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公司避稅與金字塔結構

Tax Avoidance and Pyramidal Layers

許文馨 / 國立臺灣大學會計學系教授
Wen-Hsin Hsu, Professor, Department of Accounting, National Taiwan University
劉心才 / 國立臺灣大學會計學系助理教授
Hsin-Tsai Liu, Assistant Professor, Department of Accounting, National Taiwan University
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摘 要

本文探討公司金字塔結構的投資層級多寡與公司避稅活動的關聯性。本文預期，當投資層級愈多，公司與金融市場之間的資訊不對稱及代理問題愈大，公司愈容易透過投資層級進行避稅，降低公司的有效稅率。因台灣公開交易公司依法需揭露其所有的關係企業，故本文以台灣公開交易的非金融公司為樣本，實證發現，投資層級的數量與公司避稅活動（有效稅率）呈現正向（反向）關係。此外，當公司較多的關係企業設立在避稅天堂時，此正向關係更為明顯。整體而言，實證結果支持以下論述－當公司投資層級愈多，母公司愈容易透過關係企業之間的交易來進行避稅活動並避免檢查。

【關鍵字】金字塔投資層級、企業避稅活動、有效稅率

Abstract

This study investigates whether the span of corporate pyramids (as measured by the number of ownership layers) is associated with a firm's tax avoidance activities. Using a unique sample of publicly traded non-financial firms of Taiwan, which are required to disclose information on all of their affiliates, we measure the span of corporate pyramids using the number of layers in them. Consistent with corporate pyramids generating higher agency costs and information asymmetries, we find that firms with a large number of layers engage in more tax avoidance activities, leading to lower effective tax rates. Furthermore, we find that the well-documented positive association between the level of tax avoidance and having investees in tax havens becomes more pronounced as the number of layers increases. Overall, the results support the argument that the length of pyramidal layers allows the parent firm to conduct intercompany transactions to prevent inappropriate tax avoidance activities from detection.

【Keywords】pyramidal layers, tax avoidance, effective tax rate

1. Introduction

This study examines whether the number of investment layers within corporate pyramids can facilitate tax avoidance. The corporate pyramid, with the parent at the top and successive layers of subsidiaries below, is one frequently used ownership structure to establish control of the subsidiaries (Hoyle, Schaefer, and Doupnik, 2011; La Porta, Lopez-De-Silanes, and Shleifer, 1999; Claessens, Djankov, and Lang, 2000; Claessens, Djankov, Fan, and Lang, 2002). Many firms around the world are organized into pyramid-like structures (La Porta et al., 1999; Claessens et al., 2000; Claessens et al., 2002; Khanna and Yafeh, 2005); however, whether corporate pyramid is used to facilitate tax avoidance is still unknown. Shackelford and Shevlin (2001) point out that insider control and ownership structure are important but are relatively unexplored. We fill the gap by examining the impact of corporate pyramidal structure on tax avoidance.

We argue that corporate tax avoidance is positively associated with the number of layers in corporate pyramids based on two reasons. First, establishing a long chain of pyramidal layers allows the parent firm to leverage up its control relative to its ownership of the bottom-layer firm and is a mechanism to preserve private benefits of control for the ultimate controlling shareholders (e.g., La Porta et al., 1999; La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2000; Claessens et al., 2002). While tax avoidance is beneficial to all investors in terms of greater tax savings, recent literature highlights that tax avoidance (Desai and Dharmapala, 2006) can be used for rent extraction purposes. Rent extraction refers to non-value maximizing activities decision makers pursue at the expense of shareholders, including earnings management and related-party transactions. Desai and Dharmapala (2006) argue that tax avoidance often comprises very complex transactions or structures that are designed to obscure the underlying intent and to avoid detection by the authority. The characteristics can create opportunities for controlling shareholders to engage in non-value maximization activities. Thus, consistent with the agency perspective of tax avoidance (e.g., Desai and Dharmapala, 2008; Chen and Chu, 2005; Crocker and Slemrod, 2005), we argue that the obscure nature of a long pyramid structure may make it easier for controlling owner to hide rent extraction activities. Since the parent firm usually moves taxable income within a multinational group from high-tax to low-tax source countries, the length of corporate pyramid makes it easier for the controlling parent to conduct some intercompany trading, or other transactions on royalties, rents, and etc. Although all the shareholders seem to enjoy the benefits of tax avoidance, controlling

shareholders can reap both the benefits of tax saving and rent extracted via obfuscated tax avoidance and the non-controlling shareholders can be harmed by rent extraction behaviors.

Second, prior literature argues that a higher level of corporate pyramid leads to greater information opaqueness of the company, making it more difficult for outside investors to evaluate a pyramidal firm's financial position and performance. Chan and Hsu (2013) find a positive association between the number of investment layers and cost of debt. Manconi and Massa (2009) also indicate that organizational complexity, captured by the number of layers, makes the firm less transparent. If a high number of investment layers is associated with high opaqueness, it will become more difficult for tax authorities to detect inappropriate tax avoidance activities within multiple pyramidal layers. In particular, regulators and practitioners also have concerns about lower quality of subsidiary audit (Doty, 2011). Thus, we expect that the increase in the number of layers allows the parent firm to conduct tax avoidance activities because the corporate pyramid may shield the tax avoidance activities from detection.

In addition, our study also tests whether the positive association between tax avoidance activities and having investees in tax haven can increase with the number of layers in corporate pyramids. Prior literature documents that a parent shifts income to the 'tax havens' (e.g., see Hines and Rice, 1994 and Grubert and Slemrod, 1998), and there is a positive association between tax avoidance and the number of subsidiaries in tax havens (Wilson, 2009; Lisowsky, 2010). Tax haven operations facilitate tax avoidance both by reducing the burden of home country taxation of foreign income and by permitting firms to allocate taxable income on the lower-tax jurisdictions (Dyreng and Lidsey, 2009). As the number of layers within a pyramid increases, organizational complexity and obfuscation of tax activities also increase, which makes tax aggressive activities become less likely to be detected. Thus, we predict that the impact of having investees in tax havens on tax avoidance can increase with the number of investment layers.

We conduct our analyses using a sample of listed non-financial firms of Taiwan for the period of 2000-2011; as all listed companies in Taiwan are required to disclose information on all of their affiliated enterprises according to "*Criteria Governing Preparation of Affiliation Reports, Consolidated Business Reports and Consolidated Financial Statements of Affiliation Enterprises*" (hereafter CGPAR). This allows us to calculate the number of layers based on publicly available affiliation information. In many

countries[1], firms are not required to disclose the structure of corporate pyramids; such mandatory disclosures in Taiwan provide a natural choice to test our research questions. In order to measure the "length" of layers, we identify all intermediate layers connecting the parent company and the lowest-tire firms. That is, the holding company (i.e., the parent company) at the apex of investment structure indirectly controls firms sitting on the lowest tier of investment layer through intermediate companies. If firms have multiple chains in investment structure, we will focus on the longest chain which has the largest number of intermediate layers, and calculate the number of intermediate layers connecting the parent company and the lowest-tier firms.

We then examine the association between tax avoidance and the length of corporate pyramids. Following prior studies (Phillips, 2003; Rego, 2003; Dyreng, Hanlon, and Maydew, 2010; Robinson, Sikes, and Weaver, 2010), our first measure of tax avoidance is GAAP effective tax rate, which is designed to capture tax avoidance activities that directly affect net income via the tax expense. Prior literature suggests that a lower effective rate reflects higher incidences of tax avoidance (e.g., Gupta and Newberry, 1997; Rego, 2003). Consistent with our expectation, we find that firms with more layers within the pyramidal structure engage in more tax avoidance than do firms with fewer layers. Our results are the same when measuring tax avoidance with cash effective tax rate and long-term cash effective tax rate over three-year period (five-year period). Our results remain the same when controlling variables documented in the literature do affect tax avoidance activities, such as firm size, market-to-book ratio, financial leverage, and etc.

In addition, we measure tax-haven intensity using the number of investees in tax haven divided by total number of investees and interact the intensity variable with the number of layers. We find that the well-documented positive association between tax avoidance activities and having investees in tax haven becomes more pronounced as the number of layers increases. The results support the notion that the number of layers facilitates tax avoidance activities.

The relation between layers and tax avoidance may have endogenous issues. In particular, investment layers help facilitate tax avoidance activities and managers who intend to engage into tax avoidance activities may tend to build more layers. To mitigate

1 For example, in the US, publicly traded firms are required to disclose their subsidiaries in Exhibit 21 of 10K. However, from Exhibit 21 sections of each firm's annual 10-K report, the whole structure of pyramidal ownership is not available as firms are not required to disclose the number of layers in which each subsidiary is located.

these reverse causality issues that may lead to biased ordinary least squares (OLS) estimates, we employ a two-stage regression analysis Heckman (1979) as the robustness check. The results remain the same.

The study contributes to a few streams of literature. First, prior studies (e.g., Rego, 2003) argue that firms can avoid taxes through structured transactions among different entities. We identify a measure, the number of layers, which can serve as organizational complexity as well as opaque information environment for accelerating corporate tax avoidance. Second, we contribute to the parent-subsidiary literature. Prior studies examining tax avoidance activities have traditionally focused on corporate-level influences (e.g., Rego, 2003). Only few studies to date examine the characteristics of subsidiaries within a firm (e.g., Dyreng, Hanlon, and Maydew, 2012; Shroff, Verdi, and Yu, 2014). Our study takes a close look at the internal organizational structure of a parent-subsidiary firm and helps understand the influence of lower organizational levels within the pyramidal firms on tax avoidance. Third, we contribute to the literature on corporate pyramids (e.g., Bebchuk, Kraakman, and Triantis, 2000; Claessens et al., 2002; La Porta et al., 1999). The literature on corporate pyramids has so far almost exclusively focused on the ownership structure and corporate value, and paid little attention to tax activities.

The paper proceeds as follows. Section 2 provides related literature review and develops hypotheses. Section 3 outlines the research design. Section 4 describes the sample selection and descriptive statistics. Section 5 discusses the results. Section 6 introduces additional analyses, and Section 7 is our conclusion.

2. Literature Review and Hypothesis Development

2.1 Corporate Pyramidal Structure

Many firms around the world are organized into pyramid-like structures (La Porta et al., 1999; Claessens et al., 2000; Claessens et al., 2002; Khanna and Yafeh, 2005). Pyramidal ownership structure is defined as a business entity whose ownership structure displays a top-down chain of control (La Porta et al., 1999). In such a multi-layer organizational structure, the holding company (i.e., the parent company) at the apex of an investment structure indirectly controls firms sitting on the lowest tier of investment structure through intermediate companies. For example, Figure 1 shows the investment structure of Far Eastern Department Store, with the parent company (Far Eastern Department Store) indirectly controlling the lowest-tier firm (Beijing Xidan Pacific Department Stores) at layer 5 through Pacific Current Investment (layer 1), Pacific Chong

Guang (layer 2), Pacific China Holdings (HK) Corporation (layer3), and Pacific China Holdings (BVI) (layer 4). The parent can control several subsidiaries within the pyramid indirectly through layers of intermediate subsidiaries simultaneously.

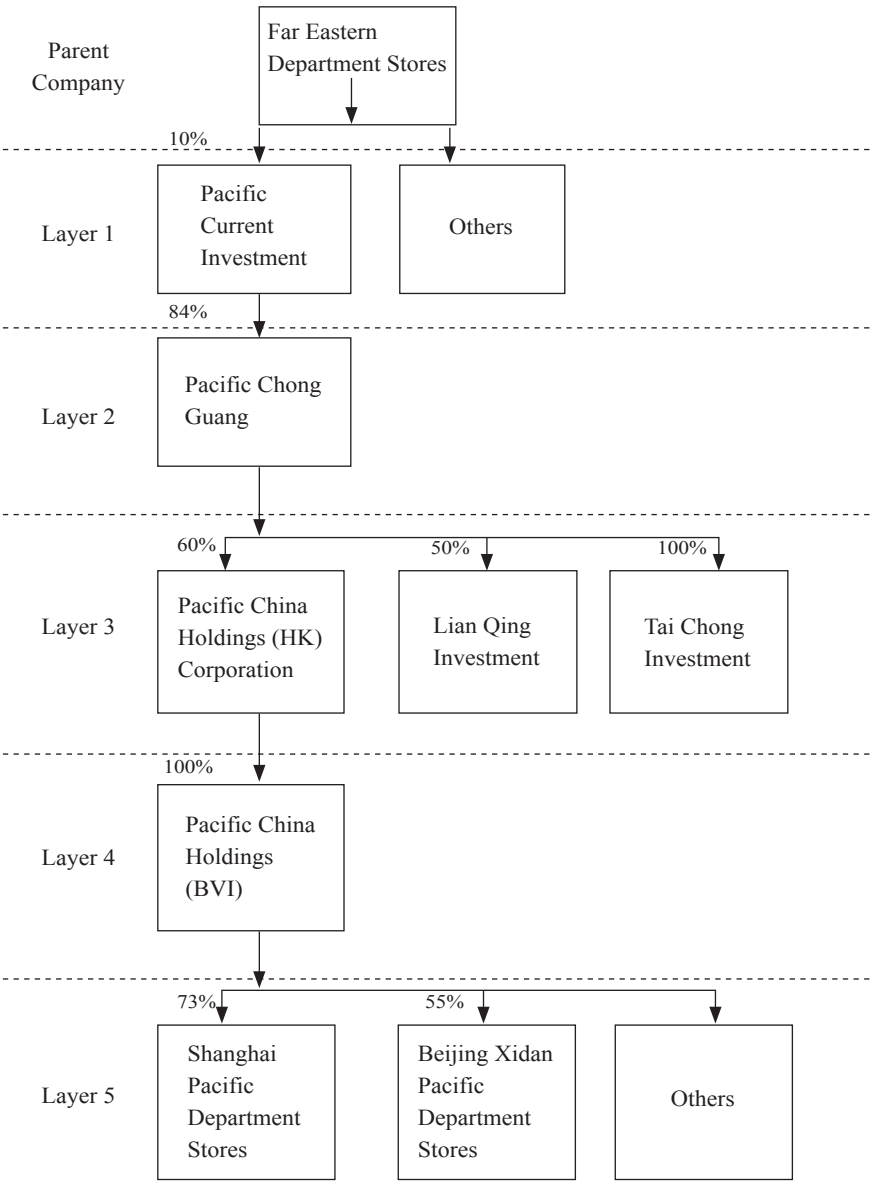

Figure 1 Pyramidal Firm Structure of Far Eastern Department Stores[2]

2 The chart is based on Far Eastern Department Stores annual financial report 2002.

Several studies document evidence of pyramid-like structures in East Asia (e.g., La Porta et al., 1999; Claessens et al., 2000; Claessens et al., 2002). Bebchuk et al. (2000), Morck, Wolfenzon, and Yeung (2004), and Johnson, La Porta, Lopez-de-Silanes, and Shleifer (2000) argue that corporate pyramid can be used to facilitate non-arm's length transactions. Gramlich, Limpaphayom, and Rhee (2004) document that keiretsu group member firms have lower effective tax rates than stand-alone firms in Japan. Keiretsu firms strategically shift reported income among affiliates in order to reduce overall effective tax rates. With the control right disproportionate to the ownership, controlling shareholders can easily expropriate wealth from minority shareholders and creditors (Bebchuk et al., 2000; Morck et al., 2004). The resources of the lower layer firm can easily be transferred out of the firm for the benefit of the controlling shareholders, a practice known as tunnelling (Johnson et al., 2000). Thus, pyramidal structures shift the central agency problem from a problem between outside investors and managers (Jensen and Meckling, 1976) to a problem between controlling shareholders and other stakeholders (Shleifer and Vishiny, 1997; La Porta et al., 1999).

2.2 Literature on Tax Avoidance and Firm Characteristics

Prior studies have identified many firm characteristics as being associated with tax avoidance using the actual data of tax avoidance activities or a number of proxies based on the financial reporting data (e.g., GAAP effective tax rate, cash effective rate, book-tax difference, etc.). The characteristics include firm size, profitability, leverage, capital intensity and foreign operations (e.g., Gupta and Newnerry, 1997). For example, Gupta and Newnerry (1997) document that effective tax rates are negatively associated with a firm's leverage, PPE intensity (the ratio of net property, plant, equipment to total assets), and positively associated with firm performance (ROA) and inventory intensity. Rego (2003) finds that firms of greater pre-tax income have more incentives to engage in tax avoidance activities and that firms operating in more dispersed geographic areas have more opportunities to take tax avoidance activities.

Using confidential tax shelter and tax returns from the Internal Revenue Service, Lisowsky (2010) develops a model to infer the likelihood that a firm engages in a tax shelter. He finds that tax shelter likelihood is positively associated with subsidiaries located in tax havens. However, Lisowsky (2010) suffers from three drawbacks. First, he does not explore whether the practice of tax shelter can vary with investment structure. He assumes that the organization structure is not a factor affecting tax shelter. Second,

Lisowsky (2010) uses only 267 tax shelter-year observations between year 2000-2004 in the U.S. The small sample size may limit its generalizability to other firms, or other countries. Third, Lisowsky (2010) cross-reference Exhibit 21 of 10K to identify the subsidiaries in tax havens. In the U.S., the Securities and Exchange Commission rules demand subsidiary disclosure in Exhibit 21 of 10K only when subsidiary operations are "significant", using the 10% threshold based on assets, investment, or income. Lisowsky (2010) suffers from selection bias by ignoring subsidiaries who do not meet “significant” criteria. Thus, our study will fill the gap by taking advantage of a comprehensive subsidiary data in Taiwan to explore the relationship between tax avoidance, investment layers, and tax havens.

2.3 Literature on Tax Avoidance and Agency Costs

Traditional view is held that tax avoidance is value enhancing to shareholders because tax avoidance can reduce the wealth transfers from shareholders to the government. This view is associated with the underlying premise that the interests of shareholders and managers are aligned and a firm makes the tax reporting decisions without agency considerations but consider only tax rates, the probability of tax avoidance being detected, and penalties (Allingham and Sandmo, 1972).

Recently, there is another stream of research exploring the association between tax avoidance activities and the agency problems between shareholders and managers (e.g., Desai, Dyck, and Zingales, 2007; Desai and Dharmapala, 2008; Chen and Chu, 2005; Crocker and Slemrod, 2005; Slemrod, 2004). Using the principal-agency model, Slemrod (2004) and Chen and Chu (2005) incorporate the non-tax cost considerations and find that separation of ownership and management can lead to corporate avoidance behavior that does not maximize shareholders’ benefits, but reflect the private interest of the manager or the controlling shareholders. In particular, Desai and Dharmapala (2006) argue that the crucial characteristics of tax avoidance activities are complexity and obfuscation. Controlling shareholders can exploit the proprietary and obfuscation nature of tax avoidance to mask rent extraction, such as earning management, related-party transactions, selective information disclosure, and etc., which reduces firm value (Desai and Dharmapala, 2009). Consistent with this perspective, Desai and Dharmapala (2009) and Wilson (2009) document that tax avoidance (Tax Sheltering) increases firm value only for well-governed firms. Likewise, Desai and Dharmapala (2009) find that the effect of tax avoidance on firm valuation is positive only for firms with lower level of anti-takeover

protection or higher levels of institutional holding. Hanlon and Slemrod (2009) find a negative market reaction to news about a firm's involvement in tax shelters, which is consistent with the notion that investors are concerned about managers using tax shelters for diversion and earnings manipulation, even though reducing tax payment can increase shareholders' benefits. The negative reaction is more pronounced in firms with weak corporate governance.

Finally, two studies have recently examined the relation between tax avoidance and agency costs between controlling shareholders and non-controlling shareholders. Chen, Chen, Cheng, and Shevlin (2010) argue that as family owners have bigger agency conflicts between dominant and small shareholders, family owners' greater influence provide them more opportunities to seek rents, through transactions such as tax avoidance activities and related-party transactions. Thus, the potential private benefits from rent extraction can be bigger for family owners than for managers in non-family firms. However, in the U.S., the potential penalty imposed by the IRS and the litigation costs are likely more substantial to family owners than to CEOs. Thus, Chen et al. (2010) find that family owners exhibit lower tax aggressiveness because they are concerned with potential damage on family reputation and the potential penalty imposed by IRS. Our results differ from Chen et al. (2010) in one main aspect. Chen et al. (2010) examines the agency conflicts between controlling and non-controlling shareholder using family firms in the U.S., where the agency conflicts are not so pronounced compared to those in East Asia. One main reason is that family owner's greater reputation and litigation concerns in the U.S. may mitigate the conflicts. For example, Chen, Chen, and Cheng (2008) find that family firms provide less voluntary disclosure than nonfamily firms, but they are more likely to give earnings warnings to preempt the negative publicity that can result from not issuing warnings. Thus, we would like to re-examine whether a high level of tax aggressiveness is associated with higher agency conflicts between controlling shareholder and non-controlling shareholders.

The second paper that link tax avoidance with the agency costs between controlling shareholder and non-controlling shareholder is McGuire, Wang, and Wilson (2014), who investigate the effect of dual class ownership structure on the level of firms' tax avoidance. The dual class ownership structure entails agency problems between controlling shareholder and non-controlling shareholder, because the superior class of stock allows insiders to control a majority of the votes but have claims to a minority of the firms' cash flows (Gompers, Ishii, and Metrick, 2010). Using the quiet life theory

(Bertrand and Mullainathan, 2003), which predicts that managers expropriate wealth in the easiest possible manner, avoid expropriation activities and legitimate activities that require a great deal of risk and effort on the part of the manger; McGuire et al. (2014) argues that firms whose managers have greater excess voting rights over cash flow rights will exhibit less tax avoidance. Consistent with the quiet life theory, McGuire et al. (2014) find that the dual class firms engage in lower level of tax avoidance than do the propensity matched single class firms and that the extent of tax avoidance declines as the deviation between voting rights and cash flow rights increases.

Our study is different from that of McGuire et al. (2014) in two aspects. First, they do not test the agency theory developed by Desai and Dharmapala (2006), instead, the quiet theory is tested. They test whether managers' preference for the quiet life leads to lower levels of tax avoidance among dual class firms. However, ours is more akin to the tests of Desai and Dharmpala (2006). According to Desai and Dharmpala (2006), dual-class firms may engage in higher levels of tax avoidance because insiders view tax avoidance as a means to expropriate wealth from shareholders (Francis, Schipper, and Vincent, 2005; Masulis, Wang, and Xie, 2009). Second, McGuire et al. (2014) investigate tax avoidance in the U.S., where corporate pyramids is not common. We explore another common practice in East Asia that relates to the agency costs between controlling and non-controlling shareholders-corporate pyramids.

2.4 Hypothesis Development

We expect that firms with a long span of corporate pyramid are associated with high tax avoidance. One main reason is that the pyramidal structure is a convenient device for a controlling shareholder to expropriate rents (Bebchuk et al., 2000; Morck et al., 2004). The use of pyramidal structures could lead to agency costs between the controlling shareholders and non-controlling shareholders. The corporate pyramid allows controlling shareholders to exercise controlling power in excess of their cash flow rights via pyramidal structures. The controlling shareholders can conduct tax avoidance activities by creating complex structures (e.g., related-party transactions) to obscure the underlying intent and to avoid detection by the government. Desai and Dharmapala (2006) argue that tax avoidance activities comprising complex and obscure transactions make it easier for controlling shareholders to hide rent extraction activities. While related-party transactions can be promoted as saving taxes for the company of interest, the controlling shareholder can benefit themselves by extract rents through affiliates. For example, they can buy assets

at a higher price than the fair value from their investees, or borrow money at higher interest rates from their controlled entities.

In addition, the probability of detection can reduce with the length of corporate pyramid. Regulators often have concerns about audit deficiencies that are attributed to the business group setting (Doty, 2011). While many studies find tax-motivated income reallocation among the affiliated firms (Harris, 1993), and firms that have more entities, such as subsidiaries have greater opportunities for tax avoidance (Mills, Erickson, and Maydew, 1998), the use of corporate pyramid makes it increasingly difficult for outsiders to disentangle the rent extraction and tax avoidance. Bushman, Chen, Engel, and Smith (2004) suggest that organizational complexity can limit corporate transparency and increase information asymmetry. Manconi and Massa (2009) and Chan and Hsu (2013) argue that the number of layers within a corporate pyramid makes the firm more opaque and more difficult for the capital market participants to access its information. For example, to transfer financial information from the bottom of investment layers to the parent firm, the information of Shanghai Pacific Department Stores at layer 5 (See Figure 1) is consolidated with the parent's accounting information through 5 times consolidation process. Combining long length of layers of subsidiaries within a pyramidal firm creates information aggregation problems that can result in substantial information asymmetries within a firm, or between insiders and outsiders (including tax authorities). As the number of investment layers increases, the process of transferring information from the lowest-tier subsidiaries to the parent company becomes more complex, thereby rendering it more difficult for external investors to assess and monitor the risk in the investment projects of a firm.

With the above reasons, we expect that the number of layers is positively associated with corporate tax avoidance. We form our hypothesis, stated in its alternative form, as follows:

H1: Ceteris paribus, corporate tax avoidance is positively associated with the number of layers in corporate pyramids.

We next examine whether the use of corporate pyramid makes it even easier to avoid tax through offshore havens. Prior studies argue that multinational firms reallocate taxable income from high-tax jurisdiction to low-tax-jurisdiction, or tax havens and the reallocation occurs through structuring transactions between affiliates, such as royalty payments, dividend repatriations and intra-firm debt (Dyreng and Lindsey, 2009;

Dharmapala and Hines, 2009). A tax haven in which certain taxes are levied at an extremely lower rate or even zero attracts corporate entities to establish subsidiaries to avoid taxes by permitting firms to shift the domestic income away from high-tax jurisdictions to the tax havens (e.g., see Hines and Rice, 1994 and Grubert and Slemrod, 1998). It is very common to find giant businesses like Boeing, General Electric, Pfizer, Microsoft, and Google using tax havens to dramatically lower their taxes often to zero. Angel Gurría, current secretary general of the OECD, called for the need of G20 combating tax avoidance of shifting profits to offshore tax havens (Inman, 2013).

We argue that as the number of layers increases, the obscure nature of tax avoidance can increase, which makes it easier to conduct intercompany transactions to avoid tax and make it difficult to be detected by the government. For example, in 2010, it was reported that Google reduced its overseas tax rate to 2.4% by moving most of its foreign profits from Ireland to Netherlands and then to Bermuda (Drucker, 2010). The use of three layers for foreign subsidiaries in Europe is claimed to help Google Inc. to avoid taxes overseas (Kleinbard, 2011). Thus, we expect the positive association between tax avoidance activities and having subsidiaries in tax havens can increase with the number of layers. We form our hypothesis as follows.

H2: Ceteris paribus, the positive association between tax avoidance activities and the number of layers becomes more pronounced as firms have more investees in tax haven countries.

3. Research Design

3.1 The Number of Investment Layers

All listed companies in Taiwan are required to disclose information on all of their affiliated enterprises according to "*Criteria Governing Preparation of Affiliation Reports, Consolidated Business Reports and Consolidated Financial Statements of Affiliation Enterprises*" (hereafter CGPAR). This allows us to calculate the number of layers based on publicly available affiliation information. As firms in many countries are not required to disclose the structure of corporate pyramids in many countries, such mandatory disclosures in Taiwan provide a natural choice to test our research questions.

Take Figure 1 as an example. Our firm of interest is Far Eastern Department Stores on layer 0 because it is the listed firm (or the parent firm). The successive layers of affiliates below the parent firm are used for calculating the number of layers of the corporate pyramid. Companies located at layer 1 to layer 5 are all Far Easter Department

Stores' affiliates. Our research question would like to examine whether the listed firms such as Far Eastern Department Stores having 5 layers are more likely to avoid tax than other listed firms (located at layer 0) having the number of investment layers less than 5.

Specifically, to measure the length of investment layers, we first identify all subsidiaries as defined by R.O.C accounting standards No. 7, consolidated financial statements. We only focus on subsidiaries because the parent firm can only control these firms' operating and financing decisions. Second, we then identify all intermediate layers connecting the parent company and the lowest-tire affiliates. That is, the holding company (i.e., the parent company) at the apex of investment structure indirectly controls firms sitting on the lowest tier of investment layer through intermediate companies. If firms have multiple chains in investment structure, we will focus on the longest chain which has the largest number of intermediate layers, and calculate the number of intermediate layers connecting the parent company and the lowest-tier firms.

3.2 Measures of Tax Avoidance

To examine the level of tax avoidance (*AVOID*), we employ four commonly used measures of tax avoidance drawn from the prior literature. Our first measure of tax avoidance is *GAAP_ETR*, where we define *GAAP_ETR* as total tax expense divided by pre-tax accounting income in year t. As this measure reflects tax avoidance via permanent differences between financial and tax reporting, prior research suggest that a lower value of *GAAP_ETR* reflects an increased level of tax avoidance (e.g., Rego, 2003).[3] Although *GAAP_ETR* is commonly used (e.g., Chen et al., 2010; Dyreng et al., 2010; Rego, 2003; Rego and Wilson, 2012; Robinson et al., 2010), it has two limitations. First, tax avoidance activities that generate temporary differences between financial and tax reporting (e.g., those that defer cash taxes paid to later periods) are not reflected in *GAAP_ETR*.[4] Second, financial accounting rules also affect *GAAP_ETR*.[5]

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3 e.g., investments in tax exempt or tax-favored assets, such as interest received on certain types of government obligation is recognized for financial reporting purpose but is tax free.

4 According to IAS 12 *Income Taxes* as well as SFAS No. 109 *Accounting for Income Taxes*, income tax expense is the aggregate amount of both current tax and deferred tax. Accelerating expenses or deferring income for tax purpose reduces current taxes but increases deferred taxes, which is not captured by *GAAP_ETR*.

5 It sometimes captures several items that are not tax planning strategies, but caused by financial accounting rules such as changes in the valuation allowance or changes in the tax contingency reserve (Hanlon and Heitzman, 2010). Thus, GAAP_*ETR* is the jointed product of both tax avoidance activities and financial accounting rules.

To address the concern, we employ the cash effective tax rate (*CASH_ETR*) as the second measure of tax avoidance. Following Dyreng et al. (2008, 2010), we define *CASH_ETR* as cash taxes paid divided by pre-tax accounting income in year t. Unlike *GAAP_ETR*, *CASH_ETR* is not biased by changes in tax accounting accruals. *CASH_ETR* reflects avoidance activities that directly affect net income (i.e., permanent book-tax differences) as well as those that defer income taxes to the later periods (i.e., temporary book-tax differences). Consistent with prior research, lower values of *CASH_ETR* represent higher levels of tax avoidance (Dyreng et al., 2008, 2010).

One potential issue of the annual *CASH_ETR* can arise from the mismatch between the timing of cash payment to tax authorities and when the tax is incurred. Cash taxes paid represent the actual taxes paid by the firm during a given year and could include estimated tax payments associated with the prior year's income. In addition, to avoid year-to-year volatility in annual *CASH_ETR*, our third (fourth) measure of tax avoidance is the long-term cash effective tax rate following Dyreng et al. (2008). Specifically, we define *LT_ETR_3Y* (*LT_ETR_5Y*) as the sum of the cash taxes paid over the current year t and the preceding two (four) years divided by pre-tax accounting income summed over the corresponding three-year (five-year) period. Prior research suggests that lower values of *LT_ETR_3Y* (*LT_ETR_5Y*) reflect higher levels of tax avoidance (e.g., Gupta and Newberry, 1997; Rego, 2003; Dyreng et al., 2008).

3.3 Research Design

To examine the association between tax avoidance and the number of layers, the following empirical model is employed using ordinary least squares (OLS):

$$\begin{aligned} AVOID_{i,t} = {} & \beta_0 + \beta_1 LAYER_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 MB_{i,t} + \beta_4 LEV_{i,t} + \beta_5 ROA_{i,t} + \beta_6 NOL_{i,t} \\ & + \beta_7 \Delta NOI_{i,t} + \beta_8 STD\_ROA_{i,t} + \beta_9 \Delta SALES_{i,t} + \beta_{10} CASH_{i,t} + \beta_{11} INTAN_{i,t} \\ & + \beta_{12} RD_{i,t} + \beta_{13} PPE_{i,t} + \beta_{14} ADV_{i,t} + \beta_{15} SGA_{i,t} + \beta_{16} ln(NUM\_INVESTEE)_{i,t} \\ & + YEARdummy + INDUSTRYdummy + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Where $AVOID_{i,t}$ is the tax avoidance as measured with *GAAP_ETR*, *CASH_ETR*, *LT_ETR_3Y*, and *LT_ETR_5Y*. $LAYER_{i,t}$ is the number of layers of the longest investment chain in firm's pyramidal structure for firm *i* in period *t*. We take the natural log of $LAYER_{i,t}$ to avoid the non-linearity issue; $SIZE_{i,t}$ the firm size for firm i, year t, measured as natural log of total assets in year t; market to book ratio $MB_{i,t}$, measured as the market

value of equity in year t, scaled by book value of equity in year t; financial leverage $LEV_{i,t}$, measured as long term debt for year t scaled by total assets in t-1; $ROA_{i,t}$ the return on assets for firm i, year t, measured as the ratio of pre-tax income for year t to beginning of the year total assets; $NOL_{i,t}$ indicator variable coded as one if net income from continuing operations in year t is smaller than zero and zero otherwise; $\Delta NOI_{i,t}$ the change in net income from continuing operations in year t, scaled by total assets in t-1); $STD\_ROA_{i,t}$ the standard deviation of the previous five years' return on assets; $\Delta SALES_{i,t}$ change in sales, measured as the annual percentage change in net sales in year t; $CASH_{i,t}$ the level of firm's cash and cash equivalent holdings; $INTAN_{i,t}$ intangible assets for year t scaled by beginning of the year total assets); $RD_{i,t}$ is the total research and development expenditure in year t divided by beginning of the year total assets; $PPE_{i,t}$ the property, plant, and equipment in year t divided by beginning of the year total assets; $ADV_{i,t}$ advertising expense in year t divided by net sale in year t; when missing, reset to 0; $SGA_{i,t}$ is the selling, general, and administrative expense in year t divided by net sales in year t; missing values of SGandA are set to 0; $NUM\_INVESTEE_{i,t}$ the number of investees. The variable definitions are also presented in Appendix 1.

To support our H1, we expect a negative coefficient, β_1 on $LAYER_{i,t}$ if pyramidal firms with more number of layers engage in more tax avoidance than those with fewer number of layers. In model (1), we control for firm characteristics that could be associated with ETRs drawn from tax avoidance literature. We do not have a sign prediction for $SIZE_{it}$ because of the lack of consensus. Dyreng et al. (2008) find that smaller firms have higher tax rates, but Rego (2003) finds that larger firms are associated with higher worldwide ETRs.[6] We expect growth firms have lower tax rate because they may make more investments in assets that can generate temporary difference in the recognition of expenses or permanent difference in tax credits (Chen et al., 2010). We also do not have sign expectation for *LEV* because highly leveraged firms may have more ability to minimize tax payment through interest expense deduction, leading to lower effective tax rate (Mills et al., 1998; Stickney and McGee, 1982; Dyreng et al., 2008), however, they may have less need for other non-debt tax deduction (Graham and Tucker, 2006).

6 This finding is consistent with the political cost theory, stating that the higher visibility of larger firms causes them to face stricter regulatory scrutiny and wealth transfers (Watts and Zimmerman, 1986). In contrast, it can be argued that larger firms have greater incentives and more resources to influence the political process in favor for them and organize their activities to achieve optical tax savings.

Appendix 1 Variable Definitions

GAAP_ETR	Tax expense divided by pre-tax accounting income.
CASH_ETR	Cash taxes paid divided by pre-tax book income.
LT_ETR_3Y	Average cash taxes paid to pre-tax book income over three years.
LT_ETR_5Y	Average cash taxes paid to pre-tax book income over five years.
CASHRATIO	Cash taxes paid in year t divided by pre-tax cash flows, where pre-tax cash flows is defined as cash flow from operations plus cash taxes paid.
TAXH1	The number of investees in tax haven divided by the total number of investees, based on the list of tax haven as in Durnev et al. (2017).
TAXH2	The number of investees in tax haven divided by the total number of investees, based on the list of tax haven as in Dyreng and Lindsey (2009).
LAYER	The natural log of the number of investment layers of the longest investment chain in firm's investment structure.
SIZE	Natural log of total assets.
MB	The ratio of the market value of equity to the book value of equity.
LEV	The ratio of long term debts to total assets.
ROA	The ratio of pre-tax income to total assets.
NOL	An indicator variable which equals to one if net income from continuing operations is smaller than zero and zero otherwise.
∆NOI	The change in net income from continuing operations in current year, scaled by total assets in the prior year.
STD_ROA	The standard deviation of the ratio of pre-tax income to total assets over five years.
∆SALES	The annual percentage change in net sales.
CASH	Cash and cash equivalents in current year divided by beginning of the year total assets.
INTAN	Intangible assets in current year divided by beginning of the year total assets.
RD	Total research and development expense divided by beginning of the year total assets.
PPE	The ratio of property, plant, and equipment to total assets.
ADV	Advertising expense in year t divided by net sale in year t; when missing, reset to 0.
SGA	Selling, general, and administrative expense in year t divided by net sales in year t; missing values of SGandA are set to 0.
NUM_ INVESTEE	The number of the investees of the firm.
NUM_TAX_ HAVEN	The number of subsidiaries in tax haven countries.
DOWN	Director ownership.
MOWN	Management ownership.

INDEP	The proportion of independent directors.
DUAL	An indicator variable that equals one if the CEO also serves as chairman of the board and zero otherwise.
DEV	The ratio of cash flow rights to control rights.
SALES_R	Related party sales over total sales.
INST	The percentage of common stocks held by institutional investors.
IMR	The inverse Mills ratio generated from the first-stage Probit regression model (3).

The second set of control variables (*ROA, NOL, and* ΔNOI) captures a firm's profitability and the presence of net operating loss. More profitable firms tend to have higher effective tax rates (Chen et al., 2010), but they may have more incentives to be engaged in tax avoidance (Rego, 2003; Wilson, 2009). Firms with net operating loss may entail tax loss carryback or carryforward which affects the effective tax rates. The third set of control variables (*STD_ROA and* $\Delta SALES$) captures performance volatility. It could be more difficult for firms with higher performance volatility to manage tax saving plan (Cazier, Rego, Tian, and Wilson, 2009). The fourth set of control variables (*CASH, PPE, INTAN, RD, ADV, and SGA*) captures a firm's asset mix and expenditures that could impact its ETRs. In particular, we control for the level of firms' cash holdings to account for firms' cash needs that might be necessary for certain types of tax avoidance (McGuire, Omer, and Wang, 2012); the tax code typically allows corporations to take depreciation expense on property, plant, and equipments over periods much shorter than their economic lives. Thus, more capital-intensive firms are expected to have lower ETRs (Gupta and Newberry, 1997); the tax code also grants corporations the differential book and tax treatments of intangible assets and RandD expenditures. RandD intensive firms are especially affected by RandD-encouraging tax credit (Chen et al., 2010; Grubert and Slemrod, 1998). We also include firms' advertising expense and SGandA expense since firms can manage tax avoidance plans via discretional spending such as advertising expenses and selling, general, and administrative expense (Dyreng et al., 2010). Finally, we control the number of investees of a firm since firms with more investees can use transfer pricing and income shifting among the parent and investees to reduce tax burden. We also control for firms' industry and year because firm-specific characteristics might vary systematically by industry and economic environment over time (Rego, 2003).

To test H2, we employ Model (2):

$$\begin{aligned} AVOID_{it} = {} & \beta_0 + \beta_1 LAYER_{it} + \beta_2 TAXH_{it} + \beta_3 LAYER_{it} \times TAXH_{it} + \beta_4 SIZE_{it} + \beta_5 MB_{it} \\ & + \beta_6 LEV_{it} + \beta_7 ROA_{it} + \beta_8 NOL_{it} + \beta_9 \Delta NOI_{it} + \beta_{10} STD\_ROA_{it} + \beta_{11} \Delta SALES_{it} \\ & + \beta_{12} CASH_{it} + \beta_{13} INTAN_{it} + \beta_{14} RD_{it} + \beta_{15} PPE_{it} + \beta_{16} ADV_{it} + \beta_{17} SGA_{it} \\ & + \beta_{18} ln(NUM\_INVESTEE)_{it} + YEARdummy + INDUSTRYdummy + \varepsilon_{it} \end{aligned} \quad (2)$$

In Model (2), we add *TAXH*, which is defined as the number of investees in tax havens divided by the total number of investees. Because there is no consensus on which countries are considered tax havens, we employ two lists of tax havens to identify whether a country is a tax haven.[7] We identify tax havens based on the list of tax havens as in Durnev, Li, and Magnan (2017) to construct a variable, denoted as *TAXH1*. The list of offshore financial centers (Tax Havens) comes from the International Monetary Fund (IMF) and Financial Stability Forum (2000). We also employ the list of tax havens following Dyreng and Lindsey (2009) to construct another variable, *TAXH2*.[8] The two lists of tax havens are slightly different. We then interact L*AYER* with *TAXH1 (TAXH2)* as our experimental variables.[9] Based on H2, we expect that the coefficient on the interaction term, *LAYER*×*TAXH1 (TAXH2)* is significantly negative. We winsorize all used variables at the 1 percent and 99 percent level.

7 While there is not an official definition of a tax haven, the Organization for Economic Cooperation and Development (OECD) defined a tax haven in 1998 as a jurisdiction which has (1) no or only nominal taxes, (2) a lack of transparency, (3) laws or administrative practices which prevent the effective exchange of relevant information with other governments on taxpayers benefiting from the low or no tax jurisdiction and (4) the absence of a requirement that the activity be substantial.

8 Following Dyreng and Lindsey (2009), tax haven countries are identified as countries that are on at least three of the four commonly used tax haven lists. See http://www.globalpolicy.org on March 4, 2008. The four commonly used tax haven lists come from (1) the Organization for Economic Co-Operation and Development (OECD), (2) the International Monetary Fund (IMF), (3) the Stop Tax Haven Abuse Act adopted in the U.S. that targets a large number of tax haven countries, and (4) the Tax Research Organizations.

9 We also use *NUM_TAX_HAVEN*, the number of investees in tax havens in year t to capture the extent of the firm operating in tax haven countries, and the results are robust.

4. Sample and Descriptive Statistics

4.1 Sample Selection

Using Taiwan Economic Journal (TEJ) database, we focus on firms that are now listed on the Taiwan Stock Exchange (TWSE) and over-the-counter market (OTC). The number of initial observations recorded from 2000-2011, excluding financial firms which have unique industry characteristics and capital structure, amount to 21,725. We exclude firms that do not issue "Quanxi Business Operation Report" and observations with the missing value for the control variable, leading to a final sample of 8,244 observations.

4.2 Descriptive Statistics

Table 1 reports the sample descriptive statistics for the variables included in our empirical models. The mean (median) of the number of the layers is 3.44 (3.00), and the mean (median) of the number of the investees is 11.45 (7), which indicates that the use of pyramidal layers is quite common for parent-subsidiary investments. Consistent with prior studies, the mean (median) value of *GAAP_ETR, CASH_ETR, LT_ETR_3Y* and *LT_ETR_5Y* is 0.16 (0.17), 0.14 (0.10), 0.14 (0.12), and 0.14 (0.13), respectively. On average, firms have 3.75 investees in tax havens based on the list of tax haven countries as in Durnev et al. (2017), and 4.21 investees based on the definition of Dyreng and Lindsey (2009).

Table 1 Descriptive Statistics. Full Sample (n = 8,244)

Variable	Mean	STD	P25	P50	P75
GAAP_ETR	0.16	0.23	0.07	0.17	0.24
CASH_ETR	0.14	0.15	0.01	0.10	0.21
LT_ETR_3Y	0.14	0.12	0.03	0.12	0.21
LT_ETR_5Y	0.14	0.12	0.04	0.13	0.21
LAYER (number)	3.44	1.12	2.00	3.00	4.00
SIZE	15.35	1.60	14.23	15.07	16.11
MB	1.53	1.10	0.82	1.23	1.89
LEV	0.08	0.10	0.00	0.04	0.12
ROA	0.08	0.11	0.02	0.07	0.13
NOL	0.14	0.35	0.00	0.00	0.00
∆*NOI*	0.01	0.07	-0.02	0.01	0.04
STD_ROA	5.09	3.98	2.33	4.00	6.57
∆*SALES*	0.15	0.35	-0.04	0.10	0.27
CASH	0.16	0.16	0.06	0.12	0.21
INTAN	0.01	0.03	0.00	0.00	0.02
RD	0.03	0.04	0.00	0.01	0.04
PPE	0.31	0.21	0.15	0.29	0.44
ADV	0.00	0.01	0.00	0.00	0.00
SGA	0.13	0.12	0.05	0.10	0.15
NUM_INVESTEE	11.45	17.77	4.00	7.00	12.00
NUM_TAX_HAVEN (based on Durnev et al., 2017)	3.75	6.31	1.00	2.00	4.00
NUM_TAX_HAVEN (based on Dyreng and Lindsey, 2009)	4.21	6.72	2.00	3.00	5.00

Note: This table provides descriptive statistics on the main variables used in model (1) and (2). The sample contains 8,244 observations, selected as outlined in section 4.1. *GAAP_ETR* is the tax expense divided by pre-tax accounting income. *CASH_ETR* is the cash taxes paid divided by pre-tax book income. *LT_ETR_3Y* is the average cash taxes paid to pre-tax book income over three years and *LT_ETR_5Y* is the average cash taxes paid to pre-tax book income over five years *LAYER* is the number of layers of the longest investment chain in firm's investment structure. *SIZE* is the natural log of total assets. MB is the ratio of the market value of equity to the book value of equity. *LEV* is the ratio of long term debts to total assets. *ROA* is the ratio of pre-tax income to total assets. *NOL* is an indicator variable which equals to one if net income from continuing operations is smaller than zero and zero otherwise. ∆*NOI* is the change in net income from continuing operations in current year, scaled by total assets in the prior year. *STD_ROA* is the standard deviation of the ratio of pre-tax income to total assets over five years. ∆*SALES* is the annual percentage change in net sales. *CASH* is cash and

cash equivalents in current year divided by beginning of the year total assets. *INTAN* are the intangible assets in current year divided by beginning of the year total assets. *RD* is the total research and development expense divided by beginning of the year total assets. *PPE* is the ratio of property, plant, and equipment to total assets. *ADV* is the advertising expense in year t divided by net sale in year t; when missing, reset to 0. *SGA* is selling, general, and administrative expense in year t divided by net sales in year t; missing values of SGandA are set to 0. *NUM_INVESTEE* is the number of the investees of the firm. *NUM_TAX_HAVEN* is the number of subsidiaries in tax haven countries, based on the list of tax haven countries as in Durnev et al. (2017) and in Dyreng and Lindsey (2009).

Table 2 presents Pearson and Spearman correlations for our sample of firm-year observations. Our measure of layers is negatively correlated with our tax avoidance measures. Specifically, *LAYER* is negatively and significantly correlated with *GAAP_ETR* and *CASH_ETR*. In addition, we note that the four measures of tax avoidance are significantly correlated. Furthermore, *GAAP_ETR* is negatively correlated with *SIZE*, *MB*, *LEV*, *ROA*, *RD*, and *PPE*, and positively correlated with *SGA*. The control variables are also correlated with other measures of tax avoidance.

Table 2 Pearson (above) and Spearman (below) Correlation Table

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. GAAP_ETR	1.00	0.40	0.40	0.42	-0.04	-0.15	-0.17	0.00
	.	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.98)
2. CASH_ETR	0.33	1.00	0.59	0.53	-0.08	-0.08	-0.08	-0.08
	(0.00)	.	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3. LT_ETR_3Y	0.32	0.47	1.00	0.77	-0.03	-0.14	-0.05	-0.08
	(0.00)	(0.00)	.	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)
4. LT_ETR_5Y	0.32	0.41	0.64	1.00	-0.01	-0.15	-0.10	-0.07
	(0.00)	(0.00)	(0.00)	.	(0.39)	(0.00)	(0.00)	(0.00)
5. LAYE)	-0.04	-0.05	-0.01	-0.01	1.00	0.36	0.02	0.17
	(0.00)	(0.00)	(0.21)	(0.48)	.	(0.00)	(0.05)	(0.00)
6. SIZE	-0.14	-0.10	-0.14	-0.15	0.42	1.00	-0.03	0.31
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	.	(0.01)	(0.00)
7. MB	-0.18	-0.13	-0.11	-0.14	0.02	-0.01	1.00	-0.10
	(0.00)	(0.00)	(0.00)	(0.00)	(0.18)	(0.37)	.	(0.00)
8. LEV	-0.03	-0.07	-0.08	-0.07	0.12	0.27	-0.04	1.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	.
9. ROA	-0.23	-0.16	-0.11	-0.12	-0.03	-0.06	0.69	-0.09
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)
10. ∆NOI	-0.18	-0.38	-0.20	-0.16	-0.03	-0.02	0.31	0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.20)	(0.00)	(0.00)
11. STD_ROA	-0.07	-0.09	-0.13	-0.13	-0.06	-0.17	0.30	-0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
12. ∆SALES	-0.15	-0.25	-0.16	-0.13	0.01	0.06	0.26	0.16
	(0.00)	(0.00)	(0.00)	(0.00)	(0.25)	(0.00)	(0.00)	(0.00)
13. CASH	-0.06	-0.03	-0.04	-0.07	0.11	-0.11	0.37	-0.15
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
14. INTAN	0.04	0.05	0.05	0.02	0.22	0.12	0.05	0.08
	(0.00)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)
15. RD	-0.10	-0.08	-0.12	-0.17	0.04	-0.18	0.35	-0.17
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
16. PPE	-0.03	-0.03	-0.04	-0.05	-0.02	0.11	-0.07	0.42
	(0.02)	(0.00)	(0.00)	(0.00)	(0.08)	(0.00)	(0.00)	(0.00)
17. ADV	0.02	0.02	0.03	0.02	-0.07	-0.07	0.03	-0.03
	(0.12)	(0.18)	(0.00)	(0.10)	(0.00)	(0.00)	(0.03)	(0.01)
18. SGA	0.09	0.06	0.07	0.05	-0.02	-0.27	0.02	-0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.05)	(0.00)	(0.07)	(0.00)
*19. NUM_*	-0.03	0.00	-0.02	-0.03	0.56	0.58	0.00	0.14
INVESTEE	(0.02)	(0.98)	(0.06)	(0.01)	(0.00)	(0.00)	(0.79)	(0.00)

Note: This table presents the bivariate Pearson (above the diagonal) and Spearman (below the diagonal) correlations. All the variables are defined as in Table 1 Panel A.

9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
-0.19	-0.20	-0.10	-0.12	-0.02	0.08	-0.04	-0.02	0.03	0.13	0.05
(0.00)	(0.00)	(0.00)	(0.00)	(0.09)	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)	(0.00)
-0.05	-0.41	-0.12	-0.24	0.05	0.11	-0.04	-0.02	0.03	0.13	0.05
(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)	(0.00)
-0.02	-0.24	-0.14	-0.17	0.04	0.08	-0.16	-0.04	0.01	0.19	-0.07
(0.06)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.50)	(0.00)	(0.00)
-0.05	-0.19	-0.13	-0.14	0.00	0.06	-0.16	-0.04	0.01	0.19	-0.07
(0.00)	(0.00)	(0.00)	(0.00)	(0.87)	(0.00)	(0.00)	(0.00)	(0.50)	(0.00)	(0.00)
0.00	-0.03	-0.04	0.03	0.21	0.29	0.15	0.00	-0.07	-0.02	0.72
(0.80)	(0.02)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.97)	(0.00)	(0.06)	(0.00)
-0.05	0.01	-0.20	0.07	-0.12	0.15	-0.22	0.15	-0.04	-0.39	0.55
(0.00)	(0.50)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
0.68	0.28	0.28	0.28	0.33	-0.01	0.32	-0.11	0.04	-0.01	-0.02
(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.23)	(0.00)	(0.00)	(0.00)	(0.37)	(0.03)
-0.16	0.05	-0.11	0.15	-0.22	0.13	-0.19	0.42	0.01	-0.07	0.23
(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.29)	(0.00)	(0.00)
1.00	0.37	0.27	0.34	0.37	-0.03	0.17	-0.03	0.00	-0.20	0.05
.	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.73)	(0.00)	(0.00)
0.45	1.00	0.09	0.50	0.04	-0.02	0.00	0.03	-0.01	-0.08	-0.01
(0.00)	.	(0.00)	(0.00)	(0.00)	(0.14)	(0.68)	(0.00)	(0.19)	(0.00)	(0.30)
0.32	0.15	1.00	0.10	0.26	-0.09	0.30	-0.13	-0.01	0.05	-0.14
(0.00)	(0.00)	.	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.39)	(0.00)	(0.00)
0.33	0.48	0.13	1.00	0.05	0.04	0.04	0.13	-0.02	-0.22	0.05
(0.00)	(0.00)	(0.00)	.	(0.00)	(0.00)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)
0.42	0.11	0.29	0.10	1.00	0.09	0.47	-0.24	-0.08	0.04	0.13
(0.00)	(0.00)	(0.00)	(0.00)	.	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
0.00	-0.01	-0.02	0.02	0.06	1.00	0.09	0.18	0.01	0.13	0.31
(0.72)	(0.44)	(0.09)	(0.07)	(0.00)	.	(0.00)	(0.00)	(0.20)	(0.00)	(0.00)
0.29	0.07	0.31	0.06	0.44	0.09	1.00	-0.16	-0.01	0.16	0.10
(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	.	(0.00)	(0.29)	(0.00)	(0.00)
-0.04	0.04	-0.11	0.12	-0.25	0.05	-0.23	1.00	-0.01	0.01	0.02
(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	.	(0.41)	(0.61)	(0.13)
-0.01	-0.02	-0.03	-0.03	-0.03	0.08	0.00	-0.05	1.00	0.32	-0.01
(0.35)	(0.11)	(0.01)	(0.01)	(0.02)	(0.00)	(0.91)	(0.00)	.	(0.00)	(0.18)
-0.06	-0.03	-0.02	-0.10	0.08	0.17	0.16	-0.04	0.39	1.00	-0.02
(0.00)	(0.02)	(0.09)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	.	(0.10)
-0.06	-0.03	-0.13	0.01	-0.02	0.15	-0.03	0.01	-0.04	-0.07	1.00
(0.00)	(0.01)	(0.00)	(0.34)	(0.10)	(0.00)	(0.01)	(0.57)	(0.00)	(0.00)	

5. Empirical Results

Table 3 presents the regression analysis of model (1). In columns (1), we report the results of estimating equation (1) using *GAAP_ETR* as the dependent variable. We find that the coefficient on *LAYER* is -0.011 (p-value < 0.01), which suggests that firms which have more number of layers tend to be engaged in more tax avoidance activities. In column (2), we report the results of re-estimating equation (1) using *CASH_ETR* as the dependent variable. We find that the coefficient on *LYEAR* is -0.008 (p-value < 0.05), also suggesting that firms which have more number of layers tend to be engaged in more tax avoidance activities. Likewise, in columns (3), we report the results of estimating equation (1) using *LT_ETR_3Y* as the dependent variable. We find that the coefficient on *LYEAR* is -0.008 (p-value < 0.05); in columns (4), we report the results of estimating equation (1) using *LT_ETR_5Y* as the dependent variable and the coefficient on LYEAR is -0.010 (p-value < 0.05).

In addition to these primary results, several of the estimated coefficients for the control variables are statistically significant. For example, focusing on column (1), when *GAAP_ETR* is used as a measure of tax avoidance, the coefficients on *CASH, INTAN*, and *ln(NUM_INVESTEE)* are positive and significant, while the coefficients on *SIZE, NOL,* Δ*NOI,* Δ*SALES*, and *RD* are negative and significant. In column (2), when the *CASH_ETR* is used as a measure of tax avoidance, the coefficients on *INTAN*, and *ln(NUM_INVESTEE)* are positive and significant, while the coefficients on *SIZE, MB, LEV, NOL,* Δ*NOI, STD_ROA,* Δ*SALES*, and *RD* are negative and significant.

In addition, following Balakrishnan, Blouin, and Guay (2012) and Armstrong, Blouin, Jagolinzer, and Larcker (2015), we also use the industry-size-adjusted effective tax rate by adjusting the firm's *GAAP_ETR (CASH_ETR)* with the mean *GAAP_ETR (CASH_ETR)* of the firm's size and industry peers. The use of these industry-adjusted measures is based on the premise that, all else equal, similar firms in terms of industry and size should have similar tax avoidance opportunities. The industry-adjusted measures of tax avoidance capture cross-sectional variation in firms' tax avoidance after benchmarking a given firm's tax avoidance relative to that of similar-sized firms in the same industry.

Table 3 The Effect of Layer on Tax Avoidance

	(1)	(2)	(3)	(4)
	GAAP_ETR	*CASH_ETR*	*LT_ETR_3Y*	*LT_ETR_5Y*
INTERCEPT	0.533	0.421	0.443	0.482
	(26.23)***	(18.55)***	(21.98)***	(24.97)***
LAYER	**-0.011**	**-0.017**	**-0.008**	**-0.010**
	(-2.82)**	**(-3.73)*****	**(-1.99)***	**(-2.52)***
SIZE	-0.021	-0.017	-0.019	-0.021
	(-14.93)***	(-10.94)***	(-13.53)***	(-15.68)***
MB	-5.775	-4.193	-6.781	-8.465
	(-3.61)***	(-2.34)*	(-4.26)***	(-5.56)***
LEV	0.008	-0.038	-0.016	0.000
	(0.56)	(-2.33)*	(-1.11)	(0.03)
ROA	-0.208	0.062	0.167	0.154
	(-9.23)***	(2.47)*	(7.45)***	(7.17)***
NOL	-0.252	-0.184	-0.084	-0.063
	(-54.27)***	(-35.39)***	(-18.24)***	(-14.20)***
∆NOI	-0.119	-0.533	-0.306	-0.261
	(-5.38)***	(-21.53)***	(-13.93)***	(-12.38)***
STD_ROA	-0.000	-0.001	-0.003	-0.003
	(-0.96)	(-2.23)*	(-8.61)***	(-7.40)***
∆SALES	-0.017	-0.054	-0.022	-0.011
	(-3.54)***	(-10.00)***	(-4.62)***	(-2.39)*
CASH	0.026	0.022	0.018	0.006
	(2.37)*	(1.84)	(1.67)	(0.54)
INTAN	0.235	0.316	0.279	0.185
	(4.25)***	(5.12)***	(5.09)***	(3.53)***
RD	-0.349	-0.396	-0.388	-0.502
	(-8.24)***	(-8.37)***	(-9.23)***	(-12.46)***
PPE	-0.007	0.004	-0.014	-0.026
	(-0.95)	(0.41)	(-1.81)	(-3.56)***
ADV	0.107	0.073	0.350	0.283
	(0.83)	(0.51)	(2.72)**	(2.31)*
SGA	-0.000	-0.009	-0.032	-0.049
	(-0.03)	(-0.49)	(-2.05)*	(-3.29)**
ln(NUM_INVESTEE)	0.012	0.011	0.013	0.013
	(4.97)***	(3.91)***	(5.12)***	(5.66)***
N	8244	8244	8244	8244
adj. R^2	0.332	0.251	0.148	0.130

Note: *t* statistics in parentheses. Asterisks *, **, and *** denote two-tailed significance levels at 5%, 1% and 0.1%, respectively.

Among firms with similar tax avoidance opportunities, firms with lower effective tax rate can be considered to be engaged in more tax avoidance (Balakrishnan et al., 2012). Table 4 presents the results of our multivariate analyses using industry-adjusted effective tax rates as dependent variables. Specifically, using *IND_GAAP_ETR* as a dependent variable, we find that the coefficient on *LYEAR* is -0.011 (p-value < 0.01); using *IND_CASH_ETR* as a dependent variable, the coefficient on *LAYER* is -0.010 (p-value < 0.01). Firms which have more number of layers tend to be engaged in more tax avoidance activities. We also get the qualitatively similar results using *IND_LT_ETR_3Y* and *IND_LT_ETR_5Y*. Overall, these results suggest that the controlling shareholders (along with managers) can conduct tax avoidance activities by creating complex structures to obscure the underlying intent and to avoid detection by the government. The increase in the number of layer grants pyramidal firms more opportunities to take tax avoidance without being detected.

Table 5 presents the regression model (2). The definition of tax haven countries is based on Durnev et al. (2017). In columns (1), (2), (3), and (4), we report the results of estimating equation (2) using *GAAP_ETR, CASH_ETR, LT_ETR_3Y*, and *LT_ETR_5Y* as the dependent variables respectively. In column (1) and (2), We find that the coefficient on *LAYER* is -0.019 (p-value < 0.001) and -0.022 (p-value < 0.01), which is consistent with the results of model (1), suggesting that firms which have more number of layers tend to be engaged in more tax avoidance activities. Moreover, the coefficient on *LAYEAR*TAXH1* is -0.024 (p-value < 0.05) and -0.044 (p-value < 0.01), suggesting that the positive association between tax avoidance activities and having subsidiaries in tax haven countries becomes more pronounced as the number of layers in corporate pyramids increased. Likewise, in column (3) and (4), we find that the coefficient on LYEAR is -0.024 (p-value < 0.001) and -0.030 (p-value < 0.001), which is consistent with the results of model (1). Moreover, the coefficient on *LAYEAR*TAXH1* is -0.049 (p-value < 0.01) and -0.047 (p-value < 0.01).

Table 6 presents the results using the definition of tax haven countries as in Dyreng and Lindsey (2009). The results qualitatively lead to similar inferences. Overall, these results suggest that the positive association between tax avoidance activities and having subsidiaries in tax haven countries become more pronounced as the number of layers in corporate pyramids increases.

Table 4 The Effect of Layer on Tax Avoidance Using Industry-Adjusted Effective Tax Rate

	(1)	(2)	(3)	(4)
	GAAP_ETR	*CASH_ETR*	*LT_ETR_3Y*	*LT_ETR_5Y*
INTERCEPT	0.231	0.207	0.251	0.251
	(9.18)***	(9.85)***	(9.87)***	(10.91)***
LAYER	**-0.011**	**-0.010**	**-0.005**	**-0.011**
	(-2.31)**	**(-2.42)****	**(2.07)****	**(-2.46)****
SIZE	-0.013	-0.012	-0.015	-0.015
	(-7.38)***	(-7.87)***	(-8.38)***	(-9.32)***
MB	-11.341	-0.442	-9.437	-9.921
	(-5.73)***	(-0.27)	(-4.70)***	(-5.47)***
LEV	0.026	-0.016	-0.011	0.043
	(1.45)	(-1.05)	(-0.60)	(2.61)**
ROA	-0.026	-0.001	0.114	0.090
	(-0.94)	(-0.05)	(4.03)***	(3.52)***
NOL	-0.138	-0.158	-0.042	-0.038
	(-24.00)***	(-32.93)***	(-7.13)***	(-7.23)***
∆NOI	-0.111	-0.390	-0.190	-0.134
	(-4.06)***	(-17.02)***	(-6.82)***	(-5.33)***
STD_ROA	-0.001	-0.001	-0.002	-0.001
	(-1.23)	(-1.38)	(-3.75)***	(-3.53)***
∆SALES	-0.009	-0.035	-0.016	-0.007
	(-1.50)	(-6.90)***	(-2.55)*	(-1.25)
CASH	0.007	0.009	-0.008	-0.007
	(0.53)	(0.80)	(-0.61)	(-0.54)
INTAN	0.156	0.238	0.269	0.155
	(2.29)*	(4.16)***	(3.88)***	(2.48)*
RD	-0.307	-0.345	-0.374	-0.458
	(-5.86)***	(-7.88)***	(-7.04)***	(-9.55)***
PPE	-0.040	-0.027	-0.054	-0.056
	(-4.11)***	(-3.35)***	(-5.56)***	(-6.38)***
ADV	0.077	-0.006	0.316	0.205
	(0.48)	(-0.05)	(1.95)	(1.40)
SGA	-0.025	-0.008	-0.047	-0.029
	(-1.29)	(-0.48)	(-2.42)*	(-1.63)
ln(NUM_INVESTEE)	0.013	0.010	0.018	0.014
	(4.11)***	(3.84)***	(5.71)***	(4.91)***
N	8244	8244	8244	8244
adj. R^2	0.112	0.201	0.052	0.055

Note: *t* statistics in parentheses. Asterisks *, **, and *** denote two-tailed significance levels at 5%, 1% and 0.1%, respectively.

Table 5 Layer, the Number of Subsidiaries Operating in Tax Haven Countries and Tax Avoidance. The Definition of Tax Haven Countries Is Based on Durnev et al. (2017).

	(1)	(2)	(3)	(4)
	GAAP_ETR	*CASH_ETR*	*LT_ETR_3Y*	*LT_ETR_5Y*
INCERPT	0.540	0.496	0.328	0.454
	(12.43)***	(9.43)***	(6.43)***	(9.70)***
LAYER	**-0.019**	**-0.022**	**-0.024**	**-0.030**
	(-3.42)* **	**(-3.24)** **	**(-3.60)*** **	**(-5.07)*** **
TAXH1	0.003	0.043	0.062	0.054
	(0.09)	(0.99)	(1.47)	(1.39)
LAYER× TAXH1	**-0.024**	**-0.044**	**-0.049**	**-0.047**
	(-1.74)*	**(-2.61)** **	**(-2.97)** **	**(-3.11)** **
SIZE	-0.020	-0.018	-0.011	-0.021
	(-7.44)***	(-5.60)***	(-3.61)***	(-7.42)***
MB	-4.112	-1.655	-6.489	-9.501
	(-1.29)	(-0.43)	(-1.74)	(-2.77)**
LEV	-0.031	-0.005	-0.032	0.115
	(-1.07)	(-0.15)	(-0.95)	(3.67)***
ROA	-0.233	-0.222	0.196	0.314
	(-5.14)***	(-4.05)***	(3.67)***	(6.41)***
NOL	-0.359	-0.306	-0.104	-0.086
	(-38.80)***	(-27.29)***	(-9.58)***	(-8.66)***
∆NOI	-0.154	-0.683	-0.376	-0.406
	(-3.49)***	(-12.80)***	(-7.25)***	(-8.53)***
STD_ROA	-0.001	0.001	-0.003	-0.004
	(-0.87)	(1.34)	(-3.15)**	(-4.53)***
∆SALES	-0.021	-0.094	-0.019	-0.022
	(-2.07)*	(-7.58)***	(-1.61)	(-2.03)*
CASH	0.009	0.044	0.008	0.010
	(0.41)	(1.68)	(0.31)	(0.42)
INTAN	0.133	0.079	0.233	0.001
	(1.20)	(0.58)	(1.78)	(0.01)
RD	-0.409	-0.507	-0.507	-0.568
	(-4.85)***	(-4.97)***	(-5.11)***	(-6.25)***
PRE	-0.023	-0.010	-0.047	-0.069
	(-1.42)	(-0.51)	(-2.48)*	(-3.97)***
ADV	0.575	0.198	0.243	0.369
	(1.86)	(0.53)	(0.67)	(1.11)
SGA	-0.075	-0.094	-0.036	-0.053
	(-2.08)*	(-2.16)*	(-0.85)	(-1.37)
ln(NUM_INVESTEE)	0.000	0.000	0.000	0.000
	(0.33)	(0.13)	(0.47)	(0.95)
N	8244	8244	8244	8244
adj. R^2	0.245	0.156	0.050	0.067

Note: *t* statistics in parentheses. Asterisks *, **, and *** denote two-tailed significance levels at 5%, 1% and 0.1%, respectively.

Table 6 Layer, the Number of Subsidiaries Operating in Tax Haven Countries and Tax Avoidance. The Definition of Tax Haven Countries Is Based on Dyreng and Lindsey (2009).

	(1)	(2)	(3)	(4)
	GAAP_ETR	*CASH_ETR*	*LT_ETR_3Y*	*LT_ETR_5Y*
INCERPT	0.540	0.499	0.381	0.495
	(12.56)***	(9.58)***	(7.55)***	(10.79)***
LAYER	**-0.017**	**-0.021**	**-0.026**	**-0.031**
	(-2.88)**	**(-2.86)****	**(-3.69)*****	**(-4.82)*****
TAXH2	-0.000	0.045	0.043	0.037
	(-0.00)	(1.12)	(1.10)	(1.05)
LALER×TAXH2	**-0.026**	**-0.032**	**-0.044**	**-0.037**
	(-2.22)**	**(-2.05)****	**(-2.84)*****	**(-2.66)*****
SIZE	-0.020	-0.019	-0.015	-0.024
	(-7.49)***	(-5.80)***	(-4.66)***	(-8.39)***
MB	-4.520	-1.506	-6.344	-8.754
	(-1.47)	(-0.40)	(-1.76)	(-2.67)**
LEV	-0.024	-0.017	-0.042	0.105
	(-0.85)	(-0.50)	(-1.27)	(3.48)***
ROA	-0.222	-0.220	0.195	0.300
	(-5.06)***	(-4.13)***	(3.78)***	(6.41)***
NOL	-0.357	-0.310	-0.105	-0.091
	(-39.81)***	(-28.56)***	(-10.02)***	(-9.51)***
∆NOI	-0.133	-0.687	-0.353	-0.375
	(-3.10)**	(-13.24)***	(-7.03)***	(-8.22)***
STD_ROA	-0.001	0.001	-0.003	-0.004
	(-1.34)	(0.99)	(-3.76)***	(-5.07)***
∆SALES	-0.023	-0.093	-0.017	-0.024
	(-2.34)*	(-7.80)***	(-1.45)	(-2.28)*
CASH	0.008	0.032	0.005	0.012
	(0.41)	(1.27)	(0.19)	(0.53)
INTAN	0.161	0.121	0.247	0.044
	(1.52)	(0.95)	(1.99)*	(0.39)
RD	-0.369	-0.457	-0.484	-0.598
	(-4.64)***	(-4.75)***	(-5.18)***	(-7.05)***
PRE	-0.017	0.000	-0.037	-0.060
	(-1.10)	(0.02)	(-2.02)*	(-3.58)***
ADV	0.406	-0.026	0.137	0.245
	(1.46)	(-0.08)	(0.42)	(0.83)
SGA	-0.077	-0.073	-0.052	-0.062
	(-2.24)*	(-1.76)	(-1.30)	(-1.70)
ln(NUM_INVESTEE)	0.000	0.000	0.000	0.000
	(0.48)	(0.17)	0.47)	(0.99)
N	8244	8244	8244	8244
adj. R^2	0.241	0.157	0.050	0.069

Note: *t* statistics in parentheses. Asterisks *, **, and *** denote two-tailed significance levels at 5%, 1% and 0.1%, respectively.

6. Additional Tests

6.1 Weighted Number of Investment Layers

In the main tests, we measure our variable of interest (*LAYER*), the "length" of layers as the number of the intermediate layers connecting the parent company and the lowest-tire firms. If firms with multiple chains in the investment structure, we focus on the longest chain which has the largest number of intermediate layers. The design is based on the premise that most investment capital is allocated along the longest chain. However this may not be the case for firms with multiple investment chains. To address this concern, we create another measure of layer by considering the weight of investment capital in each chain.

$$WLAYER_{it} = \sum_{c=1}^{n} \frac{INV_c \times LAYER_c}{TOTAL\_INV}$$

$WLAYER_{it}$ is the weighted number of layer for each parent firm; INV_c is the amount of the investment capital in each chain from the parent firm; $LAYER_c$ is the number of investment layers in each chain; *TOTAL_INV* is the amount of total investments in all subsidiaries for the parent firm. *WLAYER* is calculated as the sum of the number of layers for each investment chain weighted by the proportion of investment capital in each chain relative to total investment in the subsidiaries.

Table 7 reports the results. The results show that *WLAYER* is negatively associated with *GAAP_ETR, CASH_ETR, LT_ETR_3Y*, and *LT_ETR_5Y*. Thus, our results are robust with alternative measure of layers.

6.2 Tax Incentives

Our results may be driven by high-tech companies, who received great tax credits under either the Statute for Upgrading Industries before 2010 or the Act for Industry Innovation from May 2010. The Statute for Upgrading Industries, promulgated on January 1st 1991, acts as one of the Government's most important industrial technology policy implementations. According to Article 6 of the Statute for Upgrading Industries relates to the investment tax credits, a firm can enjoy investment tax credit by the amount of 5-20 percent of its investment in five categories: (1) automatic equipments and technology, (2) environment-friendly equipments and technology, (3) energy-efficient equipments and technology, (4) the investment tax credit according to 35% of their investment in R&D,

Table 7 The Effect of Layer on Tax Avoidance: Weighted Number of Investment Layers

	(1)	(2)	(3)	(4)
	GAAP_ETR	*CASH_ETR*	*LT_ETR_3Y*	*LT_ETR_5Y*
INTERCEPT	0.527	0.384	0.407	0.451
	(23.00)***	(14.88)***	(17.76)***	(20.78)***
LAYER	**-0.012**	**-0.009**	**-0.007**	**-0.010**
	(-4.71)* **	**(-3.29)** **	**(-2.75)** **	**(-4.26)*** **
SIZE	-0.021	-0.015	-0.017	-0.020
	(-12.47)***	(-7.89)***	(-10.08)***	(-12.51)***
MB	-5.463	-4.324	-7.301	-8.836
	(-3.08)**	(-2.16)*	(-4.11)***	(-5.25)***
LEV	0.008	-0.033	0.002	0.021
	(0.48)	(-1.82)	(0.14)	(1.38)
ROA	-0.235	0.030	0.159	0.157
	(-9.29)***	(1.05)	(6.28)***	(6.53)***
NOL	-0.257	-0.189	-0.082	-0.061
	(-49.77)***	(-32.46)***	(-15.89)***	(-12.49)***
∆NOI	-0.112	-0.534	-0.312	-0.263
	(-4.55)***	(-19.26)***	(-12.67)***	(-11.28)***
STD_ROA	0.000	-0.001	-0.003	-0.002
	(0.13)	(-1.10)	(-6.72)***	(-5.47)***
∆SALES	-0.007	-0.053	-0.019	-0.011
	(-1.20)	(-8.19)***	(-3.40)***	(-2.03)*
CASH	0.023	0.035	0.021	0.001
	(1.91)	(2.61)**	(1.76)	(0.08)
INTAN	0.227	0.304	0.206	0.147
	(3.68)***	(4.37)***	(3.34)***	(2.52)*
RD	-0.432	-0.462	-0.421	-0.521
	(-9.18)***	(-8.72)***	(-8.93)***	(-11.67)***
PPE	-0.035	-0.014	-0.038	-0.052
	(-3.89)***	(-1.38)	(-4.20)***	(-6.05)***
ADV	0.454	0.172	0.361	0.511
	(2.63)**	(0.88)	(2.09)*	(3.12)**
SGA	-0.013	-0.003	-0.014	-0.041
	(-0.65)	(-0.12)	(-0.70)	(-2.15)*
ln(NUM_INVESTEE)	0.020	0.018	0.017	0.022
	(7.63)***	(5.85)***	(6.36)***	(8.46)***
N	8244	8244	8244	8244
adj. R^2	0.342	0.248	0.138	0.129

Note: *t* statistics in parentheses. Asterisks *, **, and *** denote two-tailed significance levels at 5%, 1% and 0.1%, respectively.

and (5) personnel training over the five-year time period; the categories listed above account for the most tax credits issued in Taiwan.

We re-examine our tests by removing high-tech industries (i.e., TEJ industry classification equals 23) from our sample. Table 8 shows that the number of investment layers is negatively associated with tax rates for non-high-tech firms. The results suggest that our results are not driven by companies from a specific industry who are under the protection from the Statute for Upgrading Industries.

7. Conclusion

We examine whether a firm's tax avoidance activities are influenced by its organizational structure (i.e., the number of layers within the corporate pyramid). We investigate whether organizational complexity, captured by the number of layers, influences a firm's tax avoidance level. To address this research question, we employ the sample of publicly traded companies in Taiwan since all publicly traded companies in Taiwan are required to disclose information on all of their subsidiaries according to "*Criteria Governing Preparation of Affiliation Reports, Consolidated Business Reports and Consolidated Financial Statements of Affiliation Enterprises*", which allows us to calculate the number of layers based on publicly available affiliation information. We find that firms with more number of layers engage in more tax avoidance. These results support the notion that the use of corporate pyramid allows the parent firm to have more opportunities to take tax avoidance activities without being detected. In addition, we further document that the increase in the number of layers in corporate pyramids helps facilitate tax avoidance activities, and thus, the negative association between effective tax rates and the number of subsidiaries operating in tax havens relative to the total number of subsidiaries becomes more pronounced as the number of layers in corporate pyramids increases.

The study contributes to a few streams of literature. First, we contribute to the tax literature by providing evidence that corporate pyramids may explain the channel by which companies conduct their tax avoidance. Shackelford and Shevlin (2001) call for the research on the effect of insider control and other organizational factors such as ownership structure on tax avoidance. While there are various ways to empirically measure organizational complexity, such as geographic and industry diversification, we identify a measure, the number of layers, which can serve as organizational complexity as well as

Table 8 The Effect of Layer on Tax Avoidance: Non High-Tech Firms

	(1)	(2)	(3)	(4)
	GAAP_ETR	*CASH_ETR*	*LT_ETR_3Y*	*LT_ETR_5Y*
INTERCEPT	0.513	0.417	0.373	0.458
	(15.66)***	(11.25)***	(10.96)***	(13.92)***
LAYER	**-0.008**	**-0.014**	**0.007**	**-0.011**
	(-1.85)*	**(-2.10)****	**(-2.13)****	**(-1.94)***
SIZE	-0.021	-0.019	-0.016	-0.021
	(-9.46)***	(-7.48)***	(-6.99)***	(-9.43)***
MB	-9.993	-4.428	-4.559	-6.902
	(-3.46)***	(-1.35)	(-1.52)	(-2.38)*
LEV	0.017	-0.062	-0.036	-0.023
	(0.75)	(-2.47)*	(-1.59)	(-1.03)
ROA	-0.148	0.133	0.204	0.152
	(-3.82)***	(3.04)**	(5.06)***	(3.90)***
NOL	-0.250	-0.175	-0.086	-0.080
	(-35.70)***	(-22.07)***	(-11.85)***	(-11.38)***
∆NOI	-0.207	-0.699	-0.399	-0.314
	(-5.40)***	(-16.14)***	(-10.01)***	(-8.16)***
STD_ROA	0.001	-0.001	-0.003	-0.002
	(1.61)	(-0.75)	(-3.66)***	(-2.54)*
∆SALES	-0.021	-0.037	-0.020	-0.006
	(-2.86)**	(-4.42)***	(-2.67)**	(-0.81)
CASH	0.065	0.071	0.098	0.053
	(2.89)**	(2.81)**	(4.20)***	(2.36)*
INTAN	0.095	0.308	0.237	0.089
	(1.02)	(2.93)**	(2.45)*	(0.95)
RD	-0.401	-0.435	-0.254	-0.278
	(-3.18)**	(-3.05)**	(-1.94)	(-2.19)*
PPE	0.024	0.034	0.041	0.023
	(2.01)*	(2.56)*	(3.36)***	(1.93)
ADV	-0.062	0.014	0.304	0.048
	(-0.41)	(0.08)	(1.91)	(0.32)
SGA	0.017	0.007	-0.025	-0.034
	(0.84)	(0.31)	(-1.17)	(-1.65)
ln(NUM_INVESTEE)	0.013	0.013	0.008	0.011
	(3.56)***	(3.16)**	(2.13)*	(3.22)**
N	3677	3677	3677	3677
adj. R^2	0.321	0.235	0.130	0.109

Note: *t* statistics in parentheses. Asterisks *, **, and *** denote two-tailed significance levels at 5%, 1% and 0.1%, respectively.

opaque information environment for accelerating corporate tax avoidance. Second, we contribute to the parent-subsidiary literature. Prior studies examining tax avoidance activities have traditionally focused on corporate-level influences (e.g., Rego, 2003). Only few studies to date examine the characteristics of subsidiaries within a firm (e.g., Dyreng et al., 2012; Shroff et al., 2014). Our study shows that internal organizational structure of a pyramidal firm also affect tax avoidance. Third, we contribute to the literature on corporate pyramids (e.g., Bebchuk et al., 2000; Claessens et al., 2002; La Porta et al., 1999). The literature on corporate pyramids almost exclusively focuses on the ownership structure and the agency problem caused by a separation of ultimate owners' actual ownership and control in firms located at the lower layer of the pyramidal structure. Instead, we focus on operational and informational complexity that the long length of layers results in.

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作者簡介

*** 許文馨**

英國蘭開斯特大學會計暨財務博士，現任臺灣大學會計學系教授，主要研究領域為資本市場研究，財務會計品質，國際會計準則，經理人薪酬等議題。學術論文發表於國內期刊，包括會計評論和中山管理評論，以及發表學術論文於國外期刊 Abacus, Accounting Horizons, Asia Pacific Journal of Accounting and Economics, Contemporary Accounting Research, Corporate governance: an international review, European Accounting Review, Journal of Business Finance & Accounting, Journal of Contemporary Accounting and Economics, Omega, The International Journal of Management, The International Journal of Accounting, Total Quality Management & Business Excellence, Review of Quantitative Finance and Accounting 等重要國際期刊。

劉心才

美國普渡大學會計博士，現任臺灣大學會計學系助理教授。主要研究領域為資本市場研究，會計準則等議題。

* Email: audreyhsu@ntu.edu.tw