Strategic Alliances and Tax Avoidance: The Role of R&D Tax Credits

Abstract:

We identify tax avoidance as a previously undocumented benefit of forming strategic alliances. Since strategic alliances are governed by incomplete contracts with unspecified contingencies, we hypothesize that the gaps in these contracts make it difficult for external monitors to verify information and thus create opaqueness and related opportunities for alliance partners to achieve tax savings through shifting expenses. Consistent with this prediction, we find that firms with strategic alliances have lower cash effective tax rates than firms without such alliances. Specifically, we uncover that strategic alliance firms are more likely to use R&D tax credits and tax havens. Separating strategic alliances into joint ventures and contractual alliances, we find that our tax avoidance results are mostly driven by firms engaging in contractual alliances that exhibit a greater degree of complexity and information opaqueness. Moreover, our ensuing path analysis shows that contractual alliance firms employ R&D tax credits, rather than tax havens, as a tax avoidance vehicle. We further find that our baseline results are present in the subsample of domestic only firms, but absent from the subsample of multinational firms. This suggests a novel mechanism for domestic tax avoidance. We also document that strategic alliance firms pay more tax consulting fees, which is a possible cost of facilitating the use of these tax avoidance vehicles. Collectively, we show a novel mechanism of domestic tax avoidance as domestic firms can exploit their alliance relations to claim R&D tax credits.

Keywords: Strategic alliances; Tax avoidance; R&D tax credit; Tax haven; Incomplete contract

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1. INTRODUCTION

A strategic alliance is an arrangement between two companies to undertake a mutually beneficial project while each retains its independence. A company may enter into a strategic alliance to expand into a new market, improve its product line, or develop an edge over a competitor. Extant research on strategic alliances has focused on issues related to governance (e.g., Ivanov and Masulis, 2010), performance (e.g., Robinson, 2008), funding (e.g., Lerner and Merges, 1998; Lerner and Elfenbein, 2003; Lerner, Shane, and Tsai, 2003), equity participation (e.g., Robinson and Stuart, 2007a; 2007b), and auditing (Demirkan and Zhou, 2016). Different from these studies, we identify tax avoidance as a benefit of forming a strategic alliance.

It has been documented that less transparency can result in more tax avoidance (De Simone, Lester, and Markle, 2020; Overesch and Wolff, 2021). Given that it is challenging and costly to specify all contingencies, most of the incomplete contracts are relatively simple with fewer provisions (Hart and Moore, 2008; Hart, 2009; Halonen-Akatwijuka and Hart, 2013). When a dispute falls into a gap in the contract, the contention needs to be either addressed by bargaining between involved parties or resolved by court rulings. In contrast to standard contracts, strategic alliances lower transparency because incomplete contracts embedded in these collaborative agreements make it difficult for alliance partners to anticipate all future contingencies (Das, Sen, and Sengupta, 1998; Gomes-Casseres, 2006).[1] Given provisions in strategic alliance contracts are often vague and difficult to verify (Robinson and Stuart, 2007a), this opaque information

[1] Indeed, strategic alliances are found to be more likely when involved partners do not require intense contracts (Baxamusa, Datta, and Jha, 2021).

environment caused by incomplete contracts could create opportunities for strategic alliance firms to engage in tax avoidance.

Consistent with this prediction, we find that firms with strategic alliances have lower cash effective tax rates than firms without such strategic alliances. To investigate the mechanism used by our sample of strategic alliance firms to achieve tax savings, we separate strategic alliances into joint ventures and contractual alliances. Consistent with our argument that opacity created by a strategic alliance creates opportunities for more tax avoidance, we find that our tax avoidance results are mostly driven by firms engaging in contractual alliances that exhibit a greater degree of complexity and information opaqueness. As alliances are prevalent among high tech industries that require a large degree of learning and flexibility (Ciborra, 1991; Oster, 1992), we further disaggregate contractual alliances into R&D alliances and non-R&D alliances and show that our tax avoidance results are associated with R&D alliances rather than non-R&D alliances.[2] Next, we focus on R&D tax credits and tax havens as two potential channels of tax avoidance for our sample of strategic alliance firms.

First, while R&D tax credits are found to stimulate R&D spending (Finley, Lusch, and Cook, 2015; Rao, 2016), many of the firms heavily involved in R&D (e.g., small startup firms and large technology or pharmaceutical firms) are not able to benefit from the R&D deduction and/or the R&D tax credit. For example, most startup firms are not profitable (Van de Ven et al., 1984; Reynolds, 2016) and thus not able to lower income taxes through R&D deductions or tax credits. To qualify for the R&D tax credits in their current form, many firms must spend over 16 percent

[2] Contractual alliances consist of licensing, R&D, manufacturing and supply, and marketing, and other agreements. Given our focus on R&D tax credits, we separate contractual alliances into R&D and non-R&D alliances.

of their gross receipts on qualified R&D expenses.[3] Many large technology and pharmaceutical firms with high gross receipts spend considerable amount of money on marketing, administration, and distribution. As a result, these firms often fail to meet the minimum threshold for qualified research expenses and thus do not qualify for the R&D credits. As a response to these constraints, firms exploit the ambiguity in tax reporting to classify indirect costs as R&D expenditures and take advantage of the R&D tax credits (Laplante, Skaife, Swenson, and Wangerin, 2019). Proposing a new scheme undocumented in the literature, we suggest that partner firms in strategic alliances can transfer the qualified R&D expenses from the small unprofitable firm to the large profitable firm and thus allow the large profitable firm to claim the R&D credits. Due to the flexibility and information asymmetry of a strategic alliance, it would be almost impossible for an outside party to trace exactly what expenses are paid by which party and verify the nature of those expenses.

Second, tax havens offering foreign businesses minimal or no tax liabilities are frequently used by multinational firms to avoid paying taxes in countries with high tax rates (e.g., Hines and Rice, 1994; Graham and Tucker, 2006; Dyreng and Lindsey, 2009; Dyreng, Lindsey, and Thornock, 2013). The Organization for Economic Cooperation and Development (OECD) identifies a linkage between tax havens and lack of effective exchange of information (Corporate Finance Institute, 2020. Showing the importance of opaqueness to tax haven use, Bennedsen and Zeume (2018) report that one-third of firms affected by bilateral tax information exchange agreements (TIEAs) between U.S. and tax havens engage in haven hopping by moving subsidiaries from tax havens that entered TIEAs to tax havens that did not. Moreover, Cen, Maydew, Zhang,

[3] We note the actual calculation of the R&D tax credit is very complex and the 16 percent of qualified research expenses cut off varies by firm history. We discuss the rules for calculating the R&D tax credit in our literature review below.

and Zuo (2017) find that customers and suppliers likely engage in tax avoidance strategies involving shifting profits to tax haven subsidiaries. Given that standard supplier agreements are typically more structured and less complicated than strategic alliance contracts (Mayer and Teece, 2008), we conjecture that the opaque information environment induced by gaps in incomplete contracts could provide strategic alliance firms more camouflage and greater opportunities to explore the use of tax havens.

We find that strategic alliance firms are more likely to use both R&D tax credits and tax havens. Additionally, we perform a path analysis to better understand how much tax savings come from each of our two identified tax avoidance channels.[4] Specifically, our path analysis focuses on the direct and indirect (mediated) paths between contractual alliances and tax avoidance, because we find that R&D tax credits and tax havens are primarily used by contractual alliance firms rather than joint venture firms.[5] Contractual alliances have an insignificant direct effect on tax avoidance, which confirms that alliances are established primarily for operational or financial reasons rather than for tax avoidance. However, contractual alliances have a significant effect on tax avoidance via the indirect path for R&D tax credits, but not via the indirect path for tax havens. In particular, we find that the indirect path mediated by R&D tax credits accounts for 28.6% of the total effect between strategic alliances and tax avoidance. We find an insignificant path through tax haven use, consistent with Christensen, Kenchington, and Laux (2022), who find that tax haven firms are less likely to attain low ETR despite having more opportunities for aggressive tax planning.[6]

[4] Capable of estimating both the magnitude and significance of causal connections between variables (Wright, 1934), path analysis has been used in research on financial accounting (Bushee and Noe, 2000; Bhattacharya, Ecker, Olsson, and Schipper, 2011; Kanagaretnam, Lim, and Lobo, 2014), auditing (Lu, Richardson, and Salterio, 2011; DeFond, Lim, and Zang, 2016), and taxation (Demere, Donohoe, and Lisowsky, 2020).

[5] This is consistent with the evidence that earnings quality is lower for contractual alliance firms than for joint venture firms (Demirkan and Demirkan, 2014).

[6] While tax havens offer firms with tax savings, they also impose risks that result in a higher cost of capital for these firms (Lewellen, Mauler, and Watson, 2021). In addition, multinational firms with tax haven operations are under

Overall, our path analysis shows that the contractual alliance firms largely achieve lower ETR through qualifying for R&D tax credits rather than shifting profits to tax haven subsidiaries.

Dyreng, Hanlon, Maydew, and Thornock (2017) show that domestic only firms' effective tax rates have been dropping at a similar rate to multinational firms' effective tax rates. Unlike the well documented tax haven effect for multinational firms, the mechanisms through which domestic only firms avoid taxes are not well understood (Lampenius, Shevlin, and Stenzel, 2021). The R&D tax credit mechanism to avoid taxes that we identify above could occur as easily among domestic only firms as among multinational firms. Accordingly, we split our sample into domestic only and multinational firms and re-examine our main results. We find that our baseline results are present in the subsample of domestic only firms, but absent from the subsample of multinational firms. This suggests that one way domestic only firms may be lowering their effective tax rates is exploiting the ambiguity of strategic alliances and taking advantage of the R&D tax credits.

Many public accounting firms provide consulting services regarding the use of R&D tax credits or tax havens (Brown, Shu, Soo, and Trompeter, 2013; Feingold, 2021). For example, Jones, Temouri, and Cobham (2018) document a positive association between the Big 4 public accounting firms and the extent to which multinational firms build, manage, and maintain their networks of tax haven subsidiaries. Given the synergy between financial reporting and tax accounting (e.g., Maydew and Shackelford, 2007; Joe and Vandervelde, 2007), companies that purchase auditor-provided tax services can more accurately estimate their income tax positions (Gleason and Mills, 2011; Gleason, Mills, and Nessa, 2018). We document that strategic alliance firms buy more auditor-provided tax services compared to non-strategic alliance firms. This

increasing public scrutiny and do not want to be perceived as being overly aggressive in tax planning (e.g., Dyreng, Hoopes, and Wilde, 2016; Dyreng, Hoopes, Langetieg, and Wilde, 2020).

suggests that public accounting firms play a role in facilitating the tax avoidance of strategic alliance firms and that the identified tax avoidance may come at an additional cost.

Our study contributes to the literature in several aspects. First, our paper adds to the emerging strategic alliance literature in accounting. Demirkan and Zhou (2016) find that the non-verifiability of information and potential agency behavior in alliances increase audit complexity and thus result in higher audit fees. Ge, Ji, and Louis (2021) show that the number of governance provisions imposed on a firm by a strategic alliance partner decreases with the firm's accounting quality. Different from these two articles' respective focus on auditing and financial accounting, our paper adds a new tax dimension by investigating the relation between strategic alliances and tax avoidance.

Second, our paper extends the R&D tax credit literature. The extant studies on R&D tax credits largely pay attention to the policy issues. For example, Finley et al. (2015) and Rao (2016) find that R&D tax credits stimulate R&D spending as intended by the regulation. Although R&D tax credits are calculated based on accounting information, few accounting studies have examined the earnings management incentives for meeting the R&D tax credit thresholds. From the perspective of accrual earnings management, Laplante et al. (2019) find that firms exploit the ambiguity in tax reporting to classify indirect costs as R&D expenditures so as to take advantage of the R&D tax credit. In contrast, from the viewpoint of real earnings management, our paper documents that firms can obtain tax savings via the R&D tax credits by forming strategic alliances.

Third, our paper uncovers a novel mechanism for domestic tax avoidance. As tax haven research has focused almost entirely on multinational firms whose operations in multiple tax jurisdictions creates opportunities for income shifting (e.g., Graham and Tucker, 2006; Dyreng and Lindsey, 2009), little is known about how domestic only firms avoid taxes in general beyond

recent research showing that domestic firms avoid taxes through lowering their tax bases rather than tax rates (Lampenius et al., 2021). Recently, Christensen et al. (2022) find that the majority of low ETR firms rely on large net operating loss carryforwards (NOLs) to build their favorable tax positions, whereas multinationals and tax haven firms are less likely to attain low ETR despite having more opportunities for aggressive tax planning. Different from these studies with an international focus, we show that domestic firms are able to shift income across their alliance partners in the same country to claim R&D tax credits and thus lower their tax rates.

Fourth, our paper enriches the incomplete contract literature. Cen et al. (2017) find that firms in customer-supply relationships are better able to identify and implement tax avoidance strategies via supply chains. However, Mayer and Teece (2008, 120) point out that strategic alliance contracts and standard supplier agreements differ in payment terms and incentives, administrative structure, exchange of proprietary information and technological knowledge, and contingencies and dispute resolution. Supporting this argument, our paper identifies R&D tax credits as a primary tax avoidance vehicle for strategic alliance firms and points out contractual incompleteness as a driver of tax avoidance in situations like this. Christensen, Nikolaev, and Wittenberg-Moerman (2016) call for more accounting research motivated by the incomplete contract theory, which broadens our understanding of the role accounting information plays in contracting. Our empirical study is a step in this direction, as we provide novel evidence regarding the effect of incomplete contracts on tax avoidance.

The rest of the paper is as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 describes variable measurement and discusses research design. Section 4 outlines sample selection and reports descriptive statistics. Section 5 presents main empirical findings. Section 6 performs additional analyses. Section 7 concludes.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Tax Avoidance and Income Shifting

Tax avoidance is the general process firms take to lower the taxes they pay. Tax avoidance can vary from clearly legal and low risk actions such as taking deductions for legitimate business expenses to illegal and risky actions such as using tax shelters (Hanlon and Heitzman, 2010). Prior research has examined many ways firms have avoided taxes (see Wilde and Wilson, 2018 for a review). Dyreng et al. (2017) document that from 1988 to 2012, firms tax avoidance efforts lowered the average effective tax rate of US firms by five to ten percent. This trend holds among multinational firms and domestic only firms.

Researchers expected a decrease in tax rates among multinational firms due to dropping foreign tax rates and income shifting across country borders. On the other hand, researchers have struggled to understand how domestic only firms lowered their tax rates from 1988 to 2012. Some of the change can be explained by the increase in loss firms over that period and how those loss firms report taxes in the financial statements (Henry and Sansing, 2018; Drake, Hamilton, and Lusch, 2020). Yet these papers cannot explain the entire reduction in effective tax rates for domestic only firms. Further, we still know very little about how domestic only firms avoid taxes in general beyond recent research showing that domestic firms avoid taxes through lowering their tax bases rather than tax rates (Lampenius et al., 2021).

One common tax avoidance approach is income shifting—when firms shift income (expenses) from (to) high tax rate taxpayers to (from) low tax rate taxpayers. This income shifting has been widely documented among multinational firms (Harris, Morck, and Slemrod, 1993; Klassen, Lang, and Wolfson, 1993; Collins, Demsley, and Lang, 1998; Grubert, 2003). Given that these multinational firms have operations and legal entities all over the world, they are able to shift

their income to lower tax jurisdictions and lower their overall tax expense. For domestic only firms, there is some evidence of shifting income across states (Dyreng, Lindsey, and Thornock, 2013; Li, Ma, and Shevlin, 2021), but this only affects state income taxes which are only a fraction of federal income taxes.

Some recent papers have delved into the mechanisms of income shifting. Blouin, Robinson, and Seidman (2018) show that when firms coordinate their transfer pricing across units and countries, they are able to minimize their taxes. Both Klassen, Lisowsky, and Mescall (2017) and De Simone, Huang, and Krull (2017) show how R&D is an important avenue through which multinationals can shift income. R&D creates intellectual property, which is difficult to price and track. This allows firms to shift income without tax authorities having power to stop them. De Simone and Sansing (2018) show that multinational firms facilitate income shifting through cost sharing arrangements between different legal entities within the same firm.

Prior research has found a connection between income shifting and information asymmetry (Chen, Hepfer, Quinn, and Wilson, 2018). The complexity of international tax law helps facilitate this for multinational firms. As domestic only firms do not have that built in complexity or information asymmetry in their income taxes, they must find other areas of information asymmetry or turn to other tax avoidance methods. We next explore whether strategic alliances could become a significant tool for domestic tax avoidance.

2.2 Strategic Alliances

A strategic alliance is a collaborative partnership between at least two legally independent firms that pool subsets of their resources to achieve mutually beneficial objectives (e.g., Baum, Calabrese, and Silverman, 2000; Baker, Gibbons, and Murphy, 2002). Prior research has identified a number of benefits that firms gain from strategic alliances: minimizing costs (Lerner and Rajan,

2006), acquiring expertise (Gomes-Casseres, Jaffe, and Hagedoorn, 2006), enhancing resources (Chan, Kensinger, Keown, and Martin, 1997), reducing risk and obtaining economies of scale (Contractor and Lorange, 2004). Strategic alliances can generally be split into two groups: joint ventures and contractual alliances. Joint ventures involve two firms establishing a separate legal entity, sharing equity and managerial control. A contractual alliance is a looser agreement that does not create a separate legal entity. For our study, an important part of contractual alliances is that they are typically open-ended and based on incomplete contracts. While complete contracts specify the legal consequences of every possible situation, incomplete contracts do not. Instead, to reduce complexity and save costs, incomplete contracts rely on bargaining or court rulings to help any future disputes.

The incomplete contracts within contractual alliances lead to more flexibility between the two firms working together. This flexibility comes at a cost of increased opacity and information asymmetry. Prior research has found that this information asymmetry has a direct cost in higher audit fees (Demirkan and Zhou, 2016). Additionally, recent work shows that higher accounting quality can lower information asymmetry and therefore facilitate contractual agreements by reducing the number of provisions in such contracts (Ge, Ji, and Louis, 2020)

2.3 Tax Havens

Tax havens are countries with low tax rates and high levels of privacy (Dharmapala and Hines, 2009). They structure their tax laws in a way that facilitates firms' ability to shift income out of average tax law countries into the tax haven where income is barely taxed. While it is easy to define a tax haven, it is sometimes more difficult to determine exactly what countries should be considered tax havens (Dharmapala and Hines, 2009; Dyreng and Lindsey, 2009). Generally, tax haven countries tend to be small but well governed (Dharmapala and Hines, 2009). U.S. firms with

subsidiaries in tax havens have been shown to have worldwide effective tax rates 1.5 percentage points lower than firms with no tax haven subsidiaries (Dyreng and Lindsey, 2009). However, this difference may not come at the expense of the United States (Dyreng and Lindsey, 2009). Recent research has given some doubt to these prior findings, and suggests that NOLs might be driving prior tax haven findings (Christensen et al., 2022).

2.4 R&D Tax Credit

The R&D tax credit was first implemented in the United States in 1981 and has remained a part of the US tax system through various extensions and changes (Tillinger, 1991; Holtzman, 2017). It is now a permanent part of the current US tax system. In 2014, businesses claimed over 12.5 billion dollars through the R&D tax credit (IRS 2021) which is roughly 3.8 percent of total corporate income tax receipts by the US in 2014 (Tax Foundation 2021). Its calculation has generally been equal to 20 percent of qualified R&D expenses above a baseline based on the prior five years of R&D expenses or 16 percent of gross receipts, whichever is lower.[7] Qualified R&D expenses do not include foreign research, advertising or promotion, costs of land, HR expenses related to research, or employee training among other things (see §41 Internal Revenue Code for a complete explanation of what does and does not qualify for the R&D credit).

Prior research has examined the effectiveness of R&D tax credits at the country level, finding that each dollar spent by the federal government for the credit led to $1.74 of additional spending on R&D (Berger, 1993). This additional spending on R&D is primarily found in high-tech firms which have profitable innovation opportunities (Chen and Gupta, 2017). Research has also shown how the R&D tax credit in conjunction with wages paid via stock options can help

[7] Through the author's estimation of possible R&D tax credits, we found that most large R&D intensive firms spend over 16% of gross receipts on R&D in any given year. Thus, the 16% limit is generally the limit that is of most interest to these R&D intensive firms.

offsets the incentives firms have to limit R&D in attempts to avoid earnings decreases (Brown and Krull, 2008). Yet to our knowledge, no prior research has examined how the R&D tax credit in conjunction with contractual alliances can lower a firm's effective tax rate. We give a complete example how Symantec Corporation could have increased their R&D tax credit using a contractual alliance in Appendix 2.

2.5 Hypotheses

It has been documented that less transparency can result in more tax avoidance (De Simone, Lester, and Markle, 2020; Overesch and Wolff, 2021). Strategic alliances involve incomplete contracts with few provisions (Hart and Moore, 2008; Hart, 2009; Halonen-Akatwijuka and Hart, 2013), which lead to lower transparency (Das, Sen, and Sengupta, 1998; Gomes-Casseres, 2006). Further, provisions in strategic alliance contracts are often vague and difficult to verify (Robinson and Stuart, 2007a). This opaque information environment caused by incomplete contracts could create opportunities for strategic alliance firms to engage in tax avoidance. Thus, we state our first hypothesis as follows.

H1: *Firms with strategic alliances will have lower effective tax rates than other firms.*

As noted above, strategic alliances come in two major types. First, a joint venture is created with a new legal entity that owns and directs the joint work of the two companies. Second, a contractual alliance is formed when the companies work together without creating a new legal entity. Consistent with our argument that opacity created by a strategic alliance creates opportunities for more tax avoidance, we conjecture that tax avoidance results would be mostly driven by firms engaging in contractual alliances that exhibit a greater degree of complexity and information opaqueness. Thus, we have our second hypothesis as follows.

H2: *Firms with contractual alliances instead of joint ventures will have lower effective tax rates than other firms.*

Many of the firms heavily involved in R&D cannot benefit from the R&D tax credit. Large technology and pharmaceutical firms often spend so much money on marketing, administration, and distribution that they fail to meet the minimum threshold for qualified research expenses and thus do not qualify for the R&D credits. Small R&D firms rarely have enough taxable income to benefit from R&D credits. Accordingly, partner firms in strategic alliances can transfer the qualified R&D expenses from the small unprofitable firm to the large profitable firm and thus allow the large profitable firm to claim the R&D credits.[8]

H3: *Firms with contractual alliances will have higher R&D tax credits than other firms.*

While tax havens are frequently used by multinational firms to avoid paying taxes in countries with high tax rates (e.g., Hines and Rice, 1994; Graham and Tucker, 2006; Dyreng and Lindsey, 2009; Dyreng, Lindsey, and Thornock, 2013), opaqueness is also a driving factor of tax haven use (Bennedsen and Zeume, 2018). Further, the opaque information environment induced by gaps in incomplete contracts could provide strategic alliance firms more camouflage and greater opportunities to explore the use of tax havens. Given that strategic alliance and tax haven use are associated with a desire for and an increase of opaqueness, firms involved in strategic alliance should also be more likely to be involved in tax havens. Formally we have our fourth hypothesis as follows.

[8] We note that prior research has found that firms with low tax rates were more likely to create separate legal partnerships to perform R&D rather than R&D in house (Shevlin, 1987). It could be that firms can use R&D partnerships to maximize their R&D expense shifting and related tax savings without the need to create contractual alliances. Nevertheless, these R&D partnerships do not allow firms to maximize the R&D tax savings and lower their overall tax rates because of the restrictions of the R&D tax credit.

H4: *Firms involved in strategic alliances will have more subsidiaries in tax havens than other firms.*

3. VARIABLE MEASUREMENT AND RESEARCH DESIGN

3.1 Measuring Tax Avoidance

Our measure of tax avoidance is a 3-year cash effective tax rate (*CETR3*) (Chen et al., 2010; Dyreng et al., 2008; Hope et al., 2013; Lennox et al., 2013; Lisowsky et al., 2013). *CETR3* is the ratio of total cash taxes paid in the last three years divided by total pre-tax income net of total special items over the same three years. *CETR3* is a commonly used measure of tax avoidance as it considers both permanent and temporary book-tax differences, is not affected by accruals, and uses easily available public information (Hanlon and Heitzman, 2010).[9] Consistent with prior research, we remove all firm-years that have a negative denominator for *CETR5* and truncate remaining values the range [0, 1] (Dyreng et al., 2010; Dyreng et al., 2017).

3.2 Measuring Tax Avoidance Channels

We focus on two channels through which firms could lower their taxes using strategic alliances: tax havens and R&D tax credit. To capture the use of tax havens, we download a list of firms that have subsidiaries in tax havens from Scott Dyreng's personal website. Locations of operations are identified by the location of a firm's significant subsidiaries as identified in Exhibit 21 of the firm's 10K. We construct an indicator variable, *TaxHaven*, which is equal to one for firms that have a subsidiary in a country that is a known tax haven (as identified by Dyreng and Lindsey (2009)).

[9] We note that our results are consistent if we use a 1-year or 5-year cash ETR or use a 3-year GAAP ETR.

Measuring a firm's R&D tax credit is a challenge because firms are not required to make any disclosures about their use of the credit. Accordingly, we cannot use a firm's actual R&D tax credit, but estimate what that credit could have been using publicly available information. We create a variable, *R&DCredit*, based on publicly disclosed research and development expense and sales. We also use firm pre-tax domestic income data, historic tax rate, and historic R&D tax credit requirements and rules. We know the publicly disclosed values will differ from those reported on tax returns due to differing consolidation and accounting rules between GAAP and tax reporting. These differences will cause noise in our measure. However, we do not think these differences will cause any bias as there is no known connection between these difference in tax reporting and strategic alliances.

The R&D tax credit was first applicable in the US in the second half of 1981. Its basic calculation uses the ratio of R&D expense to sales. And if that ratio is above what it has been the last handful of years, then that additional amount of R&D expense (the amount that puts the current years ratio of R&D expense to sales above prior years baseline) is multiplied by a credit percent (usually 20 percent) and equals the credit amount to be taken. The exact calculation changed from year to year though it mostly stabilized after 1993. In 2007 a simpler alternative calculation was introduced and taxpayers are allowed to take the larger of the two calculations. There are a number of further restrictions and nuances to the calculation of R&D tax credit as fully detailed in Appendix 3.

3.3 Measuring Strategic Alliance Use

We obtain data on strategic alliances from the Strategic Alliance Database of the Securities Data Company (SDC) that includes agreements or contracts formed at various stages of the business. SDC obtains information from publicly available sources, including SEC filings, trade

publications and international counterparts, and news and wire sources. From SDC, we create nine different variables. First, *StrategicAlliance* represents the total number of strategic alliances a firm is involved in a given year regardless of the type of alliance. We then split those strategic alliances into two main groups. *JointVentures* is the number of strategic alliances where a joint venture or new entity is formed owned by both parties to the alliance. *ContractualAlliance* is the number of strategic alliance where no new entity is formed. Contractual alliances are generally part of an incomplete contract. Finally, we split contractual alliances based on the reason firms note for their creation. Given that our theory above suggests that research and development may be key to lowering taxes with contractual alliances, we create *CA_R&D*, the number of research and development contractual alliances, and *CA_nonR&D*, the number of contractual alliances not tied to research and development. These variables as well as the SDC data have been used in a number of prior studies suggesting its validation and usefulness (Anand and Khanna, 2000; Demirkan and Zhou, 2016).

However, the prior literature has found some possible issues with the SDC data. First, the data may not track all alliances entered into by U.S. firms, due to insufficient corporate reporting requirements (Anand and Khanna, 2000).[10] Second, SDC has information on the establishment of strategic alliances, but does not have information on the subsequent dissolutions of these alliances. Third, SDC gives brief descriptions of strategic alliances, but does not disclose the economic magnitudes of these alliances. Despite these limitations, the SDC Strategic Alliance Database is among the most comprehensive sources of information on strategic alliances.

[10] Prior literature was able to cross-verify SDC information about the contractual type of the alliance with non-SDC sources approximately 80 percent (Anand and Khanna 2000) of the time. In our sample 84% of the alliances from the SDC Platinum database match with public sources from which we collected information manually.

3.4 Main Empirical Models

To test the relation between strategic alliances and tax avoidance, we adopt the following multivariate regression model:

$$CETR3_{it} = \beta_0 + \beta_1 Alliance_{it} + \beta_2 Leverage_{it} + \beta_3 Intangible_{it} + \beta_4 ROA_{it} + \beta_5 Foreign_{it} + \beta_6 Loss_{it} + \beta_7 NOL_{it} + \beta_8 Size_{it} + \beta_9 SG\&A_{it} + \beta_{10} PPE_{it} + \beta_{11} CAPEX_{it} + \beta_{12} Advertising_{it} + \beta_{13} Acquisition_{it} + \beta_{14} Restructure_{it} + \beta_{15} Industry_{it} + \beta_{16} Year_t + \varepsilon_{it} \quad (1)$$

In Equation (1), *CETR3* is as defined above and represents tax avoidance. *Alliance* is our variable of interest and takes different forms based on what specific form of alliance we are interested in. We start looking at all *StrategicAlliances*. Then split those into *JointVentures* and *ContractualAlliances*. Finally, we split contractual alliances into *CA_R&D* and *CA_nonR&D*.

In Equation (1), we include control variables previously shown to be related to tax avoidance. *Leverage*, the ratio of debt to assets, controls for the tax deductibility of interest expense compared to dividends (Dyreng et al., 2010; Markle and Shackelford, 2011). *Intangible*, the percent of total assets that are intangible, because research has shown how intangibles can increase flexibility and tax avoidance (Markle and Shackelford, 2011). *ROA*, ratio of net income to lagged assets, *Loss*, indicator variable that a firm had negative net income, and *NOL*, an indicator if the firm has a tax loss carryforward, control for the need of a firm to avoid taxes (Chen et al., 2010; Christensen et al., 2022; Rego, 2003). *Foreign*, an indicator variable if a firm has foreign income, controls for the differences in domestic and foreign tax rates and regimes (Dyreng et al., 2017). *Size*, the natural log of total assets, controls for the complexity of operations and economies of scale (Mills et al., 1988). *SG&A*, selling general and administrative expenses scaled by sales, controls for deductible expenses and operational efficiency (Dyreng et al., 2010). *PPE*, gross property plant and equipment scaled by total assets, and *CAPEX*, capital expenditures scaled by gross property plant and equipment, control for possible deductible depreciation (Dyreng et al.,

2010). *Advertising*, advertising expense scaled by sales, controls for how well known the firm is (Dyreng et al., 2010). We include *Acquisition*, an indicator if the firm made an acquisition that year, and *Restructure*, an indicator that the firm had a major restricting that year, to make sure our results are driven by strategic alliances and not from general expanding or restructuring of a firm. *Industry* is an array of industry fixed effects and controls for the fact that firms in different industries can pay very different tax rates (Dyreng et al., 2008). Finally, *Year* is an array of year fixed effects controlling for general trends and yearly changes in tax avoidance (Dyreng et al., 2017). To limit the impact of possible outliers, all continuous variables are winsorized at the 1st and 99th percentiles unless otherwise noted. Further details about variable definitions can be found in Appendix 2.

As noted above, we are interested not only whether strategic alliances are associated with lower tax rates but also how strategic alliances lower tax rates. Accordingly, we estimate the following two equations looking at different possible tax avoidance channels:

$$TaxHaven_{it} = \beta_0 + \beta_1 Alliance_{it} + \beta_2 Leverage_{it} + \beta_3 Intangible_{it} + \beta_4 ROA_{it} + \beta_5 Foreign_{it} + \beta_6 Loss_{it} + \beta_7 NOL_{it} + \beta_8 Size_{it} + \beta_9 SG\&A_{it} + \beta_{10} PPE_{it} + \beta_{11} CAPEX_{it} + \beta_{12} Advertising_{it} + \beta_{13} Acquisition_{it} + \beta_{14} Restructure_{it} + \beta_{15} Industry_{it} + \beta_{16} Year_t + \varepsilon_{it} \quad (2)$$

$$R\&DCredit_{it} = \beta_0 + \beta_1 Alliance_{it} + \beta_2 R\&D_{it} + \beta_3 Leverage_{it} + \beta_4 Intangible_{it} + \beta_5 ROA_{it} + \beta_6 Foreign_{it} + \beta_7 Loss_{it} + \beta_8 NOL_{it} + \beta_9 Size_{it} + \beta_{10} SG\&A_{it} + \beta_{11} PPE_{it} + \beta_{12} CAPEX_{it} + \beta_{13} Advertising_{it} + \beta_{14} Acquisition_{it} + \beta_{15} Restructure_{it} + \beta_{16} Industry_{it} + \beta_{17} Year_t + \varepsilon_{it} \quad (3)$$

In Equation (2), all variables are as described above. In Equation (3), we include *R&D*, research and development expense scaled by sales, as an additional control variable. Given that the amount

of *R&D* is highly correlated with our estimation of the *R&DCredit*, we want to make sure our results are due to the credit and not just *R&D*.[11]

3.4 Path Analysis

In estimating the analyses above, we can find out if firms who are involved in strategic alliances (specifically contractual alliances), on average, have lower tax rates. And we can examine if this relation is tied to tax havens or the R&D tax credit. But we do not know how much of the effect we find is due to tax havens or the R&D tax credit compared to a direct link between contractual alliances and tax avoidance due to an aggressive attitude or general opaqueness. As shown in Figure 1, we see a possible direct path between contractual alliances and tax avoidance. We also see an indirect path where contractual alliances impact on tax avoidance is mediated by R&D tax credits. Also, we see an indirect path where contractual alliances impact on tax avoidance is mediated by tax havens. To consider these various possible paths our results could represent, we run two structural equation models consistent with Figure 1.

4. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

4.1 Sample Selection

We start our sample with 30,531 firm-years from 2001 to 2011 at the intersection of Compustat and SDC data, requiring that strategic alliances in our sample involve U.S. public firms as participants. Our sample goes from 2001 to 2011 to be consistent with prior research (Demirkan and Zhou, 2016) and allow auditor provided tax fees in additional analysis. Requiring tax avoidance, *CETR3*, removes 12,160 firm-years with negative pretax income less special items over

[11] Given that we are expecting *R&DCredit* as one channel through which strategic alliances will lower tax rates, we do not include *R&D* in Equations (1) or (2). Otherwise, we might control for the channel through which we are expecting strategic alliances to lower tax avoidance. We note that in untabulated analysis we include *R&D* as a control in Equations (1) and (2) and find consistent if statistically weaker results.

the prior three years. We lose an additional 1,306 firm-years due to missing control variables. Our main sample consists of 17,065 firm-years (1,677 firm-years with a strategic alliance) and 3,056 unique firms (849 with a strategic alliance at some point in the sample). When estimating Equation (2) examining tax havens, we remove another 9,298 firm-years due to limitations in that data, leaving 7,767 firm-years. Additional sample selection details are available in Table 1.

4.2 Descriptive Statistics

Table 2 presents the descriptive statistics for the variables in our sample. The mean CETR3 is 24.05 percent which is consistent with prior literature (Dyreng et al., 2017). 64.6 percent of firm-years in our sample have at least one tax haven subsidiary. The mean R&*DCredit* is 0.228 ($0.26 million), but over three-fourths of our sample have zero values for *R&DCredit*. Among those 2,844 observations with a non-zero value for R&*DCredit*, the mean is $14.1 million (ranging from $8,656 to $298.5 million), suggestion substantial tax savings for those who can take the credit (see Tax Foundation 2021). The average number of *StrategicAlliances* in our sample is 0.142, with the majority being contractual alliances (0.123) and not joint ventures (0.019). Roughly one-third of the contractual alliances are R&D related (0.044).

The average firm in our sample has leverage of 20.5 percent, intangible assets of 16.0 percent, and property plant and equipment of 53.0 percent. Firms in our sample are mostly profitable (mean *ROA* is 6.63 percent and only 13.8 percent of firm-years have a loss), which is expected since the requirements for *CETR3* remove a large number of loss years. However, 39.3 percent of firm-years have a net operating loss available for tax purposes. 43.8 percent of firm-years are associated with an acquisition and 27.5 percent are associated with restructuring.

On the right side of Table 2, we split our sample into those firm-years that have at least one strategic alliance (n = 1,677) and those firm-years with no strategic alliances (n = 15,388). We find

that strategic alliance firm-years are associated with a lower tax rate (0.234 compared to 0.241), higher tax haven use (80.9 percent compared to 62.0 percent), and more estimated *R&DCredit* (0.59 compared to 0.19). The *TaxHaven* and *R&DCredit* differences are statistically significant ($p < 0.01$). These univariate results are consistent with strategic alliances being associated with lower tax rates, higher tax haven use, and higher R&D tax credits. We note that most control variables are statistically different between the strategic alliance firm-years and the other. Strategic alliance firm-years have more intangible assets, are more likely to have foreign income, are larger, and are more likely to be involved in an acquisition or restructure (all $p < 0.01$).

Table 3 presents the Pearson correlations between main variables. Consistent with our univariate results in Table 2, we find a negative but insignificant correlation between *StrategicAlliances* and *CETR3* (-0.012; $p > 0.10$), a positive and significant correlation between *StrategicAlliances* and *TaxHaven* (0.122; $p < 0.05$), and a positive and significant correlation between *StrategicAlliances* and *R&DCredit* (0.194; $p < 0.05$). This is additional univariate evidence in support of our hypotheses.

5. MAIN RESULTS

5.1 Strategic Alliances and Tax Avoidance

Table 4 presents our main analysis of the relation between strategic alliances and tax avoidance. As shown in column 1 of Table 4, we find that strategic alliances have a negative and statistically significant relation with *CETR3* (-0.0062; $p < 0.05$), which supports H1 that the opaque information environment caused by incomplete contracts provides strategic alliance firms with tax avoidance opportunities. Relative to firms without strategic alliance, firms with strategic alliances are associated with a lower *CETR3* of 0.62 percent. In column 2 of Table 4, we split strategic

alliances in to *JointVentures* and *ContractualAlliances*. In both cases we find a negative relation with CETR3 (-0.0085 and -0.0059, respectively) but only the coefficient associated with *ContractualAlliances* is statistically significant ($p < 0.05$). Given that contractual alliances exhibit a greater degree of complexity and information opaqueness than joint ventures, the column 2 finding confirms H2 by showing that most of the tax avoidance associated with *StrategicAlliances* is coming through use of *ContractualAlliances*. We conjecture that tax avoidance through contractual alliances could occur through use of R&D tax credits, so in column 3 of Table 4, we split contractual alliances into those formed for R&D reasons and those formed for other reasons. The coefficient is only negative and significant for R&D related contractual alliances (-0.0097; $p < 0.01$), consistent with our expectation.

Coefficients on control variables are consistent with prior research (Dyreng et al. 2010; Mills et al. 1988). We find a positive (negative) relation between acquisitions (restructuring) and tax rates. Overall, the results of Table 4 suggest that strategic alliances are associated with tax avoidance. Moreover, tax avoidance occurs through contractual alliances, in particular R&D related contractual alliances.

5.2 R&D Tax Credits

If our results in Table 4 are driven by the use of R&D tax credits, then we should find a relation between strategic alliances and the estimated *R&DCredit*. As shown in Column 1 of Table 5, we find a positive (0.083) and significant ($p < 0.01$) relation between *StrategicAlliances* and *R&DCredit*. This confirms H3 that the use of R&D tax credits is greater for firms with contractual alliances than firms without such alliances. Column 2 of Table 5 shows that this relation is positive for *ContractualAlliances* (0.101; $p < 0.01$) but weakly negative for *JointVentures* (-0.086; $p <$

0.10).[12] Column 3 of Table 5 shows that the contractual alliance relation is stronger for *CA_R&D* (0.183; $p < 0.01$) but also present for *CA_notR&D* (0.047; $p < 0.10$).[13] We find that *R&D*, *Leverage*, *ROA*, *Foreign*, *Size*, *SG&A*, *PPE*, *Advertising*, *Acquisition*, and *Restructure* are positively related to *R&DCredit* while *Loss* is negatively related to *R&DCredit* (all $p < 0.10$). The results shown in Table 5 are consistent with Table 4, showing that strategic alliances are associated with higher R&D tax credits. Table 5 also suggests that while the largest part of the relation between strategic alliances and R&D tax credits is coming through R&D contractual alliances, some comes through other avenues. Overall, our findings indicate that partner firms in strategic alliances, specifically in R&D related contractual alliances, could transfer the qualified R&D expenses from the small unprofitable firm to the large profitable firm and thus allow the large profitable firm to claim the R&D credits. This new scheme of tax avoidance has not been documented in the literature

5.3 Tax Havens

To further explore the avenues through which our results in Table 4 are occurring, we examine the relations between strategic alliances and tax havens. As shown in column 1 of Table 6, we find that strategic alliances are associated with more tax haven use (0.252; $p < 0.01$). This confirms H4 that the use of tax havens is greater for firms with contractual alliances than firms without such alliances. However, as shown in columns 2 and 3 of Table 5, that relation is driven through *ContractualAlliances* (0.264, $p < 0.01$) and not *JointVentures* (0.168, $p > 0.10$). We find that tax haven use is positively related to *ROA*, *Foreign*, *NOL*, *Size*, *SG&A*, and *Restructure* while negatively related to *Intangible* and *Advertising* (all $p < 0.10$). The results of Table 6 are consistent

[12] This negative coefficient on *JointVentures* when predicting R&DCredit could be driven by the fact that by creating a separate legal entity, less R&D expenses will be allocated to the original company. See Appendix 1 for an example.

[13] We note that the coefficient on *CA_R&D* is statistically larger than the coefficient on *CA_notR&D* ($p < 0.01$).

with those of Table 4 and show that while *StrategicAlliances* are associated with lower tax rates, that lowering does not occur through joint ventures in tax havens. Overall, the opaque information environment associated with strategic alliances, especially contractual alliances, could provide with greater camouflage and more opportunities to explore the use of tax havens.

5.4 Path Analysis of Economic Consequences

Christensen et al. (2022) find that tax haven firms are less likely to attain low ETR despite having more opportunities for aggressive tax planning. Since it is not clear that the use of R&D credits or tax havens can actually be translated into actual tax savings, we perform a path analysis to study the economic consequences for the usage of R&D tax credits or tax havens.[14] Since Tables 5 and 6 show that strategic alliance firms are likely to use both R&D tax credits and tax havens, we perform a path analysis to better understand how much tax savings come from each of our two identified tax avoidance channels. Specifically, our path analysis focuses on the direct and indirect (mediated) paths between contractual alliances and tax avoidance, because we find in Columns 2 of Tables 5 and 6 show that R&D tax credits and tax havens are primarily used by contractual alliance firms rather than joint venture firms. Using a structural equation model (see Figure 1), we decompose the relation between contractual alliances and tax avoidance into a direct path and an indirect path mediated by either R&D tax credits or tax havens. A direct path includes a single path coefficient. An indirect path includes one path coefficient between the source variable and the mediating variable and another path coefficient between the mediating variable and the outcome variable. The total magnitude of the indirect path is the product of these two path coefficients.

[14] Path Analysis uses structural equation modeling to explore the correlations within a defined network.

Our path analysis estimates are reported in Table 7 and illustrated in Figure 2. While Figure 1 shows a single model with multiple mediators, we estimate the structural equation models for R&D tax credits and tax havens, respectively. This allows us to maximize our sample size for the *R&DCredit* analysis. This also allows us to see what percent of the total effect is mediated by each possible mediator rather than by the two combined. Results are consistent and inferences unchanged if we estimate only a single structural equation.

First, we do not find evidence for a direct path from contractual alliances to tax avoidance in either model ($p > 0.10$), suggesting that other avenues through which contractual alliances might affect tax avoidance are either weaker or inconsistent compared to the R&D tax credit. Second, column 1 reports that *ContractualAlliances* lead to more *R&DCredit* (0.1203; $p < 0.01$), more *R&DCredit* leads to lower *ETR3* (-0.0165; $p < 0.01$), and the indirect path between *ContractualAlliances* and *ETR3* is negative and statistically significant (-0.0020; $p < 0.01$). We find that the indirect path mediated by R&D tax credits accounts for 28.6% of the total effect between strategic alliances and tax avoidance, which suggests that R&D tax credits have both a statistically and an economically significant effect in lowering a strategic alliance firm's ETR. Consistent with our findings in Table 5, these results suggest that firms in contractual alliances are lowering their effective tax rates through R&D tax credits in an economically significant manner.

Third, in column 2, we do not find evidence that contractual alliances lead to additional tax haven use or that tax haven use is associated with tax avoidance (both $p > 0.10$). The total effect of contractual alliances on tax avoidance, mediated by tax havens, is insignificant ($p > 0.10$). While we find evidence that contractual alliances are associated with more tax haven use, this does not appear to lower taxes. Overall, contractual alliances have a significant effect on tax avoidance via the indirect path for R&D tax credits, but not via the indirect path for tax havens. This result

suggests that qualifying for R&D tax credits could be an unintended consequence of forming a contractual alliance.

6. ADDITIOANL ANALYSES

6.1 Domestic Only Versus Multinational firms

While much research has examined what firms avoid taxes (see Wilde and Wilson, 2018), we still know relatively little about how domestic only firms have lowered their tax rates on pace with multinational firms (Dyreng et al. 2017). Given that the R&D tax credit is a U.S. tax benefit, we argue that the tax avoidance avenue we examine above (contractual alliances leading to R&D tax credits leading to lower taxes) could partially explain tax avoidance among domestic only U.S. firms.

As shown in Table 8, we rerun Equation (1) looking at the relation between strategic alliances and tax avoidance for domestic only firms and for multinational firms, respectively. Columns 1 and 2 of Table 8 pertain to domestic only firms. Here we continue to find a negative relation between *StrategicAlliances* and *CETR3* (-0.014; $p < 0.01$); and we find a negative relation between *JointVentures* and *CETR3* (-0.028; $p < 0.10$) and between *ContractualAlliances* and *CETR3* (-0.012, $p < 0.05$). In columns 3 and 4 pertaining to multinational firms, we do not find a statistical relation between *StrategicAlliances*, *JointVentures*, or *ContractualAlliances* and *CETR3* (all $p > 0.10$). We note that the coefficients are very similar in size between the domestic only and the multinational groups, but the statistical significance only holds among domestic only firms. This suggests that differences between the two groups may be more in variation than size. However, we clearly find evidence that strategic alliances are used to avoid taxes among domestic only firms.

6.2 Auditor Provided Tax Services and Strategic Alliances

Above we document tax savings to firms that engage in strategic alliances. However, prior studies have also shown costs to the use of strategic alliances (Demirkan and Zhou 2016). Therefore, it is likely that the tax savings we find in our study come at a cost. We turn attention to auditor provided tax services, as many CPA firms provide consulting services regarding the use of R&D tax credits or tax havens (Brown, Shu, Soo, and Trompeter, 2013; Feingold, 2021). Given the synergy between financial reporting and tax accounting (e.g., Maydew and Shackelford, 2007; Joe and Vandervelde, 2007), companies that purchase auditor-provided tax services can more accurately estimate their income tax positions (Gleason and Mills, 2011; Gleason, Mills, and Nessa, 2018). Specifically, we adjust Equation (1) by making the natural log of one plus auditor provided tax services (*APTS*) the left-hand variable. As shown in Table 9, we find that *StrategicAlliances* (column 1), *JointVentures* (column 2), and all types of *ContractualAlliances* (columns 2 and 3) are associated with higher tax fees (all $p < 0.01$). These results show that on average firms involved in strategic alliances pay more in tax fees. This suggests that public accounting firms play a role in facilitating the tax avoidance of strategic alliance firms and that the identified tax avoidance may come at an additional cost.

6.3 Possible Endogeneity

While our structural equation models in the path analysis above suggest that our results are primarily driven by contractual alliance firms having a higher R&D tax credit and therefore lower effective tax rate, we acknowledge that endogeneity may continue to play some role in our main results. In untabulated analysis, we use a Heckmen Selection Model to control for the self-selection firms make into having strategic alliances (Heckman, 1979; Lennox, Francis, Wang, 2012). We use the number of strategic alliances in the industry in a given year as our exclusionary variable to

predict the probability of a firm being in a strategic alliance. The estimates of what drives that probability are then used to create an inverse mills ratio (the ratio of the pdf to the cdf of the beta estimates). When we include that the inverse mills ratio, our results are consistent with those presented in the paper (same sign and general significance as those found in Tables 4-6). Further, we find support for the same paths through which our results are driven as we do in our structural equation model. While econometric tests cannot rule out all endogeneity, these results suggest that endogeneity related to self-selection bias are likely not affecting our results.

5. CONCLUSION

Surveying 1,300 CEO of major companies worldwide, KPMG's 2016 CEO Outlook reports that the majority of respondents (58%) hold the view that strategic alliances are more important than mergers and acquisitions (KPMG, 2017). Not surprisingly, over the last decade or so, corporations have increased their usage of strategic alliances with other corporations. As strategic alliances can lead to an opaque information environment (Demirkan and Zhou, 2016), we hypothesize that ambiguity and flexibility associated with strategic alliances will allow firms to lower what they pay for income taxes. Specifically, we expect firms engaging in contractual alliances to increase their R&D tax credits by shifting expenses. We also expect firms engaging in contractual alliances to appreciate and use the opaqueness of tax havens.

We find evidence consistent with firms involved in strategic alliances paying less taxes than their peers. We find evidence consistent with contractual alliances leading to R&D tax credits and then to lower taxes. While we find evidence that contractual alliances are associated with more tax haven use, this does not appear to lower taxes. Using a path analysis estimating structural equation models, we confirm that a large portion of the connection between contractual alliances

and lower tax rates works through R&D tax credits. In additional analysis, we find that our results are present among domestic only firms rather than multinational firms. This is important as little is known about the mechanisms through which domestic only firms avoid taxes (Dyreng et al., 2017). We also find that while strategic alliances are associated with lower tax rates, it is also associated with higher auditor provided tax fees, suggesting a cost to the tax savings we identify.

Our study contributes to two main streams of literature. First, by showing tax savings and additional tax fees associated with strategic alliances, we further our understanding of the costs and benefits of strategic alliances. Better knowing the costs and benefits can inform researchers and investors when trying to understand why firms are engaging in strategic alliances and why they choose the form of alliance they do. Second, this study furthers our understanding of tax avoidance. We show that firms can use the flexibility and ambiguity of strategic alliances to avoid taxes. Specifically, we find that contractual alliances use R&D tax credits to lower their tax bills. We also show that these results are driven primarily by domestic only firms. Accordingly, we identify one avenue through which domestic only firms are lowering their taxes that multinational firms do not (Dyreng et al., 2017). Nevertheless, we caution that this study has a number of limitations. While we examine endogeneity and try to control for self-selection bias, it is possible that some of our result is driven through a different mechanism than those we examine in this study. We do not have access to actual R&D tax credit data and must rely on our estimate using publicly available R&D expense data. Finally, both our identification of strategic alliances and tax havens relies on the honest and accurate disclosure of corporations, which may not always be the case.

APPENDIX 1

Example of Lowering Taxes through a Contractual Alliance

Symantec Corporation is a software company focusing on cyber security. It is currently a Fortune 500 company under the name NortonLifeLock Inc. Back in its fiscal year ending April 1, 2006, Symantec started its first known contractual alliance for software research and development with Overland Storage Inc (now Overland-Tandberg). Through this transaction, Symantec would be able to increase its use of the research and development credit and lower its tax bill by shifting expenses that do not qualify for the R&D tax credit to the smaller company it made this contractual alliance with in return for expenses that do qualify for the R&D tax credit as detailed below. At the time Symantec entered into this contractual alliance, it was fairly typical of a large corporation that is research active. In that, while it is spending hundreds of millions of dollars on research and development each year, due to the level of its revenue and prior years of high research and development expense, Symantec was likely not able to take advantage the R&D tax credit.

For expenses to qualify for the R&D tax credit, the ratio of research expenses to gross receipts is calculated. And only the expenses that put that ratio above the prior five year's average ratio or 16 percent, whichever is lower, actually qualify for the R&D Tax Credit. So while in 2005 Symantec spent $332 million in qualified research and development expenses, that was only 13 percent of their $2.6 billion gross receipts and not higher than the five year average of 14.4 percent. Another $36 million of qualified research and development expenses would have pushed their ratio higher than the five year average. Therefore, anything above $36 million would have qualified

for the R&D Tax Credit. In the five years before the contractual alliance was formed, according to our estimates, Symantec Corporation was not able to take any R&D tax credit.[15]

While we do not expect tax avoidance to be the driving reason for Symantec to enter into an agreement with a smaller research firm (that would be the desire to obtain the expertise and time of the smaller firm), we do think it would influence how the transaction would be set up with a contractual alliance being the most tax advantageous. We see four main ways that Symantec could have partnered up with a smaller firm and benefit from their expertise. First, they could buy the smaller firm. Second, they could enter a complete contract but not create a new entity. Third, they could create a joint venture or new separate legal entity. Or fourth, they could set up a contractual alliance.

We detail the tax and non-tax consequences of each type of transaction below. In each situation, we are assuming that Symantec is involved in a $300 million research project that it wants the expertise of a small company to help with. We are assuming that currently only 80 percent of the $300 million or $240 million counts as a qualified expense for the R&D tax credit. This assumption is reasonable as depreciation is not usually a qualified expense for the R&D tax credit. Further expenses related to trial runs, production equipment, and market research surveys are never qualified expenses for the R&D tax credit. So a number of expenses required to make and sell a new product will not count towards the R&D tax credit.

First, purchasing a smaller firm for their technology and expertise is a common practice. However, there are tax and non-tax costs to this option. Purchasing a firm requires that the small firm wants to be purchased. Depending on the variety of their projects and prospects, they may not

[15] We are not certain if Symantec took the R&D tax credit as we do not have access to their actual tax returns. Our estimates of the R&D tax credit are based off the numbers reported in the financial statements applied to the laws regarding the R&D tax credit.

be interested in selling. Further, the additional legal and time constraints involved in a purchase will slow down the process and likely add costs. From a tax standpoint, this would not allow for any expense shifting between the companies as they are now one company. And since the R&D credit is limited by the ratio between research and gross receipts, adding the small company's revenue (limited as they may be) could further limit use of the credit. In this scenario, Symantec would have costs associated with purchasing a new firm without any tax savings.

Second, setting up a traditional complete contract where Symantec hires a company to do research for them but retains all rights to the outcome has two major limitations. First, the smaller company is rarely willing to share their expertise and knowledge without getting some skin in the game. Second, only sixty-five percent of research and development expenses paid to a contractor can be counted towards a tax credit. Thus, Symantec's qualified research expenses for the R&D tax credit would drop from what they are doing all work in house.

Third, a joint venture would allow the small firm to get skin in the game. Joint ventures generally happen by creating a new legal entity owned by both the large and small firm. And profits made are then jointly shared. This may please the small company as they get a share of earnings for their expertise. But the Symantec would treat the joint venture like an investment for tax purposes (if the joint venture was taxed as a corporation) or have no flexibility to adjust what expenses they get and don't get (if the joint venture was taxed as a partnership). Symantec would get no tax deductions for the amount of money spent but instead would record a new asset or investment. Plus they would get no additional expenses for the R&D tax credit. In fact, for tax purposes consolidation and sharing of tax credits only occur with over 80 percent ownership and voting power. So Symantec may actually have fewer expenses for the R&D tax credit as those would go instead to the new joint venture.

Fourth are contractual alliances. These alliances are not well structured and leave a lot of leeway for how things are accounted for both for financial reporting and for tax reporting. So while both companies are putting expenses and effort into this new alliance, there is no clear cut way to say who is paying exactly for what expenses. Symantec could claim they are now paying only for expenses that qualify for the R&D tax credit. While the small firm can claim they are only paying for expenses that do not qualify for the R&D tax credit. And it would be difficult for the IRS to prove otherwise as there is no clear contract saying what is happening as long as all expenses are properly reported by one of the companies and both companies agree with the treatment. Most small research firms are not able to take the R&D tax credit because they rarely have taxable income (Landrum and Butler 2017). The income comes years later if their research projects come to fruition. Even with a R&D tax credit carryforward, the small firm would have little incentive to care whether it is reporting expenses that qualify or do not qualify for the R&D tax credit. While Symantec would be able to increase their expenses for the R&D tax credit (due to raising the ratio between R&D and revenue), allowing them to take a larger credit. In our example with a $300 million project, that could equate to Symantec saving $12 million on their taxes (20 percent of the $60 million increase in expenses qualifying for R&D tax credit).[16] As long as Symantec shares some of that savings with the small company (through a larger percent of future profit, paying for fewer expenses, etc.), the small company is also better off under this arrangement than they would be under any of the alternative methods.

Looking at Symantec's financial statements, we find that their effective tax rate the five years before starting a contractual alliance was 38.9 percent. In the five years after it was 24.3

[16] As noted above, without the contractual alliance only $240 million of the research expenses were qualified for the R&D tax credit. So by shifting expenses, Symantec could claim the entire $300 million as qualified expenses. For simplicity, we are assuming that all of the additional $60 million of expenses would be above the qualified expenses to revenue ratio for the previous five years.

percent.[17] While we do not expect that entire drop in effective tax rates is driven by this contractual alliance, we expect some of it was. As further evidence of that fact, in the five years before the contractual alliance, our estimates suggest that Symantec would not have been able to take any research and development credit. However, in the year of the contractual alliance and the next year, we estimate they are able to take $67.0 million ($7.5 million and $59.5 million, respectively) in research and development credit.

[17] In 2009, Symantec wrote off $7.4 billion in goodwill. Given that their net income the few prior years was around $700 million this had a huge impact on their financials. Accordingly, we backed out the goodwill write off to calculate effective tax rates over the five years after the contractual alliance or else the numbers would become nonsensical with large negative income. Alternatively, if we skip the year of the goodwill write off, the effective tax rate over the next five years drops slightly more to 22.8 percent.

APPENDIX 2
Variable Definitions

Dependent Variables	**Variable Definitions with Compustat code in (parentheses)**
APTS	Auditor provided tax services, which is the natural logarithm of one plus the tax-related fees paid to the firm's auditor per Audit Analytics database.
CETR3	A three-year cash effective tax rate as a measure of tax avoidance. It is measured as follows: $$CETR3_{it} = \frac{\sum_{t=1}^{t=t+2} TXPD_{it}}{\sum_{t=1}^{t=t+2} PI_{it} - \sum_{t=1}^{t=t+2} SPI_{it}}$$ where TXPD is total income taxes paid in cash (txpd) PI is pretax income (pi) SPI is special items (spi) Any time the denominator is negative, the value is reset to missing. Values above 1 are reset to 1 and values below 0 are reset to 0.
RDCredit	Estimate of the R&D tax credit. It is based on the ratio of R&D expense (xrd) to sales (sale). When values are above a baseline, then the amount of expense over the baseline is multiplied by the credit percentage (usually 20 percent). Further details on the estimation of the R&D tax credit are found in Appendix 3.
TaxHaven	An indicator variable equal to one if the firm has a subsidiary in a country identified as a tax haven. Location of firm subsidiaries are identified through Exhibit 21 of the firm's 10K. Tax haven identification is following Dyreng and Lindsey (2009). This data was downloaded from Scott Dyreng's personal website.
Alliance Variables	
Alliance	Generic variable representing the number of alliances the firm is engaged in during the year. It can take the value of *StrategicAlliance*, *JointVenture*, *ContractualAlliance*, *CA_R&D*, or *CA_nonR&D*.
CA_nonR&D	The number of contractual alliances for purposes other than research and development that a firm is engaged in according to the SDC data.
CA_R&D	The number of contractual alliances for research and development purposes a firm is engaged in according to the SDC data.
ContractualAlliances	The number of contractual alliances a firm is engaged in according to the SDC data. A contractual alliance is an agreement between at least two firms that establish a joint operation within their businesses without forming a separate business entity.
JointVentures	The number of joint ventures a firm is engaged in according to the SDC data. A joint venture is an agreement between at least two firms that establish a joint operation within their businesses by forming a separate business entity.

StrategicAlliances	The number of strategic alliances a firm is engaged in according to the SDC data. Strategic alliances are agreements between at least two firms that establish joint operation within their business and can create a new legal entity (*JointVentures*) or not (*ContractualAlliances*).
Control Variables	
Acquisition	Indicator variable equal to one if the firm shows a non-zero value for acquisitions (aqc) or acquisition pre-tax income (aqp).
Advertising	Advertising expense (xad) scaled by sales (sale).
CAPEX	Capital expenditures (capx) scaled by gross property plant and equipment (ppegt).
Foreign	Indicator variable equal to one if the firm has a non-zero value for foreign pretax income (pifo).
Industry	An array of industry fixed effects based on two-digit SIC codes.
Intangible	Intangible assets (intan) scaled by total assets (at).
Leverage	Total debt (sum of dlc and dltt) scaled by total assets (at).
Loss	Indicator variable equal to one if the firm had a negative value for net income (ni).
NOL	Net operating loss indicator variable equal to one if the firm had a non-zero value for tax loss carryforward (tlcf).
PPE	Gross property plant and equipment (ppegt) scaled by total assets (at).
R&D	Research and development expense (xrd) scaled by sales (sale). Missing values are reset to zero.
Restructure	Indicator variable equal to one if the firm has non-missing values for restructuring costs (rca), restructuring impact on diluted EPS (rcd), or restructuring costs pre-tax (rcp).
ROA	Return on assets calculated as net income (ni) scaled by lagged total assets (at).
SG&A	Selling, general, and administrative expenses (xsga) scaled by sales (sale).
Size	Natural logarithm of total assets (at).
Year	Array of year fixed effects.

APPENDIX 3

Estimating the R&D Tax Credit

The R&D tax credit was created in the United States by the Economic Recovery Tax Act of 1981. The general purpose of the law is to incentivize firms to invest more money in R&D, hopefully leading to new technological discoveries. The general calculation of the credit is a percentage (25% initially and 20% starting in 1986) of excess or additional R&D. Excess or additional R&D is the amount of qualified research expenditures (QRE) less the mean of QRE in prior years (varies from ½ to 5 years). Initially, the calculation was based purely on the QRE, but starting in 1989, QRE was scaled by sales. The credit was first extended and adjusted in the Tax Reform Act of 1986. It has been extended numerous times since with major changes coming in 1993 (added 16% maximum for the base QRE) and 2007 (added an alternative calculation using one-half a base of the prior three years and a 14% credit rate). The credit was made permanent in the Protecting Americans from Tax Hikes Act in 2015.

QRE are qualified research expenses. They consist of wages to employees and supplies used related to qualified research activity. 65% of money paid to a contractor or 75% of money paid to an educational institution can count as qualified. For research to be qualified it must be intended to resolve some technological uncertainty, rely on hard science, related to a new or improved product, and involve experimentation. Research related to computer software has additional restrictions. And surveys, market research, routine activities, research outside the U.S., funded research, and social science research, among others, do not qualify.

Starting in 1993, the base years used can be affected by the number of years the company has existed and had QRE. Accordingly, we determined the base as follows:

Credit year	**Base years**	**Percentage**
1–5 (after 1993)	None	3%
6	4, 5	Actual % x 1/6
7	5, 6	Actual % x 1/3
8	5–7	Actual % x 1/2
9	5–8	Actual % x 2/3
10	5–9	Actual % x 5/6
After 10	Any five years from years 5-10	Actual %

The estimation of the R&D tax credit used the following details by year:

Year	Number of Prior Years in Base	Base Calculation	Base Minimum	Base Maximum	Credit Percentage	Credit Percent Limitation	Deductibility of QRE used in credit	Alternative Calcuation	Tax Rate
1981	1/2	QRE			25%	12.5% once QRE twice base	Deductible	None	46%
1982	2	QRE			25%	12.5% once QRE twice base	Deductible	None	46%
1983	3	QRE			25%	12.5% once QRE twice base	Deductible	None	46%
1984	3	QRE			25%	12.5% once QRE twice base	Deductible	None	46%
1985	3	QRE			25%	12.5% once QRE twice base	Deductible	None	46%
1986	3	QRE	At least 1/2 QRE		20%		1/2 Deductible	None	46%
1987	3	QRE	At least 1/2 QRE		20%		1/2 Deductible	None	40%
1988	3	QRE	At least 1/2 QRE		20%		1/2 Deductible	None	34%
1989	4	QRE / Sales	At least 1/2 QRE		20%		None	None	34%
1990	4	QRE / Sales	At least 1/2 QRE		20%		None	None	34%
1991	4	QRE / Sales	At least 1/2 QRE		20%		None	None	34%
1992	4	QRE / Sales	At least 1/2 QRE		20%		None	None	34%
1993	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
1994	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
1995	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
1996	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
1997	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
1998	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
1999	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2000	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2001	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2002	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2003	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2004	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2005	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2006	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	None	35%
2007	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2008	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2009	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2010	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2011	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2012	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2013	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2014	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2015	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2016	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2017	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	35%
2018	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	21%
2019	5	QRE / Sales	At least 1/2 QRE	16%	20%		None	14% of QRE above 50% of 3yr base	21%

Details regarding the R&D tax credit used for our estimated calculations come from Tillinger (1991), Swenson (1992), Holtzman (2017), and Internal Revenue Code Section 41.

As an example, we will step through our calculation of the estimated R&D Credit for Symantec Corporation's fiscal year 2015. In 2015, Symantec reported $3.6 billion in sales and $748 million in R&D expense. Assuming all R&D are qualified, that leads to a current year QRE/Sales ratio of 20.78%. Its base percentage is 15.21% based on the five prior years' ratios (13.93%, 14.40%, 14.65%, 15.49%, and 17.58%). So the current year's ratio is 5.57% above the base. We multiply that by the year's sales to get the amount of QRE that will be included for the credit and get $200.47 million. Multiplying that by 20% will give us the credit amount ($40.09 million). Here we did not have to adjust the base due to it being less than half the current year QRE. We also did not to reduce it to 16% as it was already below 16%. We also need to estimate the alternative R&D tax calculation. The base for the alternative is one-half the average of the prior three years (0.5 * 15.91% = 7.95%). We subtract that from the current year's QRE (20.78%) and get 12.82%. We then multiply that by sales and the 14% credit rate to get an alternative credit amount of $64.63 million. In this year, it would be advantageous for Symantec to use the alternative calculation to get the highest credit of $64.63 million.

Once we have an estimate for what the R&D credit would be in a given year, we add 1 and take the natural log. We end up with 2,844 non-zero values for *R&DCredit* in our sample. In our sample, the smallest estimated credit is $8,656 and the largest is $298.5 million. The mean (median) is $14.1 million ($2.1 million) with a standard deviation of $41.50 million.

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Table 1
Sample Selection

This table presents the sample selection process. Strategic alliance data comes from the Strategic Alliance Database of the Securities Data Company. It is currently available from 1986 to 2011; however, to be consistent with prior research (Demirkan and Zhou 2016) and to allow auditor provided tax fees in additional analysis, we don't start our sample until 2001. Requiring CETR3 also removes years with negative pretax income less special items over the prior three years. Our main sample consists of 17,065 firm-years (1,677 firm-years with a strategic alliance) and 3,056 unique firms (849 with a strategic alliance at some point in the sample). Our Tax Haven data limits our sample to 7,767 firm-years. Variable definitions are available in Appendix 2.

	Firm-Years	**Firms**
Intersection of Compustat and Strategic Alliance Data from 2001 to 2011	30,531	4,718
Require *CETR3*	(12,160)	(1,382)
Require control variables	(1,306)	(280)
Main Sample	**17,065**	**3,056**
Require *TaxHaven*	(9,298)	(1,367)
Tax Haven Sample	7,767	1,689

Table 2
Descriptive Statistics

This table presents descriptive statistics for our main sample. On the right, we split our sample into firm-years with one or more strategic alliance and firm-years with no strategic alliances. *, **, and *** represent statistical significance of a t-test of difference of means at the 0.10, 0.05, and 0.01 level, respectively. Sample size is only 7,767 (1,069 with at least one strategic alliance and 6,698 without) for *TaxHaven* due to limitations in its calculation. Variable definitions are available in Appendix 2.

	Main Sample (N = 17,065)					***StrategicAlliances* > 0** (N = 1,677)	***StrategicAlliances* = 0** (N = 15,388)		
Variable	**Mean**	**StDev**	**Q1**	**Median**	**Q3**	**Mean**	**Mean**	**Difference**	
CETR3	0.2405	0.2029	0.0871	0.2243	0.3321	0.2343	0.2412	-0.0069	
TaxHaven (n = 7,767)	0.6463	0.4781	0.0000	1.0000	1.0000	0.8092	0.6203	0.1888	***
R&DCredit	0.2278	0.6979	0.0000	0.0000	0.0000	0.5890	0.1884	0.4006	***
StrategicAlliances	0.1416	0.5765	0.0000	0.0000	0.0000	1.4413	0.0000	1.4413	***
JointVentures	0.0185	0.1455	0.0000	0.0000	0.0000	0.1878	0.0000	0.1878	***
ContractualAlliances	0.1232	0.5382	0.0000	0.0000	0.0000	1.2534	0.0000	1.2534	***
CA_R&D	0.0438	0.2915	0.0000	0.0000	0.0000	0.4454	0.0000	0.4454	***
CA_notR&D	0.0794	0.3779	0.0000	0.0000	0.0000	0.8080	0.0000	0.8080	***
Leverage	0.2049	0.1959	0.0194	0.1766	0.3201	0.1980	0.2057	-0.0077	
Intangible	0.1602	0.1825	0.0098	0.0893	0.2588	0.1980	0.1561	0.0419	***
ROA	0.0663	0.1041	0.0217	0.0565	0.1046	0.0604	0.0669	-0.0064	**
Foreign	0.4320	0.4954	0.0000	0.0000	1.0000	0.6661	0.4065	0.2596	***
Loss	0.1376	0.3445	0.0000	0.0000	0.0000	0.1604	0.1351	0.0253	***
NOL	0.3932	0.4885	0.0000	0.0000	1.0000	0.4460	0.3874	0.0586	***
Size	6.2250	2.0263	4.8674	6.2704	7.6159	7.6170	6.0734	1.5436	***
SG&A	0.2220	0.1733	0.0925	0.1929	0.3132	0.2820	0.2155	0.0665	***
PPE	0.5295	0.3854	0.2146	0.4373	0.7770	0.4181	0.5417	-0.1235	***
CAPEX	0.1071	0.0849	0.0511	0.0829	0.1360	0.1205	0.1057	0.0148	***
Advertising	0.0095	0.0228	0.0000	0.0000	0.0072	0.0126	0.0091	0.0035	***
Acquisition	0.4382	0.4962	0.0000	0.0000	1.0000	0.6184	0.4185	0.1999	***
Restructure	0.2747	0.4464	0.0000	0.0000	1.0000	0.4431	0.2564	0.1867	***
Year	2005.6	3.0	2003.0	2005.0	2008.0	2004.8	2005.7	-0.9000	***

Table 3
Pearson Correlations

This table presents the Pearson correlation for our main variables. Bold correlation denotes two-tailed significance at the five percent level. All variable definition are available in Appendix 2.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
1 *CETR3*	1																		
2 *TaxHaven*	-0.0106	1																	
3 *R&DCredit*	**-0.0409**	**0.219**	1																
4 *StrategicAlliances*	-0.0116	**0.122**	**0.194**	1															
5 *JointVentures*	-0.00130	**0.0587**	**0.0321**	**0.380**	1														
6 *ContractualAlliances*	-0.0120	**0.115**	**0.200**	**0.968**	**0.137**	1													
7 *Leverage*	**-0.0804**	-0.0134	**-0.0466**	-0.0137	**0.0318**	**-0.0232**	1												
8 *Intangible*	0.0163	**0.0325**	**0.118**	**0.0476**	0.00372	**0.0500**	**0.170**	1											
9 *ROA*	-0.00356	**0.0293**	**0.0943**	-0.00535	-0.0196	-0.000421	**-0.233**	**-0.0924**	1										
10 *Foreign*	**0.0308**	**0.342**	**0.369**	**0.140**	**0.0536**	**0.135**	**-0.0713**	**0.154**	-0.0177	1									
11 *Loss*	-0.00778	-0.0255	**-0.105**	0.0119	0.00662	0.0110	**0.131**	**0.0205**	**-0.566**	0.0174	1								
12 *NOL*	**-0.0759**	**0.0653**	**0.107**	0.0124	0.00424	0.0121	**0.0504**	**0.134**	**-0.0763**	**0.218**	**0.104**	1							
13 *Size*	-0.00534	**0.318**	**0.303**	**0.223**	**0.143**	**0.201**	**0.217**	**0.224**	**-0.0387**	**0.315**	**-0.108**	**0.0327**	1						
14 *SG&A*	0.000630	**0.0679**	**0.174**	**0.0933**	**-0.0544**	**0.115**	**-0.240**	**0.123**	**-0.0278**	**0.164**	**0.118**	**0.0964**	**-0.248**	1					
15 *PPE*	**-0.0594**	**-0.0692**	**-0.137**	**-0.0799**	0.0137	**-0.0893**	**0.215**	**-0.376**	**-0.0834**	**-0.158**	0.0105	**-0.0896**	**0.0198**	**-0.306**	1				
16 *CAPEX*	-0.00243	-0.0113	**0.0229**	**0.0465**	-0.0148	**0.0538**	**-0.130**	0.000623	**0.211**	**-0.0454**	**-0.0790**	-0.0109	-0.00563	**0.102**	**-0.223**	1			
17 *Advertising*	**0.0456**	-0.000844	**0.0241**	**0.0450**	0.000712	**0.0481**	-0.00618	**0.0670**	**0.0616**	0.00393	-0.0121	**-0.0276**	**0.0235**	**0.265**	**-0.0798**	**0.0778**	1		
18 *Acquisition*	**0.0325**	**0.0850**	**0.169**	**0.108**	**0.0552**	**0.100**	**0.0647**	**0.422**	**-0.0213**	**0.217**	**-0.0431**	**0.0953**	**0.314**	0.0111	**-0.193**	**0.0393**	**-0.0251**	1	
19 *Restructure*	-0.0117	**0.184**	**0.197**	**0.100**	**0.0446**	**0.0953**	**0.0832**	**0.173**	**-0.158**	**0.334**	**0.156**	**0.146**	**0.281**	**0.0933**	**-0.0570**	**-0.127**	0.00902	**0.158**	1
20 *Year*	0.0187	**0.0610**	**0.187**	**-0.0782**	**-0.0326**	**-0.0749**	**-0.0491**	**0.0885**	**0.0447**	**0.139**	**-0.0426**	**0.139**	**0.123**	-0.00104	-0.0160	**-0.0307**	0.00630	**0.0681**	**0.0553**

Table 4
Tax Avoidance and Strategic Alliances

This table presents our estimation of strategic alliances impact on tax avoidance. Estimated coefficients are reported with t-statistics based on robust standard errors in parentheses. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2.

	(1)		(2)		(3)	
	CETR3		***CETR3***		***CETR3***	
VARIABLES	coef	tstat	coef	tstat	coef	tstat
StrategicAlliances	-0.0062**	(-2.479)				
JointVentures			-0.0085	(-0.867)	-0.0082	(-0.839)
ContractualAlliances			-0.0059**	(-2.253)		
CA_R&D					-0.0097*	(-1.782)
CA_notR&D					-0.0035	(-0.748)
Leverage	-0.0838***	(-8.079)	-0.0838***	(-8.079)	-0.0838***	(-8.070)
Intangible	-0.0040	(-0.347)	-0.0041	(-0.349)	-0.0042	(-0.360)
ROA	-0.0865***	(-3.890)	-0.0866***	(-3.890)	-0.0864***	(-3.882)
Foreign	0.0239***	(6.083)	0.0239***	(6.082)	0.0239***	(6.081)
Loss	0.0000	(0.002)	0.0000	(0.003)	-0.0000	(-0.007)
NOL	-0.0339***	(-10.119)	-0.0339***	(-10.116)	-0.0339***	(-10.117)
Size	-0.0021**	(-1.993)	-0.0021**	(-1.985)	-0.0021**	(-1.994)
SG&A	-0.0569***	(-4.166)	-0.0570***	(-4.167)	-0.0564***	(-4.121)
PPE	-0.0153**	(-2.386)	-0.0153**	(-2.383)	-0.0153**	(-2.386)
CAPEX	-0.0716***	(-3.358)	-0.0717***	(-3.360)	-0.0718***	(-3.365)
Advertising	0.1982***	(2.597)	0.1982***	(2.597)	0.1955**	(2.559)
Acquisition	0.0165***	(4.598)	0.0165***	(4.600)	0.0166***	(4.614)
Restructure	-0.0076*	(-1.960)	-0.0076**	(-1.961)	-0.0075*	(-1.945)
Constant	0.3199***	(8.721)	0.3200***	(8.721)	0.3200***	(8.720)
Industry Fixed Effects	Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes	
Observations	17,065		17,065		17,065	
Adjusted R-squared	0.073		0.072		0.072	

Table 5
R&D Tax Credit and Strategic Alliances

This table presents our estimation of strategic alliances impact on estimated R&D tax credit. Estimated coefficients are reported with t-statistics based on robust standard errors in parentheses. One observation of our sample is lost in this analysis due to requiring *R&D* as an additional control variable. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2.

	(1)		(2)		(3)	
	R&DCredit		***R&DCredit***		***R&DCredit***	
VARIABLES	coef	tstat	coef	tstat	coef	tstat
StrategicAlliances	0.0825***	(4.655)				
JointVentures			-0.0855*	(-1.885)	-0.0919**	(-2.045)
ContractualAlliances			0.1005***	(5.291)		
CA_R&D					0.1827***	(5.108)
CA_notR&D					0.0469*	(1.865)
R&D	2.8848***	(19.784)	2.8572***	(19.612)	2.8323***	(19.430)
Leverage	0.0514**	(2.071)	0.0511**	(2.061)	0.0492**	(1.985)
Intangible	0.0202	(0.564)	0.0170	(0.474)	0.0189	(0.527)
ROA	0.5370***	(10.794)	0.5342***	(10.750)	0.5300***	(10.721)
Foreign	0.2161***	(26.041)	0.2160***	(26.011)	0.2161***	(26.080)
Loss	-0.1676***	(-12.610)	-0.1667***	(-12.565)	-0.1650***	(-12.425)
NOL	0.0075	(0.742)	0.0080	(0.795)	0.0082	(0.810)
Size	0.0790***	(21.611)	0.0796***	(21.833)	0.0800***	(21.965)
SG&A	0.1301***	(3.395)	0.1259***	(3.284)	0.1177***	(3.076)
PPE	-0.0013	(-0.087)	-0.0005	(-0.031)	-0.0005	(-0.036)
CAPEX	-0.0460	(-0.890)	-0.0507	(-0.982)	-0.0475	(-0.924)
Advertising	0.4185*	(1.647)	0.4099	(1.611)	0.4591*	(1.805)
Acquisition	0.0352***	(3.519)	0.0360***	(3.594)	0.0349***	(3.492)
Restructure	0.0366***	(2.733)	0.0364***	(2.720)	0.0352***	(2.634)
Constant	-0.6355***	(-13.729)	-0.6297***	(-13.770)	-0.6304***	(-13.820)
Industry Fixed Effects	Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes	
Observations	17,064		17,064		17,064	
Adjusted R-squared	0.331		0.332		0.333	

Table 6
Tax Havens and Strategic Alliances

This table presents our logistic estimation of strategic alliances impact on tax haven use. Estimated coefficients are reported with z-statistics based on robust standard errors in parentheses. Number of observations below is 53 less than shown in Table 1. This is due to use of industry fixed effects and certain industries where there is no tax haven use, which leads to dropped observations. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2.

	(1)		(2)		(3)	
	TaxHaven		***TaxHaven***		***TaxHaven***	
VARIABLES	coef	tstat	coef	tstat	coef	tstat
StrategicAlliances	0.2520***	(3.482)				
JointVentures			0.1678	(0.835)	0.1629	(0.815)
ContractualAlliances			0.2644***	(3.468)		
CA_R&D					0.3880***	(2.952)
CA_notR&D					0.2016**	(2.079)
Leverage	0.0388	(0.217)	0.0391	(0.218)	0.0396	(0.221)
Intangible	-0.4219**	(-2.090)	-0.4223**	(-2.092)	-0.4195**	(-2.076)
ROA	1.4788***	(3.850)	1.4792***	(3.851)	1.4740***	(3.837)
Foreign	0.9739***	(14.994)	0.9737***	(14.992)	0.9746***	(15.003)
Loss	0.0885	(0.868)	0.0890	(0.874)	0.0900	(0.883)
NOL	0.1768***	(2.999)	0.1769***	(3.000)	0.1761***	(2.986)
Size	0.5277***	(21.871)	0.5279***	(21.886)	0.5278***	(21.876)
SG&A	1.2204***	(5.469)	1.2158***	(5.439)	1.1984***	(5.342)
PPE	-0.1324	(-1.040)	-0.1319	(-1.036)	-0.1314	(-1.032)
CAPEX	-0.0512	(-0.135)	-0.0544	(-0.144)	-0.0501	(-0.132)
Advertising	-2.3850*	(-1.662)	-2.3836*	(-1.661)	-2.2868	(-1.589)
Acquisition	-0.0836	(-1.323)	-0.0836	(-1.323)	-0.0842	(-1.333)
Restructure	0.2848***	(4.346)	0.2847***	(4.342)	0.2827***	(4.314)
Constant	-0.9258	(-1.150)	-0.9250	(-1.149)	-0.9198	(-1.143)
Industry Fixed Effects	Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes	
Observations	7,714		7,714		7,714	
Area Under ROC	0.7992		0.7992		0.7992	

Table 7
A Path Analysis of Contractual Alliances and Tax Avoidance

This table presents our structural equation model estimates from the path analysis of the theoretical models depicted in Figure 1. While Figure 1 combines these two models into a single model with multiple mediators, we separately estimate the structural equation model separately for each possible mediator. This allows us to maximize our sample size for the *R&DCredit* analysis. This also allows us to see how what percent of the total effect is mediated by each possible mediator rather than by the two combined, which leads to percentages above 100%. Results are consistent and inferences unchanged if we estimate only a single structural equation. Z-statistics are listed in parenthesis below coefficients. Fixed effects are not allowed in Stata's structural equation modeling commands; therefore, we do not include industry and year fixed effects. All control variables from Equation 1 are included but not reported for brevity. We look at *R&DCredit* in column 1 and *TaxHaven* in column 2. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2.

	(1)	(2)
Tax Vehicle	***R&DCredit***	***TaxHaven***
Direct Path		
p (ContractualAlliances, CETR3)	-0.0050	-0.0007
	(-1.67)	(-0.22)
Mediated Path		
p (ContractualAlliances, Tax Vehicle)	0.1203***	0.0045
	(13.36)	(0.61)
p (Tax Vehicle, CETR3)	-0.0165***	-0.0016
	(-6.56)	(-0.30)
Total Mediated Path	-0.0020***	-0.0000
	(-5.89)	(-0.27)
Total Effect	-0.0070**	-0.0007
	(-2.34)	(-0.22)
The Direct Component of Total Effect	71.4%	99.0%
The Indirect Component of Total Effect	28.6%	1.0%
Observations	17,065	7,767

Table 8
Tax Avoidance and Strategic Alliances among Domestic Only Versus Multinational Firms

This table presents our estimation of strategic alliances impact on tax avoidance, restricting our sample to firm-years where *Foreign* = 0 (columns 1 and 2) or firm-years where Foreign = 1 (columns 3 and 4). We remove *Foreign* as a control variable since all observations within a column now have the same value. Estimated coefficients are reported with t-statistics (z-statistics for Panel B) based on robust standard errors in parentheses. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2.

	Domestic Only Firms				Multinational Firms			
	(1)		(2)		(3)		(4)	
	CETR3		***CETR3***		***CETR3***		***CETR3***	
VARIABLES	coef	tstat	coef	tstat	coef	tstat	coef	tstat
StrategicAlliances	-0.0140***	(-2.615)			-0.0026	(-0.936)		
JointVentures			-0.0283*	(-1.883)			-0.0031	(-0.251)
ContractualAlliances			-0.0117**	(-1.994)			-0.0026	(-0.883)
Leverage	-0.1089***	(-8.286)	-0.1088***	(-8.281)	-0.0279	(-1.611)	-0.0279	(-1.611)
Intangible	-0.0441***	(-2.770)	-0.0445***	(-2.797)	0.0398**	(2.233)	0.0398**	(2.233)
ROA	-0.1030***	(-3.722)	-0.1031***	(-3.728)	-0.0818**	(-2.167)	-0.0818**	(-2.167)
Loss	-0.0288***	(-3.138)	-0.0289***	(-3.147)	0.0344***	(3.061)	0.0344***	(3.063)
NOL	-0.0416***	(-8.543)	-0.0416***	(-8.542)	-0.0214***	(-4.606)	-0.0214***	(-4.606)
Size	0.0007	(0.486)	0.0007	(0.504)	-0.0061***	(-3.694)	-0.0061***	(-3.687)
SG&A	-0.0225	(-1.185)	-0.0228	(-1.198)	-0.0957***	(-4.774)	-0.0957***	(-4.751)
PPE	-0.0255***	(-3.132)	-0.0255***	(-3.132)	-0.0055	(-0.512)	-0.0055	(-0.511)
CAPEX	-0.0433	(-1.614)	-0.0436	(-1.625)	-0.1258***	(-3.511)	-0.1258***	(-3.510)
Advertising	0.1147	(1.028)	0.1142	(1.023)	0.3835***	(3.665)	0.3836***	(3.664)
Acquisition	0.0190***	(3.726)	0.0191***	(3.746)	0.0140***	(2.742)	0.0140***	(2.742)
Restructure	-0.0115*	(-1.792)	-0.0114*	(-1.775)	-0.0087*	(-1.756)	-0.0087*	(-1.756)
Constant	0.3087***	(6.594)	0.3091***	(6.596)	0.3571***	(7.132)	0.3571***	(7.133)
Industry Fixed Effects	Yes		Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	
Observations	9,693		9,693		7,372		7,372	
Adjusted R-squared	0.096		0.096		0.063		0.063	

Table 9
Auditor Provided Tax Services and Strategic Alliances

This table presents our estimation of strategic alliances impact on estimated R&D tax credit. Estimated coefficients are reported with t-statistics based on robust standard errors in parentheses. One observation of our sample is lost in this analysis due to requiring *R&D* as an additional control variable. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2.

	(1)		(2)		(3)	
	APTS		***APTS***		***APTS***	
VARIABLES	coef	tstat	coef	tstat	coef	tstat
StrategicAlliances	0.0622***	(8.373)				
JointVentures			0.1216***	(4.527)	0.1222***	(4.550)
ContractualAlliances			0.0559***	(7.085)		
CA_R&D					0.0483***	(3.762)
CA_notR&D					0.0609***	(5.347)
Leverage	-0.0019	(-0.171)	-0.0019	(-0.173)	-0.0017	(-0.160)
Intangible	0.0322**	(2.007)	0.0330**	(2.058)	0.0327**	(2.041)
ROA	0.0755***	(3.806)	0.0764***	(3.854)	0.0768***	(3.874)
Foreign	0.0542***	(11.207)	0.0542***	(11.222)	0.0542***	(11.220)
Loss	0.0140**	(1.990)	0.0138*	(1.960)	0.0137*	(1.940)
NOL	0.0042	(0.935)	0.0040	(0.905)	0.0040	(0.904)
Size	0.0743***	(44.055)	0.0741***	(44.076)	0.0740***	(44.011)
SG&A	0.0077	(0.501)	0.0113	(0.737)	0.0125	(0.821)
PPE	-0.0206***	(-3.015)	-0.0211***	(-3.085)	-0.0211***	(-3.090)
CAPEX	-0.1289***	(-5.887)	-0.1270***	(-5.802)	-0.1272***	(-5.809)
Advertising	0.2733***	(2.589)	0.2724**	(2.574)	0.2669**	(2.519)
Acquisition	0.0042	(0.841)	0.0039	(0.787)	0.0040	(0.807)
Restructure	0.0461***	(7.806)	0.0462***	(7.829)	0.0463***	(7.843)
Constant	-0.3824***	(-17.986)	-0.3848***	(-17.866)	-0.3848***	(-17.928)
Industry Fixed Effects	Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes	
Observations	17,065		17,065		17,065	
Adjusted R-squared	0.352		0.353		0.353	

Figure 1
Theoretical Models

This figure presents ways in which contractual alliances could increase tax avoidance and lower tax rates. We model the hypothesized direct and indirect (mediated) paths between contractual alliances and tax avoidance with the indirect paths going through tax havens and the R&D tax credits.

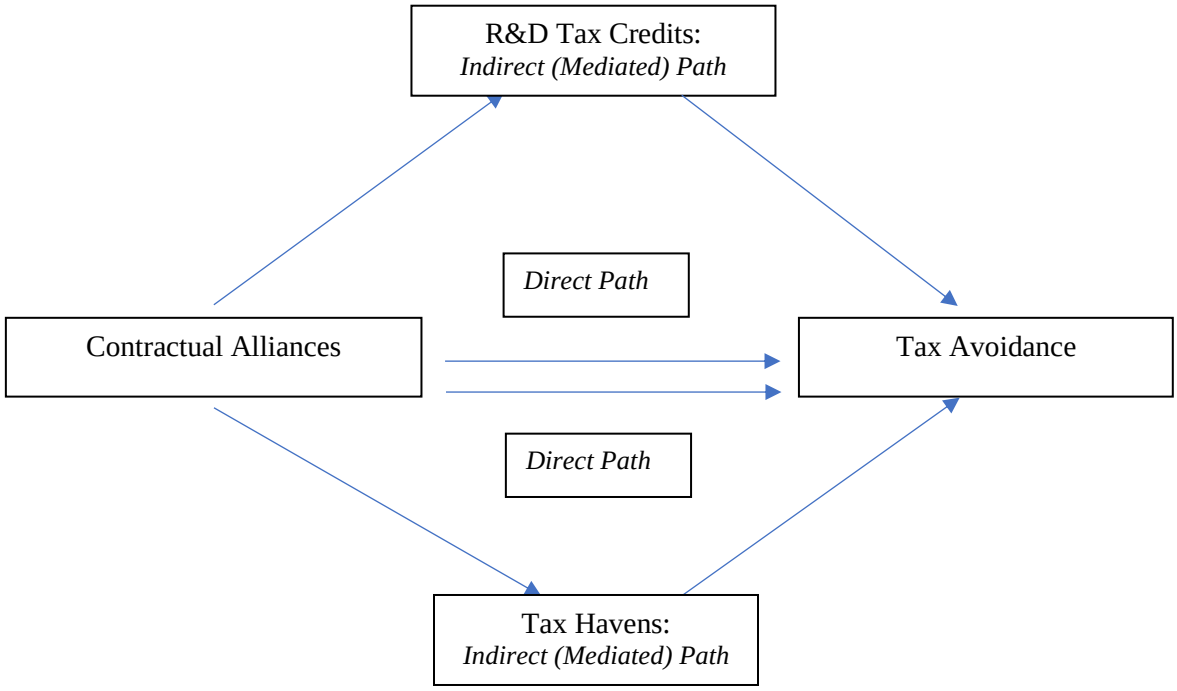

Figure 2
Structural Equation Modeling Estimation

This figure presents our estimation of a structural equation models from Figure 1 examining our hypothesized direct and indirect paths contractual alliances could impact effective tax rates. While Figure 1 has a single model with multiple mediators, we separately estimate the structural equation model separately for each possible mediator. That is why we have two separate estimates for the direct connection between contractual alliances and tax avoidance. Running two separate estimates allows us to maximize our sample size for the R&DCredit analysis. It also allows us to see how what percent of the total effect is mediated by each possible mediator rather than by the two combined, which leads to percentages above 100%. Results are consistent and inferences unchanged if we estimate only a single structural equation. Estimation was made using robust standard errors. Stars represent the statistical significance of a coefficient where *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Variables are as defined in Appendix 2. Additional details regarding these estimates are found in Table 7.