RDE) and foreign operations (FSR). Indeed the negative correlation coefficient of both RDE and FSR with ETR, shown in Table 4, suggests a general tendency whereby firms with higher RDE or FSR face lower ETR, yet we find hardly any significant association between these two factors and tax rates once controlling for firm-specific effects[13].

6. Conclusions

This paper attempted to examine which firm-level attributes influence ETR for Japanese listed companies on the first section of the Tokyo Stock Exchange. For each of two ETR metrics, defined as the ratio of corporate income tax liabilities to cash flow

[12] When regressed by removing PBR from the explanatory variables' set, the coefficient of ROA is 0.528 for ETR1 and −2.206 for ETR2, both at the 1% significance level; this is qualitatively similar to the results of the initial regression including PBR.

[13] When regressed using pooled OLS here, the coefficients of both RDE and FSR are, as anticipated, negative for ETR at the 1 % significant level.

from operations (ETR1) and the ratio of tax liabilities to pretax income (ETR2), we estimated a fixed effects model using Generalized Least Squares with cross-section weights. Controlling for the unobservable heterogeneity of firms in this way markedly improved the explanatory power of our model while avoiding issues with omitted variable bias. Our main findings are as follows.

First, larger firms were seen to have higher ETR1 and ETR2, which would support the political cost theory where more prosperous firms should bear heavier burdens related to authoritative regulation or corporate social responsibility. Second, while both ETR1 and ETR2 were lower for firms with higher DERs or with more loss carried forward, firms with higher fixed assets ratios had lower ETR1, presumably being the result of tax reduction effects by income deduction for interest expenses, loss carried-over or depreciation cost, respectively. Third, more profitable firms tend to face at once higher ETR1 and lower ETR2. This might be because firms with higher profitability, whose ratios of pretax income to cash flow are higher since they have lower depreciation costs, are more likely to be engaged in tax avoidance activity by taking advantage of tax deduction or credit systems. A similar relationship can be presumed between firms' growth potential and the two measures of ETR. Fourth, neither R&D expenditure nor foreign sales had any significant association with either ETR metric. Although we revealed a negative correlation between these two factors and ETR, the direct relationship was to be broken as a result of controlling for unobservable firms' specific effects.

This research can be extended in several ways. First, we analyzed Japanese ETR with data from 2012 to 2015. From the viewpoint of evaluating recent Japanese corporate tax reforms, however, the variabilities and determinants of the ETR should be compared with those in 1990s and 2000s etc. Second, considering this paper only covers listed firms, exploring whether and how results differ in the context of unlisted Japanese firms would be another interesting topic. Third, Gupta and Newberry (1997) and Ribeiro et al (2015) pointed out that shareholder composition or characteristics of the Board of Directors could affect firms' ETR from a perspective of corporate governance. To what extent does this apply in Japan? This question is yet to be robustly answered.

Acknowledgement

This work was supported by JSPS KAKENHI Grant-in-Aid for Scientific Research (c)15K05352.

References

Avi-Yonah, R. (2006)"Corporate Social Responsibility and Strategic Tax Behavior", Law & Economics Working Papers Archive : 2003-2009, University of Michigan Law School (http://repository.law.umich.edu/law econ archive/art65).

Brys, B., S. Matthews and J. Owens(2011) "Tax Reform Trends in OECD Countries", *OECD Taxation Working Papers* No. 1.

Derashid, C. and H. Zhang (2003) "Effective Tax Rates and the 'Industrial Policy' Hypothesis: Evidence from Malaysia", *Journal of International Accounting, Auditing and Taxation*, 12, pp. 45-62.

Devereux, M. and R. Griffith (1998) "The Taxation of Discrete Investment Choices," z Working Paper Series, No. W98/16, Institute for Fiscal Studies. (http://www.ifs.org.uk/wps/wp9816.pdf)

Dyreng, S., J. Hoopes, J. Wilde (2014)"Public pressure and corporate tax behaviour",Working Paper Series WP14/16, Oxford University Centre for Business Taxation (http://www.sbs.ox.ac.uk/sites/default/files/Business_Taxation/Docs/Publications/Working_Papers/series-14/WP1416.pdf).

Government Tax Commission (2014) *On the corporate tax reform* (in Japanese).

Gupta S. and K. Newberry (1997) "Determinants of the variability of corporate effective tax rates: Evidence from longitudinal data", *Journal of Accounting and Public. Policy,* 16, pp.1-34.

Janssen, B and W. Buijink (2000) "Determinants of the Variability of Corporate Effective Tax Rates (ETRs): Evidence for the Netherlands", MARC Working Paper MARC-WP/3/2000-08 (https://core.ac.uk/download/pdf/6941696.pdf).

Kitamura, Y.(2002)"Evidence of the corporate tax burdens in the course of firms' activity" *A report by the committee for analysis on the structure of corporate governance in fiscal year 2002* (in Japanese). (http://www.ier.hit-u.ac.jp/~kitamura/PDF/A213.pdf)

Kraft,A.(2014) "What Really Affects German Firms' Effective Tax Rate?", *International Journal of Financial Research*, 5(3), pp.1-19.

Liu, X. and S. Cao, S (2007) "Determinants of Corporate Effective Tax Rates – Evidence from Listed Firms in China", *The Chinese Economy*, 40, pp.49-67.

Manzon, B. and G. Plesko (2002) "The Relation Between Financial and Tax Reporting Measures of Income", *Tax Law Review*, 55, pp.175-213

Noor, R., M. Fadzillah and N. Mastuki(2014)"Corporate Tax Planning: A Study On

Corporate Effective Tax Rates of Malaysian Listed Companies", *International Journal of Trade, Economics and Finance*, 1(2), pp.189-193.

Porcano, T. (1986) "Corporate tax rates: Progressive, proportional, or regressive", *Journal of the American Taxation Association* 7, pp.17-31.

Rego, S. (2003)"Tax-avoidance activities of U.S. multinational corporations", *Contemporary Accounting Research,* 20, pp.805-833.

Ribeiro, A., A. Cerqueira and E. Brandao (2015)"The Determinants of Effective Tax Rates: Firms' Characteristics and Corporate Governance", FEP Working Paper, (http://wps.fep.up.pt/wps/wp567.pdf).

Richardson, G. and R. Lanis (2007)"Determinants of the variability in corporate effective income tax rates and tax reform: Evidence from Australia", *Journal of Accounting and Public Policy*, 26, pp.689-704.

Shirota, J.(2015) "Corporate tax and taxable income in Japan" *Study on Securities and Economy* (in Japanese), 91, pp.25-43.

Thomson Reuters (2013) *Worldscope Database－Data Definitions Guide (Issue 14.2)*.

Zimmerman, J. (1983) "Taxes and Firm Size", *Journal of Accounting and Economics*, 5, pp.119-149.