Hidden in Plain Sight: Havens and Captives

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Abstract: Interest in corporate tax planning is a recurring focus of policymakers, the media, activist groups, and researchers. This interest often centers on multinational enterprises' (MNEs) use of tax havens, with a wide body of research utilizing MNEs' use of tax havens as evidence of corporate tax planning activities. However, the common assumption that MNEs operate in tax havens primarily for tax planning purposes overlooks the prominent role tax havens play as a home for captive insurance entities, which allow firms to secure "self" insurance coverage, but do not provide obvious federal tax benefits. We document that non-financial firms' use of captive insurance is pervasive, spanning nearly all Fama-French 49 industries, but MNEs in our sample only disclose 56 percent of captive-years in their annual reports. Importantly, we find captive use is associated with higher levels of family ownership and higher levels of CEO firm wealth, suggesting captives allow managers to guard against risks they incur because they have considerable personal wealth tied up in the firm. We document that captives are not associated with corporate tax planning. However, 12.3 percent of firm-years reporting tax havens in Exhibit 21 appear to do so only because they have a captive in a tax haven and another 13 percent have both captive and noncaptive haven activity. When we remove the effect of captives on tax haven-based measures, we observe nearly a four-fold increase in the magnitude of tax savings specifically associated with noncaptive haven activity, underscoring the importance of separating captive and noncaptive-related haven activity.

Keywords: tax; haven; captive insurance; governance

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I. INTRODUCTION

As high-profile reports have focused attention on corporate tax planning worldwide, a centerpiece of public attention and academic research has been multinational enterprises' (MNEs) use of tax havens. From Parliamentary and Congressional actions and testimony (Senate Finance Hearings; U.K. Action Aid; E.U. State Aid Cases) to media publicity (Chen et al. 2019) and activist group attention (Dyreng et al. 2016), MNEs' ability to shift profits to these low-tax jurisdictions is often at the forefront of the discussion. In line with this public interest, more than 50 top accounting and finance publications now employ firms' use of tax havens as evidence of corporate tax planning activities, fueling an expansive literature that examines links between tax haven use and various corporate activities.

A key assumption underlying this work is that MNEs operate in tax havens primarily for tax planning purposes. Indeed, tax havens ostensibly play a key role in facilitating MNE income shifting (e.g., Dyreng and Lindsey 2009), and scholars have used evidence of foreign operations in a tax haven as evidence of profit shifting and tax avoidance more generally (e.g., Chen et al. 2018; Balakrishnan et al. 2019). While estimates of the magnitude of profit shifting can vary, even the lower bound of those estimates is economically significant. For example, Blouin and Robinson (2020) estimate between four and eight percent of corporate tax revenues are lost to base erosion and profit shifting (BEPS). Thus, the assumption that tax haven activity is primarily a result of active tax planning is reasonable. In fact, one of the oft-cited defining characteristics of a tax haven is the lack of substantial economic activity in the country offering the low or zero tax rate. After all, what other strategic advantage is derived from setting up legal entities in small markets like the Cayman Islands or Guernsey?

At the same time, reports highlight MNEs' use of captive insurance entities (e.g., Bergin

and Bousso 2020), which allow firms to secure "self" insurance coverage. Captive insurance is associated with reduced administrative and marketing costs and can provide coverage for unique risks that may not be insurable in the commercial insurance market. Importantly, these captive insurance entities are often located in tax haven countries. Thus, the core assumption that MNEs operate in tax havens primarily for tax planning purposes overlooks the prominent role tax havens play as a home for captive insurance entities. Drawing on these links, we revisit the association between firms' use of tax havens and corporate tax outcomes after accounting for their use of captive insurance.

To begin, we assess the prevalence of captive insurance both within and outside of tax havens. We document that non-financial firms' use of captive insurance is pervasive, spanning nearly all Fama-French 49 industries. Then, we examine the determinants of captive insurance use, analyze public disclosure of captive insurance entities in public financial statement filings, and re-estimate the effects of tax haven activity on MNEs' tax costs.

Both domestic and offshore captives of U.S. MNEs are subject to U.S. income taxation.[1] As such, the tax benefits for a U.S. MNE to establish a captive in an offshore tax haven are not obvious.[2] However, in our sample of U.S. MNE-controlled captive insurance entities, 57 percent are located in tax havens. This clustering of captives in tax havens is consistent with the relatively more lenient licensing and capital requirements for captives in these jurisdictions. For example, while the largest number of U.S. MNEs' captives are in Vermont (360)—which is associated with more lenient insurance regulation in other settings (Hepfer et al. 2020)—the next most common

[1] Section 2 provides a detailed discussion of the tax implications of U.S. MNEs' use of domestic and offshore captives.

[2] Importantly, our focus is on U.S. MNEs' use of captive insurance entities rather than on micro-captive entities that have been a focus of regulatory scrutiny and tax sheltering activity (GAO 2020). Micro-captives are small captive insurance companies under IRC Sec. 831(b), which are generally owned by the same individuals that own the operating company. Therefore, micro-captives generally insure private company risks as opposed to captive insurance entities in our sample, which insure the risks of publicly-held U.S. MNEs.

locations are Bermuda (271), Cayman Islands (114), Ireland (106), and Guernsey (105), which are commonly considered tax haven countries (Dyreng et al. 2015).

To examine our research questions, we use data on captive insurance subsidiaries from Captive Review's Captive Insurance Database (CID) to identify U.S. MNEs with captives. We find that MNEs disclose about 56 percent of captive-years in their annual report. Interestingly, we do not observe a large difference in disclosure rates among firms with captives in haven countries versus non-haven countries (e.g., the U.S.), suggesting that haven-related reputational concerns are unlikely to drive disclosures about firms' captives. Next, we extend the work of Chang and Chen (2018) and develop an empirical model of the determinants of captive use. We find that the likelihood of having a captive is positively associated with firm size and leverage, but negatively associated with profitability, sales growth, intangibles, R&D, and cash holdings. Out-of-sample tests demonstrate that our model of captive determinants has high discriminatory power. Specifically, our model is associated with an area under the ROC curve of 84.9 percent and exhibits a true positive prediction rate (sensitivity) of 81.8 percent and a true negative rate (specificity) of 72.3 percent. The discriminatory power of our model makes the model useful to researchers using tax haven activity as a proxy for profit shifting, and who want to parse out haven use for captive insurance purposes from haven use for profit-shifting purposes, but who do not have access to the proprietary CID data.

In our next set of tests, we investigate whether agency issues are associated with captive use. Captive insurance is a tool for corporate risk management and can thus increase firm value by helping firms avoid financial distress costs, increase debt capacity, and preserve liquidity. While captive insurance provides many benefits, it is also possible that entrenched managers, or managers with large holdings of their firm's stock, use captive insurance to protect their personal fortunes

tied up in the firm. In particular, captive insurance use could allow managers to guard against risks they incur even if such use may not be in the best interests of risk-neutral shareholders, who can diversify away some of these idiosyncratic risks. Along these lines, we find captive use is associated with higher levels of family ownership and higher levels of CEO firm wealth. We also find a strong positive association between the use of captive insurance and litigation risk.

Next, we validate our assertion that despite their prevalence in well-known tax havens, captives are not associated with corporate tax planning. In these tests, we find no evidence of a significant association between GAAP effective tax rates (ETRs), Cash ETRs, or state ETRs and the use of captives generally, or captives located in tax havens specifically. Having established that captive use is not associated with lower tax rates, we next examine the implications of removing such captives from analyses examining the association between tax haven use and corporate tax outcomes. Here, we examine the extent to which firms appear to be reporting tax haven presence in their Exhibit 21 due to captive insurance activity, noncaptive activity, or both.

Notably, 12.3 percent of our disclosure sample firm-year observations reporting tax havens in Exhibit 21 appear to do so only because they have a captive in a tax haven. Another 13 percent of firm-years operating in a tax haven have both captive and noncaptive haven activity, and 74.7 percent have only noncaptive activity. With this pattern in mind, we then assess how removing or controlling for captive-only haven firms strengthens tests examining the association between tax haven use and corporate tax outcomes. Here, we first replicate the work of Dyreng and Lindsey (2009) over our extended sample period. In their study, the authors document a 1.5 percent decrease in worldwide tax burden for firms with operations in a tax haven. Similarly, using the original measures, we find a 1.1 percentage point decrease in taxes on worldwide income for firms with tax havens in our longer sample period ending in 2014. Notably, when we remove

observations identified as having a haven presence solely due to captives, we find a 4.3 percent decrease in taxes on worldwide income for firms with noncaptive haven operations. Both the prevalence of firms operating captives in tax havens, and the nearly four-fold magnitude of observed tax savings specifically associated with noncaptive haven activity, underscore the importance of separating captive- and noncaptive-related haven activity when using the presence of a firm in a tax haven as a proxy for tax planning or profit shifting.

The CID data on captives are not widely available and matching the data to Compustat firm-year observations is laborious.[3] Thus, we also re-estimate the Dyreng and Lindsey (2009) tests after using our determinants model to identify and separate captive haven firms from noncaptive haven firms. The results are quite similar to those using the actual captive data, providing additional support for the potential value of the model for use in settings examining haven use. Using out-of-sample prediction scores, we find that havens are associated with lower average worldwide tax rates by 3.5 percentage points, after removing firm-years predicted to have haven-based captives.

Next, we examine the association between captive operations and profit shifting. For these tests we use the modified Collins et al. (1998) approach to measure profit shifting into and out of the U.S. For our full sample, we find average foreign tax rates are negatively associated with foreign return on sales. In other words, when foreign tax rates are lower, firms appear to report a higher proportion of their profits abroad. We find this association is significantly greater among noncaptive haven firms than captive haven firms. We also find the association is significantly stronger among noncaptive haven firms relative to captive haven firms when we parse the firms

[3] More specifically, researchers must purchase and scrape the data because it is not in machine readable format. From there, CID data can be matched to Compustat and CRSP based on ownership information. We primarily rely on parent company name, and due to variation across datasets (e.g., formatting, abbreviations), we manually review each match for validity.

using our captive determinants model rather than actual captive data. Again, the results are consistent with noncaptive haven, but not captive activity, being a good indicator of profit shifting.

This study provides both descriptive and empirical contributions to the accounting literature by highlighting the prevalence, distribution, and increasing use of captive insurance by U.S. firms. SEC disclosure standards require public firms to provide information on the location of their significant subsidiaries (Donohoe et al. 2012; 17 CFR 210.1-02). The evidence of our tests indicates that over 12.3 percent of firm-years reporting tax havens in Exhibit 21 appear to do so only because they have a captive in a tax haven. Further, these U.S. MNE captives primarily cluster in a small group of U.S. states and well-known tax haven countries. We also document that 43.7 percent of captives are not disclosed in annual reports, and that the undisclosed captives appear to be concentrated in European countries. Our evidence also highlights how captives are associated with proxies for managerial entrenchment, such as CEO stock ownership and family firm ownership, suggesting that captive use is more prevalent in settings often associated with potential agency conflicts. These findings are important because the evidence suggests that presence in a tax haven for non-tax planning purposes is associated with core firm governance features. Consequently, these findings are valuable to current and future research that examines the link between corporate tax planning and corporate governance or managerial incentives, given the common practice in the research that relies on tax haven use as an indication of tax planning.

Finally, this study contributes to the tax literature by providing evidence on the pervasiveness of captives in tax havens, and their lack of association with variation in corporate tax rates. We demonstrate that separating out tax haven use for captives from noncaptive haven use dramatically increases estimates of the tax savings associated with noncaptive haven use. We also provide a determinants model of captive use with a high degree of discriminatory power that

should be useful for researchers seeking to separate out tax motivated haven use from captive related haven activity. These findings are important given the dozens of existing published and working papers that use Exhibit 21 data, often to identify and use tax haven activity as an indicator of profit shifting, tax avoidance, or tax planning (e.g., Dyreng and Lindsey 2009; Hasan et al. 2014; Acito and Nessa 2022; Fox et al. 2022; Law and Mills 2022).

II. BACKGROUND

Captive Insurance

Firms establish captive insurance entities to provide insurance to themselves (i.e., self-insurance). The advantages of self-insurance, relative to traditional commercial insurance, include reduced administrative and marketing costs and the ability to cover unique risks that may not be insurable in commercial insurance markets. Insurance can be particularly challenging for companies with new business models where insurers struggle to price coverage (Uribe 2020). Captives also offer firms added financial flexibility. For example, if a captive's investments result in a surplus, the captive can provide intercompany loans to the parent that can be cheaper than external financing. Of course, choosing to use captive insurance, in lieu of commercial alternatives, introduces unique costs. Firms must risk the capital required to form a captive rather than simply paying commercial insurance premiums. Operating a captive also means firms enter into a new line of business (insurance) that is outside the scope of their core business.

As noted in the introduction, 57 percent of the captives in our sample are located in tax havens. Offshore tax havens are attractive because they offer both minimal licensing and minimal reporting requirements as well as reduced capital requirements for captives. These offshore jurisdictions also often have industry-specific areas of expertise. For example, the Cayman Islands have a concentration of healthcare-related captives. However, there are also advantages of

establishing a captive in the U.S., including lower legal and audit fees, reduced travel costs, and potentially reduced reputational costs. Sandra Fenters of Capterra Risk Solutions notes that "often our client chooses a domicile primarily because of optics, they may perceive that being onshore would be more palatable in the eyes of regulators and other bodies that may scrutinize a captive" (Captive International 2016). Consistent with these tradeoffs, we observe a mix of on and offshore captives in our sample.

Many of the most common locations for captives in our sample are countries well known as tax havens (e.g., Guernsey, Cayman Islands, and Bermuda). Hence it is natural to assume taxes must play a major role in the decision of where to locate a captive. While there are some excise tax and state-level income tax implications surrounding these decisions, we do not expect taxes to be the primary reason most captives are located in tax havens.[4] In fact, many U.S. companies elect for their offshore captives to be taxed as U.S. companies under U.S. Internal Revenue Code (IRC) Section 953(d). Indeed, the income of the offshore captive would likely be subject to U.S. tax under Subpart F income without such an election, as the U.S. parent of a foreign insurance company would be taxed on the gross premiums paid to the foreign insurance company. Moreover, certain premiums of U.S. controlled foreign insurance companies are subject to a federal excise tax (FET) of one or four percent, depending on the insurance product (IRC Sec. 4371). Importantly, if a non-U.S. insurer elects to be taxed as a U.S. company, it would not be subject to the federal excise tax. This choice suggests taxes are likely not a key determinant of the domicile decision.

[4] The captive can receive premiums tax-free, but only up to the mandated limit under IRC 831(b) of $2.4 million as of 2021. A captive making an 831(b) election is referred to as a micro-captive. The distinction between non-deductible self-insurance and deductible captive insurance is often a point of contention that has long been a focus of IRS scrutiny. In 2015, the IRS listed the micro-captive along with other abusive tax transactions in their annual Dirty Dozen listing (IRS 2015). Micro-captives are quite popular with small and mid-size businesses, but we do not believe they represent many of the captives in our sample established by large publicly traded companies. Further given the premium limitation we would not expect a micro-captive to materially affect the tax rates of our sample firms.

Related Literature

A long literature in accounting, finance, and economics examines tax havens from both a country and firm perspective. Desai et al. (2006a) examine the characteristics of firms operating in tax havens and find these firms are larger, have more intrafirm trades, and engage in more research and development. Hines (2005) considers tax havens from the country-level perspective and provide evidence consistent with tax haven countries having a disproportionate share of foreign employment, foreign property, plant and equipment, and GDP growth. Desai et al. (2006b) study the complimentary interaction between high-tax countries and tax havens. Their theory implies that reduced tax costs from tax havens stimulate investment in nearby high-tax countries. Interest in tax havens in the accounting literature significantly accelerated following the work of Dyreng and Lindsey (2009), who examine the tax benefits of U.S. MNEs operating in tax havens. In particular, the authors develop a new methodology for estimating the average worldwide, federal, and foreign tax rates on worldwide, federal, and foreign pretax book income for U.S. MNEs—with and without tax haven operations. They find the average firm disclosing material operations in a tax haven report having a 1.5 percent lower world-wide tax burden on world-wide income compared with firms without operations in a tax haven.

In the period since Dyreng and Lindsey (2009) was published, accounting research using Exhibit 21 data has grown precipitously, often with a firm's presence in a tax haven serving as an indication of profit shifting, tax avoidance, or tax planning more generally.[5] The difficulty in observing the details of specific tax strategies from public disclosures, coupled with evidence that tax haven presence is associated with lower effective tax rates (Dyreng and Lindsey 2009), make

[5] A list of papers using Exhibit 21 data to identify tax havens for their analyses is available upon request. The vast majority of these studies use the data provided by Scott Dyreng at https://sites.google.com/site/scottdyreng/Home/data-and-code.

this approach to measuring tax planning both straightforward and reasonable. However, this literature does not consider firms' use of tax havens for captive insurance purposes, which arguably provides few income tax benefits. Consistent with the lack of clear federal income tax benefits associated with U.S. MNE captive entities, we do not expect an association between captive use in tax havens and federal tax payments. In line with this prediction, we also expect the association between tax haven use and federal tax payments to be more pronounced once one removes U.S. MNE captive entities in tax havens from sets of firms identified as operating in a tax haven from Exhibit 21 subsidiaries.

III. DATA AND SAMPLE

We begin with data on captive insurance subsidiaries obtained from Captive Review's Captive Insurance Database (CID). CID maintains the most comprehensive dataset on captive insurance subsidiaries. CID data offer a profile of each captive insurance subsidiary, including the name of the legal entity, incorporation jurisdiction, year of incorporation, and ownership information. Using the ownership information, we merge CID data with firm-year data from the Compustat North America annual file and the CRSP monthly security file. Because of spelling and punctuation differences of the parent company name between datasets, we review by hand each match to ensure that the captive insurance subsidiary is linked to the proper parent company. For the primary sample, the data begin in 1987, which is chosen due to availability of the statement of cash flows, and extend through 2020.

To construct our sample, we exclude non-US corporations and entities not taxed as corporations. We require beginning-of-year assets exceed $10 million, beginning-of-year market value of equity exceed $5 million, and non-negative market-to-book value. At this point, there are 1,493 unique captive insurance subsidiaries in the sample, and 10,728 firm-years have at least one

captive. We further require non-missing data to construct variables for the captive insurance determinants model. Our full sample contains 78,649 firm-year observations from U.S.-based corporate MNEs. Within the full sample, 7,801 firm-years have at least one captive.

We also examine the disclosure behavior of U.S. MNEs with captive insurance subsidiaries. Specifically, for the full sample, we collect Exhibit 21 data from directEDGAR. We hand-match the name of the captive insurance subsidiary to the listed subsidiaries in the relevant Exhibits 21. The Exhibit 21 data from directEDGAR begins in 1994, due to availability of electronic filings on the SEC's EDGAR system. Thus, of the 10,992 captive-year observations in the full sample, 8,133 captive-years are eligible to be matched to Exhibit 21s (i.e., the firm-year to which the captive-year pertains has an Exhibit 21 in directEDGAR), which pertain to 5,259 firm-year observations. We refer to this sample as the disclosure sample.

In subsequent tests, we encounter additional sample attrition due to data availability of measures included in those tests and the use of additional data sources. As we discuss the results of those tests, we describe those data, the additional sample requirements imposed, and the combined effect on the respective test samples.

IV. DESCRIPTIVE ANALYSIS AND PREVALENCE OF CAPTIVES

Captive insurance subsidiaries are relatively underexplored in the literature because of data limitations. Our study overcomes these limitations by using the CID data. Thus, we begin with a descriptive analysis of captive insurance subsidiaries, including intertemporal trends, incorporation locations, usage by parent company industry, and parent firm's disclosure patterns.

Figure 1 graphs the intertemporal trend in captive use as well as in the number of captives per firm. Panel A reports the percentage of firm-years with at least one captive in each calendar year. We find a generally increasing trend in captive use over the sample period, with some noticeable spikes following periods of economic downtown, e.g., in the years following the financial crisis. While the sample only covers one year of the COVID-19 pandemic, anecdotally the pandemic led to an increase in both captive formations and captive premiums underwritten (Marsh 2021). The pandemic highlighted the potential usefulness of self-insurance, especially as it pertains to such things as stock outs and business interruption.

In Panel B of Figure 1, we graph the number of captive insurance entities, conditional on having at least one captive. As the percentage of firms with a captive has risen, so too has the average number of captive insurance subsidiaries per firm, from about 1.1 in 1987 to more than 1.5 in 2020. We separately graph intertemporal trends for captives in havens and dot havens.[6] While lower than total captives, reflecting the fact that firms establish captives domestically and in non-haven countries, the trends for haven and dot haven captives track closely with those for captives overall. This consistency reflects the importance of havens in the location of captive insurance subsidiaries.

This finding segues into our evidence on the incorporation locations of captive insurance subsidiaries. Table 1 presents the geographic location of all captive insurance subsidiaries before introducing additional sample requirements (i.e., to measure variables for the determinants model). Figure 2 Panel A graphically displays the same information, but for the full sample (i.e., after requiring available data to measure determinants model variables). Several insights emerge from

[6] Dot havens include all tax haven countries except for the "Big Seven." Following Hines and Rice (1994), the Big Seven havens have larger populations than dot havens. The Big Seven include Hong Kong, Ireland, Lebanon, Liberia, Panama, Singapore, and Switzerland.

this table and figure. First, approximately 57 percent of captive insurance entities (861 of 1,493 entities) are incorporated in tax haven jurisdictions. Most of these captive insurance entities are in dot havens (724 of 861 entities). Second, the most common jurisdiction is Vermont, and while Vermont is generally not considered a tax haven, it does have beneficial captive insurance regulations that encourage U.S. MNEs to incorporate their captives there. Finally, comparing the evidence in Table 1 to that in Panel A of Figure 2, the sample requirements do not appear to be affecting the distribution of captive locations.

Table 1 also reports the distribution of firm-years with at least one captive insurance subsidiary by industry, using Fama-French 49 industry classification. Perhaps not surprisingly, of the 10,728 firm-years with a captive, the two industries with the most firm-years are "insurance" (1,081 firm-years) and "banking" (893 firm-years). The next five industries are perhaps more surprising—"transportation" (583 firm-years), "petroleum and natural gas" (529 firm-years), "communication" (444 firm-years), "chemicals" (441 firm-years), and "retail" (439 firm-years)—as these industries are all non-financial and all have a significant number of firm-years with captives. Indeed, captive insurance use spans most industries and is present in all but two industries ("fabricated products" and "almost nothing").

Having shown the intertemporal trends and geographic and industry demographics of captives, we next examine to what extent captive insurance subsidiaries are disclosed versus not. For this analysis, we use the disclosure sample, as described in the previous section. Focusing on Table 2, we find that there are 8,133 captive-years that we would expect to have been disclosed on an Exhibit 21. Of these, we find that only 4,580 captive-years, or 56 percent, are disclosed. We are agnostic to the reason(s) why captives are not disclosed. It may be that some are not considered "significant" subsidiaries within the meaning of SEC Regulation S-X, Sec. 210.1-02(w), and

therefore are not required to be disclosed on Exhibit 21. Alternatively, some of the non-disclosure of captives may be strategic (e.g., Dyreng et al. 2020). Some interesting trends emerge when looking at the countries, which are best summarized by Figure 2 Panel B. Specifically, European captives generally are disclosed with a less than 50 percent likelihood, whereas U.S. and Caribbean Island captives are disclosed with a greater than 50 percent likelihood. The two most common jurisdictions in the disclosure sample are Vermont (2,685 captive-years) and Bermuda (2,396 captive-years), each of which have disclosure rates slightly higher than 50 percent. The similar disclosure rates of captives in these two jurisdictions casts some doubt on the strategic disclosure explanation.

V. DETERMINANTS OF CAPTIVE INSURANCE

Next, we model the determinants of having at least one captive insurance subsidiary. This analysis serves two key purposes. First, we wish to extend the descriptive analysis in the previous section to understand the causes and characteristics of captive use. Then, we can analyze whether governance traits exhibit a partial relation with captive use, holding constant other key determinants. Second, while we have access to actual captive insurance subsidiary data from CID, we seek to develop a prediction model that can be used to predict whether a firm has a captive in a given year, which will allow researchers to proxy for whether a firm has a captive in the absence of actual data on captives. To test the determinants of captive use, we estimate the following model:

$$\begin{aligned} CAPTIVE_{i,t+1} = {} & \alpha_{FF49} + \alpha_t + \beta_1 PTROA_{i,t} + \beta_2 ln(MVE_{i,t}) + \beta_3 SALES\_GROWTH_{i,t} + \beta_4 MTB_{i,t} \\ & + \beta_5 LEV_{i,t} + \beta_6 INTANG_{i,t} + \beta_7 R\&D_{i,t} + \beta_8 PPE_{i,t} + \beta_9 CASH\_RATIO_{i,t} \\ & + \beta_{10} TOTAL\_ACCRUALS_{i,t} + \beta_{11} BIG\_N_{i,t} + \beta_{12} LOSS\_INTENSITY_{i,t} + \beta_{13} FORINC_{i,t} \\ & + \beta_{14} MISS\_PIFO_{i,t} + \beta_{15} GEO\_CONC_{i,t} + \beta_{16} SIGMA\_CFO_{i,t} + \varepsilon_{i,t+1} \end{aligned} \quad (1)$$

where *CAPTIVE* is an indicator for whether a firm has at least one captive insurance subsidiary, *PTROA* is pretax return-on-assets, *ln(MVE)* is the natural logarithm of market value of equity, *SALES_GROWTH* is sales growth, *MTB* is market-to-book ratio, *LEV* is long-term debt to assets, *INTANG* is intangible assets scaled by total assets, *R&D* is research and development expense scaled by total assets, *PPE* is property, plant, and equipment, net of depreciation, scaled by total assets, *CASH_RATIO* is cash and cash equivalents scaled by total assets, *TOTAL_ACCRUALS* is total accruals scaled by total assets, *BIG_N* is an indicator for whether a firm has a Big N auditor, *LOSS_INTENSITY* is a count of losses in the past five fiscal years, rescaled to range from 0 (no recent losses) to 1 (five consecutive years of losses), *FORINC* is pretax foreign income scaled by assets, *MISS_PIFO* is an indicator variable for whether a firm-year is missing pretax foreign income in Compustat, *GEO_CONC* is an HHI-based measure of geographic concentration of foreign sales, and *SIGMA_CFO* is the standard deviation of cash flows from operations over the past three years. We include Fama-French 49 industry membership fixed effects and fiscal year fixed effects, and we cluster standard errors by firm.

The covariates we select for equation (1) are designed to capture ex-ante expectations about firms that utilize self-insurance through captives. While some limited evidence exists from Chang and Chen (2018), we expand upon their model to capture a broader set of potential economic determinants of captive insurance use. Specifically, we include measures of overall profitability (*PTROA* and *LOSS_INTENSITY*) and foreign profitability (*FORINC*) because we expect that more profitable firms will be more apt to self-insure against risks that might jeopardize such profitable operations. Moreover, such firms are more likely to have excess cash flows, and if such cash accumulates, self-insurance offers a mechanism to convert cash capital into investments. Depending on the location of the captive, such investments are potentially less well-regulated and

less transparent to investors as compared to investments made outside captives. Thus, we include *CASH_RATIO* and *TOTAL_ACCRUALS*.

In general, we expect captive insurance to be a mechanism to mitigate risk. If firms are more highly leveraged, if firms have greater asset intangibility, or if operations are more dependent on one or a few geographic locations, we expect captive insurance to be an avenue for minimizing the adverse effects of such risk. Thus, we include *LEV*, *INTANG*, and *GEO_CONC*. Also, we expect firms with more international presence to be exposed to greater risks. To the extent such risks are difficult to insure, self-insurance through captives plays a key role. Thus, we include *FORINC*, *MISS_PIFO*, and *GEO_CONC*.

We also expect firms in mature stages of their life-cycles are more apt to engage in captive use. For instance, we expect these firms to be larger, more profitable, but with slower sales growth. Additionally, these firms likely would have more PP&E, engage in less R&D, and have less volatile operating cash flows than younger, start-up and growth stage firms. They would also be more likely to engage a Big N auditor than firms in other life-cycle stages. To capture these features, we include *ln(MVE)*, *SALES_GROWTH*, *MTB*, *R&D*, *PPE*, and *BIG_N*.

We estimate model (1) using a logistic approach and using an OLS linear probability approach. In a subsequent test, we replace the dependent variable with *N_CAPTIVES*, a count of the number of captives, and estimate an OLS version of equation (1). Results of these tests are reported in Table 4. Before turning to the multiple regression results, we first offer descriptive statistics at the sample level and comparing firm-years with a captive (i.e., *CAPTIVE* = 1) to firm-years without (i.e., *CAPTIVE* = 0). These results are reported in Table 3, Panels A and B.

In general, the results reported in Table 3 are consistent with expectations. For instance, we find that firms with a captive are more profitable, have greater market capitalizations, and

realize less volatile operating cash flows. Captive firms also have slower sales growth, are more highly leveraged, and have more intangible assets and PP&E, but hold less cash. We further find that captive firms have higher foreign profitability, but that profitability is concentrated among fewer geographic segments.

Next, we turn to the multiple regression results of estimating equation (1), which are presented in Table 4, Panel A. Table 4 presents a more nuanced picture of the determinants of captive insurance use than that of Table 3, Panel B. Specifically, we find that size is an important determinant of captive use. A few of the partial relations exhibit opposite signs relative to the univariate comparison. For example, given size and the other determinants, less profitable firms are more likely to have a captive. Asset intangibility and tangibility also reverse sign, a finding that is attributable to controlling for size. Nonetheless, many of the key takeaways from the univariate comparison remain when we examine the logistic and linear probability estimations of equation (1). For instance, captive firms have slower sales growth, are more leveraged, generate more cash earnings but hold less cash, are more likely to have material foreign operations but those operations are more concentrated among one or a few geographic segments.

Importantly, the area under the receiver operating characteristic curve (AUROC) is 0.873, which suggests that the overall model appears to work reasonably well at distinguishing firm-years with captives from those without. This finding gives us a sense of how well the model performs in sample. However, we would like to use this model to generate prediction scores of the likelihood that a firm-year has a captive. To achieve this end, we need to evaluate how well the model performs out of sample.

Following Larcker and Zakolyukina (2012), we conduct k-fold cross-validation to both fit the model and obtain consistent estimates of the out-of-sample prediction errors. We use a 10-fold

cross-validation and repeat it 10 times (Witten and Frank 2005). We apply a bootstrap procedure using 1,000 iterations for statistical inference and to obtain a 95 percent confidence interval for the cross-validated AUROC. In Panel B of Table 4, we present the summary of these results. Figure 3 graphs the cross-validated ROC curves. We find that the model continues to perform reasonably well out of sample. In fact, we find that the determinants model performs nearly as well out-of-sample as it does in-sample. Thus, we have confidence in the ability of equation (1) to predict captive use.

Next, we consider whether corporate governance affects captive insurance use. We consider several different aspects of governance, including ex-ante litigation risk (Kim and Skinner 2012), Gompers et al. (2003) G-index, Bebchuk et al. (2009) entrenchment index, family firm ownership (Wang 2006; McGuire et al. 2014),[7] CEO firm-specific wealth (Coles et al. 2006), CEO pay-for-performance sensitivity and pay convexity (Core and Guay 2002; Coles et al. 2006), and board of directions co-option (Coles et al. 2014).[8] To test the relation between these governance traits and captive insurance use, we augment model (1) by adding each of these governance variables, one at a time. We encounter sample attrition due to the availability of each of these measures. We retain all other covariates and maintain the same fixed effect structure and standard error clustering.

Table 5 reports the results of these governance tests. In column (1), we find that firms with higher ex-ante litigation risk are more likely to engage in captive use. In columns (2) and (3), we convert the G-Index and E-Index so that they are increasing in good governance and find that both measures are negatively related to captive insurance use. This finding indicates that firms that are

[7] Data on family firm ownership were provided by Dechun Wang.
[8] Data on CEO firm-specific wealth, CEO delta, CEO vega, and board co-option are available from Lalitha Naveen at https://sites.temple.edu/lnaveen/data/.

less well governed and that have more entrenched executives are more likely to use captives. In column (4), we consider whether captive insurance use complements other, noncaptive presence in havens, and we find that indeed captives and haven use are positively related. In columns (5) and (6), we find that family firm ownership is positively related to captive use. In column (6), we find that CEOs with more firm-specific wealth are more likely to have a captive. We also find that captives are positively related to CEO pay-for-performance sensitivity (delta), but negatively related to CEO risk-taking incentives (vega). Finally, we report that firms with greater board co-option are more likely to have a captive. Overall, the results of these tests suggest that firms that are less well-governed, have weaker minority rights, and where executives are more entrenched are more likely to use captives. These findings also appear consistent with managers whose interests are deeply connected to the firm insuring for risks in a manner that may not be in the best interest of outside investors.

VI. REEXAMINING THE TAX CONSEQUENCES OF TAX HAVEN ACTIVITY

Thus far, we have shown that captives are commonly incorporated in tax haven jurisdictions. While these locations are commonly associated with significant tax savings for noncaptive entities, they are also known as places that attempt to maintain secrecy and for more lenient regulatory environments (Hines and Rice 1994). Hepfer et al. (2020) use a life insurance setting to demonstrate that haven-based self-reinsurance entities owned by U.S.-based insurers offer no tax savings potential. This follows from the fact that Subpart F of the Internal Revenue Code treats much of the foreign-source income of (re)insurance subsidiaries as effectively repatriated immediately to the U.S. and taxable at top U.S. tax rates. Moreover, in the post-TCJA era, such Subpart F income fails the participation exemption and remains taxable at top U.S. statutory tax rates. Additionally, such income is commonly subject to the FET of one or four

percent (IRC Sec. 4371). Because of this tax treatment and to avoid the FET, companies can elect to treat offshore insurance subsidiaries as though they are U.S.-based for U.S. federal tax purposes (IRC Sec. 953(d)). Thus, we expect that the tax rates faced on income by captive insurance subsidiaries of U.S. MNEs is the top U.S. statutory tax rate.

Given that we have a sample of U.S. MNEs, we estimate the following OLS regression to test the effect of having a captive insurance subsidiary (*CAPTIVE*) on various effective tax rate measures:

$$ETR\_MEASURE_{i,t\rightarrow t+2} = \alpha_{FF49} + \alpha_t + \beta_1 CAPTIVE_{i,t} + \Sigma_k \beta_k CONTROL_{k,i,t} + \varepsilon_{i,t\rightarrow t+2} \quad (2a)$$

where *ETR_MEASURE* is one of six effective tax rate measures, including one-year cash ETR (*CASH_ETR1*), three-year cash ETR (*CASH_ETR3*), one-year GAAP ETR (*GAAP_ETR1*), three-year GAAP ETR (*GAAP_ETR3*), one-year state ETR (*STATE_ETR1*), and three-year state ETR (*STATE_ETR3*).[9] We include a set of controls shown in prior research to be determinants of tax avoidance and that capture profitability, size, tax-advantaged transactions, tax exhaustion and tax loss carryforwards, and business complexity (e.g., Ege et al. 2021). Table 6 Panel A reports summary statistics for new measures included in the ETR models but not in determinants tests.

Table 6 Panel B reports the results of estimating equation (2a). This test imposes sample attrition in two ways: (i) available data to construct ETR measures and (ii) requiring positive cumulative pretax profitability over the variable measurement window. As with the previous tests, we include Fama-French 49 industry membership fixed effects and fiscal year fixed effects. Reported standard errors are clustered by firm. We focus on the coefficient on *CAPTIVE* and predict that this coefficient will not be negative. In other words, all else equal, we do not expect captive insurance subsidiaries to facilitate tax avoidance. Consistent with this expectation, across

[9] We winsorize all ETR measures to lie in the [0,1] interval.

all six tests in Panel B of Table 6, we find that the coefficient on *CAPTIVE* is statistically insignificantly different from zero.

The previous set of tests does not differentiate domestic captives from haven captives, which may explain the null results. Thus, in the next set of tests, we adapt equation (2a) to differentiate domestic from haven captives. We also include a measure designed to capture tax haven subsidiaries that are not captive insurance subsidiaries. We estimate the resultant OLS model:

$$ETR\_MEASURE_{i,t\rightarrow t+2} = \alpha_{FF49} + \alpha_t + \beta_1 CAPTIVE\_DOMESTIC_{i,t} + \beta_2 CAPTIVE\_HAVEN_{i,t} + \beta_3 NONCAPTIVE\_HAVEN_{i,t} + \Sigma_k \beta_k CONTROL_{k,i,t} + \varepsilon_{i,t\rightarrow t+2} \quad (2b)$$

where *CAPTIVE_DOMESTIC* is an indicator for firm-years with captives in the U.S., and *CAPTIVE_HAVEN* is an indicator for firm-years with captives in tax haven jurisdictions. Both *CAPTIVE_DOMESTIC* and *CAPTIVE_HAVEN* can be one for the same firm-year if it has at least one captive entity in the U.S. and at least one captive entity in a haven. *NONCAPTIVE_HAVEN* is an indicator for having at least one subsidiary in a tax haven that is not a captive insurance subsidiary. As with equation (2a), we estimate equation (2b) with controls for the determinants of tax avoidance, industry and year fixed effects. We cluster standard errors at the firm level.

If the interpretation of the coefficient on *CAPTIVE* in model (2a) is correct, then we expect that both the coefficient on *CAPTIVE_DOMESTIC* and on *CAPTIVE_HAVEN* will be non-negative in equation (2b). Such a finding would reflect the fact that captive insurance subsidiaries do not facilitate tax avoidance for U.S. MNEs. Consistent with this expectation, across all six tests in Panel C of Table 6, we find that the coefficients on *CAPTIVE_DOMESTIC* and on *CAPTIVE_HAVEN* are statistically insignificantly different from zero.

Prior research suggests that tax haven subsidiaries facilitate tax avoidance. Different from captives whose income is likely subject to Subpart F, noncaptive haven subsidiaries can be useful for mitigating or deferring the U.S. taxation of foreign source earnings. Thus, we expect that noncaptive haven subsidiaries are incrementally beneficial in lower federal and foreign taxes. However, we do not expect that haven-based noncaptive subsidiaries will affect state income taxes incurred by U.S. MNEs. Rather, the state ETR tests offer falsification. Thus, in tests using cash and GAAP ETRs, we expect that β_3 will be less than zero. Consistent with expectations, we find that the coefficient on *NONCAPTIVE_HAVEN* is negative and statistically significant in cash and GAAP ETR tests. Economically, the effect is around a one percentage point reduction in ETR. We further find that the coefficient on *NONCAPTIVE_HAVEN* is insignificantly different than zero in state ETR tests. Put together, results indicate that noncaptive subsidiaries in haven jurisdictions facilitate significant federal and foreign income tax avoidance.

Dyreng and Lindsey (2009) offer an alternative approach to assessing the tax effects of haven subsidiaries. Their model utilizes unscaled variables and therefore estimates the relation between worldwide current tax expense (*TXWW*), pretax income (*PI*), and the marginal effects of various covariates, each of which are interacted with pretax income. Thus, the coefficients from their model can be interpretated as tax rates. We estimate model (3), which closely follows equation (7) of Dyreng and Lindsey (2009):

$$TXWW_{i,t} = \gamma_0 + \gamma_1 PI_{i,t} + \gamma_2 PI_{i,t}*HAVENYEAR_{i,t} + \gamma_3 PI_{i,t}*HAVENFIRM_{i,t}$$
$$+ \Sigma_k \gamma_k PI_{i,t}*CONTROL_{k,i,t} + \varepsilon_{i,t} \quad (3)$$

where *HAVENYEAR* is an indicator for whether a firm has subsidiary in a tax haven in the current year and *HAVENFIRM* is an indicator for whether a firm has a subsidiary in a tax haven at any point in the sample. The model also controls for the existence of NOLs (*NOL*), total assets (*LNAT*),

long-term debt (*DLTT*), advertising expense (*XAD*), and R&D expense (*XRD*). In equation (3), γ_1 represents the average rate of worldwide current tax expense on worldwide pretax income, and γ_2 tests whether firm-years with significant subsidiaries in tax haven countries have incrementally different worldwide tax rates on pretax income relative to firm-years without significant subsidiaries in tax haven countries. We pay particular attention to the coefficient on γ_2. We begin by estimating the original model from Dyreng and Lindsey (2009), measuring haven presence irrespective of haven-based captives. We refer to these measures as *ORIGINAL_HAVENYEAR* and *ORIGINAL_HAVENFIRM*. For these tests, we merge our sample with Exhibit 21 tax haven data, which is provided for years 1995 through 2014. Following Dyreng and Lindsey (2009) and the recommendations of Leone et al. (2019), we employ MM-estimation robust regression and cluster standard errors at the firm level.

Table 7 Panel A presents the results of estimating equation (7) of Dyreng and Lindsey (2009) on an extended sample period. Column (1) reports the results for the sample with positive pretax income. Here, we observe that firm-years with haven subsidiaries in the current year have lower worldwide rates of taxation on pretax income by 1.1 percentage points on average. By contrast, in column (2), firm-years with non-positive pretax income do not exhibit differential tax rates conditional on having a haven subsidiary in the current year. These findings are consistent with those reported by Dyreng and Lindsey (2009).

Next, we modify the haven measures to remove the effect of captive insurance subsidiaries. Specifically, we adjust for any observations where *ORIGINAL_HAVENYEAR* or *ORIGINAL_HAVENFIRM* is classified as one solely due to the presence of captive insurance subsidiaries in tax havens. We refer to these new measures as *MODIFIED_HAVENYEAR* and *MODIFIED_HAVENFIRM*. Figure 4 graphically depicts the extent to which the original haven-

based subsidiary measures are modified due to captives. On average, 12.3 percent of firm-years are misclassified as having haven subsidiaries solely due to captives. This equates to between 111 and 141 firm-years each year being classified as having a haven subsidiary, but that subsidiary does not facilitate tax avoidance.

Table 7 Panel B presents the results of estimating the Dyreng and Lindsey (2009) model with modified measures for haven presence. Here, we find that after removing the effect of captive insurance subsidiaries on tax haven measures, that the effect of tax haven presence on average tax rates more than triples—from 1.1 percentage points lower on average to 4.3 percentage points lower on average. For completeness, we introduce two new measures to the Dyreng and Lindsey (2009) model—*CAPTIVE_HAVENYEAR*, which is an indicator for whether a firm has captive insurance subsidiary in a tax haven in the current year, and *CAPTIVE_HAVENFIRM*, which is an indicator for whether a firm has a captive insurance subsidiary in a tax haven at any point in the sample. We interact these measures with *PI* so that the coefficient is the incremental worldwide tax rate on pretax income for firm-years with haven-based captive insurance subsidiaries. These results are presented in Table 7 Panel C. Consistent with the results in Table 6, we find that firm-years with haven-based captives do not have lower tax rates, and in this case, we find some evidence that such firms face tax rates that are 0.8 to 0.9 percentage points higher than firms without haven-based captives. Critically, we continue to observe a similar effect size for firm-years that have a tax haven presence based on the modified measure—such firm-years have average worldwide tax rates that are 4.2 percentage points lower.

In Table 7 Panel D, we use the out-of-sample prediction scores to determine whether a firm-year is likely to be affected by a captive in a haven. Instead of modifying *HAVENYEAR* and *HAVENFIRM*, the prediction scores allow us to isolate and remove observations that are likely

misclassified due to having a captive in a haven. We drop these observations. We then estimate the original model on the limited sample, i.e., using *ORIGINAL_HAVENYEAR* and *ORIGINAL_HAVENFIRM* for firm-years not suspected of being contaminated by haven-based captives. In this set of tests, we report results similar to Panel B, albeit with slightly muted effect sizes, at 3.5 percentage points lower tax rates for firm-years with a haven presence. Put together with the out-of-sample findings from Table 4 Panel B, this finding suggests that the prediction model offers a reasonable approach to identify observations that are classified as having haven subsidiaries because of captives, which are of limited use for tax avoidance.

Overall, Tables 6 and 7 offer two key takeaways. First, captive insurance companies, especially those based in tax haven countries, offer limited tax avoidance potential for U.S. MNEs. These findings are consistent with Hepfer et al. (2020). Second, haven-based significant subsidiary measures that fail to account for the presence of haven-based captives likely significantly understate the tax savings potential. Specifically, Table 7 indicates the effect of having a significant haven-based subsidiary is nearly four times larger than previously thought.

VII. ADDITIONAL ANALYSES

Income Shifting Tests

We corroborate our findings using the Collins et al. (1998) model of tax-motivated income shifting, as adapted by Klassen and Laplante (2012) and McGuire et al. (2018). We conduct several sample splits to isolate the effect of having a captive entity in a haven on tax-motivated income shifting and to isolate the effect of having a noncaptive entity in a haven. To conduct the sample splits, we require the haven data from the Dyreng and Lindsey (2009) tests in Table 7. Using these data, we estimate the following model:

$$FROS_{i,t} = \alpha_{FF49} + \alpha_t + \beta_1 WWROS_{i,t} + \beta_2 AVE\_FTR_{i,t} + \Sigma_k \beta_k CONTROL_{k,i,t} + \varepsilon_{i,t} \quad (4)$$

where *FROS* is foreign return on sales, *WWROS* is worldwide return on sales, and *AVE_FTR* is a five-year average of the foreign tax rate incentive to shift. We also control for size, firm age, and worldwide pretax return-on-assets. We also require data to measure *FROS* and *AVE_FTR*. We winsorize *AVE_FTR* to lie in the [0,1] interval and require that the sum of foreign pretax profitability over the measurement window is positive. These requirements result in further sample attrition. We estimate equation (4) and then compare coefficients across subsamples using a seemingly unrelated regression approach. A negative coefficient on *AVE_FTR* is consistent with tax-motivated income shifting.

Table 8 Panel A reports results using CID data to measure haven-based captive use. In columns (1) and (2), we estimate equation (4) splitting on whether firm-years have a haven-based captive. We find that the coefficient on *AVE_FTR* is -0.036 for firm-years with haven-based captives and is -0.056 for firm-years without haven-based captives, suggesting that both groups exhibit some evidence of tax-motivated income shifting on average. Comparing these coefficients, we find that firm-years without haven-based captives engage in significantly more income shifting than those with haven-based captives.

In columns (3) and (4), we split the sample on whether a firm has a noncaptive haven-based subsidiary. Here, we find that firm-years with noncaptive haven subsidiaries exhibit income shifting. Specifically, the coefficient on *AVE_FTR* is -0.055 for firm-years with noncaptive haven subsidiaries. However, we fail to find evidence that firm-years without noncaptive haven subsidiaries engage in income shifting. Comparing the coefficients, we find that firm-years with noncaptive havens exhibit significantly more income shifting.

In columns (5) and (6), we re-estimate the tests in columns (1) and (2) and add the requirement that all firm-years have at least one noncaptive haven subsidiary. The findings in

columns (5) and (6) are remarkably similar to those in columns (1) and (2) with respect to the coefficients on *AVE_FTR*. These findings indicate that the findings are columns (1) and (2) are largely driven by firm-years with a haven subsidiary that could be utilized to shift income (i.e., that is not a captive insurance subsidiary). Putting these findings together, these tests illustrate the importance of removing the contaminating effects of captives on haven measures when it comes to estimating the ability of U.S. MNEs to utilize tax havens for income shifting.

In Table 8 Panel B, we use the out-of-sample prediction scores to determine whether a firm-year is likely to be affected by a captive in a haven. We use these out-of-sample scores to remove firm-years predicted to have a haven-based captive insurance subsidiary. We then estimate the sample splitting on whether the remaining firm-years have a haven-based subsidiary. We find that firm-years with haven subsidiaries exhibit income shifting. The coefficient on *AVE_FTR* is -0.050. However, we fail to find evidence that firm-years without haven subsidiaries engage in income shifting. This finding further supports the use of the prediction model to identify observations that are classified as having haven subsidiaries because of captives, which are of limited use for tax avoidance.

Average Federal and Foreign Tax Rates for Firm-Years with Haven Subsidiaries

We supplement the Dyreng and Lindsey (2009) tests in Table 7 by separately estimating models for federal current tax expense (*TXFED*) and foreign current tax expense (*TXFO*). Here, pretax income (*PI*) is decomposed into domestic pretax income (*PIDOM*) and foreign pretax income (*PIFO*). As with model (3), all variables are unscaled, and the coefficients can be interpreted as average tax rates:

$$TXFED_{i,t}\ [TXFO_{i,t}] = \gamma_0 + \gamma_1 PIDOM_{i,t} + \gamma_2 PIFO_{i,t} + \gamma_3 PIDOM_{i,t}*MODIFIED\_HAVENYEAR_{i,t}$$
$$+ \gamma_4 PIFO_{i,t}*MODIFIED\_HAVENYEAR_{i,t} + \gamma_5 PIDOM_{i,t}*CAPTIVE\_HAVENYEAR_{i,t}$$

$$+ \gamma_6 PIFO_{i,t}*CAPTIVE\_HAVENYEAR_{i,t} + \Sigma_k \gamma_k PIDOM_{i,t}*CONTROL_{k,i,t}$$

$$+ \Sigma_j \gamma_j PIDOM_{i,t}*CONTROL_{j,i,t} + \varepsilon_{i,t} \quad \text{(5a)[(5b)]}$$

In equation (5a), γ_1 represents the average federal tax rate on domestic income, and γ_2 represents the average federal tax rate on foreign income. γ_2 has a nuanced interpretation: it captures the incremental U.S. tax on foreign income that is repatriated or taxed as Subpart F income.[10] We expect the coefficient to be positive, but its magnitude should be modest, reflecting a general lack of repatriations and strategic use of foreign tax credits. γ_4 (γ_6) reflects incremental repatriation-related U.S. tax effects for firm-years with non-captive (captive) havens. Consistent with captives either being designated as U.S. entities to avoid the FET or being exposed to Subpart F, we expect γ_6 to be positive.

For equation (5b), γ_2 represents the average foreign tax rate on foreign pretax income. γ_4 (γ_6) reflects the incremental foreign tax effects for firm-years with non-captive (captive) havens. Consistent with non-captive havens driving tax savings for firms, we expect γ_4 to be positive.

Table 9 presents the results of estimating equations (5a) and (5b) using MM-estimation robust regression.[11] In column (1), we observe average federal tax rates of 35.8 percent on domestic income and 3.0 percent on foreign income. Firm-years with haven-based captives have 2.0 percentage points higher average federal tax rates on foreign income, consistent with foreign captives incurring U.S. tax costs due to Subpart F or to electing to treat captives as U.S. entities. In column (2), we observe average foreign tax rates on foreign income of 21.5 percent. Firm-years with haven subsidiaries face lower foreign tax rates on foreign income by 3.5 percentage points.

[10] γ_2 does not capture foreign income for which a firm recognizes a deferred tax liability (i.e., not designated as permanently reinvested). Such unrepatriated foreign income is not reflected in current federal tax expense (*TXFED*).
[11] We tabulate results for firm-years with positive *PIDOM* and positive *PIFO*. Untabulated results using subsamples where we vary whether *PIDOM* and *PIFO* are nonpositive yield consistent results with Dyreng and Lindsey (2009).

Consistent with our other findings, by purging our haven measure of captives, we find a tax rate reduction that is 2.5 times that reported by Dyreng and Lindsey (2009).

VIII. CONCLUSION

We use data on captive insurance subsidiaries from Captive Review's CID database to identify U.S. MNEs with captives. We use this dataset to develop an empirical model of the determinants of captive use. We find that the likelihood of having a captive is positively associated with firm size and leverage, but negatively associated with profitability, sales growth, intangibles, R&D, and cash holdings. Further, we find captive use is associated with higher levels of family ownership, CEO firm wealth, and litigation risk. Out-of-sample tests demonstrate that our model of captive determinants has high discriminatory power. Consistent with our expectations, we also find no evidence of a significant association between GAAP ETRs, Cash ETRs, or state ETRs and the use of captives or captives located in tax havens.

We also examine how removing or controlling for captive-only haven firms strengthens tests examining the association between tax haven use and corporate tax outcomes. We replicate the work of Dyreng and Lindsey (2009) over our extended sample period and find a 1.1 percent decrease in taxes on worldwide income for firms with tax havens. When we remove observations identified as having a haven presence solely due to captives, we find a 4.3 percent decrease in taxes on worldwide income for firms with noncaptive haven operations. The nearly four-fold increase in the magnitude of observed tax savings associated with noncaptive haven activity highlights the importance of separating captive- and noncaptive-related haven activity when using the presence of a firm in a tax haven as a proxy for tax planning or profit shifting. We also re-estimate the Dyreng and Lindsey (2009) tests after using our determinants model to identify and separate captive haven firms from noncaptive haven firms. The results are similar to those using the actual

captive data, providing support for the use of our model in settings examining haven use. Finally, we provide evidence that profit shifting appears greater among noncaptive haven firms than captive haven firms.

Our study demonstrates the prevalence of tax haven use for captive purposes, and the importance of parsing captive and non-captive haven use when using tax haven presence as a proxy for tax planning activities. We show the tax implications of non-captive haven use are significantly greater than previously thought once captive havens are removed from the sample. We also demonstrate that captive haven use is associated with measures of corporate governance, highlighting the importance of addressing the captive issue when conducting studies examining the relation between governance and tax haven use.

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Appendix A. Variable Definitions

Determinants model variables:

CAPTIVE	1 if a firm-year has a captive insurance entity, 0 otherwise
N_CAPTIVES	Count of captive insurance subsidiaries in the structure of a firm-year
PTROA	Pretax return on assets, measured as pretax income (PTI) scaled by average total assets (AT)
ln(MVE)	Natural logarithm of market value of equity, measured by multiplying common shares outstanding (CSHO) by year-end price (PRCC_F)
SALES_GROWTH	Year-over-year change in sales (SALE) scaled by prior year sales
MTB	Market-to-book ratio, measured as market value of equity (CSHO*PRCC_F) scaled by book value of equity (CEQ)
LEV	Leverage, measured as long-term debt (DLC+DLTT) scaled by total assets
INTANG	Intangible assets (INTAN) scaled by total assets
R&D	R&D expense (XRD) scaled by total assets
PPE	Property, plant, and equipment (PPENT) scaled by total assets
CASH_RATIO	Cash and cash equivalents (CHE) scaled by total assets
TOTAL_ACCRUALS	Total accruals (IB-OANCF+XIDOC) scaled by total assets
BIG_N	1 if a firm-year has a Big N auditor, 0 otherwise
LOSS_INTENSITY	Count of the number of years with a pretax loss in the prior five fiscal years, scaled by five. If fewer than five prior years are available, we require at least three prior years of pretax income and adjust the scale for the number of available years
FORINC	Pretax foreign income (PIFO) scaled by total assets. Set to zero if PIFO is missing
MISS_PIFO	1 if PIFO is missing, 0 otherwise
GEO_CONC	HHI-based measure of concentration of geographic segment sales
SIGMA_CFO	Standard deviation of operating cash flows to assets measured over three trailing fiscal years

Governance test variables:

LIT_RISK	Ex-ante litigation risk, following Kim and Skinner (2012), Table 7, Model (2)
GOOD_GOV_G	Gompers, Ishii, and Metrick (2003) governance index, transformed to be increasing in good governance and to range from 0 to 1
GOOD_GOV_E	Bebchuk, Cohen, and Farrell (2009) entrenchment index, transformed to be increasing in good governance and to range from 0 to 1
NONCAPTIVE_HAVEN	1 if a firm has one or more subsidiaries in tax havens that are not captive insurance subsidiaries, 0 otherwise
FAM_FIRM	1 for founding family ownership, 0 otherwise, following Wang (2006) and McGuire, Wang, and Wilson (2014)
FAM_OWN_PCT	Percentage ownership by founding family, following Wang (2006) and McGuire, Wang, and Wilson (2014)
CEO_FIRM_WEALTH	Natural logarithm of CEO firm-specific wealth, following Coles, Daniel, and Naveen (2006)
CEO_DELTA	CEO pay-for-performance sensitivity (delta), following Core and Guay (2002) and Coles, Daniel, and Naveen (2006)
CEO_VEGA	CEO pay convexity (vega), following Core and Guay (2002) and Coles, Daniel, and Naveen (2006)
COOPT_BOARD	Fraction of the board of directions that is co-opted, following Coles, Daniel, and Naveen (2014)

ETR model variables (not previously defined):

CASH_ETR1	Cash taxes paid (TXPD) scaled by pretax income
CASH_ETR3	Sum of cash taxes paid over the current and two future years scaled by the sum of pretax income over the same window
GAAP_ETR1	Total tax expense (TXT) scaled by pretax income

GAAP_ETR3	Sum of total tax expense over the current and two future years scaled by the sum of pretax income over the same window
STATE_ETR1	State tax expense (TXS) scaled by pretax income
STATE_ETR3	Sum of state tax expense over the current and two future years scaled by the sum of pretax income over the same window
LNAT	Natural logarithm of total assets
CAPEX	Capital expenditures (CAPX) scaled by total assets
NOL	1 if NOLs (TLCF) are greater than zero, 0 otherwise
ΔNOL	Change in NOLs scaled by total assets
CAPTIVE_HAVEN	1 if a firm has one or more subsidiaries in a tax haven that are captive insurance subsidiaries, 0 otherwise
CAPTIVE_DOMESTIC	1 if a firm has one or more U.S. incorporated subsidiaries that are captive insurance subsidiaries, 0 otherwise

Dyreng and Lindsey (2009) model variables (not previously defined):

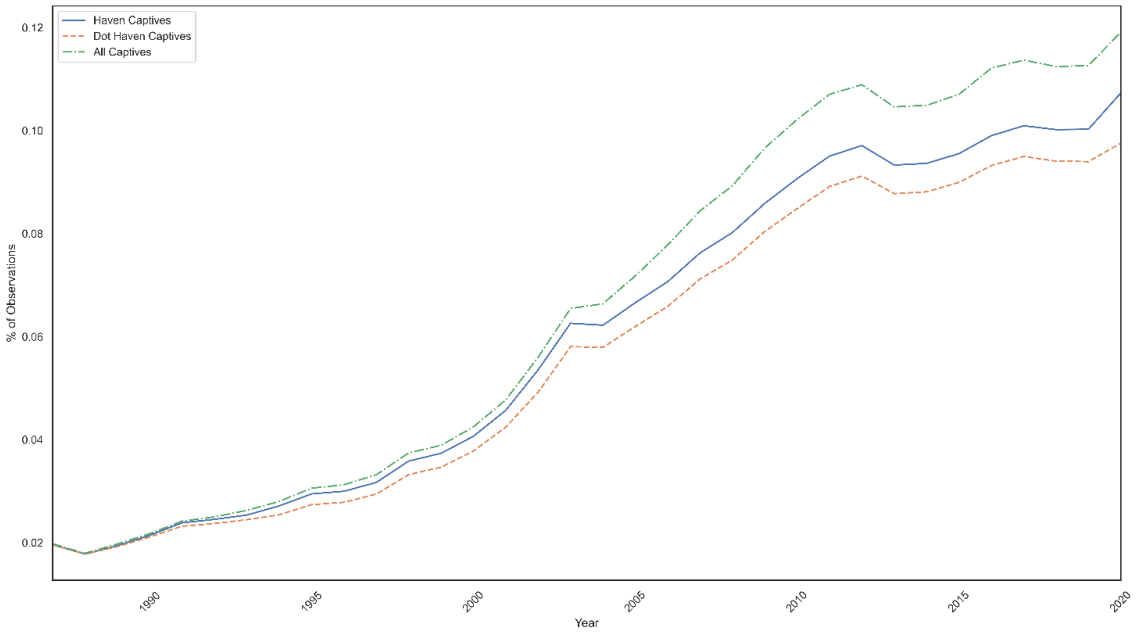
TXWW	Worldwide current tax expense, measured as federal current tax expense (TXFED) plus foreign current tax expense (TXFO)
TXFED	Federal current tax expense (TXFED)
TXFO	Foreign current tax expense (TXFO)
PI	Pretax income (PI)
PIDOM	Domestic pretax income (PIDOM)
PIFO	Foreign pretax income (PIFO)
ORIGINAL_HAVENYEAR	1 if a firm reports a subsidiary on its Exhibit 21 in a tax haven in the current year, 0 otherwise, following Dyreng and Lindsey (2009)
ORIGINAL_HAVENFIRM	1 if a firm reports a subsidiary on its Exhibit 21 in a tax haven at any point in the sample, 0 otherwise, following Dyreng and Lindsey (2009)
MODIFIED_HAVENYEAR	Adjusts *ORIGINAL_HAVENYEAR* by setting to zero any observations for which it was 1 due solely to captive insurance subsidiary presence in a tax haven
MODIFIED_HAVENFIRM	Adjusts *ORIGINAL_HAVENFIRM* by setting to zero any observations for which it was 1 due solely to captive insurance subsidiary presence in a tax haven
CAPTIVE_HAVENYEAR	1 if a firm reports a captive insurance subsidiary on its Exhibit 21 in a tax haven in the current year, 0 otherwise
CAPTIVE_HAVENFIRM	1 if a firm reports a captive insurance subsidiary on its Exhibit 21 in a tax haven at any point in the sample, 0 otherwise
DLTT	Long-term debt
XAD	Advertising expense (XAD)
XRD	R&D expense

Income shifting model variables (not previously defined):

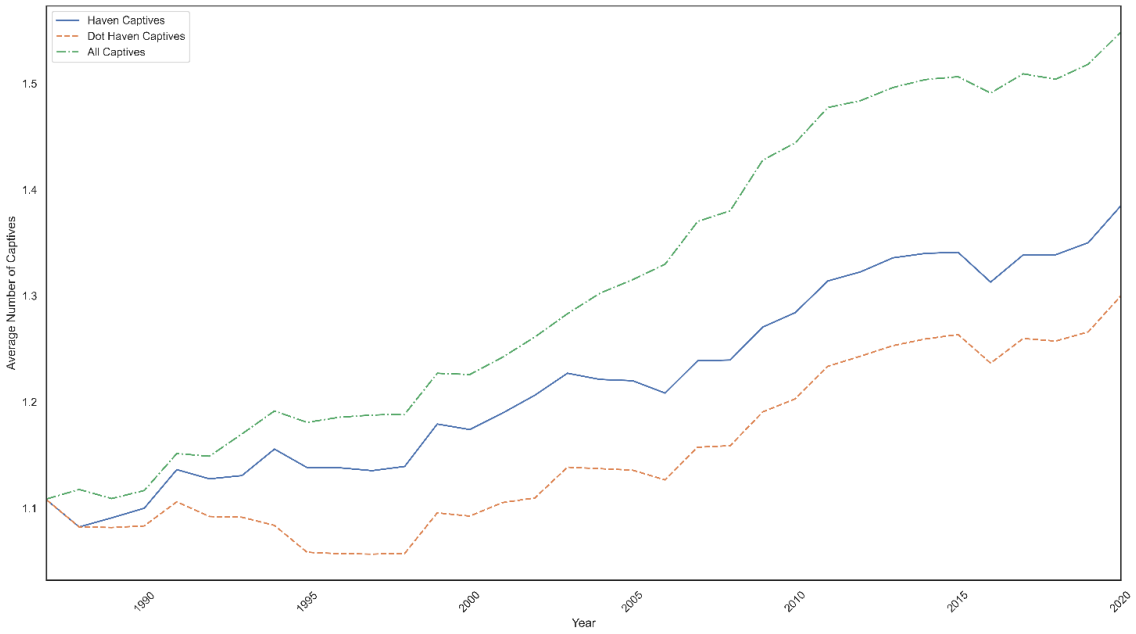
FROS	Foreign return on sales, measured as pretax foreign income scaled by foreign segment sales
WWROS	Worldwide return on sales, measured as pretax income scaled by sales
AVE_FTR	Five-year average foreign tax rate incentive to shift income, measured over five-year rolling windows (following Klassen and Laplante 2012), and calculated as the sum of foreign tax expense (TXFO+TXDFO) over the sum of pretax foreign income (PIFO) less the average top federal U.S. statutory tax rate
ln(AGE)	Natural logarithm of the count of prior and current fiscal years of data in Compustat for each firm

Figure 1. Captives Over Time

Panel A. Percentage of Sample Firm-Years with a Captive Insurance Entity

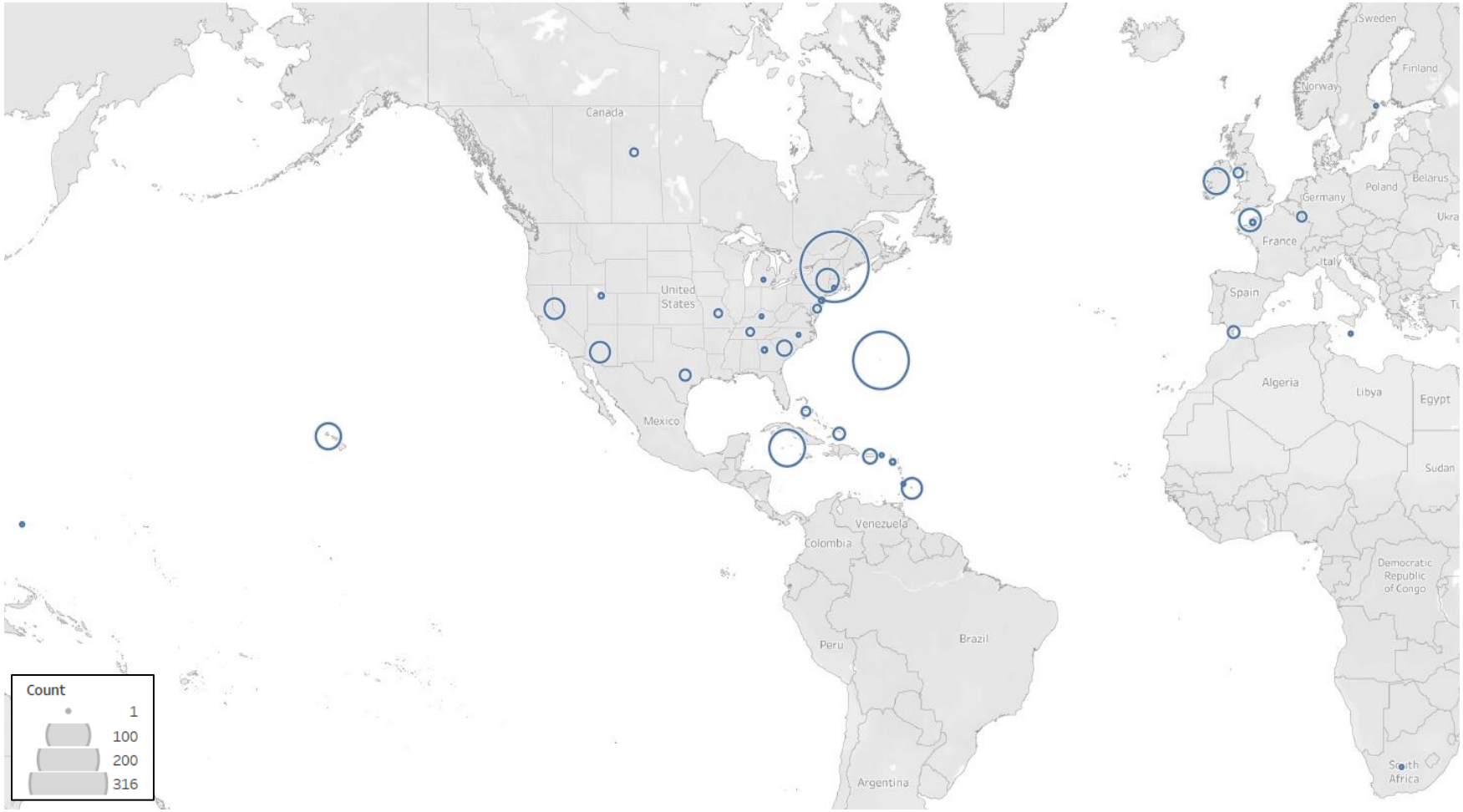


Panel B. Average Number of Captive Insurance Subsidiaries for Firm-Years with a Captive



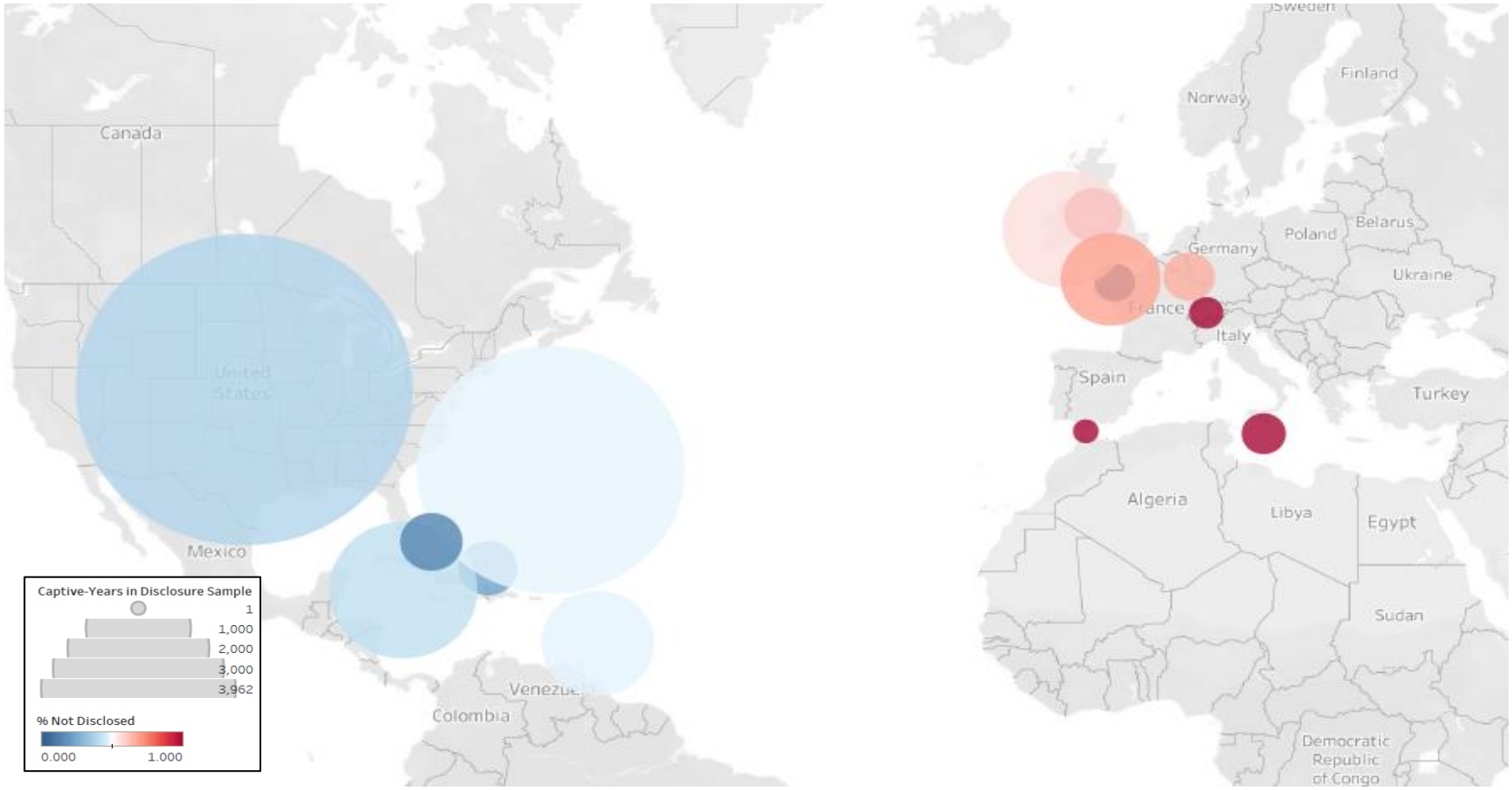
Notes: Panel A displays the trend in sample firm-years with at least one captive insurance entity over the sample window, 1987-2020. Panel B displays the average number of captive insurance subsidiaries per firm for firm-years that have a captive insurance entity over the sample window, 1987-2020.“Haven Captives” are captives in foreign countries identified as tax havens by Dyreng and Lindsey (2009). “Dot Haven Captives” include captives in all tax haven countries except for the “Big Seven” havens, which are Hong Kong, Ireland, Lebanon, Liberia, Panama, Singapore, and Switzerland (Hines and Rice 1994). “All Captives” includes both foreign and domestic captive insurance entities.

Figure 2. Geographic Location of Captive Insurance Subsidiaries
Panel A. All Captive Insurance Subsidiaries



Notes: This figure displays the incorporation location of captive insurance entities owned by sample firms. The placement of blue circles denotes the location of the captive insurance entity. The size of the blue circle denotes the count of captive insurance subsidiaries in that jurisdiction and corresponds to the legend at the bottom left. In this graph, U.S. observations are broken out by state.

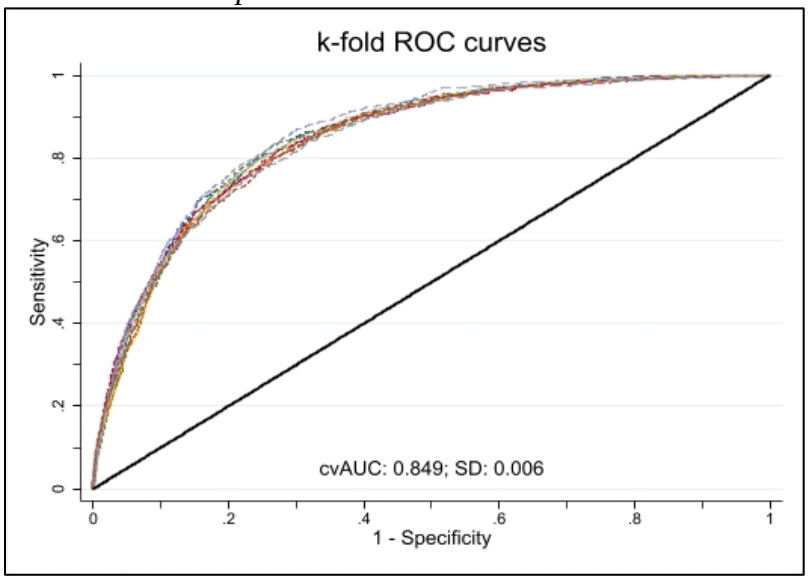
Figure 2—continued
Panel B. Captive Insurance Subsidiaries Disclosed in Exhibit 21 versus Not Disclosed



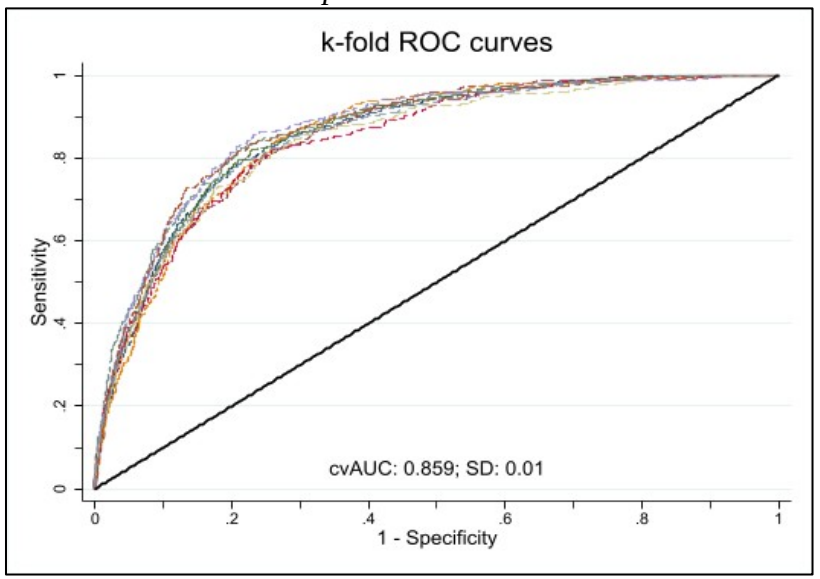
Notes: This figure displays the incorporation location of captive insurance entities owned by sample firms for which we can obtain an Exhibit 21 disclosure from directEDGAR, i.e., the disclosure sample. The size of each circle denotes the number of captive insurance subsidiaries located in a given jurisdiction. The shading of the circle denotes the percentage of non-disclosure—dark blue indicates full disclosure and dark red indicates full non-disclosure. In this graph, we group all U.S. observations into one jurisdiction.

Figure 3. Out-of-Sample k-Fold Validation: ROC Curves

Panel A. Full Sample

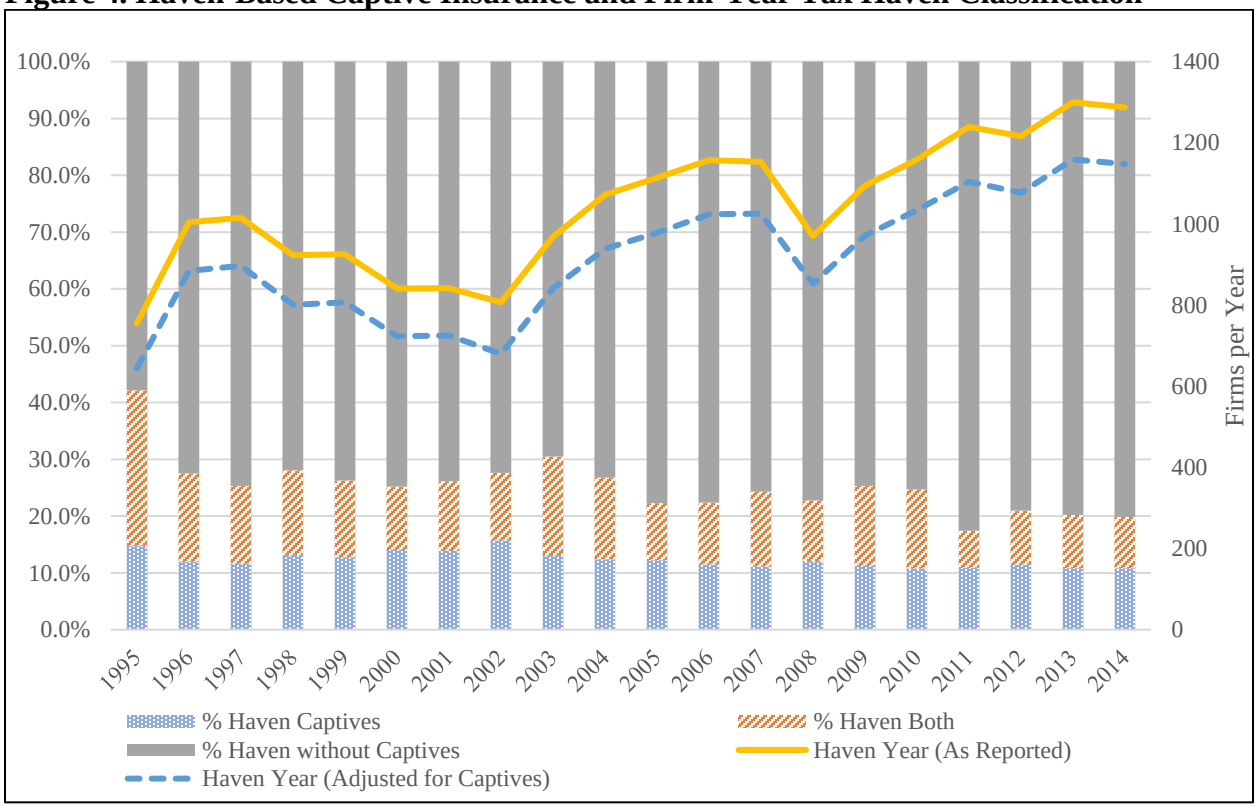


Panel B. Disclosure Sample



Notes: These figures display the cross-validated receiver operator characteristic (ROC) curves for out-of-sample validation of the determinants model. To conduct this, we perform k-fold (k=10) validation separately on the full sample (Panel A) and on the disclosure sample (Panel B). Each graph separately reports the mean cross-validated area under the ROC curves (cvAUC) and its standard deviation (SD).

Figure 4. Haven-Based Captive Insurance and Firm-Year Tax Haven Classification



Notes: Using subsidiary location data provided by Scott Dyreng, which extends the data used in Dyreng and Lindsey (2009), we merge the disclosure sample and consider which observations have subsidiaries in tax havens and whether those subsidiaries are all or partially captive insurance subsidiaries. For each sample year, we report the percentage of firm-years that report haven subsidiaries none of which are captives (grey bars), that report haven subsidiaries that are both captives and not (orange bars), and that report haven subsidiaries all of which are captives (blue bars). The yellow line represents the time series of observations classified as having a presence in a tax haven based on Exhibit 21 reporting. The light blue line represents the time series of observations classified as having a tax haven after removing observations whose disclosed tax haven presence is solely due to captive insurance.

Table 1. Location and Industry Frequencies

Unique Captives by Incorporation Location	
Domicile	Freq.
Australia	6
Bahamas	**6**
Barbados	**72**
Belgium	3
Bermuda	**271**
British Virgin Islands	**3**
Canada	7
Cayman Islands	**114**
Denmark	2
France	1
Germany	7
Gibraltar	**20**
Guernsey	**105**
Hong Kong	**1**
Ireland	**106**
Isle of Man	**41**
Jersey	**4**
Liechtenstein	**2**
Luxembourg	**51**
Malta	**12**
Micronesia	**5**
Netherlands	**3**
Netherlands Antilles	**2**
New Zealand	3
Norway	3
Singapore	**21**
South Africa	10
St. Kitts & Nevis	**3**
St. Lucia	**1**
Sweden	15
Switzerland	**9**
Turks & Caicos	**9**
United States, AZ	29
United States, CT	2
United States, DC	16
United States, DE	6
United States, GA	2
United States, HI	49
United States, KY	2
United States, MI	1
United States, MO	6
United States, NC	1
United States, NJ	2
United States, NV	28
United States, NY	40
United States, SC	15
United States, TN	5
United States, TX	9
United States, UT	2
United States, VT	360
Total	1,493

Firm-Years with a Captive by Fama-French 49 Industry		
Code	Industry Description	Freq.
1	Agriculture	17
2	Food Products	300
3	Candy & Soda	57
4	Beer & Liquor	106
5	Tobacco Products	40
6	Recreation	64
7	Entertainment	124
8	Printing and Publishing	76
9	Consumer Goods	236
10	Apparel	32
11	Healthcare	174
12	Medical Equipment	187
13	Pharmaceutical Products	294
14	Chemicals	441
15	Rubber and Plastic Products	23
16	Textiles	14
17	Construction Materials	223
18	Construction	303
19	Steel Works Etc	249
20	Fabricated Products	0
21	Machinery	361
22	Electrical Equipment	108
23	Automobiles and Trucks	419
24	Aircraft	164
25	Shipbuilding, Railroad Equipment	45
26	Defense	18
27	Precious Metals	65
28	Non-Metallic & Industrial Metal Mining	100
29	Coal	16
30	Petroleum and Natural Gas	529
31	Utilities	336
32	Communication	444
33	Personal Services	129
34	Business Services	396
35	Computer Hardware	85
36	Computer Software	179
37	Electronic Equipment	242
38	Measuring and Control Equipment	106
39	Business Supplies	174
40	Shipping Containers	86
41	Transportation	583
42	Wholesale	170
43	Retail	439
44	Restaurants, Hotels, Motels	194
45	Banking	893
46	Insurance	1,081
47	Real Estate	54
48	Trading	352
49	Other: Almost Nothing	0
Total		10,728

Notes: This table presents geographic location and industry frequencies for the full sample before requiring data to construct determinants model variables. On the left are incorporation location frequencies for each captive insurance subsidiary. **Bolded** jurisdictions are classified as tax havens. On the right are Fama-French 49 industry classification frequencies for each firm-year with a captive insurance subsidiary.

Table 2. Location Frequencies: Disclosure of Captive Insurance Subsidiaries in Exhibit 21

Domicile	Captive-Year Total	Disclosed Captive-Years	Percent Disclosed
Bahamas	**56**	**48**	**85.7%**
Barbados	**313**	**165**	**52.7%**
Bermuda	**2,396**	**1,255**	**52.4%**
Cayman Islands	**613**	**357**	**58.2%**
Gibraltar	**1**	**0**	**0.0%**
Guernsey	**227**	**74**	**32.6%**
Ireland	**415**	**183**	**44.1%**
Isle of Man	**44**	**6**	**13.6%**
Jersey	**10**	**10**	**100.0%**
Luxembourg	**29**	**10**	**34.5%**
Malta	**15**	**0**	**0.0%**
Singapore	**2**	**0**	**0.0%**
Switzerland	**4**	**0**	**0.0%**
Turks & Caicos	**46**	**35**	**76.1%**
United States, AZ	184	86	46.7%
United States, DC	56	30	53.6%
United States, DE	20	6	30.0%
United States, HI	400	266	66.5%
United States, KY	13	10	76.9%
United States, MO	26	25	96.2%
United States, NC	3	0	0.0%
United States, NV	189	131	69.3%
United States, NY	237	186	78.5%
United States, SC	98	51	52.0%
United States, TN	21	14	66.7%
United States, TX	9	9	100.0%
United States, UT	21	18	85.7%
United States, VT	2,685	1,605	59.8%
Subtotal: United States	3,962	2,437	61.5%
Total	8,133	4,580	56.3%

Notes: This table displays the incorporation location of captive insurance entity-years owned by sample firms for which we can obtain an Exhibit 21 disclosure from directEDGAR, i.e., the disclosure sample. For each jurisdiction, we report the total captive-years, the total disclosed captive-years, and the percent of disclosure. **Bolded** jurisdictions are classified as tax havens.

Table 3. Descriptive Statistics

Panel A. Determinants Model Variables

	N	Mean	S.D.	P25	Median	P75
CAPTIVE	78,649	0.099	0.299	0.000	0.000	0.000
N_CAPTIVES	78,649	0.140	0.500	0.000	0.000	0.000
PTROA	78,649	0.061	0.136	0.018	0.063	0.122
ln(MVE)	78,649	6.644	1.978	5.240	6.580	7.951
SALES_GROWTH	78,649	0.119	0.269	0.000	0.060	0.184
MTB	78,649	3.297	4.411	1.361	2.096	3.508
LEV	78,649	0.231	0.198	0.045	0.210	0.363
INTANG	78,649	0.134	0.180	0.000	0.049	0.208
R&D	78,649	0.036	0.078	0.000	0.000	0.034
PPE	78,649	0.270	0.249	0.069	0.190	0.414
CASH_RATIO	78,649	0.156	0.187	0.024	0.081	0.219
TOTAL_ACCRUALS	78,649	-0.048	0.076	-0.080	-0.043	-0.012
BIG_N	78,649	0.874	0.332	1.000	1.000	1.000
LOSS_INTENSITY	78,649	0.182	0.291	0.000	0.000	0.250
FORINC	78,649	0.012	0.031	0.000	0.000	0.010
MISS_PIFO	78,649	0.572	0.495	0.000	1.000	1.000
GEO_CONC	78,649	0.508	0.345	0.223	0.333	1.000
SIGMA_CFO	78,649	0.052	0.049	0.022	0.038	0.065

Notes: This panel presents descriptive statistics for the variables in the captive insurance entity determinants model. We report the number of observations (N), mean, standard deviation (S.D.), 25th percentile (P25), median, and 75th percentile (P75).

Table 3—continued

Panel B. Determinants Model Variables: Firm-Years with versus without Captives

	***CAPTIVE* = 1**			***CAPTIVE* = 0**			**Mean**		**Median**	
	N	**Mean**	**Median**	**N**	**Mean**	**Median**	**Diff.**	**t-stat.**	**Diff.**	**z-stat.**
CAPTIVE	7,801	1.000	1.000	70,848	0.000	0.000	n.a.	n.a.	n.a.	n.a.
N_CAPTIVES	7,801	1.409	1.000	70,848	0.000	0.000	n.a.	n.a.	n.a.	n.a.
PTROA	7,801	0.074	0.069	70,848	0.060	0.063	0.014	8.400	0.006	5.763
ln(MVE)	7,801	8.786	8.835	70,848	6.409	6.379	2.377	107.950	2.456	73.114
SALES_GROWTH	7,801	0.073	0.039	70,848	0.124	0.063	-0.051	-15.960	-0.024	-16.425
MTB	7,801	3.446	2.259	70,848	3.281	2.081	0.165	3.130	0.178	8.125
LEV	7,801	0.273	0.261	70,848	0.227	0.200	0.046	19.690	0.061	24.682
INTANG	7,801	0.166	0.099	70,848	0.131	0.044	0.035	16.570	0.055	21.223
R&D	7,801	0.015	0.000	70,848	0.039	0.000	-0.024	-26.010	-0.000	-6.082
PPE	7,801	0.282	0.219	70,848	0.269	0.187	0.013	4.380	0.032	9.795
CASH_RATIO	7,801	0.099	0.068	70,848	0.163	0.084	-0.064	-28.680	-0.016	-12.489
TOTAL_ACCRUALS	7,801	-0.042	-0.039	70,848	-0.049	-0.043	0.006	6.970	0.004	7.123
BIG_N	7,801	0.976	1.000	70,848	0.863	1.000	0.113	28.760	0.000	28.610
LOSS_INTENSITY	7,801	0.100	0.000	70,848	0.191	0.000	-0.091	-26.310	-0.000	-22.051
FORINC	7,801	0.020	0.001	70,848	0.011	0.000	0.009	24.790	0.001	33.940
MISS_PIFO	7,801	0.425	0.000	70,848	0.588	1.000	-0.163	-27.830	-1.000	-27.699
GEO_CONC	7,801	0.374	0.269	70,848	0.523	0.333	-0.149	-36.400	-0.064	-32.701
SIGMA_CFO	7,801	0.032	0.025	70,848	0.054	0.040	-0.022	-37.870	-0.015	-41.571

Notes: This panel displays means and medians for each variable in the determinants model for firm-years with captive insurance subsidiaries (*CAPTIVE* = 1) and for firm-years without captive insurance subsidiaries (*CAPTIVE* = 0). We test the difference in means and medians and report the respective test statistics.

Table 4. Determinants Model

Panel A. In-Sample Estimation

	Logistic	OLS	OLS
	(1)	(2)	(3)
	CAPTIVE	*CAPTIVE*	*N_CAPTIVES*
PTROA	-1.496***	-0.105***	-0.173***
	(-3.589)	(-6.517)	(-6.640)
ln(MVE)	0.722***	0.058***	0.092***
	(19.254)	(18.651)	(15.259)
SALES_GROWTH	-0.488***	-0.041***	-0.062***
	(-3.639)	(-6.953)	(-6.876)
MTB	-0.009	-0.001*	-0.003***
	(-1.062)	(-1.924)	(-3.298)
LEV	0.842***	0.049***	0.065**
	(2.968)	(2.714)	(2.321)
INTANG	-1.865***	-0.114***	-0.170***
	(-5.486)	(-4.482)	(-3.436)
R&D	-9.709***	-0.149***	-0.180***
	(-4.434)	(-4.220)	(-3.527)
PPE	-1.597***	-0.096***	-0.165***
	(-4.821)	(-4.093)	(-4.150)
CASH_RATIO	-1.680***	-0.093***	-0.137***
	(-3.617)	(-4.971)	(-4.449)
TOTAL_ACCRUALS	1.239**	0.120***	0.211***
	(2.431)	(5.359)	(5.677)
BIG_N	0.156	-0.006	-0.022**
	(0.933)	(-0.919)	(-2.303)
LOSS_INTENSITY	0.080	0.015*	0.034***
	(0.532)	(1.910)	(2.594)
FORINC	-0.390	0.063	0.166
	(-0.282)	(0.536)	(0.749)
MISS_PIFO	-0.373***	-0.010	-0.009
	(-3.178)	(-1.167)	(-0.600)
GEO_CONC	-0.732***	-0.028**	-0.053**
	(-4.053)	(-2.480)	(-2.387)
SIGMA_CFO	-3.810***	0.040	0.109*
	(-2.889)	(1.045)	(1.781)
Fixed Effects	FF49, Year	FF49, YEAR	FF49, YEAR
Observations	78,649	78,649	78,649
Pseudo R-Squared	0.304		
Adjusted R-squared		0.177	0.166
Area under ROC Curve (AUROC)	0.873		

Notes: Column (1) presents logistic estimation of the captive insurance determinants model, and column (2) estimates the same model using a linear probability approach. In column (3), we estimate a model of the count of captive insurance entities owned by firms in the sample. All tests in this panel are estimated using the full sample. In parentheses, below each coefficient, are test statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 4—continued

Panel B. Out-of-Sample k-Fold Validation (k=10): Prediction Model Characteristics

	Full Sample	**Disclosure Sample**
Mean AUROC	0.849	0.859
Bootstrap AUROC 95% C.I.	(0.845,0.854)	(0.856, 0.865)
Sensitivity	0.818	0.834
Specificity	0.723	0.737
Precision	0.899	0.918
Accuracy	0.733	0.745

Notes: This panel reports the outputs from the out-of-sample estimation of column (1) from Panel A. We utilize k-fold cross-validation to obtain estimates for the cross-validated AUROC and estimate confidence intervals by bootstrapping 1,000 times. We report sensitivity, specificity, precision, and accuracy as well. We conduct this testing on the full sample and the disclosure sample (i.e., for which we are able to obtain Exhibit 21 data).

Table 5. Governance Tests

	(1) *CAPTIVE*	(2) *CAPTIVE*	(3) *CAPTIVE*	(4) *CAPTIVE*	(5) *CAPTIVE*	(6) *CAPTIVE*	(7) *CAPTIVE*	(8) *CAPTIVE*	(9) *CAPTIVE*
LIT_RISK	0.159***								
	(6.421)								
GOOD_GOV_G		-0.267***							
		(-4.131)							
GOOD_GOV_E			-0.068**						
			(-2.210)						
NONCAPTIVE_HAVEN				0.157***					
				(19.300)					
FAM_FIRM					0.176***				
					(3.300)				
FAM_OWN_PCT						0.277***			
						(5.533)			
CEO_FIRM_WEALTH							0.009***		
							(2.873)		
CEO_DELTA								0.006**	
								(2.257)	
CEO_VEGA								-0.007***	
								(-2.652)	
COOPT_BOARD									0.023***
									(2.843)
Determinants Model Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR
Observations	78,649	18,039	32,577	78,649	3,669	3,669	33,903	33,903	23,249
Adjusted R-squared	0.179	0.191	0.207	0.223	0.209	0.209	0.205	0.205	0.230

Notes: In this table, we estimate linear probability models for having a captive insurance subsidiary. Each column tests whether a different measure of corporate governance affects the probability of captive insurance. All models include the full set of covariates from the determinants model in Table 4. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 6. Effective Tax Rate Tests

Panel A. Additional Descriptive Statistics for Effective Tax Rate Tests

	N	Mean	S.D.	P25	Median	P75
CASH_ETR1	*61,044*	*0.261*	*0.218*	*0.096*	*0.243*	*0.357*
CASH_ETR3	*61,657*	*0.278*	*0.211*	*0.135*	*0.267*	*0.364*
GAAP_ETR1	*64,239*	*0.296*	*0.171*	*0.212*	*0.333*	*0.382*
GAAP_ETR3	*64,699*	*0.306*	*0.177*	*0.227*	*0.337*	*0.384*
STATE_ETR1	*52,682*	*0.039*	*0.077*	*0.004*	*0.025*	*0.051*
STATE_ETR3	*53,108*	*0.042*	*0.079*	*0.006*	*0.028*	*0.053*
LNAT	*78,649*	*6.780*	*1.925*	*5.347*	*6.701*	*8.120*
CAPEX	*78,649*	*0.052*	*0.059*	*0.015*	*0.035*	*0.068*
NOL	*78,649*	*0.371*	*0.483*	*0.000*	*0.000*	*1.000*
ΔNOL	*78,649*	*0.012*	*0.090*	*0.000*	*0.000*	*0.000*

Notes: This panel presents descriptive statistics for variables in the effective tax rate tests that are not included in the determinants tests. We report the number of observations (N), mean, standard deviation (S.D.), 25th percentile (P25), median, and 75th percentile (P75).

Table 6—continued

Panel B. Captive Insurance Subsidiaries and Effective Tax Rates

	(1)	(2)	(3)	(4)	(5)	(6)
	CASH_ETR1	*CASH_ETR3*	*GAAP_ETR1*	*GAAP_ETR3*	*STATE_ETR1*	*STATE_ETR3*
CAPTIVE	**0.005**	**0.006**	**0.003**	**0.003**	**-0.001**	**0.000**
	(0.867)	**(0.963)**	**(0.592)**	**(0.591)**	**(-0.396)**	**(0.234)**
PTROA	-0.406***	-0.429***	0.071***	-0.006	-0.129***	-0.114***
	(-16.555)	(-19.330)	(3.927)	(-0.368)	(-15.174)	(-13.297)
LNAT	-0.001	-0.004***	-0.001	-0.001	-0.003***	-0.003***
	(-1.147)	(-3.147)	(-0.753)	(-0.646)	(-6.957)	(-8.200)
SALES_GROWTH	0.040***	-0.018***	0.024***	0.006*	0.013***	0.005***
	(9.502)	(-4.227)	(7.678)	(1.733)	(8.229)	(3.248)
MTB	0.001***	0.002***	0.000	0.001***	0.001***	0.001***
	(4.046)	(4.763)	(0.095)	(3.920)	(5.658)	(5.718)
LEV	-0.150***	-0.143***	-0.065***	-0.077***	-0.022***	-0.019***
	(-14.059)	(-12.389)	(-7.172)	(-7.879)	(-6.564)	(-5.253)
INTANG	0.070***	0.075***	0.071***	0.087***	0.016***	0.020***
	(6.854)	(6.839)	(8.753)	(9.591)	(4.845)	(5.605)
R&D	-0.134***	-0.152***	-0.147***	-0.086**	0.022	0.015
	(-3.880)	(-3.825)	(-5.130)	(-2.530)	(1.625)	(1.006)
CAPEX	-0.140***	-0.234***	-0.021	-0.020	-0.039***	-0.031***
	(-4.848)	(-7.617)	(-0.895)	(-0.788)	(-4.097)	(-3.190)
TOTAL_ACCRUALS	-0.069***	-0.220***	-0.421***	-0.358***	-0.065***	-0.081***
	(-3.461)	(-10.988)	(-25.681)	(-21.109)	(-7.908)	(-9.522)
FORINC	-0.360***	-0.283***	-0.463***	-0.327***	-0.215***	-0.180***
	(-7.458)	(-5.546)	(-11.510)	(-7.598)	(-14.684)	(-12.462)
MISS_PIFO	-0.035***	-0.038***	-0.026***	-0.024***	-0.004***	-0.003**
	(-9.920)	(-9.924)	(-9.010)	(-7.240)	(-3.159)	(-1.977)
BIG_N	0.001	0.005	-0.003	0.000	-0.000	0.002
	(0.133)	(0.968)	(-0.874)	(0.002)	(-0.285)	(1.013)
LOSS_INTENSITY	-0.154***	0.007	-0.071***	0.014*	-0.004	0.050***
	(-24.148)	(0.783)	(-13.222)	(1.769)	(-1.238)	(12.825)
SIGMA_CFO	0.012	0.036	-0.154***	-0.127***	0.032**	0.019
	(0.356)	(0.879)	(-5.580)	(-3.872)	(2.551)	(1.287)
NOL	-0.021***	-0.026***	0.001	-0.001	-0.002**	-0.003***
	(-7.194)	(-7.974)	(0.530)	(-0.346)	(-2.158)	(-2.787)
ΔNOL	0.145***	0.134***	0.072***	0.114***	0.026**	0.003
	(6.195)	(5.298)	(3.499)	(5.065)	(2.525)	(0.353)
Fixed Effects	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR
Observations	61,044	61,657	64,239	64,699	52,682	53,108
Adjusted R-squared	0.137	0.160	0.210	0.189	0.073	0.093

Notes: This panel presents OLS estimations of effective tax rate models, specifically testing the null prediction that captive insurance subsidiaries do not facilitate tax savings for U.S. multinational corporations. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 6—continued

Panel C. The Effect of Captive and Noncaptive Haven Subsidiaries on Effective Tax Rates

	(1)	(2)	(3)	(4)	(5)	(6)
	CASH_ETR1	*CASH_ETR3*	*GAAP_ETR1*	*GAAP_ETR3*	*STATE_ETR1*	*STATE_ETR3*
CAPTIVE_DOMESTIC	**0.004**	**0.007**	**0.005**	**0.005**	**-0.001**	**0.001**
	(0.752)	**(1.177)**	**(1.072)**	**(0.957)**	**(-0.668)**	**(0.699)**
CAPTIVE_HAVEN	**0.004**	**-0.003**	**-0.008**	**0.006**	**-0.001**	**0.002**
	(0.722)	**(-0.457)**	**(-1.619)**	**(1.153)**	**(-0.280)**	**(0.888)**
NONCAPTIVE_HAVEN	**-0.003*****	**-0.006*****	**-0.012*****	**-0.009*****	**0.001**	**0.001**
	(-3.316)	**(-2.813)**	**(-4.991)**	**(-3.538)**	**(0.348)**	**(1.209)**
PTROA	-0.406***	-0.429***	0.072***	-0.006	-0.129***	-0.114***
	(-16.559)	(-19.319)	(3.964)	(-0.338)	(-15.167)	(-13.291)
LNAT	-0.001	-0.004***	-0.000	-0.000	-0.003***	-0.003***
	(-1.182)	(-3.048)	(-0.346)	(-0.359)	(-6.897)	(-8.062)
SALES_GROWTH	0.040***	-0.018***	0.024***	0.006*	0.013***	0.005***
	(9.498)	(-4.217)	(7.676)	(1.738)	(8.234)	(3.260)
MTB	0.001***	0.002***	0.000	0.001***	0.001***	0.001***
	(4.049)	(4.755)	(0.091)	(3.911)	(5.666)	(5.737)
LEV	-0.150***	-0.143***	-0.066***	-0.078***	-0.022***	-0.019***
	(-14.050)	(-12.412)	(-7.272)	(-7.944)	(-6.581)	(-5.297)
INTANG	0.070***	0.075***	0.070***	0.086***	0.016***	0.020***
	(6.861)	(6.803)	(8.612)	(9.508)	(4.841)	(5.605)
R&D	-0.134***	-0.152***	-0.148***	-0.086**	0.022	0.015
	(-3.878)	(-3.830)	(-5.168)	(-2.540)	(1.626)	(1.013)
CAPEX	-0.140***	-0.233***	-0.019	-0.018	-0.038***	-0.030***
	(-4.861)	(-7.589)	(-0.820)	(-0.729)	(-4.075)	(-3.119)
TOTAL_ACCRUALS	-0.069***	-0.220***	-0.422***	-0.359***	-0.065***	-0.081***
	(-3.455)	(-11.007)	(-25.768)	(-21.155)	(-7.913)	(-9.546)
FORINC	-0.360***	-0.285***	-0.467***	-0.330***	-0.216***	-0.181***
	(-7.453)	(-5.582)	(-11.671)	(-7.696)	(-14.697)	(-12.486)
MISS_PIFO	-0.035***	-0.038***	-0.026***	-0.023***	-0.004***	-0.003*
	(-9.923)	(-9.886)	(-8.833)	(-7.122)	(-3.135)	(-1.909)
BIG_N	0.001	0.004	-0.003	-0.000	-0.000	0.002
	(0.139)	(0.948)	(-0.972)	(-0.063)	(-0.293)	(0.995)
LOSS_INTENSITY	-0.154***	0.007	-0.071***	0.014*	-0.004	0.050***
	(-24.150)	(0.786)	(-13.238)	(1.765)	(-1.231)	(12.839)
SIGMA_CFO	0.012	0.036	-0.153***	-0.125***	0.032**	0.019
	(0.353)	(0.888)	(-5.544)	(-3.839)	(2.553)	(1.298)
NOL	-0.021***	-0.026***	0.001	-0.001	-0.002**	-0.003***
	(-7.195)	(-7.973)	(0.538)	(-0.343)	(-2.163)	(-2.806)
ΔNOL	0.145***	0.134***	0.072***	0.114***	0.026**	0.003
	(6.195)	(5.296)	(3.504)	(5.068)	(2.524)	(0.359)
Fixed Effects	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR	FF49, YEAR
Observations	61,044	61,657	64,239	64,699	52,682	53,108
Adjusted R-squared	0.137	0.160	0.211	0.189	0.073	0.093

Notes: This panel presents OLS estimations of effective tax rate models. In these tests, we split out captive insurance subsidiaries that are incorporated in the U.S. and those that are incorporated in tax haven countries. We also introduce a measure for subsidiaries that are not captive insurers but are located in tax haven countries. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 7. Estimating Worldwide Current Tax Rates for Firm-Years with Tax Haven Subsidiaries – Dyreng and Lindsey (2009) Tests

Panel A. Estimation of Original Model

	PI > 0	*PI* ≤ 0
	(1)	(2)
	TXWW	*TXWW*
INTERCEPT	-0.002***	0.002***
	(-20.110)	(33.114)
PI	0.384***	0.007***
	(167.549)	(9.527)
*PI * ORIGINAL_HAVENYEAR*	-0.011***	0.000
	(-2.987)	(0.176)
*PI * ORIGINAL_HAVENFIRM*	-0.005	0.000
	(-0.913)	(0.216)
*PI * NOL*	-0.028***	-0.000
	(-27.999)	(-0.190)
*PI * LNAT*	-0.010***	-0.001***
	(-33.248)	(-8.110)
*PI * DLTT*	-0.044***	0.001**
	(-16.786)	(2.103)
*PI * XAD*	0.012***	-0.004***
	(12.925)	(-6.179)
*PI * XRD*	-0.182***	-0.002***
	(-17.569)	(-2.984)
Observations	22,697	4,894
Adjusted R-squared	0.869	0.025

Notes: This panel estimates the original Dyreng and Lindsey (2009) model for worldwide current tax expense (*TXWW*) from 1995 through 2014. Haven measures use Exhibit 21 data and haven classifications provided by Scott Dyreng. We use MM-estimation robust regression. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 7—continued

Panel B. HAVENYEAR and HAVENFIRM with Captive Insurance Subsidiaries Removed

	PI > 0	*PI* ≤ 0
	(1)	(2)
	TXWW	*TXWW*
INTERCEPT	-0.002***	0.003***
	(-20.004)	(39.282)
PI	0.384***	0.007***
	(164.840)	(9.525)
*PI * MODIFIED_HAVENYEAR*	-0.043***	0.000
	(-4.533)	(0.332)
*PI * MODIFIED_HAVENFIRM*	-0.003	0.000
	(-1.397)	(0.103)
*PI * NOL*	-0.028***	-0.000
	(-27.857)	(-0.178)
*PI * LNAT*	-0.010***	-0.001***
	(-33.389)	(-8.133)
*PI * DLTT*	-0.044***	0.001**
	(-16.351)	(2.110)
*PI * XAD*	0.012***	-0.004***
	(12.909)	(-6.138)
*PI * XRD*	-0.182***	-0.002***
	(-17.536)	(-2.982)
Observations	22,697	4,894
Adjusted R-squared	0.870	0.025

Notes: This panel estimates the original Dyreng and Lindsey (2009) model for worldwide current tax expense (*TXWW*) from 1995 through 2014. *MODIFIED_HAVENYEAR* and *MODIFIED_HAVENFIRM* include adjustments to remove the effects of captive insurance subsidiaries from the original *HAVENYEAR* and *HAVENFIRM* measures, respectively. We use MM-estimation robust regression. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 7—continued

Panel C. Using Actual Captive Insurance Entity Data to Split Out Captive and Noncaptive HAVENYEAR and HAVENFIRM

	PI > 0	*PI* ≤ 0	*PI* > 0	*PI* ≤ 0
	(1)	(2)	(3)	(4)
	TXWW	*TXWW*	*TXWW*	*TXWW*
INTERCEPT	-0.002***	0.002***	-0.002***	0.004***
	(-20.623)	(33.195)	(-20.394)	(23.361)
PI	0.425***	0.008***	0.380***	0.009***
	(181.164)	(10.210)	(176.929)	(9.385)
*PI * CAPTIVE_HAVENYEAR*	0.008***	-0.001	0.009***	-0.000
	(2.687)	(-0.287)	(2.995)	(-0.005)
*PI * CAPTIVE_HAVENFIRM*	0.000	0.001	-0.003	0.002
	(0.109)	(0.606)	(-1.391)	(0.904)
*PI * MODIFIED_HAVENYEAR*			-0.042***	0.000
			(-4.162)	(0.035)
*PI * MODIFIED_HAVENFIRM*			-0.002	0.000
			(-0.834)	(0.188)
*PI * NOL*	-0.026***	-0.000	-0.028***	-0.000
	(-25.633)	(-0.260)	(-27.589)	(-0.592)
*PI * LNAT*	-0.010***	-0.001***	-0.009***	-0.001***
	(-29.606)	(-7.989)	(-28.963)	(-7.251)
*PI * DLTT*	-0.047***	0.001**	-0.042***	0.002***
	(-16.172)	(2.048)	(-15.782)	(3.094)
*PI * XAD*	0.012***	-0.004***	0.012***	-0.004***
	(12.548)	(-6.158)	(12.646)	(-5.755)
*PI * XRD*	-0.231***	-0.002***	-0.185***	-0.002**
	(-21.452)	(-2.871)	(-17.873)	(-2.446)
Observations	22,697	4,894	22,697	4,894
Adjusted R-squared	0.861	0.024	0.870	0.025

Notes: This panel estimates the original Dyreng and Lindsey (2009) model for worldwide current tax expense (*TXWW*) from 1995 through 2014. *CAPTIVE_HAVENYEAR* and *CAPTIVE_HAVENFIRM* are calculated solely based on captive insurance subsidiary data and indicate whether observations have captive insurance subsidiaries in tax haven countries. As in Panel B, *MODIFIED_HAVENYEAR* and *MODIFIED_HAVENFIRM* include adjustments to remove the effects of captive insurance subsidiaries from the original *HAVENYEAR* and *HAVENFIRM* measures, respectively. We use MM-estimation robust regression. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 7—continued

Panel D. Using Prediction Model to Identify Captive Insurance in Havens

	Removing **Predicted** *CAPTIVE_HAVEN* = 1	
	PI > 0	*PI* ≤ 0
	(1)	(2)
	TXWW	*TXWW*
INTERCEPT	-0.002***	0.003***
	(-13.244)	(18.095)
PI	0.381***	0.012***
	(79.127)	(5.385)
*PI * ORIGINAL_HAVENYEAR*	-0.035***	0.001
	(-7.698)	(0.473)
*PI * ORIGINAL_HAVENFIRM*	-0.004	0.008
	(-0.976)	(0.500)
*PI * NOL*	-0.026***	-0.001
	(-9.614)	(-0.945)
*PI * LNAT*	-0.010***	-0.003***
	(-13.032)	(-4.432)
*PI * DLTT*	-0.042***	0.005***
	(-5.911)	(2.816)
*PI * XAD*	0.234***	-0.053*
	(14.614)	(-1.779)
*PI * XRD*	-0.188***	-0.005*
	(-4.435)	(-1.658)
Observations	17,063	3,834
Adjusted R-squared	0.849	0.022

Notes: This panel estimates the original Dyreng and Lindsey (2009) model for worldwide current tax expense (*TXWW*) from 1995 through 2014. We re-estimate the tests of Panel A after removing observations predicted to have captive insurance subsidiaries in havens using the out-of-sample prediction model scores (Table 4, Panel B). We use MM-estimation robust regression. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.

Table 8. Income Shifting Tests

Panel A. Using Actual Captive Insurance Entity Data to Identify Captive Insurers in Havens

					Removing *NONCAPTIVE_HAVEN* = 0	
	(1)	(2)	(3)	(4)	(5)	(6)
	CAPTIVE_HAVEN = 1	*CAPTIVE_HAVEN = 0*	*NONCAPTIVE_HAVEN = 1*	*NONCAPTIVE_HAVEN = 0*	*CAPTIVE_HAVEN = 1*	*CAPTIVE_HAVEN = 0*
	FROS	*FROS*	*FROS*	*FROS*	*FROS*	*FROS*
WWROS	0.729***	0.619***	0.627***	0.656***	0.755***	0.618***
	(4.779)	(8.659)	(9.381)	(7.408)	(4.847)	(8.589)
AVE_FTR	-0.036**	-0.056***	-0.055***	-0.020	-0.038**	-0.056***
	(-2.383)	(-8.577)	(-8.711)	(-1.121)	(-2.133)	(-8.565)
ln(MVE)	0.007	0.006***	0.006***	0.014	0.008	0.006***
	(1.234)	(2.975)	(3.205)	(1.502)	(1.167)	(2.950)
ln(AGE)	-0.002	-0.010**	-0.010**	0.003	-0.008	-0.009*
	(-0.076)	(-2.018)	(-2.116)	(0.181)	(-0.354)	(-1.904)
PTROA	-0.143	-0.115*	-0.109*	-0.209*	-0.195	-0.110
	(-0.921)	(-1.678)	(-1.691)	(-1.915)	(-1.227)	(-1.596)
Fixed Effects	FF49, Year	FF49, Year	FF49, Year	FF49, Year	FF49, Year	FF49, Year
Test of equality: Chi-Squared (p-value)	(1) *AVE_FTR* = (2) *AVE_FTR* 4.47** (0.035)		(3) *AVE_FTR* = (4) *AVE_FTR* 5.24** (0.022)		(5) *AVE_FTR* = (6) *AVE_FTR* 3.44* (0.064)	
Observations	958	6,318	7,091	185	839	6,252
Adjusted R-squared	0.492	0.320	0.328	0.684	0.463	0.321

Notes: In this panel, we present estimations of the Collins, Kemsley, and Lang (1998) model for tax-motivated income shifting, as adapted by McGuire, Rane, and Weaver (2018). In columns (1) and (2), we separate sample observations based on whether firm-years have captive insurance subsidiaries located in tax haven countries. In columns (3) and (4), we separate sample observations based on whether firm-years have subsidiaries located in tax haven countries that are not captive insurance subsidiaries. In columns (5) and (6), we repeat the tests from columns (1) and (2) but drop observations that do not have noncaptive tax haven subsidiaries. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. Highlighted cells indicate where we expect haven subsidiaries to facilitate greater income shifting. All variables are defined in Appendix A.

Table 8—continued

Panel B. Using Prediction Model to Identify Captive Insurance in Havens

	Removing **Predicted** *CAPTIVE_HAVEN* = 1	
	(1)	(2)
	ORIGINAL_HAVENYEAR = 1	*ORIGINAL_HAVENYEAR* = 0
	FROS	*FROS*
WWROS	0.543***	0.657***
	(7.368)	(3.167)
AVE_FTR	-0.050***	-0.007
	(-10.086)	(-0.649)
ln(MVE)	0.004**	0.012
	(2.048)	(0.469)
ln(AGE)	-0.010**	-0.028
	(-2.131)	(-0.789)
PTROA	-0.058	-0.447***
	(-0.866)	(-2.931)
Fixed Effects	FF49, Year	FF49, Year
Test of equality:	(8) AVE_FTR = (9) AVE_FTR	
Chi-Squared (p-value)	13.79*** (0.000)	
Observations	5,785	108
Adjusted R-squared	0.291	0.574

Notes: In this panel, we present estimations of the Collins, Kemsley, and Lang (1998) model for tax-motivated income shifting, as adapted by McGuire, Rane, and Weaver (2018). In columns (1) and (2), we separate sample observations using out-of-sample prediction model scores (Table 4, Panel B) to indicate whether firm-years have captive insurance subsidiaries located in tax haven countries. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. The highlighted cell indicates where we expect haven subsidiaries to facilitate greater income shifting. All variables are defined in Appendix A.

Table 9. Estimating Federal and Foreign Current Tax Rates for Firm-Years with Tax Haven Subsidiaries – Dyreng and Lindsey (2009) Tests

	PIDOM > 0, *PIFO* > 0	*PIDOM* > 0, *PIFO* > 0
	(1)	(2)
	TXFED	*TXFO*
INTERCEPT	-0.003***	0.001***
	(-23.423)	(13.926)
PIDOM	0.358***	-0.014***
	(72.009)	(-7.366)
PIFO	0.030***	0.215***
	(8.306)	(84.444)
*PIDOM * MODIFIED_HAVENYEAR*	0.002	0.000
	(1.091)	(0.041)
*PIFO * MODIFIED_HAVENYEAR*	-0.002	-0.035***
	(-0.513)	(-3.077)
*PIDOM * CAPTIVE_HAVENYEAR*	-0.005	0.001
	(-0.704)	(1.045)
*PIFO * CAPTIVE_HAVENYEAR*	0.020***	0.030***
	(4.729)	(7.269)
Control variables interacted with *PIDOM*	Yes	Yes
Control variables interacted with *PIFO*	Yes	Yes
Observations	16,883	16,883
Adjusted R-squared	0.891	0.845

Notes: This table estimates the original Dyreng and Lindsey (2009) model for federal current tax expense (*TXFED*) in column (1) and foreign current tax expense (*TXFO*) in column (2). *MODIFIED_HAVENYEAR* is adjusted to remove the effects of captive insurance subsidiaries, and *CAPTIVE_HAVENYEAR* is calculated solely based on captive insurance subsidiary data and indicates whether a firm-year has a captive insurance subsidiary located in a tax haven country. We use MM-estimation robust regression. In parentheses, below each coefficient, are *t*-statistics based on standard errors clustered by firm. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels. All variables are defined in Appendix A.