AUSTRALIA–JAPAN RESEARCH CENTRE
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TAX LAW ASYMMETRIES AND INCOME SHIFTING: EVIDENCE FROM JAPANESE CAPITAL *KEIRETSU*

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Contents

Figures

Tables

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Abstract

When positive and negative income are treated asymmetrically under a corporate income tax (CIT) without allowance for group taxation, a group of affiliated corporations may engage in tax avoidance by shifting income from profitable to unprofitable subsidiaries for the sole purpose of minimising the sum of tax liabilities of the group members. The aim of this paper is to offer systematic evidence on the behavioural response to a tax penalty that arises from doing business in multiple entities, in order to provide justification for group tax systems such as consolidated filing and loss transfer. The setting for our investigation is the Japanese CIT before the introduction of a group tax system. We develop a theoretical model of a corporate group that predicts a difference in profit reporting behaviour between subsidiaries above and below 100 million yen in paid-in capital due to the progressive feature of the Japanese CIT. We test the implications of the model with a company-level data on subsidiaries based on survey that covers over 1,700 corporate groups headed by large corporations. The sample consists of 33,340 subsidiary-time pairs from 1988, 1990, and 1992. We find evidence consistent with a hypothesis that corporate groups shift income among group members. The finding underscores the importance of accounting for the group behaviour in the design of CIT.

Introduction

It is common practice for a firm to organise its businesses as legally distinct corporations for several efficiency reasons; to tie managers' pay to performance, separate entities may be preferable to internal divisions (Holemström and Roberts 1998); to avoid negative synergy, it may be necessary to separate conflicting business activities (John and Ofek 1995); to control the risk of new ventures, investors may utilise the limited liability status of corporations. Despite the efficiency grounds for organizing activities in separate entities, in the vast majority of nations, there is a *tax penalty* for forming a corporate group. Of 121 countries listed in PricewaterhouseCoopers (2002), 92 countries tax corporations separately from group members, while 29 countries allow for group taxation.[1] Since a stand-alone entity can only partially offset its own profit with losses made by its affiliates in the absence of group provisions, the tax liability of a corporate group would be greater than that of a conglomerate when some member companies are making losses.[2]

There are loss-offset provisions moderating the degree of penalty, but they are known to be imperfect (Altshuler and Auerback 1990). As a result, there are concerns about the behavioural response to avoid the penalty and about the consequences on efficiency: firms may waste resources through engineering transactions of which the sole aim is to shift income from profitable to unprofitable corporations; firms may choose a suboptimal form of organisation due to concern about the tax penalty.

To highlight the perverse incentives under a tax system that lacks group provisions, this paper aims to provide evidence from a large-scale dataset on the behavioural response to tax penalties, taking the Japanese tax system of the early 1990s as a setting. The focus is on the incentives to shift income among domestic affiliates, a type of behaviour under-studied in the field. Certainly, there is extensive evidence on income shifting in the international context (Grubert and Mutti 1991; Hines and Rice 1994; Grubert and Slemrod 1998), where the differences in tax rates across countries create opportunity for tax avoidance. Here, the differences in marginal tax rates between profitable and unprofitable corporations create the incentives to shift income.

The key distinction between these two types of income shifting is that, unlike the tax shelters involving offshore tax havens, which is a problem in itself, the income shifting among domestic affiliates can be viewed as a symptom of problems with the tax system, provided that the shifting takes place in groups where there are efficiency grounds for organising businesses in multiple entities.[3] In this view, the policy implication is that rather than strengthen enforcement efforts, the tax law should be amended to account for business practices.

Our examination of within-jurisdiction income shifting adds to a relatively small number of previous empirical studies (Giudici and Paleari 1998; Gramlich et al. 2004; Jung et al., 2007). In a closely related study, Gramlich et al. (2004) examine the income shifting among the members of bank-centered corporate groups, or horizontal *keiretsu*, in Japan. Our setting is also on Japan but our study focuses on a different type of grouping, sometimes referred to as a capital *keiretsu*, which is a group of businesses consisting of a parent company, subsidiaries and affiliates.[4] The latter type of grouping is tightly integrated: the members of capital *keiretsu* reports consolidated financial statements since 1978; the members of horizontal *keiretsu* do not. The focus on capital *keiretsu* is conducive to the examination of tax-motivated income shifting since there would be smaller transaction costs in sharing the benefits of tax saving.

The context of the study is the Japanese corporate income tax (CIT) prior to the introduction of group taxation in April 2002. One advantage of the Japanese setting is

that an available data on corporate groups, *Affiliated Company Data*, contains a large number of individual observations on parents and their domestic subsidiaries, a type of data that is relatively rare.[5] Naturally, the diversity of CIT around the world preclude the direct extrapolation of the results from this study, but there is a number of generic features of the Japanese CIT that make the discussion in this study relevant to the policy debate in countries that do not adopt group taxation.

Another advantage of the Japanese setting is on its institutional features that provide a "natural experiment". The previous empirical studies on income shifting by multi-national corporations utilise the variation in tax rates across jurisdictions. Such an identification strategy is not readily applicable in the context of within-jurisdiction income shifting. We suggest and implement an identification strategy that utilises the progressive feature of the Japanese CIT in detecting the spread of income shifting. The intuition underlying the test is as follows.

For "large" corporations with paid-in capital above 100 million yen, the corporate tax is proportional to profit, with at best only a partial offset for losses. For groups containing some large corporations with losses but making overall profits, there is an incentive to shift enough profits to the large corporations with losses to the extent possible, thereby raising profits to zero. Any further shifting creates no tax saving, yet involves real costs. On the other hand, for small corporations with paid-in capital of 100 million yen or less, the tax rate is reduced on the first 8 million yen of income, and the remaining income is taxed at the same rate as that of large corporations. Because of this progressive tax schedule, there is an incentive to shift more than the amount of the losses that small corporations make, so as to exploit the rate reduction. Thus, the income shifting hypothesis implies that the higher propensity for large corporations to report zero profit when other factors are held constant.

We test the implications with a company-level data on subsidiaries based on survey that covers over 1,700 corporate groups headed by large corporations. The sample consists of 33,340 subsidiary-time pairs from 1988, 1990, and 1992. Controlling for company characteristics in a binary response model, large subsidiaries have higher propensity to report zero profit, consistent with the prediction based on the tax institution that puts a cap on shifting for large corporations at zero profit but not on that for small corporations. The difference is modest, however; after several specification tests, we put the bound to 0.5–2.7 percentage points. The difference in the propensities to report zero profit is two to three times as large in the financial-insurance sector as in the other sectors of the economy, in line with the prediction that the restriction on an alternative avoid-

ance strategy renders income shifting more attractive. There is also a higher propensity for tightly controlled subsidiaries to report zero profit, consistent with the notion that the costs of shifting are affected by the degree of control. Excluding profitable groups increases the point estimates; at least part of the increase is attributable to the tax incentives. Thus, there seem sufficient indications to conclude that the income shifting was pervasive among large Japanese corporate groups over the period of our study.

The literature on horizontal *keiretsu* emphasizes the risk sharing as one of the main function of the grouping (Nakatani 1984).[6] The empirical strategy to test the risk sharing hypothesis is based on the comparison of the variance of profitability between group members and non-group members, interpreting the low variance of group-affiliated companies as due to risk sharing. Notice that some of the documented low variances may be attributable to tax-motivated income shifting but the hypotheses are not necessarily mutually exclusive. If, for instance, a dollar of financial assistance to a group member in distress reduces the tax liability of the group by t dollars, the tax motive re-enforces the risk sharing motive. In a recent survey of business groups by Khanna and Yafeh (2007), for instance, little attention is given to tax considerations. Our paper adds to the literature by indicating the influences of taxes on the degree of intra-group transfers.

The paper is organised as follows. Section 2 discusses the tax incentives generated by the Japanese CIT of 1988-92. Section 3 examines the tax incentives with a model of a corporate group. Section 4 outlines the empirical approach. Section 5 presents the analysis. Section 6 draws conclusions.

Institution

Tax incentives

There are two generic features of tax institutions that give rise to the tax penalty in forming corporate groups: the separate tax filing of group members and the asymmetric treatment of positive and negative income. Corporations are generally taxed on their positive income but they do not receive full credit on negative income. The deductibility of loss is partial, in that corporations with negative income do not receive tax credits immediately. If group members are taxed separately, they cannot offset profits made by some members with losses incurred by others. Thus, in a given year, the tax base under separate filing is no smaller than that under consolidated filing where the group is taxed on the combined income.[7] Under the Japanese CIT of 1988, the effective tax rate is 56

per cent, so that a dollar of income shifted from profitable corporations to unprofitable corporations reduces the tax liability by 56 cents.[8] Therefore, the tax penalty can be a significant disincentive to the formation of corporate groups.

There are various complementary institutional arrangements that alleviate the degree of tax penalties, including the deductibility of losses across years.[9] Under the Japanese CIT, qualified corporations may carry back losses for one year and receive a commensurate tax refund for that year. They may choose to carry forward losses up to five years, and receive tax credits in future years.[10] Since the disadvantage of carrying losses forward is that they are carried with zero nominal interest and may expire unused (Altshuler and Auerbach 1990), these provisions reduce the incentives for income shifting but not entirely. Another institutional arrangement is the deductibility of intra-group contribution. The Scandinavian nations have formal allowances: Norway treats the contribution to companies in which parents hold more than ninety per cent of the direct or indirect common ownership as deductible expense.[11] Japan has no such formal allowance, but donations, which include intra-group transfers, are deductible up to a limit.[12] This form of shifting transaction is legal and can be arranged with minor transaction costs.[13]

To shift income beyond the amount of tax-deductible contributions, a firm would need to arrange intra-group transactions that are analogous to the income shifting strategies in the international setting; carefully setting transfer pricing and arranging intra-company loans (Grubert 2003). The strategy may also involve changing the timing of transaction.[14] These means would be costly, given the accounting costs and the risk of getting caught by tax inspectors.[15]

To merge or not to merge

By merging a subsidiary, the group may save on taxes when losses arising from the subsidiary's business can offset the profit made by the merging company. Since the group does not incur further costs of shifting income, for the purpose of tax planning, it may seem attractive to merge a loss-making subsidiary rather than to retain a separate organisational form. There would certainly be cases where tax-motivated mergers being a superior tax planning strategy. When tax-motivated mergers are widely practiced, income shifting would be an irrelevant consideration. But this begs a question: for the purpose of avoiding the tax penalty, why do not firms do business as a conglomerate rather than as separate entities?

To the extent that corporate groups considered in this study overlap with business

groups studied extensively, the reasons for the group formation can be found in the various hypotheses explored in the literature on business groups (Khanna and Yafeh 2007), such as risk sharing, costly contracting environment, expropriation of minority shareholders, and family considerations. Our data, for instance, included a group where the founder's two sons are heads of two different group companies; perhaps the arrangement facilitates the management of family relations as well as businesses. When there are business reasons for maintaining separate business entities, the tax advantage of a conglomerate may not justify mergers, since a firm would weigh the tax advantage with transaction costs (Scholes et al. 2002).

In addition, there are several institutional hindrances to tax-motivated mergers in Japan. Perhaps the clearest is the regulatory restrictions. Under the banking law and the insurance business law, financial and insurance parents are prevented from directly undertaking periphery activities including leasing, credit card operation, and credit guarantee but are allowed to establish subsidiaries and to conduct a regulated range of activities through them. Thus, a tax-motivated merger is not a feasible option for finance and insurance parents.

The tax consequence of a merger is not necessarily favourable. First, there are various small business provisions under the Japanese CIT, and because subsidiaries are taxed separately from their parents in most cases, the tax base can increase from a merger. Second, some of the well-known tax avoidance strategies utilise the group structure.[16] Third, out of concern about abusive tax planning, merging companies are not permitted to take over losses carried forward by merged companies (Kaneko 2003).[17] Since any unused credits accumulated by merged companies are lost in the process, the rule reduces the incentives to merge.[18] In sum, the relevance of income shifting as a strategy to avoid tax penalty is somewhat diminished by the possibility of merger but not to the extent of rendering the strategy irrelevant.

Theoretical Model

This section outlines the tax incentives generated by the Japanese CIT with a model of a corporate group. For tractability, we focus on the static setting to abstract away from loss-carry provisions and assume the group's choice of organisational form as exogenous so that the possibility of merger does not complicate the exposition. Further, we consider the case of a two-member group in which one corporation is profitable but the other is not. The focus on two-member groups is not overly unrealistic, since for the population of corporations surveyed under the *2001 Establishment and Enterprise Census* in Japan,

the average number of members is 3.5. However, *Affiliated Company Data* contains large corporate groups with the number of members reaching up to 342 for Mitsui & Co., Ltd., and we will note a consideration about generalising to larger corporate groups at the end of the section.

Let us define a firm consisting of two corporations, Company 1 (parent) and Company 2 (subsidiary). Their underlying incomes (y_1, y_2) are determined exogenously and the parent is profitable and the subsidiary is running at a loss $(y_1 > 0 > y_2)$. Their incomes are taxed separately; hence unless the firm shifts income, there is a tax penalty. Further, let us focus on the case where the amount of shifting is not capped by the parent's profit. The following condition on overall income,

$$(1 - \tau_H) y_1 + y_2 > m \tag{1}$$

rules out such a corner solution, whether the subsidiary is small or large. m is the tax threshold to be defined below. The following are after-tax profits of the parent and subsidiary.

$$\pi_1 = y_1 - s - g(s) - T\big(y_1 - s - g(s); k_1\big) \tag{2}$$

$$\pi_2 = y_2 + s - T\big(y_2 + s; k_2\big) \tag{3}$$

$s > 0$ is the amount of income shifted from the parent to the subsidiary. $g(s)$ is the cost of shifting income. It is assumed that the parent incurs the transaction costs, which are tax deductible. $g(s)$ is a quadratic function of the amount shifted based on the standard formulation in the literature (Hines and Rice 1994).

$$g(s) = \frac{s^2}{2\bar{y}\psi} \tag{4}$$

In this formulation, shifting costs are high if the amount shifted is large relative to the average size $\left(\bar{y} = \frac{1}{2}\left(y_1 + |y_2|\right)\right)$ It also depends on the degree of control exerted by the parent, which is represented by $\psi > 0$. The tax liability $T(.)$ is a function of before-tax profit (π_i^b) and the level of paid-in capital (k_i, in million yen). In practice, there are two different tax schedules, and their applicability depends on the level of paid-in capital.

$$T(\pi_i^b; k_i > 100) = \max\left[0, \tau_H \pi_i^b\right] \tag{5}$$

$$T(\pi_i^b; k_i \leqslant 100) = \max\left[0, \tau_L \pi_i^b, \tau_H(\pi_i^b - m) + \tau_L m\right] \tag{6}$$

Like a payoff function of a call option (Majd and Myers 1987), large corporations pay proportional tax on their positive income (5). Small corporations pay at the reduced rate τ_L on their first m million yen of income and at τ_H on the amount exceeding m million

yen (6). Under the 1989 law, $\tau_H = 0.560$, $\tau_L = 0.405$ and $m = 8$ and $\tau_H = \tau_L$.[19] In this analysis, the parent is assumed to be a large corporation. The subsidiary may be small or large. Here, we will focus on the case where the subsidiary is small, since the case of a large subsidiary is a special case where $\tau_H = \tau_L$.

Under the income shifting hypothesis, the group chooses the amount of shifting to maximise the after-tax group profit $(\pi_1 + \pi_2)$. The optimisation problem is equivalent to the following.

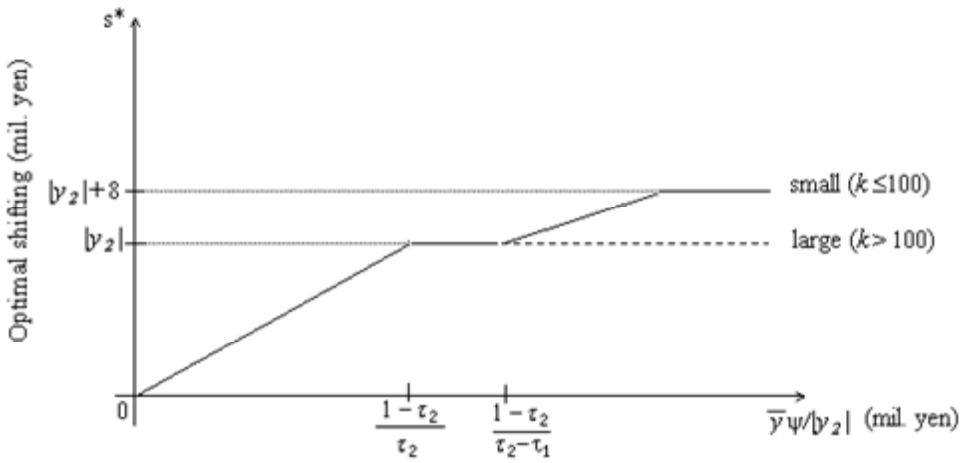
$$\underset{s}{Max}\left\{-g(s) - \max\left[0, \tau_H \pi_1^b(s)\right] - \max\left[0, \tau_L \pi_2^b(s), \tau_H(\pi_2^b(s) - m) + \tau_L m\right]\right\} \quad (7)$$

Simply put, the firm chooses the amount of shifting by weighing tax savings versus shifting costs. The objective function is not readily differentiable, but by imposing appropriate constrains on s, sub-problems can be solved algebraically. Appendix 1 details the derivation of the solution (8).

$$s^* = \min\left\{\max\left[\min\left(|y_2|, \frac{\tau_H}{1-\tau_H}\bar{y}\psi\right), \frac{\tau_H - \tau_L}{1-\tau_H}\bar{y}\psi\right], m + |y_2|\right\} \quad (8)$$

Figure 1 illustrates the relationship between the optimal level of shifting and the parameters affecting the ease of shifting.

Figure 1: Illustration of the optimal shifting schedules



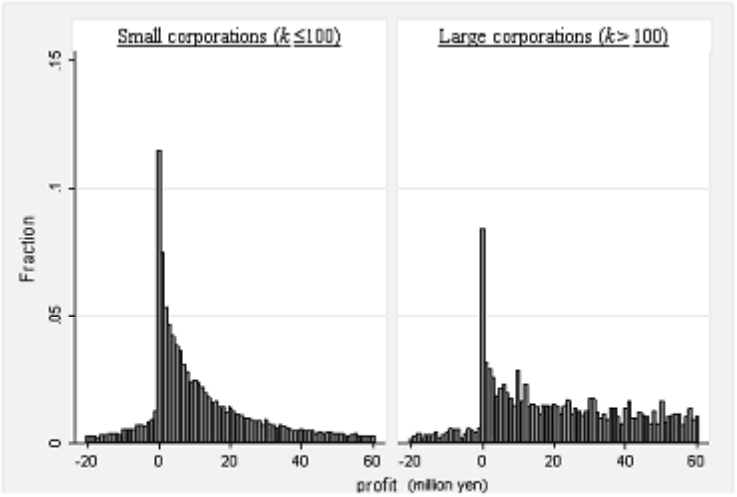
The solution function for small subsidiaries has two steps as shown by the solid line. The solution function for large subsidiaries is flat at $|y_2|$ as shown by the dotted line. In general, the optimal shifting is weakly decreasing in shifting costs $(1/\psi)$ and in relative size $(|y_2|/\bar{y})$. In addition, the solution is a weakly increasing function of the tax rate facing the parent and the progressiveness of the tax system (that is, $(\text{i.e., } \tau_H - \tau_L)$).

The model illustrates the difference in the predicted pattern of shifting by subsidiary size. For large subsidiaries, the amount of shifting is capped at $|y_2|$, indicating the natural limit; at the amount $|y_2|$, where the subsidiary reports zero profit, the subsidiary faces the tax rate of τ_H at the margin, the same rate as that faced by the parent. Small subsidiaries, in contrast, face the marginal rate of τ_L at zero profit. Shifting beyond $|y_2|$ is optimal when the underlying shifting costs are sufficiently low. Therefore, the amount of income shifted into small subsidiaries is not necessarily limited to the amount of losses unlike large subsidiaries.

One insight from the model is that there is a range of shifting costs for which the zero profit is optimal for a small subsidiary. This implies that the clustering of small corporations at zero profit is a possibility. Further, if there are other loss-making subsidiaries in group, losses in another company shelter remain income for higher tax saving, thus rendering shifting beyond $|y_2|$ into a small subsidiary unattractive.[20] Because of these theoretical possibilities, it may be difficult to observe the differences in reported profits across size groups in practice, but in the absence of knowledge about the parameters of the cost function, this is an empirical question.

As a preliminary examination, we plot histograms of profits around zero by the size of corporation to see if there are differences in profit reporting pattern (Figure 2). The left-hand side is for corporations at and below 100 million yen in paid-in capital. Recall that this group has no unambiguous incentive to restrict shifting up to zero profit. The profit distribution is half-pyramid shaped; the highest fraction of samples occurs in the zero-profit bin, with progressively declining fractions on the right and with a sharp decline on the left. The right-hand panel is for large corporations. Unlike in the histogram for small corporations, the distribution is much flatter with an apparent clustering at zero. It seems natural to observe the high fraction of zero-profit corporations in the sample of small corporations. But there does not seem to be an apparent reason to expect causing the clustering at the zero profit for the large corporations. This evidence is in line with the model that predicts a cap to the income shifting at zero-profit for larger corporations, but not for smaller corporations.[21]

Figure 2: The distribution of profits by the size of paid-in capital



Empirical Approach

Our empirical approach focuses on a particular aspect of the profit distribution: the incidence of zero profit. The choice is based on theoretical as well as practical considerations. First, the theoretical model predicts that the shifting is capped at the zero profit for large corporations but not necessarily capped for small corporations. Thus, the extent to which corporations report zero profit would be affected by the corporate size, if tax considerations are important. Second, it would be ideal to compare the observed distribution of large corporations' profit with what would have prevailed had there been no tax discontinuity. In the absence of such counter-factual data, we are forced to make comparison with the profit distribution of small corporations.[22] Naturally, large corporations are likely to report larger profit since most of them would not have became large unless their business was successful. Thus, to properly compare the pattern of profit reporting, the analysis would require a control for the corporate size, along with controls for other company characteristics. We chose to focus on the incidence of zero-profit reporting, since it allows us to frame the analysis in a transparent way; the assumptions underlying the identification would be apparent in a simple binary response model.

Put differently, our analysis is a generalisation of the visual inspection presented above. The visual inspection indicated what seems to be an unusual distribution of large corporations' profits: the fraction of corporations reporting zero profit seems unnaturally high. We test to see whether there is a statistically significant difference and whether the pattern remains after controlling for company characteristics. Further, to the extent that the tax incentives have significant influence on reported profits, we would expect to observe correlation between the shifting costs and the incidence of zero profits. The binary

response model allows us to incorporate such considerations in a simple manner.

Data

We use the *Affiliated Company Data*, a survey of large corporations conducted by a private publishing company, Toyo Keizai. It contains information on group companies including after-tax book profit, paid-in capital, number of workers, sales and contact details. Ideally, we would like to observe the tax income filed with the National Tax Agency, but the available data is after-tax accounting profit. The discrepancies between these two notions of corporate income arise from, among other things, the differences in the definitions of costs and in the treatment of timing.[23] To account for this issue, we define zero profit in several ways to assess the sensitivity of estimates. The dataset is constructed from three surveys conducted in 1989, 1991, and 1993. We omit subsidiaries deemed to be inactive at the time of survey from the dataset to ensure that zero profit is not due to inactivity. Some observations are reported twice in the same year because some sub-groups of larger groups are surveyed separately. We removed overlapping observations from the larger group and retained the sub-groups. Table 1 presents summary statistics.

Empirical Model

The following model (empirical model) postulates that the probability of subsidiary reporting zero profit is a function of observable characteristics X_i.

$$\Pr(\pi_i = 0) = f(\mathrm{X}'_i\beta) \qquad (9)$$
$$\text{where } \mathrm{X}'_i = (LARGE_i, HOLDING_i, RELATIVESIZE_i, \mathrm{Z}'_i)$$

$f(.)$ is assumed to be a normal density in the main analysis but logistic density is tried.

The dependent variable is the indicator for subsidiary i reporting zero profit. In the main analysis, zero profit is defined as accounting profit in the range (-1 million yen, 1 million yen).[24]

$LARGE_i$ is a dummy for paid-in capital of i being larger than 100 million yen. Other things held constant, the income shifting hypothesis implies that there would be higher propensity for large subsidiaries to report zero profit, so the sign on this coefficient is expected to be positive. It is, however, natural for small corporations to report, on average, smaller profits than large corporations. We control for the size effect by including the natural logarithm of paid-in capital.

$HOLDING_i$ is a proxy for shifting costs (ψ) in the theoretical model and is the

Table 1: Summary Statistics

Variable	Subsidiaries of F&I Parents	Subsidiaries of non-F&I Parents	ALL Subsidiaries
PROFIT [mil. Yen]	61.1	81.6	79.7
	(472.2)	(978.8)	(944.3)
HOLDING [%]	42.5	74.4	71.5
	(45)	(29.1)	(32.2)
RELATIVESIZE	0.013	0.028	0.026
	(0.038)	(0.052)	(0.051)
AGE [month]	138.2	234.5	225.9
	(123)	(170.4)	(168.9)
ln(paid-in capital)	233.6	292.9	287.5
	(1162.9)	(6164.8)	(5890.5)
ZEROPROFIT	0.132	0.07	0.076
LARGE	0.187	0.22	0.217
SAME ADDRESS	0.207	0.115	0.123
SAMEREP	0.135	0.19	0.185
N	3,008	30,322	33,340

Notes: Standard deviations are in parentheses. "F&I" refers to financial and insurance. ZEROPROFIT is the indicator for reported profit in the range of (-1, 1). SAMEREP is the indicator for subsidiaries that share same company representative with another

per cent of voting stock held within a group, or the sum of voting stock held directly by its parent and indirectly by other members. Intuitively, we would expect that the tight control would facilitate financial arrangements to shift income and to share the benefit of tax savings. Under the theory the propensity to report zero profit is expected to be higher for tightly controlled corporations, especially those that are also large. The sign on the coefficients on *HOLDING* and the interaction term of *LARGE* and *HOLDING* is expected to be positive.

One concern with measuring control with the reported level of stock holding is window dressing; a parent may artificially keep the stock holding of certain members below the statutory limit for reporting consolidated financial statement to enhance its appearance.[25]

Table 2 reports the level of holding by industry classification of parent. In most industries, the mean holding level is around 70 per cent; for financial and insurance parents, the mean is apparently low and the standard deviation is high, reflecting Article 11 of the Antitrust Regulation. Prior to the reforms of 1997, the law restricted banks from holding more than a 5 per cent stake in other companies in principle. The upper limit for insurance corporations was 10 per cent. However, there are exceptions to this principle; upon approval banks and insurance corporations may hold wholly-owned subsidiaries, generally in activities integrated with the operation of parents, such as ATM machine maintenance, personnel service, maintenance of branch buildings, and bank logistics.

Many subsidiaries that conduct periphery activities, such as leasing, investments advising, and credit card operation, have holding levels as high as the law allows.

Table 2: The percentage of voting shares by industry classification of parent

Industry Classification of Parent Company	Average	Std.Dev.	N
Telecomm.,Newspaper,Publishing,Broadcasting	82.5	25.7	165
Agriculture and Fishery	81.9	22.4	186
Communication Equipment	81.4	26.4	515
Precision Instruments	80.8	26.2	463
Paper, Pulp and Allied Products	80.4	25.6	347
Retail	80.0	27.6	1,688
Petroleum and Coal Products	79.3	26.7	303
Real Estate	78.9	28.5	566
Food Products	78.6	27.6	1,526
Nonferrous Metal Products	78.2	27.5	686
Textile Mill Products	78.0	25.6	210
Textile	77.8	28.0	1,171
Pharmaceuticals	76.4	29.5	441
Wholesale	76.2	28.4	3,178
Machinery and Equipment	76.1	29.0	851
Electrical and Electronic Equipment	76.1	29.0	851
Rubber Products	75.2	26.3	155
Service	73.6	29.8	1,174
Land Transportation	73.0	31.0	2,192
Miscellaneous Manufacturing Industries	72.9	28.6	930
Chemical Manufacturing	71.9	28.3	2,519
Stone, Clay, Glass, and Concrete Products	71.2	30.5	825
Transportation Equipment	71.1	29.7	1,744
Electric and Gas	70.3	29.1	560
Construction	70.2	30.0	2,812
Metal Products	69.7	29.0	851
Water Transportation	68.1	30.1	2,192
Iron and Steel Industries	67.9	29.9	885
Other	66.7	21.0	10
Warehousing and Other Transportation	66.5	30.7	726
Air Transportation	54.6	28.5	239
Financial and Insurance	43.0	45.1	3,131
All Industries	71.6	32.2	34,887

The standard solution for measurement issues in a linear regression is the instrumental variable estimation. But the model is non-linear and we can not apply the solution even if valid instruments are available (Hauseman 2001). In the absence of a clearly established solution, we consider additional variables that would capture shifting costs: $SAMEADD_i$ is the indicator for the subsidiary that shares an address with another group member; $SAMEREP_i$ is the indicator for the company representative of the subsidiary also being the head of some other group company.

In principle, the true amount of loss is not observable, so that the average size of corporations $\left(|y_2|/\bar{y}\right)$ is also not observable. $RELATIVESIZE_i$ is a proxy for this variable and is defined as the percentage of total group sales accounted for by subsidiary i. We

would expect it is less likely for subsidiaries that are large relative to other group members to report zero profit. The model suggests that tax rates affect tax incentives but there is little variation in tax rates over the sample period.

Control variables (Z_i) include age of the company in months, natural logarithm of paid-in capital, a dummy for a public company, industry dummies, eight geographic region dummies and time dummies. Parent industry dummies are also included for the regression except on the sub-sample of the financial and insurance industry.

Analysis

Baseline specification

The marginal effects estimated with the baseline probit model is presented in Columns 1 through 3 in Table 3 for the sample that pools all sectors.[26]

Table 3: Baseline probit model

	(1) pooled	(2) pooled	(3) pooled	(4) Non F&I	(5) F&I
LARGE = 1	-0.045**	0.047**	0.042**	0.031**	0.147**
	(0.003)	(0.007)	(0.006)	(0.006)	(0.036)
HOLDING	0.030**	0.016**	0.017**	-0.008*	0.096**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.013)
RELSIZE	-0.974**	-0.496**	-0.377**	-0.392**	-0.225
	(0.130)	(0.092)	(0.082)	(0.082)	(0.379)
AGE		-0.270**	-0.240**	-0.205**	-0.783**
		(0.020)	(0.019)	(0.020)	(0.105)
AGE SQ		0.244**	0.203**	0.152**	0.879**
		(0.028)	(0.027)	(0.028)	(0.189)
PUBLIC		-0.033*	-0.029+		0.324
		(0.017)	(0.016)		(0.225)
LN(PCAP)		-0.029**	-0.027**	-0.023**	-0.057**
		(0.001)	(0.001)	(0.001)	(0.005)
YEAR1990			-0.008**	-0.011**	0.017
			(0.003)	(0.003)	(0.012)
YEAR1992			0.010**	0.007*	0.036**
			(0.003)	(0.003)	(0.013)
Observations	33340	33340	33340	30332	3008
Pseudo R-squared	0.05	0.11	0.14	0.12	0.31

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Column 3-5 include dummies for own industry, headquarter location, and a constant.
Column 3 and 4 also includes parent industry dummies.
PUBLIC is ommitted in non F&I subsample because all public corporations reported non-zero profits.

Without controlling for corporate size in the regression, the coefficient on *LARGE* is negative as shown in Column 1. This is as expected: corporations would not likely to become large unless they are successful. A control variable for the size—a natural log of paid-in capital (*PCAP*)—turns the coefficient to positive and significant (Column 2), a pattern consistent with the income shifting hypothesis. The signs of coefficients on *HOLDING* and *RELATIVESIZE* are consistent with the income shifting hypothesis and are significant. The pattern is robust to inclusion of a host of control variables including time dummies, dummy for publicly-listed corporations, own industry dummies, parent industry dummies, and region dummies (Column 3). The positive coefficient on Year 1992 dummy reflects the onset of recession after the collapse of the bubble economy. The significantly negative coefficient on the public corporation dummy reflects the stringent criteria for being listed on the stock exchange, but it may in part capture the disincentive to reduce profits artificially out of the concern about market valuation.

Since the Antitrust Regulation places stronger restriction on group formation by the financial/insurance parents, the sample has been split (Column 4–5). The coefficient on in the financial/insurance is three times as large as in the other sectors, being consistent with the conjecture that the tighter restriction on mergers renders income shifting attractive in the sector. The industry differences in profitability alone would not explain this finding, since the likelihood of zero-profit reporting is relative to another group of firms in the same sector.

Note that the coefficient on *HOLDING* is negative and significant for the other sectors (Column 4). Though this result is inconsistent with the income shifting hypothesis, given the lower standard deviation on *HOLDING* for the other sectors—29 as compared to 45 percentage points in the financial/insurance— it is possible that the low holding may not accurately reflect the degree of control in other sectors. For the financial/insurance sector, where the five per cent rule puts exogenous restriction on the level of intra-group shareholding, the coefficient on *HOLDING* is positive and significant. Overall, the results of the baseline estimation are largely consistent with the income shifting hypothesis.

Extensions

Table 4 includes additional proxy for shifting costs: dummies for the subsidiary that shares headquarter address and company representative with another group member. The result on the pooled sample shows that both indicators are positive and significant (Column 1), but the strength of the relationship is somewhat sensitive to the sample specification, especially with regard to the coefficient on the shared headquarter (Columns 3 and 5). Part of

the reason may be that in the financial/insurance, after controlling for *HOLDING*, these variables have no explanatory power. Interaction terms with the proxy for shifting costs and *LARGE* are generally positive but not significant, indicating that large subsidiaries with low shifting costs are not significantly more likely to report zero profit.

Table 4: Baseline model with additional explanatory variables

	(1) pooled	(2) pooled	(3) Non F&I	(4) Non F&I	(5) F&I	(6) F&I
LARGE = 1	0.042**	0.032**	0.030**	0.022+	0.147**	0.125**
	(0.006)	(0.011)	(0.006)	(0.013)	(0.036)	(0.042)
HOLDING	0.014**	0.013**	-0.010*	-0.010*	0.092**	0.090**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.013)	(0.013)
OFFICE SHARE	0.008*	0.008*	0.003	0.003	0.017	0.013
	(0.003)	(0.004)	(0.004)	(0.004)	(0.011)	(0.011)
SAME HEAD	0.012**	0.011**	0.011**	0.010**	0.006	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.014)	(0.014)
RELSIZE	-0.387**	-0.388**	-0.399**	-0.400**	-0.209	-0.202
	(0.082)	(0.082)	(0.083)	(0.083)	(0.374)	(0.361)
AGE	-0.235**	-0.235**	-0.202**	-0.202**	-0.767**	-0.769**
	(0.019)	(0.019)	(0.020)	(0.020)	(0.108)	(0.106)
AGE SQ	0.201**	0.202**	0.151**	0.152**	0.859**	0.866**
	(0.027)	(0.027)	(0.028)	(0.028)	(0.195)	(0.191)
PUBLIC	-0.029+	-0.028			0.326	0.344
	(0.016)	(0.017)			(0.224)	(0.224)
LN(PCAP)	-0.027**	-0.027**	-0.023**	-0.023**	-0.056**	-0.056**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.005)
YEAR1990	-0.009**	-0.009**	-0.011**	-0.011**	0.016	0.017
	(0.003)	(0.003)	(0.003)	(0.003)	(0.012)	(0.012)
YEAR1992	0.009**	0.009**	0.006*	0.006*	0.035**	0.036**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.013)	(0.013)
LXH	-	0.008	-	0.006	-	0.009
	-	(0.011)	-	(0.013)	-	(0.047)
LXadd	-	-0.001	-	0.000	-	0.073
	-	(0.012)	-	(0.012)	-	(0.091)
LXrep	-	0.011	-	0.011	-	0.033
	-	(0.011)	-	(0.011)	-	(0.080)
Observations	33340	33340	30332	30332	3008	3008
Pseudo R-squared	0.14	0.14	0.12	0.12	0.31	0.31

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
All regression include dummies for own industry, headquarter location, and a constant.
Except F&I sectors, parents' industry dummies are included.
PUBLIC is ommitted in non F&I sub-sample because all public corporations reported non-zero profits.

The tax penalty, and thus the tax incentive to shift income, arises only when some group members are making losses while others are making profit. Our study so far used a sample that includes all observations regardless of the overall profitability of the group. Since the incentives to shift income would be more pressing for groups in which the profitability varies among members, we have tried excluding observations from profitable groups to check sensitivity. Here, a group is defined to be profitable if x per cent

of group members reports positive profit in the respective year, so that the profitability is based on the unweighted count of group members. The cut-off percentages we have tried are 100, 90, 80 and 70 per cent. The sample is based on all sectors as it is generally representative of the sub-sample.

By excluding such observations, we would expect to observe a stronger correlation between the explanatory variables and the incidence of zero-profit reporting for the tax reason, provided that the excluded observations are sufficiently similar to included observations. If, for instance, the fraction of large corporations in excluded observations is greater, the coefficient on *LARGE* from the remaining sample mechanically increases since excluded large-corporations would mostly be reporting non-zero profit. Thus, caution is required in interpretation.

Table 5 presents the results. Column 1 reproduces the baseline result excluding 3,103 observations that are in groups where some group member did not report profit. Column 2 excludes 4,828 observations in groups with all members reporting profits.

Table 5: Exclusion of profitable groups

	(1) balanced	(2) [, 1)	(3) [, 9)	(4) [, 8)	(5) [, 7)
LARGE = 1	0.046**	0.054**	0.055**	0.072**	0.076**
	(0.007)	(0.009)	(0.010)	(0.013)	(0.017)
HOLDING	0.012**	0.015**	0.018**	0.022**	0.033**
	(0.004)	(0.005)	(0.005)	(0.007)	(0.010)
OFFICE SHARE	0.010*	0.018**	0.017**	0.021**	0.025*
	(0.004)	(0.005)	(0.005)	(0.007)	(0.010)
SAME HEAD	0.013**	0.015**	0.015**	0.021**	0.028**
	(0.003)	(0.004)	(0.004)	(0.006)	(0.008)
RELSIZE	-0.370**	-0.323**	-0.356**	-0.442**	-0.510**
	(0.047)	(0.059)	(0.063)	(0.083)	(0.110)
AGE	-0.220**	-0.253**	-0.266**	-0.322**	-0.314**
	(0.021)	(0.026)	(0.029)	(0.039)	(0.054)
AGE SQ	0.176**	0.193**	0.199**	0.241**	0.212*
	(0.034)	(0.042)	(0.047)	(0.064)	(0.089)
LN(PCAP)	-0.029**	-0.036**	-0.039**	-0.047**	-0.054**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
YEAR1990	-0.000	-0.003	-0.003	-0.007	-0.020*
	(0.003)	(0.004)	(0.004)	(0.006)	(0.009)
YEAR1992	0.020**	0.016**	0.014**	0.005	-0.011
	(0.003)	(0.004)	(0.004)	(0.006)	(0.008)
Observations	30237	25409	23210	15918	10673
Pseudo R-squared	0.14	0.14	0.14	0.14	0.16
Fraction LARGE =1	0.188	0.188	0.187	0.178	0.171

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
All regression include dummies for own industry, parents' industry, headquarter location, and a constant

The coefficient on *LARGE* increases by 0.08 as expected under the hypothesis. Since the fraction of large corporations is identical to three decimal points, it is likely that not all of the increase is attributable to the mechanical effects, but rather, attributable to tax incentives. The subsequent restrictions on the sample also increase the coefficient (Columns 3–5), but it is difficult to attribute to the tax incentives as the fraction of large corporations decreases. Cautions are required in interpreting these results, but at the least, Table 5 shows that the results are qualitatively robust to excluding samples that would have smaller tax incentives.

Robustness check

As noted earlier, the available data is on book income rather than tax income. To check the sensitivity to the definition of profit, we tried alternative specifications of the dependent variable under different assumptions about the reporting discrepancy. The first specification assumes that the tax profit of zero corresponds to a range of book profit around zero, thereby zero profit is defined to be a range of (-2, 2) million yen. The second specification assumes that tax incomes are systematically smaller than book incomes, and the range for book profit coded as zero profit is (-1, 3).[27] Columns 1 and 2 of Table 6 shows that estimates are qualitatively unchanged, suggesting that the discrepancy between the two concepts is unlikely to be a serious concern.

Table 6: Specification tests

	(1) PROFIT1	(2) PROFIT2	(3) NON F&I	(4) NON F&I	(5) F&I	(6) F&I
LARGE = 1	0.054**	0.059**	0.025**	0.025**	0.048*	0.048*
	(0.008)	(0.009)	(0.006)	(0.006)	(0.023)	(0.024)
HOLDING	0.017**	0.017**	-	-	-	-
	(0.005)	(0.006)	-	-	-	-
OFFICE SHARE	0.018**	0.029**	-0.005	-0.005	-0.001	-0.001
	(0.005)	(0.006)	(0.003)	(0.003)	(0.008)	(0.008)
SAME HEAD	0.014**	0.010*	0.003	0.003	-0.014	-0.014
	(0.004)	(0.005)	(0.003)	(0.003)	(0.010)	(0.010)
RELSIZE	-0.762**	-0.761**	-0.018	-0.017	0.431**	0.424**
	(0.109)	(0.108)	(0.048)	(0.048)	(0.108)	(0.110)
AGE	-0.378**	-0.410**	-0.090**	-0.089**	-0.337**	-0.337**
	(0.027)	(0.031)	(0.019)	(0.019)	(0.106)	(0.106)
AGE SQ	0.324**	0.326**	0.046	0.046	0.365+	0.365+
	(0.038)	(0.046)	(0.030)	(0.030)	(0.208)	(0.208)
PUBLIC	-0.038	-0.039	-	-	0.319	0.374
	(0.029)	(0.033)	-	-	(0.216)	(0.244)
LN(PCAP)	-0.051**	-0.064**	-0.008**	-0.008**	-0.022**	-0.022**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)	(0.004)
YEAR1990	-0.012**	-0.013**	-0.011**	-0.011**	0.016	0.016
	(0.004)	(0.004)	(0.003)	(0.003)	(0.010)	(0.010)
YEAR1992	0.010*	0.011*	0.005*	0.005*	0.019+	0.019+
	(0.004)	(0.005)	(0.003)	(0.003)	(0.011)	(0.011)
LN(SALES)	-	-	-0.021**	-0.021**	-0.032**	-0.032**
	-	-	(0.001)	(0.001)	(0.004)	(0.004)
LN(WORKER)	-	-	0.001	0.001	0.008*	0.008*
	-	-	(0.001)	(0.001)	(0.003)	(0.003)
q100	-	-	-	-0.000	-	0.083**
	-	-	-	(0.002)	-	(0.014)
q75	-	-	-0.001	-	0.081**	-
	-	-	(0.002)	-	(0.014)	-
Observations	33340	33340	29348	29348	2880	2880
Pseudo R-squared	0.15	0.15	0.16	0.16	0.28	0.28

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
All regressions include dummies for own industry, headquarter location, and a constant.
Parent's industry dummies are included except for F&I subsamples.
PUBLIC is ommitted in non F&I subsample because all public corporations reported non-zero profits.
The range of zeroprofit for PROFIT1 and PROFIT2 is (-2,2) and (-1,3) respectively.

In the main analysis, *HOLDING* enters linearly in the regression. To account for the possibility that income shifting involves subsidiaries with a certain minimum degree of control, two discrete specifications of this variable are tried. The first specification replaces *HOLDING* with the dummy variable for 75 per cent or more of voting shares being controlled by the group. The second specification uses the dummy for being wholly-owned subsidiary. Table 6 presents the result. For the financial/insurance sector, the estimated marginal effects on the holding variable are very similar between the specifications. It reflects the regulation that causes the variable to be close to discrete in the first place. For the sub-sample of other industries, the level of holding has no explanatory power.

In sum, the results regarding the level of *HOLDING* are generally not sensitive to the specification.

Finally, the functional form of the size control poses a trade-off in the model specification choice. Since the identification of the tax effects on large corporation is based on a dummy variable for size exceeding the tax threshold, control variables based on under-

Table 7: Flexible size controls

	(1)	(2)	(3)	(4)
LARGE = 1	0.036**	0.027**	0.008	0.005
	(0.006)	(0.006)	(0.006)	(0.005)
HOLDING	0.011**	0.015**	0.012**	0.015**
	(0.004)	(0.004)	(0.004)	(0.004)
OFFICE SHARE	0.003	-0.002	0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)
SAME HEAD	0.007*	0.001	0.007*	0.000
	(0.003)	(0.003)	(0.003)	(0.003)
RELSIZE	-0.351**	0.010	-0.363**	-0.032
	(0.078)	(0.046)	(0.078)	(0.048)
AGE	-0.206**	-0.105**	-0.211**	-0.111**
	(0.019)	(0.019)	(0.019)	(0.019)
AGE SQ	0.160**	0.071*	0.168**	0.075*
	(0.027)	(0.029)	(0.027)	(0.030)
PUBLIC	-0.028+	-0.021	-0.041**	-0.035**
	(0.016)	(0.017)	(0.006)	(0.007)
YEAR1990	-0.009**	-0.008**	-0.009**	-0.009**
	(0.003)	(0.003)	(0.003)	(0.003)
YEAR1992	0.007*	0.006*	0.007*	0.007*
	(0.003)	(0.003)	(0.003)	(0.003)
LN(PCAP)	-0.024**	-0.010**	-0.040**	-0.023**
	(0.001)	(0.001)	(0.002)	(0.002)
LN(WORKER)	-	0.003*	-	0.000
	-	(0.001)	-	(0.003)
LN(SALES)	-	-0.023**	-	-0.032**
	-	(0.001)	-	(0.004)
LN(PCAP) SQ	-	-	0.003**	0.002**
	-	-	(0.000)	(0.000)
LN(SALES)SQ	-	-	-	0.001*
	-	-	-	(0.000)
LN(WORKER)SQ	-	-	-	0.000
	-	-	-	(0.000)
Observations	32228	32228	32228	32228
Pseudo R-squared	0.12	0.16	0.13	0.17

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
All regressions include dummies for own industry, parent's industry, headquarter location, and a constant.
The sample in this table omits 1,112 observations with missing information on workers and/or sales

lying (untransformed) size inevitably capture some of the effects of the taxes, especially when it is in a flexible form.[28] We think the log-linear specification is appropriate for the purpose of this study since the specification avoids attributing the tax effects to the average size-effects. Given the concern about specification errors, and to be conservative, we consider the estimates based on the log-linear specification as an upper bound and those based on flexible forms as a lower bound.

As a basis for comparison, Column 1 of Table 7 presents the result of a baseline model with a sample that omits observations with missing information on the number of workers and/or sales. Column 2 includes in the regression the log of number of workers and log of sales as additional controls. The coefficient on *LARGE* is lowered but is statistically significant. Column 3 includes a quadratic control of paid-in capital. As expected, the point estimate is positive but is insignificant, since the quadratic controls would attribute increases in the propensity to report zero profit to the average sizeeffects. The results are similar when including quadratic controls for other size variables. Overall, based on the estimates from Column 2 and 4, our analysis indicate that the tax incentives increase the propensity for large corporations to report zero profit by 0.5–2.7 percentage points on average.

Concluding remarks

This paper considered perverse incentives caused by the tax law asymmetries in a corporate income tax that lacks an explicit allowance for loss offsets with group members. We argued that to the extent that corporate groups are formed for business purposes, the income shifting within corporate groups is an unintended consequence of government's failure to account for the group behaviour in the tax law. Taken as a whole, the findings are highly suggestive of income shifting being pervasive among large Japanese capital *keiretsu* around the early 1990s.

Our findings underscore the importance of accounting for group behaviour in corporate taxation. Under the CITs of most nations, there is no consolidated filing of taxes, in spite of the consolidated *financial* reporting becoming the global standard; it seems reasonable to suspect that income shifting is pervasive among corporate groups in such nations. In this view, the introduction of consolidated filing of 2002 is a step forward for Japan's tax system. Yet, the nation's tax system contains various inconsistencies in how groups of corporations are treated. For example, consider the special depreciation deduction for small companies, which provides against subsidiaries of large corporations benefiting from the scheme.[29] There is, however, no restriction placed on the same subsidiaries from

paying taxes at the reduced rate intended for small stand-alone corporations. Our paper calls for further amendments to the tax system to reflect the business practices.

Finally, we interpreted the evidence as being driven by the tax motives based on our model of income shifting that predicts the excessive tendency to report zero profit by large corporations. But one may argue that the other motives for within-group transfers, particularly the risk sharing (Nakatani 1984; Hoshi and Kashyap 2001; Khanna and Yafeh 2005) and the tunnelling (Bertrand, Mehta, and Mullainathan 2002; Morck, Wolfenzon and Yeung 2005), being the main driving force behind the pattern, with perhaps the tax incentive playing a minor role.[30] It is beyond the scope of the current paper to distinguish between different motives for within-group transfers. As such, we view this paper as an early step in understanding the importance of tax motives in interpreting the within-group transfers. It would be of interest to undertake further studies to see if the tendency to report zero profits is reduced once groups start filing consolidated tax returns.

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Appendix 1

To simplify the problem (7), divide the domain of s into three segments $[0,|y_2|],[|y_2|,|y_2|+m]$ and $(|y_2|+m,\infty)$. Denote the solution to the problem by s^*.

First, note that the solution cannot be in the last range, i.e., $s^* \notin (|y_2|+m,\infty)$. For $s \in (|y_2|+m,\infty), \pi_2^b(s) >$, so that the marginal tax rate faced by the subsidiary is τ_H. Since the parent also faces τ_H when they are profitable, there is no tax savings from an additional s in this range. Thus, to save on transaction costs, the firm will not shift more than $|y_2|+m$.

Second, consider the range $s \notin [0,|y_2|]$. The subsidiary reports income of zero or below, since the amount of shifting in this range is no greater than the amount of loss. In general, the after-tax income of the parent can be positive or negative; in the absence of transaction costs, the condition (1) guarantees that the parent reports positive income, but depending on the costs of shifting, the parent can report negative income. However, we can ignore

the case of negative income. To see why, suppose that there is a value for $\hat{s} \in [0, |y_2|]$ such that $\pi_1^b(\hat{s}) < 0$. Since we also have $\pi_2^b(\hat{s}) < 0$, the overall income must be negative, that is, $\pi_1^b(\hat{s}) + \pi_2^b(\hat{s}) < 0$. Given the condition (1), the firm makes positive profit without shifting income, $0 < (1 - \tau_H)\pi_1^b(0) + \pi_2(0)$, so that $\hat{s}$ is dominated by $s = 0$. In other words, at the optimum, the parent must have positive profit, $y_1 - s - g(s) > 0$. Thus, the parent faces τ_H, and the firm's optimisation problem becomes (10).

$$\frac{Max_s \tau_H s - (1 - \tau_H) g(s)}{s.t.\ y_2 + s \leqslant 0} \tag{10}$$

Note that there is no explicit inequality constraint on a parent's profit, but since it can be verified that the constraint holds with a slack, the constraint on a parent's profit is not included here. The first order conditions for the problem are

$$\tau_H - (1 - \tau_H)\frac{s}{\bar{y}\psi} - \lambda = 0 \tag{11}$$

$$\lambda(y_2 + s) = 0, \lambda \geq 0 \tag{12}$$

The solution for this restricted problem is summarised as:

$$s^* = \min\left(|y_2|, \frac{\tau_H}{1 - \tau_H}\bar{y}\psi\right) \tag{13}$$

Third, consider the problem with the restriction that $s \in [|y_2|, |y_2| + m]$. The subsidiary faces the marginal rate of τ_L in this range. The parent faces τ_H by a similar argument to above. To see that the parent must have positive income, suppose that at $\hat{s} = m + |y_2|, \pi_1^b(\hat{s}) < 0$. Since $\pi_2^b(m + |y_2|) = m$, the overall profit is $\Pi(m + |y_2|) = \pi_1^b(\hat{s}) + m(1 - \tau_L) < m$. $\hat{s}$ cannot be the optimal value, since the profit without shifting income is $\Pi(0) = (1 - \tau_H)y_1 + y_2 > m$ by assumption, i.e., $\hat{s}$ is dominated by $s = 0$. It follows that for any other value of s in the range, $\pi_1^b(s) > 0$. Thus, the problem can be written as

$$\frac{Max_s (\tau_H - \tau_L)s - (1 - \tau_H)g(s)}{s.t.\ y_2 + s \leqslant m, -y_2 - s \leqslant 0} \tag{14}$$

The first order conditions for the problem are

$$(\tau_H - \tau_L) - (1 - \tau_H)\frac{s}{\bar{y}\psi} - \lambda_1 + \lambda_2 = 0 \tag{15}$$

$$\lambda_1(y_2 + s - m) = 0 \tag{16}$$

$$\lambda_2(-y_2 - s) = 0 \tag{17}$$

$$\lambda_1, \lambda_2 \geq 0 \tag{18}$$

The solution to the problem is summarised as

$$s^* = \min\left[\max\left(|y_2|, \frac{\tau_H - \tau_L}{1 - \tau_H}\bar{y}\psi\right), m + |y_2|\right] \tag{19}$$

By combining the two solutions, we obtain

$$s^* = \min\left\{\max\left[\min\left(|y_2|, \frac{\tau_H}{1-\tau_H}\bar{y}\psi\right), \frac{\tau_H - \tau_L}{1-\tau_H}\bar{y}\psi\right], m + |y_2|\right\} \quad (20)$$

Appendix 2

This note demonstrates the underestimation of tax effects in a regression with a flexible size control. One way to identify the effects of tax incentives would be to compare the actual fraction of corporations reporting zero profit with the predicted fraction based on the sample without the cap. To the extent that the tax incentives are influential, we would expect to observe the actual fraction to be greater than the predicted fraction. As an example, we examine the propensity to report zero profit using a probit model with a cubic function of the log of paid-in capital as the control.

In Figure A1, the long-dotted line shows the predicted fraction of zero-profit corporations based on the model estimated on a sample below 100 million yen in paid-in capital. The figures are averaged over intervals with the width of 0.2. The amount above 4.6, which corresponds to $\ln(100)$, is therefore an out-sample prediction, representing the pattern that would have prevailed had the relationship between the propensity to report profit and the corporate size remained as it was below 100 million. Broadly speaking, the fraction declines over the size. However, the out-sample prediction is generally low compared to the actual figure, indicating a systematically high incidence of zero profit among large corporations unexplained by the level of size.

Now consider the short dotted line, which is an in-sample prediction based on the estimates from the whole sample. As the model is fit to the data, any effects of taxes are absorbed into the coefficients on the size controls, so that the predicted values trace the actual values closely. Thus, by incorporating a flexible size control in the analysis presented in the text, the tax effects would inevitably be underestimated.

Notes

1 The twenty-nine countries include those that adopt a consolidated filing or fiscal unity of affiliated corporations, even if the allowance is restricted to certain industries.

2 See the simulation by Majd and Myers (1987) on the impact of tax asymmetry on the after-tax net present value of a stand-alone project.

3 Corporate groups may be formed for pervasive reasons, such as to take advantage of the preferential treatment of small businesses (Onji 2007). The income shifting in such contexts is problematic in exacerbating the existing problem.

4 See Westney (1998) for a descriptive study of capital *keiretsu*, referred to as vertical *keiretsu* in his paper. Shimotani (1993) provides a through documentation in Japanese. On horizontal *keiretsu*, see for instance, Flath (2005) and Kester (1989). Granovetter (1995) offers a review of international corporate groupings.

5 Samphantharak (2003) uses the entity-level data from Thailand to study the internal capital market in business groups.
6 See Khanna and Yafeh (2005) for an updated review of the literature. Hoshi and Kashyap (2001) document several examples of rescue operations in the post-war Japan.
7 For simplicity, here, we assume that the law determining the tax base is common regardless of corporate size.
8 The rate is for non-dividend income of corporation with paid-in capital exceeding 100 million yen. Unlike the CIT in the U.S., the tax rate is flat for this category of income. Taxes include the corporate income tax, the corporate inhabitant tax, and the corporate enterprise tax. See Ishi (2001) for a nice overview of the Japanese tax system.
9 For a detailed discussion, see Altshuler and Auerbach (1990).
10 To qualify for these benefits, corporations need to file their tax return in a specific format, known as blue form, but nearly all corporations do so in recent years. There was a temporary disallowance between April 1992 and March 2000 (Ishi 2001, p168).
11 PricewaterhouseCoopers (2002). Some countries allow profitable companies to take over the losses of another group company. In New Zealand, a profitable company can make subvention payment to an unprofitable company and deduct the expense.
12 The limit varies by company and is computed as the simple average of 2.5 per cent of income and 0.25 per cent of paid-in capital.
13 Since the deduction for intra-group contribution is aggregated with other contributions, there is a concern about the crowding out of charitable donation.
14 In a recent high-profile case involving subsidiaries of Marubeni, a major general trading company, a gasoline wholesaler is found shifting the timing of rebates totaling around 300 million yen paid to five gas station operators to utilize losses made in them (*Yomiuri Shimbun/Daily Yomiuri*, July 2, 2005, p.19).
15 Strictly speaking, the tax law in general permits these types of transactions so long as the amount of income shifted is treated as contribution.
16 As an example, there is a strategy on the compensation of executives. Since bonuses to executives are not tax deductible but severance payments are deductible, firms have incentives to reward executives in form of severance pay rather than paying them bonuses. By making senior executives 'hop around' affiliated companies, making severance payments each time, the group tax liability is lowered.
17 Certain exceptions were made under the tax reform of 2001, which is well after our sample period, to facilitate business restructurings much needed during the prolonged recession.
18 Since merging company retains losses carried forward, the merger may be an option, if so-called up-side-down merger, an operation referring to a loss-making company merging a profit-making company, is feasible.
19 In practice, income below 4 million yen is taxed at 38.9 per cent. This is ignored for simplicity.
20 A consideration in a model with more than two members is the possibility of parceling out of profit by small amount to numerous subsidiaries. Depending on the cost function assumed, such a strategy would reduce the overall incidence of zero-profit reporting, but it would not change the limits to the amount of shifting.
21 There is no apparent clustering on the after-tax profit equivalent to 8 million yen in before-tax income, but this might be due to the presence of multiple small companies as discussed.
22 It might appear that the effects of the tax threshold can be better analysed by the regression discontinuity design. However, for corporations just above the threshold to forego the preferential tax treatments, there must be some business reasons that analysts cannot observe in the dataset.
23 Although Desai (2005) reports that book and tax income diverge considerably in the U.S. data, the breakdown in the relationship does not happen until the mid-1990s. If the technology for accounting manipulation developed concurrently in Japan, then the two notions of corporate income should be reasonably close since the sample year is before the mid-1990s.
24 This roughly translates to the range (-$7,000, $7,000) using the average dollar–yen exchange rate is $1=¥150 in 1990.
25 A recent high-profile case includes the criminal indictment of Kanebo Co. (*Nihon Keizai Shimbun*, August 19, 2005).
26 The result from logit model is qualitatively the same and is available from the corresponding author.
27 The ranges of alternative definition are restricted by the data publisher's reporting procedure to round off figures below one million yen.
28 As a demonstration of this point, Appendix 2 fits a flexible model fit to the data. We then compare it with an extrapolation based on the sample of small corporations and show that for large corporations the observed fraction of zero-profit reporting is greater than the predicted.
29 National Tax Agency, 2007. *Chūshō kigyōsha tou no shōgaku genka shukyaku shisan no shutoku kakaku no sonkin sannyū no tokurei (Special rule on the acquired price of small depreciable asset for small- and medium-sized enterprises)*, No. 5408, National Tax Agency, Japan. Available from http://www.nta.go.jp/taxanswer/

hojin/5408.htm (accessed 29 October 2007). Here, a small company refers to a joint-stock corporation with paid-in capital less than 100 million yen that is filing separate tax return from its parent.

30 Another explanation involves the accounting gimmickry involving so-called 'hidden assets'. Hidden assets arise from the discrepancy between the value of assets in the balance sheet, which is recorded in book value, and the value in the market. There is a well-known strategy to offset operation loss, available to corporations that hold hidden assets: a corporation sells an asset, realises its hidden value while offsetting operation loss, and repurchases it immediately. Such a financial operation allows firms to window-dress financial statements, and to realise the capital gain without invoking tax liability. To the extent that the strategy is limited to subsidiaries that are large, tightly controlled, and/or with lower relative size, the estimated coefficients on these explanatory variables would pick up the accounting-gimmick effect.

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