# The Economic Effects of Special Purpose Entities on Corporate Tax Avoidance

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**Abstract**

This study provides the first large-sample evidence on the economic tax effects of special purpose entities (SPEs). Unlike *transactions* that directly generate tax savings, these increasingly common components of corporate *organizational structures* facilitate tax savings by enabling sponsor-firms to conduct a greater level of tax-advantaged transactions and/or enhance the tax efficiency (i.e., relative tax savings) of such transactions. Using path analysis, we find that SPEs facilitate a greater level of specific transactions such that 1.8% of the cash tax savings from leverage, 3.3% from net operating loss carryforwards, 8.7% from research and development (R&D), 6.1% from intangibles, and all cash tax savings from tax havens occur within SPEs. We estimate that SPEs facilitate incremental cash tax savings of about $82.4 billion for our sample of 10,284 SPE users, or roughly 2% of total U.S. federal corporate tax collections during 1997-2011. Finally, moderation analysis reveals that SPEs enhance the total tax efficiency of transactions involving R&D and intangibles by 92.6% and 72.5%, respectively. Overall, these findings provide economic insight into complex organizational structures facilitating corporate tax avoidance.

**Keywords:** organizational structure; special purpose entity; tax avoidance
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## 1. Introduction

Both academic research and government reports study the tax effects of many different tax-advantaged *transactions*.[1] However, few studies evaluate the *organizational structures* facilitating such transactions, while those that do examine tax incentives and general determinants rather than the tax effects (Shevlin 1987; Beatty et al. 1995; Feng et al. 2009; Donohoe et al. 2013). Empirical evidence on the tax effects of organizational structures is important because, while lawmakers and regulators call for changes in the tax and financial reporting policies for organizational structures (JCT 2003; Basel Committee on Banking Supervision 2009; OECD 2013, 2015a, 2015b), existing knowledge about the tax revenue losses attributable to such structures is largely anecdotal. We fill this void by examining whether, how, and the extent to which increasingly common components of organizational structures—special purpose entities (SPEs)—facilitate corporate tax avoidance.[2]

SPEs are separate legal entities created by a sponsor-firm to perform narrow, predefined business activities or series of transactions (Feng et al. 2009).[3] Corporate use of SPEs is large and growing, with nearly a quarter of all Compustat firms and one-half of S&P 500 firms using at least one SPE (Zion and Carcache 2003). The number of SPE users in our sample has also increased by more than 600% from 1997 to 2011. While SPEs are used in common financial arrangements, such as leases and securitizations, anecdotes suggest companies use them to facilitate corporate tax avoidance; that is, reduce explicit taxes (JCT 2003). To this end, critics consider special purpose entities a "series of dirty words" in taxation (Forbes and Sharma 2008), while many other groups, including researchers (Mills et al. 2012; Zion and Carcache 2003), global tax authorities (Internal

[1] See U.S. Treasury (1999); Graham (2000); Hanlon and Heitzman (2010); Government Accountability Office [GAO] (2011); Organisation for Economic Co-Operation and Development [OECD] (2011); and U.S. Congress Joint Committee on Taxation [JCT] (2011).

[2] Tax avoidance does not necessarily imply improper behavior as managing tax costs is an appropriate component of a firm's long-term strategy (Atwood et al. 2012). Section 2 describes how SPEs facilitate tax avoidance.

[3] SPEs are also known as variable interest entities (VIEs) or special purpose vehicles (SPVs). VIEs are a subset of SPEs subject to consolidation under Financial Interpretation No. 46 (Financial Accounting Standards Board [FASB] 2006) and subsequent pronouncements (Chasteen 2005). We use the term "SPE" to refer to all such entities.

Revenue Bulletin 2011-39; Inland Revenue 2013), and regulators (FASB 2003; JCT 2003, 2011; OECD 2013, 2015a, 2015b; United Nations 2013) suspect that SPEs contribute to the continuing decline in corporate tax revenues.

Unlike tax-advantaged transactions, SPEs are organizational structures that do not directly generate tax savings, but instead facilitate tax savings in two ways.[4] The first way is by allowing sponsors to conduct a greater *level* of tax-advantaged transactions. By separating high risk assets from the sponsor, SPEs can enable greater (1) debt capacity, resulting in more tax deductible interest expense (Mills and Newberry 2005), (2) external financing, leading to more research and development (R&D) deductions and tax credits (Shevlin 1987); and (3) synthetic leases, increasing depreciation deductions (Zechman 2010). The second way that SPEs facilitate tax savings is by enhancing tax *efficiency*, or the relative tax savings from existing tax-advantaged transactions (i.e., holding *level* constant). For example, SPEs allow firms to (1) shift profits to jurisdictions with low tax rates (Drucker 2007; Forbes and Sharma 2008; Dyreng et al. 2013), (2) design and operate tax shelters (Graham and Tucker 2006; Wilson 2009; Lisowsky 2010), and (3) structure intercompany transactions that result in tax credit and loss duplication (JCT 2003; Sheppard 2017).

It is important to understand the ways in which SPEs facilitate tax-advantaged transactions (i.e., by changing their level or efficiency) because they shed light on the tax-motivated business strategies to achieve tax savings (Scholes et al. 2014). For example, if SPEs enable a firm to engage in a greater level of tax-advantaged transactions, such as R&D, then this tax avoidance may be within the bounds of tax law and beneficial to corporate stakeholders. However, if SPEs enable a firm to enhance the tax efficiency of a transaction, such as shifting R&D-related profits to tax havens or implementing a tax shelter that results in R&D credit duplication, then this tax avoidance may be pushing the bounds of tax law and exposing corporate stakeholders to additional costs (e.g., tax

[4] A tax-advantaged transaction reduces tax costs independent of taxpayer motives. For example, the debt-tax shield of leverage and tax credits from R&D expense reduce taxes, but do not necessarily result from intentional tax planning. We discuss this concept further in Section 2, and map empirical proxies to such transactions in Section 3.

audits and penalties).

Despite our focus on taxes, some experts argue that obtaining tax savings is *not* the main objective of common SPEs (e.g., for asset financing), suggesting these organizational structures play a minor role in corporate tax avoidance (Soroosh and Ciesielski 2004). Even when tax savings are a primary objective, SPEs are not necessarily optimal once all costs are considered (Scholes et al. 2014). For example, in addition to legal setup costs, SPEs can reduce information quality (Feng et al. 2009), increase regulatory scrutiny (Internal Revenue Bulletin 2011-39; Inland Revenue 2013), enhance public pressure (Dyreng et al. 2016), and result in large tax penalties (Wilson 2009).

Accordingly, we investigate whether and under what circumstances the tax effects of SPEs are economically significant by answering three open empirical questions. First, to what extent do SPEs enable sponsor-firms to conduct a greater *level* of tax-advantaged transactions? That is, we examine which specific transactions are commonly used within SPE-structures for tax avoidance. Second, how large are the tax savings facilitated by SPEs? Third, for which specific transactions do SPEs enhance tax *efficiency*, or relative tax savings? Directly measuring the level and efficiency of tax savings facilitated by SPEs will empirically answer important tax policy questions; namely, whether, how, and the extent to which organizational structures enable corporate tax avoidance.

We begin our analyses by providing the first large-sample empirical evidence on the overall relation between SPEs and corporate tax avoidance. Specifically, we regress two different forward-looking effective tax rates (ETRs) estimated over a three-year horizon ($t$ to $t$+2) on both a binary and continuous measure of SPEs derived from Exhibit 21 of Form 10-K during 1997-2011. We use fixed-effects estimation (a generalized difference-in-differences framework), which measures the effect of changes in SPE use on ETRs; that is, the *incremental* tax savings attributable to SPEs (Wooldridge 2010; Roberts and Whited 2013). We find that both the number of SPEs and the use of SPEs are negatively and significantly associated with future GAAP ETRs (i.e., total tax expense scaled by pretax income) and cash ETRs (i.e., cash taxes paid scaled by pretax income), suggesting that SPEs

facilitate tax avoidance incremental to common tax-advantaged transactions and other controls.

Next, we use path analysis to decompose the overall relation between SPEs and ETRs into direct and indirect paths. While regression analysis gauges overall effects, path analysis considers the existence and relative importance of alternative (indirect) paths of influence that jointly create overall effects (Bhattacharya et al. 2012). As a class of structural equation models, path analysis allows us to investigate the extent to which tax-advantaged transactions captured in our model are used *within* SPEs to avoid taxes. In other words, path analysis estimates the extent to which SPEs incrementally increase the *level* of tax-advantaged transactions, and provides a focused setting in which to estimate the total tax savings facilitated by SPEs.

We find that several tax-advantaged transactions are used within SPEs to avoid corporate taxes. Specifically, we estimate that SPEs facilitate 1.8% of the cash tax savings from leverage, 3.3% from net operating loss (NOL) carryforwards, 8.7% from R&D, 6.1% from intangibles, and all of the cash tax savings from tax havens. Thus, the path analysis indicates that SPEs increase the *level* of several specific tax-advantaged transactions in an economically meaningful way.

The path analysis also reveals that SPEs facilitate an economically significant amount of total tax savings. Among our principal results, we find that firms using the mean number of SPEs (5.48) have cash ETRs that are 4.4% lower than non-users. At the firm-level, these effects indicate that SPE users realize $7.8 million more in cash tax savings per year than firms not using SPEs. In aggregate, we estimate total cash tax savings of $82.4 billion for our sample of 10,284 SPE users, or approximately 2% of total U.S. federal corporate income tax collections during the sample period.[5] These estimates are considerably larger than those for other complex planning strategies, including tax shelters (Wilson 2009), tax havens (Dyreng and Lindsey 2009), round-tripping (Hanlon et al. 2015), and financial derivatives (Donohoe 2015).

[5] U.S. federal corporate income tax collections totaled approximately $4.46 trillion from 1997 to 2013 (irs.gov/uac/SOI-Tax-Stats-Collections-and-Refunds,-by-Type-of-Tax-IRS-Data-Book-Table-1). While our sample spans 1997-2011, our tests use data through 2013 to calculate forward-looking effective tax rate measures.

We next use moderation analysis to estimate the extent to which SPEs enhance the relative tax savings (i.e., tax *efficiency*) of tax-advantaged transactions. Moderation analysis considers if the relation between two variables depends on a third variable, allowing us to examine if specific transactions (as captured by model covariates) generate more or less tax savings when performed within versus outside SPEs. While the *path* analysis reveals that an economically large portion of the tax savings from leverage, NOLs carryforwards, and tax havens occur within SPEs by contributing to increased debt capacity, loss deductibility, and income shifting opportunities, respectively, the *moderation* analysis shows that SPEs do not enhance the tax efficiency of these transactions. However, SPEs enable a greater level *and* efficiency of total tax savings for R&D and intangibles-based transactions by 92.6% and 72.5%, respectively.

Finally, we perform several other tests to provide further insight on the tax effects of SPEs. First, we consider the link between SPEs and tax aggressiveness. We find that SPE use has a positive relation with unrecognized tax benefits (Lisowsky et al. 2013), but not the likelihood of tax shelter participation (Lisowsky 2010), suggesting that, on average, SPEs facilitate some tax uncertainty, but not extremely aggressive positions.[6] Second, we find that the GAAP ETR results are stronger for U.S. multinationals compared to U.S. domestic firms, and a majority of the tax savings of SPEs comes from avoiding U.S. federal, rather than foreign or state, income taxes. Our results also hold across several industries, suggesting that SPE-facilitated tax avoidance is pervasive and not simply confined to high-tech or intangible-intensive firms. Third, we mitigate alternative explanations by showing that our results are not driven by (1) the endogenous choice to use SPEs; (2) the financial reporting of minority owners of SPEs; (3) variation in firms' subsidiary reporting over time; or (4) potential increases in overall organizational complexity.

This study contributes to the literatures on SPEs (Shevlin 1987; Beatty et al. 1995; Feng et al.

[6] Tax aggressiveness is typically considered the use of tax positions which "push the envelope of tax law" (Hanlon and Heitzman 2010) and is a subset of tax avoidance (Lisowsky et al. 2013).

2009) and corporate tax avoidance (see Hanlon and Heitzman 2010) in three ways. First, we differ from traditional tax avoidance research in that we consider whether, how, and the extent to which tax avoidance is facilitated by increasingly common and uniquely complex organizational *structures*. In doing so, we identify some of the transactions used within such structures to facilitate tax savings, which is relevant to market participants as they analyze firms' tax profiles (Weber 2009), and tax authorities as they evaluate enforcement efforts to combat declining corporate tax revenues (Fox and Luna 2005; Inland Revenue 2013; Bozanic et al. 2017; Dyreng et al. 2017). Second, by providing the first large-sample estimates of the total tax savings facilitated by SPEs, we clarify inconclusive anecdotal evidence routinely cited by experts (e.g., Zion and Carcache 2003; Soroosh and Ciesielski 2004; Forbes and Sharma 2008) and researchers (e.g., Chasteen 2005; Desai and Dharmapala 2006; Feng et al. 2009; Zechman 2010), as well as help move the literature beyond the notion that firms simply *can* use SPEs to facilitate tax savings. Further, while prior research finds that tax incentives are an important, but not leading determinant of SPE use, we show that SPEs facilitate economically significant tax savings nonetheless. Finally, our study is the first to use both path and moderation analysis to (1) evaluate the tax effects of organizational structure and (2) separate level from efficiency effects. It can thus guide future research examining the economic outcomes of other corporate organizational structures.

Section 2 provides background on SPEs and develops our research questions. We discuss research design, results, and other tests in Sections 3, 4, and 5, respectively. Section 6 concludes.

## 2. Background and research questions

### *2.1 Corporate tax avoidance*

Prior research has extensively examined cross-sectional variation in firms' *transactions* to identify determinants of corporate tax avoidance (see Hanlon and Heitzman 2010). For example, studies show that tax avoidance is greater in firms with greater leverage, international operations, R&D, intangibles, and financial derivatives (e.g., Gupta and Newberry 1997; Graham and Tucker

2006; Rego 2003; Lisowsky 2009; Donohoe 2015). Additional research examines the link between tax avoidance and ownership type. For example, tax avoidance is lower in family-owned than non-family-owned firms (Chen et al. 2010) and in firms owned by private equity shareowners (Badertscher et al. 2013) or hedge funds (Cheng et al. 2012). Another stream of research examines the link between tax avoidance and managerial incentives. For instance, tax avoidance is greater when managers are compensated based on after-tax earnings (Phillips 2003), with stock options (Lisowsky 2009; Rego and Wilson 2012), or when they have less debt-like retirement wealth tied to the firm (Chi et al. 2017). A particular manager, especially a tax director, also matters in generating corporate tax savings (Armstrong et al. 2012; Dyreng et al. 2010). Finally, other research finds that internal tax departments, external tax advisors, and tax authorities can increase or constrain corporate tax avoidance (Robinson et al. 2010; Hoopes et al. 2012; Beck and Lisowsky 2014; Klassen et al. 2016; Klassen et al. 2017). Overall, these studies provide important insights into *what* companies and managers do—and to some extent *why*—to generate tax savings.

However, there is a noticeable void in the literature pertaining to *how* corporations facilitate tax avoidance. It is well-known that firms employ complex structures, such as using corporate and pass-through subsidiary entities, some with multiple tiers, to operate and invest in various activities and locations (GAO 2011; OECD 2011; Donohoe et al. 2013). What is less-known is whether, how, and how much corporations use these structures to avoid tax. Only recently do some studies examine the link between corporate organizational structure and tax avoidance, although the focus is on multinational corporations. For example, Dyreng and Lindsey (2009) find that U.S. firms with a subsidiary in a tax haven country report lower effective tax rates than other firms. Hope et al. (2013) find that the lack of disclosures on organizational complexity (measured by geographic business segments) facilitates greater tax avoidance. In several working papers, Blouin and Krull (2015) investigate the role of the U.S.'s "check-the-box" rules on how entity type choice reported on the tax return affects firms' foreign operations, while Lewellen and Robinson (2014) examine internal

ownership structures of U.S. multinationals.[7] Wagener and Watrin (2014) and Amberger and Kohlhase (2017) show in a European setting that choices over organizational structures are likely tax-motivated.

Even considering this recent research, no study identifies or estimates the tax effects of organizational structure *regardless* of corporations' domestic or multinational activities. The lack of empirical evidence on these issues is largely due to the challenges researchers face with (1) identifying organizational structures, and (2) separating the tax avoidance effects of transactions from the organizational structures that facilitate the transactions. Our specific examination of SPEs used by U.S. public corporations in a path analysis framework addresses these challenges.

*2.2 Special purpose entities (SPEs)*

In general, SPEs are created by a sponsor-firm for a specific business purpose or series of transactions (Feng et al. 2009). Although they serve many purposes, SPEs are often used to obtain external financing for corporate activities. For example, a sponsor might contribute "high-risk" assets, such as construction or R&D projects, to a SPE, which is legally separate from the sponsor by name, financial reports, and legal liability. The SPE can then obtain financing via equity or securitized debt, ultimately increasing the financing ability of the entire corporate group.[8] Along these lines, prior research finds higher leverage among firms that use SPEs (Mills and Newberry 2005; Feng et al. 2009), and suggests that separating assets with different risks and matching them with investor risk preferences can lead to more favorable financing terms (Shevlin 1987; Beatty et al. 1995). In asset securitizations, the sponsor uses SPEs to create new types of financing that can reduce

[7] The "check-the-box" regulations (IRC §7701) permit certain business entities to choose their classification for federal income tax purposes. These regulations can create discrepancies in how pass-through entities (e.g., partnerships) are treated for tax purposes across U.S. and foreign jurisdictions, enabling some tax avoidance strategies (Munden et al. 2002). For instance, the IRS has targeted SPEs in conjunction with schemes that duplicate foreign tax credits (Internal Revenue Bulletin 2011-39). New Zealand tax authorities also consider SPEs as audit red-flags for multinational companies (Inland Revenue 2013), and, as of 2009, the Chinese government restricts the use of SPEs by foreign firms to obtain tax-favorable outcomes with regards to tax treaty benefits when exiting Chinese investments (KPMG 2010).

[8] See Hartgraves and Benston (2002), Chasteen (2005), and Feng et al. (2009) for further details.

capital costs, provide incentives to use debt over equity, and attract different types of investors (Schwarcz 1994; Landsman et al. 2008).

Corporate use of SPEs has flourished over time for at least two reasons. First, from a tax perspective, the U.S. Supreme Court permitted sponsor-firms to deduct SPE expenses from taxable income after 1974, increasing the tax planning capabilities of SPEs.[9] Second, from a financial reporting perspective, "bright-line" tests in ARB No. 51 (AICPA 1959) made it relatively easy for sponsors to avoid the consolidation of SPEs (Soroosh and Ciesielski 2004; Callahan et al. 2012, 2013).[10] As a result, SPEs became a popular way to move debt, expenses, and high-risk assets off-balance-sheet to reduce taxes, enhance profitability, and reduce perceptions of risk.

For these reasons, Feng et al. (2009) investigate the use, determinants, and earnings effects of SPEs. Using a novel measure of SPEs, they find a two-and-a-half fold increase in the percentage of firms using at least one SPE during 1997-2004. They also show that SPE activity increases with a firm's intangible assets and marginal tax rate (MTR), and decreases with foreign activity and the quality of governance. Firms also use more SPEs when facing higher financial reporting pressures, primarily those related to debt obligations. Finally, they document that SPEs arranged for financial reporting purposes (rather than economic reasons) are linked to earnings management.

Not surprisingly, the ability of SPEs to help sponsors "manage" financial reports has led to high-profile cases of earnings manipulation and fraud. For example, some sponsors used SPEs to create related-party income not eliminated in the consolidation process. This type of manipulation was largely behind the Enron fraud, which involved income overstatements of $591 million during 1997-2000 (Thomas 2002). SPEs have also played a role in other scandals, such as Dynegy (Desai

[9] *Snow v. Commissioner*, 416 U.S. 500 (1974), allowed limited partners to deduct partnership expenses from taxable income. A corporation that is a limited partner in a SPE structured as a partnership can thus deduct SPE expenses.

[10] ARB No. 51 required consolidation of an entity in the sponsor's financial statements if the sponsor held more than 50% of the outstanding voting shares of the entity. Many sponsors simply limited their ownership of SPE voting shares to less than 50% and used other mechanisms, such as lease agreements and debt covenants, to maintain effective control of the SPE while avoiding financial statement consolidation (Chasteen 2005).

and Dharmapala 2006), PNC Financial (SEC 2002), and Olympus (Verschoor 2012). In the cases of Enron and Dynegy, SPEs were used to avoid a substantial amount of corporate taxes (McGill and Outslay 2004). More recently, SPEs were an integral factor in the financial crisis, with several banks using SPEs to hold, package, and sell mortgage-backed securities (Kothari and Lester 2012).

*2.3 Tax advantages of SPEs*

Tax avoidance represents a continuum of tax planning strategies, where relatively benign strategies lie at one end, and aggressive or illegal strategies (e.g., tax shelters) lie at the other end (Lisowsky et al. 2013). Despite many aggressive ways in which SPEs can be used for tax avoidance (McGill and Outslay 2004), SPEs can promote tax planning along the entire continuum. However, regardless of where tax planning falls on the continuum, the mere inclusion of a SPE in a firm's organizational structure does *not* automatically generate tax savings. For example, while SPEs often use legal forms that are not subject to entity-level taxes on profits (e.g., partnerships), the net income/loss of such forms "flow through" to the sponsor's tax return. Similarly, tax savings are seemingly generated when non-consolidated SPEs face higher tax rates than the sponsor; but, different tax rates do not necessarily result in cash tax savings when the entire group (sponsor and SPE) is viewed as a whole.[11] Thus, rather than generate tax savings, SPEs *facilitate* tax savings by allowing sponsors to (1) conduct a greater level of tax-advantaged transactions, and/or (2) enhance the tax efficiency (i.e., relative tax savings) of such transactions. Eq. (1) stylizes this logic:

$$Total\ Tax\ Savings = f(Level, Efficiency) \quad (1)$$

By allowing sponsors to conduct a greater level of tax-advantaged transactions (*Level* in Eq. (1)), SPEs facilitate tax savings in many ways. For example, by holding high-risk assets, SPEs can

[11] Financial reporting consolidation standards changed during our sample period from a 50% ownership test before 2003, to a majority of rewards, losses, or risks threshold from 2003 to 2009 (FIN 46), to a qualitative test of a sponsor's ability to direct the activities or absorb the losses of an entity after 2009 (SFAS 167). For tax reporting purposes, entities can be consolidated if they are owned 80% or more, unless "check-the-box" regulations apply. Inferences remain the same across these reporting regimes, suggesting that our results are not driven by the inclusion or exclusion of SPEs with lower effective tax rates than those of the consolidated group.

increase a sponsor's debt capacity which, in turn, can lead to greater tax deductible interest expenditures and fewer cash tax payments (Graham 2000; Blouin et al. 2010). Due to their ability to attract additional financing, SPEs can also acquire and hold depreciable assets, R&D projects (Shevlin 1987; Beatty et al. 1995), and securitized assets (Landsman et al. 2008), which further increase a sponsor's depreciation deductions, tax credits, and bad debt deductions, respectively.

SPEs also facilitate tax savings across the tax avoidance continuum by enhancing the tax efficiency of transactions (*Efficiency* in Eq. (1)). In particular, SPEs can help sponsors enhance the relative tax savings of transfer pricing and profit shifting to more tax-favorable jurisdictions. For example, in the "Double Irish With a Dutch Sandwich" tax planning strategy pioneered by Apple, Inc., a sponsor uses a SPE to relocate intangibles (e.g., patents) to other countries (e.g., Ireland) to benefit from lower tax rates and advantageous tax treatments of intangibles (Forbes and Sharma 2008; Duhigg and Kocieniewski 2012).[12] These types of strategies have become so popular that the OECD (2013) now views legal ownership of intangibles as merely a reference point for determining actual ownership, and has labeled SPEs as a major source of international tax treaty abuse in Action 6 of its Base Erosion and Profit Shifting Project (OECD 2015a).

U.S. domestic firms can similarly enhance the tax efficiency of tax-advantaged transactions by using SPEs in low-tax states. Gupta and Mills (2002) find that firms operating in multiple states reduce taxes by exploiting differences in state tax rates and rules. One example is Wal-Mart's use of captive real estate investment trusts, a specific type of SPE, to shift profits from high-tax states into low-tax states (Drucker 2007). In addition, Dyreng et al. (2013) find that corporate subsidiaries in Delaware and opportunities to shift profits between states are associated with lower state ETRs, and Fox and Luna (2005) show a decrease in state tax collections as the number of limited liability companies (a common legal form of SPEs) in a state increases. Overall, these examples show how

[12] More generally, firms are able to transfer property with untaxed built-in gains to low-tax jurisdictions without paying tax on the transfer if they use a pass-through SPE to complete the transfer (Madara 2017).

SPEs enhance the relative tax savings of transactions by facilitating the movement of taxable profit from high-tax to low-tax jurisdictions.

Lastly, at the aggressive end of the tax avoidance continuum, SPEs can enhance the relative tax savings of tax shelters. In the early 2000s, the IRS caught some firms using SPEs to accelerate the cost recovery of fixed assets, resulting in greater tax depreciation deductions (JCT 2003). More complex shelters used SPEs to generate "double deductions" for a single loss. For instance, using losses from prior asset sales (along with dividends subject to the dividends received deduction), Enron Corp. sold low tax basis SPEs (sometimes to other Enron SPEs) at a loss. These transactions resulted in federal tax savings of $2.2 billion, about 85% of which was facilitated by SPEs.[13]

In sum, the examples above illustrate how SPEs can increase the level of tax-advantaged transactions or enhance the relative tax savings of transactions. These examples also illustrate that interpreting the tax effects of SPEs is nuanced. Most level-increasing tax savings of SPEs may arise in conjunction with other non-tax benefits (e.g., greater debt capacity), while efficiency-increasing effects of SPEs may reflect a more tax-motivated business strategy to achieve tax savings (Scholes et al. 2014). SPEs can also increase both the level and efficiency of transactions concurrently. See Appendix A for more examples.

*2.4 Tax disadvantages of SPEs*

Despite the vast potential for tax planning, SPEs might not facilitate an economically large amount of tax savings. SPEs enable a wide variety of transactions, many of which are not tax-advantaged or for which tax savings is not the primary objective. Such transactions can include securitizations (Landsman et al. 2008), synthetic leases with similar book/tax reporting (Zechman 2010; Callahan et al. 2013), asset-backed commercial paper conduits (Bens and Monahan 2008), and

[13] JCT (2003) provide further details on this transaction, and SPEs and tax shelters more generally. The tax savings amounts are estimates as Enron went bankrupt before realizing all of the tax savings from these structures. Even though Enron is a classic example, transactions that use SPEs set up as partnerships to generate "double deductions" have persisted into recent years (Sheppard 2017).

others (Zion and Carcache 2003; Soroosh and Ciesielski 2004; Basel 2009). In addition, many firms use parent-subsidiary organizational structures, particularly in states with favorable laws, to both limit and contain legal liability from business operations (Davis et al. 2002). More generally, Feng et al. (2009) find that financial reporting pressures, governance, and other non-tax factors drive SPE use, implying that tax avoidance may not be a primary objective. Aside from setup costs, SPEs can reduce information quality (Feng et al. 2009), increase regulatory scrutiny (Internal Revenue Bulletin 2011-39; Inland Revenue 2013), and heighten public pressure (Dyreng et al. 2016), among other costs.[14] Thus, SPEs are not necessarily an optimal tax planning tool once all non-tax costs are considered (Scholes et al. 2014).

SPEs can even lead to *higher* taxes, especially if *ex post* events affect the realization of expected tax savings. For instance, tax authorities can disallow tax positions upon audit and levy severe penalties. Wilson (2009) finds that interest and penalties arising from tax shelters account for 49% of total assessed deficiencies. Transfer prices in cross-border transactions can also be adjusted by tax authorities upon audit. If a jurisdiction does not allow for an offsetting adjustment, double-taxation of the same transaction can be a costly outcome (Wittendorff 2010).

*2.5 Research questions*

We focus on three related research questions, which are novel because prior research primarily considers the tax effects of different transactions rather than the organizational structures facilitating such transactions. As separate legal entities, SPEs do not directly generate tax savings, but instead facilitate tax savings via the level and efficiency effects discussed earlier. Accordingly, our questions consider both of these effects, as well as the incremental tax savings from SPEs.

First, Section 2.3 (and Appendix A) highlights a number of tax-advantaged transactions involving SPEs. However, aside from anecdotes in the financial press and government reports, no

[14] For example, Enron paid external tax advisors $87.6 million to ensure its SPEs were structured to obtain robust tax savings (JCT 2003). This amount does not include the internal costs of establishing the transactions or the time-value of money effects of paying fees upfront while waiting years to realize any tax benefits.

empirical evidence exists on the extent to which these transactions are systematically facilitated by SPEs. For this reason, and because tax-advantaged transactions vary in the degree to which they can generate tax savings, we first examine the extent to which SPEs enable sponsors to conduct a greater level of such transactions (*Level* in Eq. (1)). Our first research question is as follows:

**RQ1**: To what extent are specific transactions used *within* SPEs for tax avoidance?

Second, prior research directly examines the link between SPEs and taxes. Shevlin (1987) and Beatty et al. (1995) evaluate whether firms with *low* marginal tax rates (MTRs) are more likely to use R&D limited partnerships (a specific type of SPE) under the hypothesis that such firms can transfer tax benefits to affiliates facing higher MTRs. Both studies find evidence consistent with this hypothesis, suggesting that incentives for tax avoidance (in the form of MTRs) explain SPE use. However, neither study estimates the magnitude of any resulting tax savings.

In contrast, Feng et al. (2009) find an association between *high* MTRs and SPE use. Aside from considering a wider array of SPE organizational forms than the other two studies, Feng et al. examine the more recent period of 1997-2004 (versus 1975-1984 in Shevlin (1987) and 1978-1992 in Beatty et al. (1995)). While the opposite results could be explained by examining different types of SPEs, their findings may suggest a change in how sponsors use SPEs over time, consistent with the changing role of corporate tax departments over this period (Donohoe et al. 2014). However, Feng et al. do not estimate the tax savings facilitated by SPEs.

While these three studies offer evidence on the tax *incentives* for SPE use, we are interested in whether tax *outcomes* change (namely, total tax expense and cash taxes paid) as a result of SPE use. We do not formalize a hypothesis due to the volume of anecdotal evidence (Section 2.3 and Appendix A) suggesting a positive relation between SPEs and tax avoidance. Instead, we seek to measure the magnitude of total tax savings facilitated by SPEs (*Total Tax Savings* in Eq. (1)), which could be economically small due to the non-tax costs and objectives of SPEs (Section 2.4). Our second research question is as follows:

**RQ2**: How economically significant are the total corporate tax savings facilitated by SPEs?

Third, due to the paucity of research on the tax outcomes of SPEs, only anecdotes indicate which transactions generate more tax savings when conducted *within* (rather than outside) SPEs. Because the use of SPEs to increase the relative tax savings of transactions likely reflects firms' motivation to enhance tax avoidance, we also evaluate the extent to which SPEs enhance the tax efficiency of specific transactions (*Efficiency* in Eq. (1)). We state our final research question as follows:

**RQ3**: For which transactions do SPEs enhance relative corporate tax savings?

## 3. Research design

### *3.1 Measures of SPE use*

Prior research uses a variety of methods to identify the existence of SPEs, which often rely on unique data from sponsor directories (Shevlin 1987), DealScan transactions (Zechman 2010), or searches of financial statement footnotes (Beatty et al. 1995; Landsman et al. 2008; Callahan et al. 2013). Although these methods can identify specific sets of SPE transactions (low Type I error), they do not always capture the full range of SPEs (high Type II error) because SPEs facilitate a wide variety of transactions and their existence is disclosed voluntarily in such data sources.

To identify SPEs, we follow Feng et al. (2009) by developing a Python script that counts the total number of subsidiaries listed in Exhibit 21 (a mandatory filing) whose names contain "Limited Partnership," "Limited Liability Partnership," "Limited Liability Company," or "trust" for all electronically-filed Form 10-Ks. Because the SEC's Office of Chief Accountant and many anecdotes indicate that SPEs are primarily organized as one of these types of pass-through entities (Feng et al 2009), the script does not count *corporate* subsidiaries.[15] Feng et al. extensively validate this

[15] A list of subsidiaries must be disclosed to the SEC as Exhibit 21 to Form 10-K. We also include subsidiaries whose names contain the abbreviations ''L.P.'', ''LP'', ''LLP'', ''L.L.P.'', ''LLC'', or ''L.L.C.'' Consistent with Feng et al. (2009), we do not include non-English-language pass-through subsidiaries. Jurisdictions that use English subsidiary designations include The Bahamas, Bermuda, Canada, Jordan, Singapore, and the U.S., among others.

approach to ensure it captures SPEs. In particular, they find that the number of SPEs in Exhibit 21 is associated with press mentions of SPE use, asset securitizations, and the voluntary mention of SPEs in financial statements. The advantages of their approach include its (1) ability to identify virtually all SPEs; (2) mitigation of selection bias by relying on mandatory disclosures; and (3) computational ease. However, there are two key limitations. First, a company could misclassify its subsidiary list as something other than Exhibit 21. Second, a company could file Form 10-K in such a way that the SEC cannot parse out the various exhibits (e.g., as a single text document).

Feng et al. (2009) search directly within Form 10-Ks to overcome the second concern (i.e., some exhibits may not be correctly parsed by the SEC). However, their approach is still susceptible to misclassified subsidiary lists (i.e., the first concern). Therefore, we obtain Exhibit 21 disclosures from the Filing Exhibits database in the Wharton Research Data Services (WRDS) SEC Analytics Suite, which only includes exhibits that are correctly classified by the SEC in their filings library. We then fill missing observations with data kindly provided to us by Feng et al.[16] These data, along with the increase in electronic filing quality during the sample period (e.g., XBRL), mitigate both limitations noted above and ensure we identify the vast majority of SPE users. Should our approach fail to identify a SPE user, the economic tax effects we observe will be understated because SPE users will be incorrectly classified as non-users. In addition, while some SPEs might not be consolidated in a firm's financial reports, SEC regulations require the disclosure of consolidated as

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Any omission of SPEs organized as corporations understates our estimates of the economic effects of SPE-related tax avoidance. Our Python script was unable to reliably collect the total number of subsidiaries or match specific SPEs and jurisdictions, so we cannot control for total subsidiaries or analyze geographic patterns in SPEs.

[16] To obtain as many subsidiary listings as possible, we collect all exhibits in the WRDS SEC Analytics Suite and search among those labeled "EX-21*", "EX-22*", or containing "sub" in the description. We also examine all exhibits other than Exhibit 21 by hand and retain those that contain the subsidiary listing, where the firm-year did not otherwise report Exhibit 21 or the exhibit labeled "Exhibit 21" was not a subsidiary list. We find many misclassifications in the early years of the sample, which further motivates our SPE search procedure. Our searches are not affected by HTML quality or readability because the Python script was adapted to accommodate all HTML schema and file types.

well as non-consolidated entities in Exhibit 21.[17] Because these regulations remain relatively unchanged since implementation, our approach captures SPE use consistently across time.[18]

We construct two measures of SPE use: (1) the log of (one plus) the total number of SPE subsidiaries (*SPETOT*); and (2) a binary variable (*SPEBIN*) that equals one for firm-years with a SPE subsidiary (0 otherwise). Consistent with Feng et al. (2009), we winsorize *SPETOT* at the top 1% to reduce the influence of outliers. Both of our measures are highly correlated ($\rho$>0.98) with those of Feng et al. across common years (untabulated).[19]

*3.2 Measures of tax avoidance*

We use two forward-looking ETRs estimated over three years (*t* to *t*+2) to measure tax avoidance: (1) GAAP ETR (*GETR*), total tax expense scaled by pre-tax book income less special items; and (2) cash ETR (*CETR*), worldwide cash taxes paid scaled by pre-tax book income less special items (Dyreng et al. 2008; Hanlon and Heitzman 2010). *GETR* captures tax strategies that generate permanent differences between book and tax income, as well as tax credits, while *CETR* captures tax strategies that generate both permanent and temporary differences between book and tax (i.e., that affect book income and defer cash tax payments to later periods), as well as tax credits. We use forward-looking ETRs to capture the diverse effects of SPEs along the entire tax avoidance continuum (e.g., Lisowsky et al. 2013), which can occur contemporaneously or with a delay.[20]

[17] Under SEC Regulation S-K, a registrant must provide a list of all its material subsidiaries, whether or not they are consolidated for income statement or balance sheet reporting purposes. Under SEC Regulation S-X, the definition of control that is used to determine if an entity is a subsidiary is "the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a person, whether through the ownership of voting shares, by contract, or otherwise." However, because disclosure of ownership details is not mandatory, we cannot observe or infer organizational hierarchies (i.e., whether an SPE is owned by the sponsor or another subsidiary).

[18] We increase our sample size with the Feng et al. data, but add only 28 SPE observations for 2004 (3%), consistent with an increase in the quality of Exhibit 21 classifications in the SEC electronic filing system over time.

[19] By searching the population of Form 10-Ks, Feng et al. (2009) capture Exhibit 21 information regardless of classification errors (i.e., a subsidiary list is *not* separately identified by the SEC) in the annual report. However, the SEC Analytics Suite allows us to identify subsidiary lists that use file headers other than Exhibit 21. As such, we find subsidiary lists where a keyword search for Exhibit 21 finds no results. In such cases, we obtain some SPE observations where Feng et al. do not, which contributes to the less-than perfect correlation across common years.

[20] Consistent with prior studies (McGuire et al. 2012; Donohoe 2015), we drop observations with negative ETR denominators as unprofitable firms are unlikely to have a significant tax liability. Our results are robust to separately

*3.3 Empirical model*

We estimate the following fixed-effects model (i.e., a generalized difference-in-difference model) for firm *i* at time *t*:

$$ETR_{it\ to\ t+2} = \beta_{i0} + \beta_1 SPE_{it} + \sum_{j=2}^{11} \beta_j TAT_{jit} + \sum_{j=12}^{20} \beta_j CTRL_{jit} + \delta_{0t} + \epsilon_{it}, \qquad (2)$$

where the dependent variable (*ETR*) is one of the future-period ETRs described above (*GETR* or *CETR*). The variable of interest, *SPE*, is alternately *SPETOT* and *SPEBIN*. Consistent with SPE use facilitating tax avoidance, we expect $\beta_1<0$.

Including firm and year fixed-effects creates a generalized difference-in-differences model, where $\beta_1$ is the difference-in-differences estimator of interest. $\beta_1$ thus captures the effect of *changes* in SPE use on ETRs by using each firm as its own control, and can be interpreted as the *incremental* effect of SPEs on the tax savings attributable to a transaction. This specification allows for more robust modeling of time- and firm-effects, and captures a wide range of firm changes (Wooldridge 2010; Roberts and Whited 2013).[21] In Section 4, we explain how we adapt this baseline model to address each of our research questions.

*TAT* is a vector of tax-advantaged transactions known to influence ETRs (McGuire et al. 2012; Donohoe 2015). To capture elements of corporate borrowing, we include leverage (*LEV*), net debt issuances (*DISS*), and the current portion of long-term debt (*CLTD*). We include R&D expense (*RDE*) and fixed assets (*PPE*) to reflect both depreciable assets and basis-shifting to tax preferred assets. Similarly, intangible assets (*INTANG*) capture amortizable assets, as well as elements of both

(1) controlling for special items and (2) including special items in ETR denominators. We use three-year ETRs to control for variation in tax laws over time, long-run strategies employed by the firm, and settlement of disputes over previously filed tax returns (Dyreng et al. 2008). By doing so, the measures are three-year forward-looking averages of ETRs (*t* to *t*+2) computed as of year *t* while our SPE (and control) variables are generally measured in year *t*. This design aligns with our research question regarding whether SPE use in year *t* influences *future* tax avoidance.

[21] We select a fixed-effects estimator over a first-differences estimator because our data is an unbalanced panel (Wooldridge 2010). Results using a first-differences estimator are similar, but statistically weaker than those obtained from fixed-effects estimation, suggesting that fixed-effects is a more efficient estimator. Hausman (1978) tests (untabulated) reject the null hypothesis that replacing firm fixed-effects with industry fixed-effects, or modeling firm effects as random effects, provide an estimator with comparable consistency ($p<0.01$). *F*-tests (untabulated) also suggest that firm fixed-effects are statistically significant ($p<0.01$).

U.S. domestic and foreign profit shifting. Net operating loss carryforwards (*NOL*) capture tax loss duplication, and mergers and acquisitions (*M&A*) reflect basis shifting to tax-preferred assets. Foreign income (*FINC*) captures elements of foreign profit shifting. Finally, the number of tax haven subsidiaries (*HAVEN*; Dyreng and Lindsey 2009) controls for foreign tax deferrals and ensures our results are not driven by SPEs located in tax haven countries.

*CTRL* is a vector of control variables. Following prior research (Feng et al. 2009; Donohoe 2015), we include total assets (*SIZE*), profitability (*ROA*), book-to-market (*BM*), cash holdings (*CASH*), interest coverage ratio (*INTCOV*), stock return volatility (*SVOL*), internal funds (*IFUND*), and discretionary accruals (*DACC*). We also include business segments (*BUSSEG*) to ensure our results are not driven by operational complexity.[22] All variables are defined in Appendix B.

*3.4 Sample selection*

We begin with Compustat observations for fiscal years 1997-2011 meeting the following criteria: (1) publicly traded; (2) domestically incorporated; and (3) positive total assets. Fiscal year 1997 coincides with the effective date of the check-the-box regulations, which permit some entities to choose a classification for federal income tax purposes, and is also the first year that registrants electronically filed annual reports with the SEC, a necessity for computing our SPE measures. From this initial sample, we remove observations with (1) negative three-year pre-tax income; (2) insufficient data to estimate ETRs; and (3) regulated and financial firms (NAICS codes 22 and 52).[23] We require two future years of data to estimate the three-year forward-looking ETRs (i.e., ETRs for 2011 also require data from 2012 and 2013). These screens result in a sample of 54,887 firm-year observations. Further data criteria for control variables yield 25,533 observations from 4,566 unique

[22] Prior research finds that corporate governance explains both tax avoidance (Desai and Dharmapala 2006) and SPE use (Feng et al. 2009). Because governance characteristics are "sticky" over time and the relevant data reduces our sample by 66%, we include firm fixed-effects in Eq. (2) instead. Nevertheless, in untabulated tests, we find similar results after controlling for the (1) bonus portion of executive compensation, (2) percentage of shares held by executives, (3) percentage of shares held by independent board members, and (4) proportion of independent board directors. Also, estimating Eq. (2) on this smaller sample (without governance variables) yields similar results.

[23] We exclude regulated and financial firms as they face fundamentally different financial and tax reporting rules.

firms. Table 1 summarizes the sample selection process.

## 4. Main results

### *4.1 Descriptive statistics and univariate tests*

Panel A of Table 2 reports the temporal distribution of the number of SPEs and SPE users, which exhibit nearly monotonically-increasing growth over the sample period. From 1997 to 2011, the total number of SPEs used by sample firms increased from 605 to 18,436 (a growth rate of over 3,000%), while the number of firms using SPEs increased by over 600% (from 165 to 999). Only 9.4% of sample firms used SPEs in 1997, but 62.1% used SPEs by 2011. Feng et al. (2009) document several firm-level determinants of this growth in SPE use; however, another potential explanation is the enactment of the check-the-box regulations in 1997, which increased the tax advantages of subsidiaries structured as pass-through entities (Munden et al. 2002).

<INSERT TABLES 1-2 & FIGURE 1 ABOUT HERE>

Recent research finds that ETRs are decreasing over time (Dyreng et al. 2017), consistent with the changing role of corporate tax planning from a compliance-focused activity to a profit enhancing objective to a risk management function (Donohoe et al. 2014). This finding inversely mirrors the temporal growth in SPEs shown in Panel A of Table 2. To further illustrate, Figure 1 plots average GAAP ETRs (*GETR*) and the total number of SPEs used by sample firms over time. The strong negative relation provides univariate evidence that corporate use of SPEs coincides with the decline in ETRs over (at least) the 15-year sample period.[24]

Panel B of Table 2 reports industry distributions for the number of SPEs, SPE users, and non-users by two-digit NAICS code. Industries with a higher concentration of SPEs are those with more intangibles (arts and entertainment), legal risk (construction), or both (health care), whereas industries with fewer intangibles (agriculture, transportation) have a lower concentration of SPEs. Firm fixed-effects in Eq. (2) control for any industry-related confounds.

[24] We find a similar, yet slightly more volatile, pattern using cash ETRs (*CETR*).

<INSERT TABLE 3 ABOUT HERE>

Table 3 reports descriptive statistics for measures of tax avoidance (*ETR*), SPE use (*SPE*), tax-advantaged transactions (*TAT*), and controls (*CTRL*), along with *t*-statistics for mean tests of differences between SPE users and non-users, where *GETR* is the dependent variable.[25] Means and medians of *GETR* and *CETR* are between 24.1% and 30.1%, similar to prior studies. Relative to non-users, SPE users have significantly smaller mean *GETR* (27.2% vs. 28.4%) and *CETR* (24.7% vs. 27.2%). These tests suggest that SPE users avoid more taxes than non-users. Further, about 41.5% of sample firms use SPEs (*SPEBIN*), with about 5 SPEs (*SPETOT*) per user (1.869 in log form).

Statistics for other variables are similar to prior studies and suggest that SPE users and non-users differ across several features. For example, relative to non-users, SPE users are larger (*SIZE*), more levered (*LEV*), less profitable (*ROA*), and have less R&D (*RDE*). We include firm fixed-effects in Eq. (2) to model observable (and unobservable) differences.[26] Pearson correlations (untabulated) indicate that SPE use is negatively related to both ETRs ($p<0.01$), consistent with expectations. Also, business segments (*BUSSEG*) and tax havens subsidiaries (*HAVEN*) are positively correlated with *SPEBIN* ($\rho$=0.079 and 0.382, respectively), suggesting it is important to control for these structures. Variance Inflation Factors (untabulated) reveal no issues with multicollinearity.

*4.2 Relation between SPEs and corporate tax avoidance*

We begin our multivariate analyses by providing the first large-sample empirical evidence on the overall relation between SPEs and corporate tax avoidance. Table 4 reports estimates of Eq. (2) for both measures of ETRs and SPEs. We find that both the change in the number of SPEs (*SPETOT*) and use of SPEs (*SPEBIN*) are negatively and significantly associated with future GAAP (*GETR*) and cash (*CETR*) ETRs across the four columns. These results suggest SPEs facilitate tax avoidance above and beyond common tax-advantaged transactions (vector *TAT*) and other controls (vector

[25] When *CETR* is the dependent variable, there are 23,543 observations in the full sample, 10,284 SPE Users, and 13,259 Non-Users. All statistics are similar across both sets of subsamples and *t*-statistics remain significant.
[26] We evaluate the endogeneity surrounding the choice to use SPEs in Section 5.3.

*CTRL*) included in the model. The coefficients for explanatory variables are largely consistent with prior research. For example, ETRs are negatively associated with leverage (*LEV*), net operating loss carryforwards (*NOL*), and foreign income (*FINC*). However, coefficients for R&D (*RDE*) and tax haven subsidiaries (*HAVEN*) are not significant.[27] In sum, consistent with the anecdotes discussed earlier, SPEs are strongly associated with greater corporate tax avoidance.

<INSERT TABLE 4 ABOUT HERE>

*4.3 Path analysis (RQ1 and RQ2)*

Path analysis belongs to a class of structural equation models that provide explanations of correlation structures (Bhattacharya et al. 2012; Gow et al. 2016). We use it to decompose the relation between the source (causal) variables, our *TAT* vector, and outcome variable, *ETR*, shown in Table 4 into direct and indirect paths. Recall that as separate entities, SPEs do not directly generate tax savings. Rather, they facilitate tax savings, in part, by allowing sponsors to conduct a greater level of tax-advantaged transactions. Using path analysis, we evaluate the extent to which the tax-advantaged transactions measured by vector *TAT* in Eq. (2) are used within SPEs to incrementally avoid more taxes (RQ1; *Level* in Eq. (1)). We then use the results to estimate the total tax savings likely facilitated by SPEs (RQ2; *Total Tax Savings* in Eq. (1)).

Bhattacharya et al. (2012) compare path analysis to regression analysis, noting two relevant issues for our study. First, like regression analysis, path analysis requires the researcher to postulate source, mediating, and outcome variables. This *ex ante* specification can be based on theory and/or substantive knowledge-based reasoning about the linkages among the variables. Figure 2 diagrams the recursive path (links flow in only one direction) that we consider among manifest (observable)

[27] In untabulated tests, we drop *SPE* from Eq. (2) and find that the coefficient for *HAVEN* is negative and significant (insignificant) in regressions of *GETR* (*CETR*). We find similar results for non-users. The *SPE* results also hold for observations without a tax haven subsidiary. Collectively, this evidence suggests that the effect of *HAVEN* on tax avoidance is subsumed by *SPE* and other controls, and *SPE* has an incremental effect on tax avoidance beyond *HAVEN*. This outcome likely occurs when firms structure their tax haven (and other) subsidiaries as SPEs.

variables, which is guided by the anecdotal evidence discussed in Section 2.3 and Appendix A.[28]

Second, whereas regression analysis evaluates overall effects, path analysis considers the existence and relative importance of alternative (indirect) paths of influence that jointly create the overall effects. For example, with *SPE* in Eq. (2), the coefficients for the vector of tax-advantaged transaction variables (*TAT*) capture the direct effect of each *measured* transaction on ETRs absent the use of SPEs (i.e., the solid arrows in Figure 2). Thus, if *TAT* variables perfectly measure every tax-advantaged transaction facilitated by SPEs, the coefficient for *SPE* will equal zero because (1) the direct effects of each transaction are captured by *TAT* variable coefficients, and (2) regression analysis ignores indirect effects (i.e., the dashed arrows in Figure 2). However, because it is inherently difficult to measure the array of transactions facilitated by SPEs, the coefficient for *SPE* captures the direct and indirect effects of *unmeasured* transactions (i.e., those not captured by *TAT* due to measurement error or omission). Path analysis identifies and measures the relative importance of such indirect effects, ultimately allowing us to infer the incremental effect of SPEs on the level of tax-advantaged transactions captured by *TAT* as well as those not captured by *TAT*.

*4.3.1 Level of tax-advantaged transactions used within SPEs (RQ1)*

The output of path analysis includes path coefficients that link the postulated variables. In our setting, we are interested in three sets of path coefficients: (1) *Total* coefficients, which reflect the total (direct and indirect) effect of each tax-advantaged transaction measured by vector *TAT* on ETRs; (2) *Direct* coefficients, which reflect the direct effect of each measured transaction on ETRs *absent* SPEs; and (3) *Indirect* coefficients, which reflect the indirect (incremental) effect of each measured transaction on ETRs *within* (i.e., facilitated by) SPEs. To gauge the relative importance of the indirect effects and address RQ1 (*Level* in Eq. (1)), we also estimate the proportion of the total effect that is incrementally facilitated by SPEs, which we term *Indirect%* (i.e., the ratio of the

[28] SPEs are the mediator of interest because they do not result in tax savings without having tax-advantaged transactions within them. Thus, switching the order of our path analysis would result in invalid inferences.

indirect effect to total effect).

<INSERT FIGURE 2 & TABLE 5 ABOUT HERE>

We conduct our path analysis in three steps. First, we map each tax-advantaged transaction in Section 2 and Appendix A to at least one variable in vector *TAT* (see Figure 2).[29] For example, *NOL* reflects loss duplication by firms with NOLs, while *INTANG* and *FINC* reflect tax avoidance via transfer pricing. Second, we standardize each variable (subtract the mean and divide by standard deviation) to simplify the coefficient comparisons. Third, consistent with methodological best practices (Iacobucci 2009; LeBreton et al. 2009; Zhao et al. 2010), we estimate Eq. (2) as a full-information maximum likelihood structural equations model to obtain coefficients of interest that explain the causal path illustrated in Figure 2 (further details below).

Table 5 presents path coefficients. For brevity, we only report results for *SPETOT* (results for *SPEBIN* are similar). In the *Total* columns, we estimate Eq. (2) without *SPETOT* to examine the total (direct and indirect) effect of each variable on *GETR* (Panel A) and *CETR* (Panel B). In the *Direct* columns, we estimate Eq. (2) with *SPETOT* such that the coefficients for other variables capture the direct effect of each variable on ETRs, controlling for the use of SPEs. Finally, the *Indirect* columns report the difference between *Total* and *Direct*, which reflects the incremental effect of each variable on ETRs within, or incrementally facilitated by, SPEs.[30] A negative (positive) indirect effect indicates that SPEs result in more (less) tax avoidance for a given variable.[31] For instance, the

[29] We separately examine tax shelters in Section 5.1.

[30] The total effect represents the sum of the direct and indirect effects; thus, the indirect effect is measured as the total effect less the direct effect.

[31] We compute standard errors for indirect effects using the Sobel Multivariate Delta Method (Sobel 1982), adjusted for firm-level clustering. However, because Sobel standard errors rely on strict normality assumptions, in untabulated tests we re-estimate Eq. (2) using bootstrapped standard errors (Preacher and Hayes 2004; Zhao et al. 2010). Inferences remain the same (with improved statistical significance in many cases). Because the t-statistics for total and direct effects are based only on the information in a single regression, while the t-statistics for indirect effects use information from both the total and direct regressions, thus giving them more power, it is not unusual to find statistically significant indirect effects even when only one (or neither) of the total and direct effects is statistically significant. Traditionally, a four-part test was used to infer statistically significant mediation (Baron and Kenny 1986). However, recent research shows that a significant *indirect* effect from a path analysis is sufficient to indicate mediation (LeBreton et al. 2009; Zhao et al. 2010).

negative indirect coefficients for *LEV* and *RDE* suggest firms facilitate tax avoidance by placing a portion of debt and R&D, respectively, within a SPE. To gauge the effects, *Indirect%* reports the proportion of the total effect occurring within SPEs (|*Indirect/Total*|). This ratio is interpreted, for example, as follows: a one standard deviation increase in leverage (*LEV*) results in a 0.030 standard deviation decrease in *GETR*, where 0.001 of such decrease occurs from leverage located in SPEs and 0.029 occurs from leverage not located in SPEs. That is, 3.6% (0.001/0.029) of the total tax savings from leverage is incrementally facilitated by debt located within SPEs.

The results in Table 5 indicate that the tax savings from several tax-advantaged transactions measured by vector *TAT* are incrementally greater when located within rather than outside of SPEs. That is, the relation between ETRs and several *TAT* variables are facilitated by SPEs. Specifically, 3.6% of total tax expense (*GETR*) and 1.8% of cash tax savings (*CETR*) generated by leverage (*LEV*) occurs within (i.e., is facilitated by) SPEs. In addition, 2.0% of tax expense and 3.3% of the cash tax savings from NOLs (*NOL*), 6.6% and 8.7% of the tax savings from R&D (*RDE*), and 3.5% and 6.1% of the tax savings from intangibles (*INTANG*) are facilitated by SPEs.

The results also indicate that 34.6% of tax expense (*GETR*) and 331.2% of cash tax savings from tax havens (*HAVEN*) are facilitated by SPEs. The amount of cash tax savings is large because tax havens are not associated with lower ETRs in our sample (Table 4), implying that tax havens *combined* with SPEs reduce ETRs more than tax haven jurisdictions alone. In other words, because only the indirect effect of *HAVEN* is significant for *CETR*, most of the cash tax savings from tax havens likely occurs *within* SPEs. This result is consistent with recent anecdotes of firms using SPEs to place specific assets (e.g., intangibles) in tax haven jurisdictions (Forbes and Sharma 2008; Duhigg and Kocieniewski 2012). Similarly, the insignificant total effect combined with the negative and significant indirect effect for *HAVEN* can occur when tax haven transactions not held within SPEs increase ETRs. This situation arises when non-SPE tax haven subsidiaries incur large financial penalties and related interest charges from tax authorities (perhaps by attracting scrutiny), experience

double taxation of transactions due to transfer pricing adjustments by tax authorities, or otherwise structure transactions in a tax inefficient manner.

Finally, SPEs reduce the (1) scale effects of assets (*SIZE*), (2) ability to use cash holdings (*CASH*) to obtain tax savings; and (3) tax savings from debt issuances (*DISS*) likely by improving financing terms (Mills and Newberry 2005). Overall, these findings are consistent with SPEs facilitating a greater level of the tax-advantaged transactions in an economically meaningful way.

*4.3.2 Total tax savings facilitated by SPEs (RQ2)*

The path analysis provides a setting in which to estimate the total tax savings facilitated by SPEs (RQ2; *Total Tax Savings* in Eq. (1)). We use coefficient estimates in each column of Table 5 to compute average firm-level and sample-level tax savings. We also compute maximum firm-level and sample-level tax savings using the untabulated lower (most negative) bound of the 95% coefficient confidence interval.[32] To estimate the direct effects—the tax savings attributable to SPE-facilitated transactions *not* captured by vector *TAT*—we use the coefficient for *SPETOT* to compute the effect that moving from zero SPEs to the mean number of SPEs (5.48) held by sample firms has on *GETR* and *CETR* (i.e., the percentage point reduction in each ETR).[33] To estimate the indirect effects—the tax savings attributable to SPE-facilitated transactions—we sum coefficients for all *TAT* and *CTRL* variables in the *Indirect* column of Table 5, and compute the effect that moving from zero to the mean number of SPEs has on ETRs. Finally, to estimate the total effects—the direct and indirect effect of SPE-facilitated transactions—we sum the direct and indirect ETR effects. We then compute average firm-level (sample-level) tax savings as the product of the (a) absolute value of the ETR effects and (b) average firm-level (sample-level) sum of pre-tax book income less special items for SPE users ($624.5 million and $6.621 trillion for firm-level and sample-level estimates,

[32] We focus on the lower bound because tests reported in Section 5 suggest the coefficient estimates are understated.
[33] Specifically, because variables are standardized, we multiply ETR coefficients by the standard deviation of *GETR* and *CETR* (0.190 and 0.207, respectively), divide by the standard deviation of *SPETOT* (1.150), and then multiply by the mean of *SPETOT* (1.869).

respectively). This approach is similar to Donohoe (2015).

<INSERT TABLE 6 ABOUT HERE>

Panel A of Table 6 reports estimates of the tax savings due to SPE-facilitated transactions (1) not captured by vector *TAT* (direct effects); (2) captured by vector *TAT* (indirect effects); and (3) combined (total effects). For the direct effects, we find that moving from no SPEs to the average number of SPEs is related to GAAP (*GETR*) and cash (*CETR*) ETRs that are 1.1 and 0.9 percentage points lower than non-users, respectively. For the indirect effects, moving from no SPEs to the mean number of SPEs results in a 0.4 and 0.3 percentage point reduction in GAAP and cash ETRs, respectively. Thus, in total, SPE users have GAAP and cash ETRs that are 1.6 and 1.2 percentage points lower than non-users, respectively. As a percentage of mean ETRs (see Table 2), SPE users have GAAP and cash ETRs that are 5.6% and 4.4% lower than non-users, respectively. At the firm-level, these total effects equate to average GAAP and cash tax savings of $9.84 million and $7.77 million per year, respectively. At the sample-level, the cash tax savings is over $82.4 billion, or 1.9% of total U.S. federal corporate tax collections during 1997-2013. However, these average amounts could be as large as $165 billion.

To place the estimates in perspective, Panel B of Table 6 compares the total SPE-facilitated tax savings to the savings from other types of tax planning. Both the aggregate and annual cash tax savings facilitated by SPEs are markedly larger than the savings from "round-tripping" (Hanlon et al. 2015), tax shelters (Wilson 2009), derivatives (Donohoe 2015), subsidiaries in tax havens (Dyreng and Lindsey 2009), and deferral of U.S. taxes by placing non-U.S. income in tax havens (Dyreng and Lindsey 2009). These comparisons help explain why global regulators (JCT 2011; Basel Committee on Bank Supervision 2009), tax authorities (Internal Revenue Bulletin 2011-39; Inland Revenue 2013), and investors (Feng et al. 2009) are interested in the tax effects of SPEs.

*4.4 Moderation analysis (RQ3)*

Moderation analysis considers whether the relation between two variables depends on (is

moderated by) a third variable. Recall that as separate entities, SPEs do not generate tax savings, rather they facilitate tax savings by allowing sponsors to conduct a greater level of tax-advantaged transactions and/or enhance the tax efficiency of such transactions. We use moderation analysis to estimate the extent to which SPEs enhance the tax efficiency, or relative tax savings, of tax-advantaged transactions (RQ3; *Efficiency* in Eq. (1)). That is, we evaluate if transactions generate more or less tax savings when performed within versus outside of SPEs, *holding level constant*.

In general, moderation and path analysis can produce similar results if, all else equal, firms conduct transactions within SPEs when SPEs make the transactions more tax-advantaged. This outcome would suggest that tax savings are a primary goal for placing a transaction within a SPE. Results will differ, however, when SPEs contain tax-advantaged transactions, but ultimately make the related tax avoidance less efficient (i.e., the non-tax benefits of SPEs exceed any loss in tax savings; see example 2 in Appendix A). Similarly, results will differ if the firm does not use SPEs for tax-advantaged transactions, even if SPEs would make tax avoidance more efficient (i.e., the non-tax costs of SPEs exceed any gain in tax savings). As a result, moderation analysis provides insight into the tax and non-tax costs of facilitating SPE-based transactions (Scholes et al. 2014).

We implement moderation analysis by estimating Eq. (2) with an interaction term between *SPETOT* and each covariate, where all variables are demeaned and standardized.[34] Table 7 presents the results for *GETR* and *CETR* in Panels A and B, respectively, where column (1) reports the main effect of each covariate, column (2) reports the interaction between *SPETOT* and the relevant covariate, and column (3) reports estimates of the extent to which SPEs enhance the tax efficiency savings of tax-advantaged transactions captured by each covariate.

The results are interpreted as follows. First, the main effect for *SPETOT* (column (1)) reflects the effect of SPEs on ETRs at the mean level of both SPEs and all covariates. For example, in Panel

[34] We find similar results when interactions between *SPETOT* and each covariate are added one at a time in separate model estimations. The results are also robust to (1) including interactions between *SPETOT* and vector *CTRL* (rather than only vector *TAT*) and (2) substituting *SPEBIN* for *SPETOT*.

A, a one standard deviation increase in *SPETOT* (1.150, or 2.2 SPEs unlogged; Table 3) results in a 0.038 standard deviation decrease in *GETR* (measured at the mean of SPEs and other variables). Likewise, a one standard deviation increase in *LEV* (0.183; Table 3) is associated with a 0.034 standard deviation decrease in *GETR*. Second, the interaction effect (column (2)) captures the effect of SPEs on *GETR* changes as each covariate changes. For instance, for a one standard deviation increase in *SPETOT*, the effect of a one standard deviation increase in *LEV* is associated with a further 0.002 standard deviation reduction in *GETR* (totaling 0.036=0.034+0.002) at the mean of *LEV* and other covariates (except *SPETOT*, which increased by one standard deviation).[35] Third, the percentage change (column (3)) measures the relative increase in tax savings from SPEs. For example, at the mean of *SPETOT*, a one standard deviation increase in *RDE* results in a 0.027 standard deviation decrease in *GETR* (column (1)). If *SPETOT* increases by one standard deviation, the effect of a one standard deviation increase in *RDE* is a 0.052 (0.027+0.025) standard deviation decrease in *GETR*. The incremental reduction in *GETR* (0.025) due to the increase in *SPETOT* reflects a 92.6% increase in tax savings relative to no change in *SPETOT* (0.025/0.027).

<INSERT TABLE 7 ABOUT HERE>

The path analysis (Table 5) indicates that a portion of the total tax savings from debt (*LEV*) occurs within SPEs. However, the *positive* interaction coefficients (column (2)) for *LEV* in Panel B and *CLTD* in Panel A of Table 7 indicate that debt within SPEs is 47.8–53.8% *less* efficient at generating tax savings than debt elsewhere in the organizational structure (*Efficiency* in Eq. (1)), although this result does not consider that SPEs can increase a firm's financing capacity (*Level*, as estimated in Table 5). Similarly, the positive interaction for *NOL* in Panel A reveals 47.5% more total tax savings (*GETR*) when transactions related to NOLs are conducted outside of SPEs.

Conversely, R&D (*RDE*) and intangibles (*INTANG*) are associated with 92.6% and 72.5% greater total tax savings, respectively, when held within SPEs. This result occurs when SPEs are used

[35] In this example, the 0.002 additional reduction in *GETR* is not statistically significant.

to shift profits or duplicate tax credits, losses, and deductions relating to R&D and intangibles. In such cases, profit shifting is likely between U.S. states or between the U.S. and non-tax havens given that *HAVEN* is included in Eq. (2). Moreover, because these results hold for *GETR* but not *CETR*, the tax savings from R&D and intangibles transactions are likely due to permanent book-tax differences. Finally, the negative interaction coefficient for *M&A* in Panel B suggests SPEs facilitate cash tax savings (*CETR*) from mergers/acquisitions by 53.3%, even though the overall magnitude of such savings is not large (as shown in Table 5). In contrast to R&D and intangibles-based transactions, these tax savings are likely due to temporary (timing) book-tax differences that accelerate deductions or delay income recognition for tax reporting purposes relative to GAAP.

Overall, while the path analysis (Table 5) indicates that an economically large portion of the tax savings from leverage, NOL carryforwards, and tax havens occur within SPEs, the moderation analysis (Table 7) reveals that SPEs do *not* also enhance the tax efficiency of these transactions. That is, SPEs facilitate tax avoidance by enabling sponsors to conduct a greater level of these tax-advantaged transactions (*Level* in Eq. (1)) rather than by enhancing their relative tax savings (*Efficiency* in Eq. (1)). For R&D and intangibles, however, SPEs both enable a greater level of transactions *and* enhance the total tax efficiency of these transactions.[36]

We acknowledge that our tests focus on *tax* costs/benefits. If non-tax benefits (e.g., lower financing costs, limited liability) exceed the potential tax savings, then conducting leverage, NOL carryforwards, and tax haven transactions within SPEs could still be optimal for a sponsor (Scholes et al. 2014). This reasoning likely explains why sponsors still use SPEs to conduct a greater level of these types of transactions. For R&D and intangibles, however, the increase in tax savings from an SPE is likely a primary motive for using SPEs.

[36] It is econometrically (and conceptually) challenging to investigate any cross-sectional variation of these findings. For example, testing whether firms with higher R&D have a greater increase in the tax efficiency of R&D than firms with lower R&D requires partitioning the dependent variable on the independent variable of interest, which biases any estimates of the moderation effect.

## 5. Other tests

### *5.1 Tax aggressiveness*

We use *GETR* and *CETR* to capture tax positions along the entire tax avoidance continuum. However, because SPEs have played a prominent role in many corporate tax shelters, we directly consider the relation between SPEs and aggressive tax planning; that is, tax positions with weak legal support that push the envelope of tax law (Hanlon and Heitzman 2010). We re-estimate Eq. (2) after replacing *ETR* with two measures of tax aggressiveness: (1) natural log of the FIN 48 tax reserve (*LNUTB*), available for fiscal years 2007-2011 (Lisowsky et al. 2013); and (2) predicted tax shelter score (*TSSCORE*), available for the entire sample period (Lisowsky 2010). We report the results in columns (1) and (2) of Table 8, respectively.

<INSERT TABLE 8 ABOUT HERE>

The results in column (1) suggest firms using more SPEs have larger reserves for uncertain tax positions, which aligns with the main result that SPEs facilitate transactions along the entire tax avoidance continuum. In column (2), the results reveal a *negative* relation between SPEs and the likelihood of tax shelter participation. As such, uncertain and/or aggressive tax positions *other than* tax shelters (e.g., transfer pricing, basis replication) likely drive our main results. The negative relation also suggests that SPEs possibly substitute for tax shelters; however, we leave further analysis on these links for future research.[37]

### *5.2 Location of SPE-based tax avoidance*

To examine *where* SPE-based tax avoidance occurs, we re-estimate Eq. (2) after adding an indicator variable, *DOM*, equal to one for U.S. domestic firms (i.e., no foreign income); 0 otherwise, and its interaction with *SPETOT*. We report the results in columns (3) and (4) of Table 8. The

[37] In untabulated tests, we find an insignificant coefficient for *SPEBIN* when *TSSCORE* is the dependent variable. We also remove control variables from Eq. (2) that are inputs of *TSSCORE* (Lisowsky 2010) and re-estimate using both SPE measures. We find an insignificant coefficient for *SPETOT* and a positive and significant ($p<0.05$) coefficient for *SPEBIN*. Because the omitted controls include many key determinants of tax avoidance, we conclude that there is weak evidence of a relation between SPEs and the likelihood of tax shelter participation.

interaction coefficients suggest less or similar levels of tax avoidance facilitated by SPEs for domestic-only firms relative to multinational firms, highlighting the need for research on the tax effects of organizational structures beyond its current focus on multinational firms (see Section 2.1). Further, because *GETR* does not capture tax savings that will reverse in the future (but *CETR* does), the interactions also imply that U.S. multinational SPE users obtain tax savings primarily through permanent book-tax differences.[38]

To evaluate the primary jurisdiction in which SPEs facilitate tax savings, we replace *ETR* with a firm's U.S. federal ETR (*FED*), foreign ETR (*FRN*), and state ETR (*STA*), and report results in columns (5), (6), and (7) of Table 8, respectively. The sample size for these tests declines as not all firms disclose these components, and the foreign ETR applies only to U.S. multinationals. We only find a negative and significant coefficient for *SPETOT* when the U.S. federal ETR (*FED*) is the dependent variable. Thus, we conclude that the tax savings facilitated by SPEs is likely driven by a reduction in U.S. federal income tax liabilities.

We also consider if SPE-based tax avoidance predominantly occurs in one or more specific industries. For instance, anecdotes suggest that high-tech and/or high-intangible firms (e.g., Apple, Inc.) use SPEs to relocate patents to tax favorable jurisdictions (Forbes and Sharma 2008). We re-estimate Eq. (2) separately for the eight largest industries in our sample (based on the number of observations to ensure sufficient statistical power).[39] The (untabulated) coefficients for *SPETOT* and *SPEBIN* are significantly negative for many of these industries when either *GETR* or *CETR* is the dependent variable. Thus, we conclude that SPE-based tax avoidance is pervasive and not simply confined to high-tech or intangibles-intensive firms.

[38] For example, domestic firms could have more temporary differences (e.g., accelerated depreciation) than multi-national firms, which decrease cash ETRs (by lowering cash taxes paid) but not GAAP ETRs because of deferred tax accounting rules under ASC 740, *Income Taxes*.

[39] Specifically, we examine the following industries: (1) Mining, Oil, and Gas Extraction; (2) Food and Apparel Manufacturing; (3) Woods and Petroleum Products Manufacturing; (4) Other Manufacturing; (5) Consumer Retail; (6) Transportation; (7) Information; and (8) Professional Services.

*5.3 Endogeneity*

Endogeneity is an issue for our study because firms choose whether and to what extent they use SPEs. While firm and year fixed-effects in Eq. (2) control for the endogeneity linked to firm-and time-invariant factors, respectively, the tax savings estimates in Table 5 can be biased if other unobservable factors affect the decisions to use SPEs and avoid taxes. We consider this issue with a two-stage control function procedure known as an endogenous switching model (Heckman 1979; Maddala 1991; Vella and Verbeek 1999; Tucker 2010).[40] To be a consistent estimator, all variables from the second-stage regression must be included in the first-stage binary choice model (e.g., *SPEBIN*=1 or 0). However, binary choice models (e.g., probit) cannot be "identified" with firm fixed-effects, which we include in Eq. (2), because they can theoretically expand to infinity under regression asymptotics. Therefore, we use an industry fixed-effects model (at the two-digit NAICS level) for this analysis, which is identified because of the fixed number of industries.

Our first-stage model of the decision to use SPEs (i.e., *SPEBIN*) includes the variables in Eq. (2) and an exclusion restriction variable defined as the percentage of SPE users in the same two-digit NAICS industry (*%SPEIND*). Our second stage model is the first-stage model without *%SPEIND*, but including a self-selection bias correction term (inverse Mills ratio). The exclusion restriction meets the necessary econometric requirements as it is insignificant in the second-stage using industry fixed-effects, but highly significant in the first stage ($p<0.01$).[41] Conceptually, *%SPEIND* is a valid exclusion restriction as other firms' SPE choices should not directly affect a firm's tax avoidance.

The (untabulated) results for the first stage indicate sufficient discriminatory power for the model, with an area under the ROC curve of 0.83. The results for the second stage show that, while some endogeneity exists, the relation between *SPEBIN* and *ETR* remains negative and significant. In

[40] This technique is also known as a treatment effects model (e.g., Leuz and Verrecchia 2000).

[41] In untabulated tests, we calculate the exclusion-restriction variable as mean *SPETOT* in the same two-digit NAICS industry, and alternately include and exclude a given firm's values in the calculation. Results are similar across these specifications. In all cases, diagnostic tests reveal no evidence of significant multicollinearity.

addition, the magnitude and significance level of the coefficients for *SPEBIN* are greater than or equal to coefficients obtained by excluding the control function adjustment, suggesting any endogeneity *understates* the economic significance of our results. For this reason, and because the two-stage method does not accommodate firm fixed-effects which Hausman and *F*-tests indicate are necessary, we use Eq. (2) to conduct our primary analyses.[42]

In a second set of tests, we use propensity score matching (PSM) to evaluate how ETRs change for SPE users as they change their SPE use. Table 2 indicates significant differences in control variables across SPE users and non-users. PSM allows us to control for time- and firm-variant factors, and observable differences between SPE users and non-users (Tucker 2010). The untabulated coefficient for *SPETOT* is negative and significant, consistent with our main results.[43]

*5.4 Minority ownership interest and consolidation issues*

If a SPE is wholly owned by a sponsor, then ETRs reflect the related tax effects of the SPE. However, measuring the tax effects of a SPE is more nuanced when a sponsor has a non-controlling minority interest in a SPE. For instance, if a sponsor does not wholly own a SPE and the minority interest portion of the SPE ownership is not consolidated into pre-tax income and tax expense/cash taxes paid, ETRs will not capture the tax effects of the SPE. Although possible, this situation would *understate* the economic significance of our main results. More critical for our study is the situation where the minority interest portion of pre-tax income from a SPE is consolidated while that for tax expense/cash taxes paid is not, creating a mechanical negative relation between SPE use and ETRs.

[42] Although prior research finds that MTRs are determinants of SPE use, we exclude them from our first-stage model because they are highly correlated with *ETR*, and including them in the first-stage requires that they also be included in the second-stage model. Thus, controlling for MTRs in an ETR regression will eliminate much of the variation in ETRs and reduce the power of our tests. Nevertheless, in untabulated tests, we include MTRs (as measured by Blouin et al. 2010) in both models. As expected, the coefficients for many independent variables are smaller; however, the coefficients for *SPE* remain negative and significant, consistent with our main results.

[43] We match over common support, without replacement, using a caliper of 0.01. Diagnostic tests indicate a successful and robust matching process. We also use entropy balancing (Hainmueller 2012) with industry fixed-effects to ensure convergence; inferences remain the same. Because we match SPE users to non-users, and use firm and year fixed-effects to capture changes in the number of SPEs, we cannot estimate a model with *SPEBIN* for these tests.

To evaluate this possibility, we separately (1) include a control variable for minority interest, and (2) perform our tests on firms without minority interest. In both cases, the results are similar or stronger.

To further mitigate concerns about consolidation, we estimate Eq. (2) around changes in book consolidation rules; specifically, the implementation of FIN 46 (FASB 2003) in 2003 and SFAS Nos. 166 and 167 (FASB 2009) in 2009. The results (untabulated) are economically significant in both pre- and post-implementation periods for these reporting regimes, suggesting that our results are not influenced by exogenous changes in GAAP consolidation standards.

*5.5 Subsidiary disclosures*

A recent study finds that some firms have reduced disclosures of subsidiaries in Exhibit 21 (Gramlich and Whitaker-Poe 2013). Although this change has little effect on our binary measure of SPE use (*SPEBIN*), it could influence our continuous measure (*SPETOT*). We investigate this possibility by removing all firm-years in which the previous firm-year has (1) ten or more SPEs, and (2) 200% or more of the current year number of SPEs (*SPETOT*). Our results (untabulated) are stronger when these firms are omitted from the sample.

Similarly, to consider changes in the quality of Exhibit 21 disclosures across time, we also limit our analyses to firms that begin or end SPE use at most once during the sample period (i.e., firms with one change in *SPEBIN* across the sample period). Inferences remain the same. Another interpretation of this finding is that our results are not driven by changes in overall organizational complexity that may be correlated with SPE use. Including controls for the number of business segments, tax haven use, and firm and year fixed effects in the model also mitigate this concern.

**6. Conclusion**

Prior research considers the tax outcomes of different tax-advantaged transactions (Hanlon and Heitzman 2010). However, few studies consider organizational *structures* that facilitate such transactions, while those that do primarily focus on incentives and general determinants rather than tax outcomes (Shevlin 1987; Beatty et al. 1995; Feng et al. 2009). We study the tax outcomes of

SPEs, increasingly complex and common organizational structures that facilitate (rather than generate) tax savings by allowing firms to conduct a greater *level* of tax-advantaged transactions and/or enhance the tax *efficiency* (i.e., relative tax savings) of such transactions.

Using path analysis and well-validated measures of SPEs (Feng et al. 2009), we first show that SPEs facilitate a greater *level* of specific tax-advantaged transactions. Specifically, SPEs incrementally increase the cash tax savings from transactions involving leverage (1.8%), NOL carryforwards (2.0%), R&D (8.7%), intangibles (6.1), and tax havens (all). Next, we estimate that SPEs facilitate total incremental cash tax savings of about $82.4 billion for our sample of 10,284 SPE users, or roughly 2% of U.S. federal corporate tax collections during 1997-2011. Finally, moderation analysis reveals that SPEs enhance the total tax efficiency (i.e., relative tax savings) of transactions involving intangibles and R&D, suggesting strong tax motivations to use SPEs for these activities. Overall, our study provides economic insight into complex organizational structures that facilitate corporate tax avoidance, and offers an empirical "roadmap" using path analysis for future research on organizational structure.

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**Appendix A**
**Examples of SPE-facilitated tax avoidance: Levels and Efficiency**

As separate legal entities, SPEs do not directly generate tax savings. Adding another entity to an organizational structure, without conducting operations and transactions within the entity, is unlikely to influence a firm's income tax liability. However, features of SPEs can affect taxes by allowing a firm to change the level of tax-advantaged transactions it conducts (*Level* in Eq. (1)) and/or enhancing the relative tax savings of such transactions (*Efficiency* in Eq. (1)).

To illustrate, consider a firm that has $20 of R&D expenses, all of which are eligible for the R&D tax credit at a 20% rate. The firm can incur these expenses within the primary corporate entity, or choose to place the R&D activity (and related expenses) in a SPE. In using the SPE, the firm separates the R&D assets from the sponsor corporation and may be able to obtain additional financing for R&D activities (Shevlin 1987). If the firm is able to use the additional financing afforded by the SPE to increase its R&D expenses to $25, then the firm has increased its tax savings by increasing the level of R&D activity. Assuming that the pre-R&D pre-tax income is $100 and the tax rate is 30%, then the firm's ETR without using the SPE is:

$$\frac{(100-20)\times 30\% - (20\times 20\%)}{100-20} = \frac{20}{80} = 25.00\%$$

The firm's ETR after using the SPE (assuming the additional financing is equity financing) is:

$$\frac{(100-25)\times 30\% - (25\times 20\%)}{100-25} = \frac{17.5}{75} = 23.33\%$$

In this example, the firm reduces its ETR because the SPE allowed it to increase its *level* of R&D.

Now assume the firm does not obtain additional financing when it places R&D into a SPE. However, all of the firm's income results from selling waterproof boots, where half of the profit is attributable to waterproofing technology the firm generated and patented from internal R&D. If the firm's primary location is in Iowa (with a 12% state corporate income tax rate), it can create a SPE in South Dakota (with no state corporate income tax) and transfer these patents to the SPE. That is, the

SPE is used for the specific purpose of holding the patents. If the SPE is not treated as a pass-through entity (e.g., it is structured as an LLC that has elected to be treated as a corporation using check-the-box rules), it can charge fees for the sponsor's use of the patents, which shifts income to the lower-tax state jurisdiction. Assuming the U.S. federal tax rate is 30% and that both the U.S. and Iowa have 20% R&D tax credit, the firm's ETR without using the SPE is:

$$\frac{(100-20)\times 42\% - 2\times(20\times 20\%)}{100-20} = \frac{25.6}{80} = 32.00\%$$

The firm's ETR after using the SPE (assuming the additional financing is equity financing) is:

$$\frac{(100-20)\times 42\%\times 0.5 + (100-20)\times 30\%\times 0.5 - (20\times 20\%)}{100-20} = \frac{24.8}{80} = 31.00\%$$

In this example, the firm reduces its ETR because SPEs allow the firm to increase the *efficiency* of the tax savings related to R&D. That is, holding the level of R&D and patents fixed, the sponsor realizes greater tax savings. Although level and efficiency effects are shown separately in these examples, SPEs can facilitate tax savings by changing both factors at the same time.

As another example, consider a firm with pre-tax book income of $100 and taxable income of $70. Assume that because the firm is financially constrained it cannot obtain financing. Further assume that by transferring some of its low-risk assets into a SPE, the SPE can borrow $200 at a 10% interest rate. Assuming a 30% tax rate, the sponsor's ETR before the SPE-based financing is:

$$\frac{70\times 30\%}{100} = \frac{21}{100} = 21.00\%,$$

while the sponsor's ETR after the SPE-based financing is:

$$\frac{\big(70-(200\times 10\%)\big)\times 30\%}{100-(200\times 10\%)} = \frac{15}{80} = 18.75\%$$

The sponsor reduces its ETR because the SPE enabled a greater *level* of interest-bearing debt.

Now assume the sponsor does not need funds, but can obtain a more favorable cost of debt by

transferring more of its assets into another SPE. In other words, the firm can then refinance its $200 of debt at an interest rate of 5%. The sponsor's ETR after the SPE-based refinancing is:

$$\frac{\big(70-(200\times 5\%)\big)\times 30\%}{100-(200\times 5\%)}=\frac{18}{90}=20.00\%$$

Although level of debt does not change, the SPE facilitated a lower interest rate that ultimately reduced the tax *efficiency* of the debt in generating tax deductible interest expense. Thus, the non-tax benefits of SPEs can *reduce* the relative tax savings of otherwise tax-advantaged transactions.

While these examples have focused on R&D and debt, similar examples can be constructed for other tax advantaged transactions. All of the examples above would result in cash tax savings, and are not simply artifacts of GAAP-based tax accruals. Additionally, tax savings related to both the level and efficiency of a transaction can lie towards the benign end of the tax avoidance continuum (e.g., enabling more credit-eligible R&D) or the aggressive end (e.g., enabling cross-border income shifting or more tax shelter transactions), although changing the tax efficiency of a transaction more likely reflects a stronger motivation to achieve tax savings over generating other non-tax benefits.

## Appendix B
## Variable definitions

**Measures of SPE use (*SPE*)**

*SPETOT* Total number of SPEs, defined as the natural log of one plus the total number of subsidiaries in Exhibit 21 of Form 10-K meeting relevant criteria (see Section 3).

*SPEBIN* Indicator variable equal to 1 if the firm-year has at least one SPE subsidiary in Exhibit 21 of Form 10-K; 0 otherwise.

**Measures of tax avoidance (*ETR*)**

*GETR* GAAP effective tax rate (3-year), defined as the three-year sum (t to t+2) of total tax expense (txt) divided by the three-year sum (t to t+2) of pre-tax book income (pi) less special items (spi). Observations with negative denominators are dropped. ETRs are reset to 1 (0) if greater (less) than 1 (0).

*CETR* Cash effective tax rate (3-year), defined as the three-year sum (*t* to *t*+2) of cash taxes paid (txpd) divided by the three-year sum (*t* to *t*+2) of pre-tax book income (pi) less special items (spi). Observations with negative denominators are dropped. ETRs are reset to 1 (0) if greater (less) than 1 (0).

**Tax-advantaged transactions (*TAT*)**

*LEV* Leverage, defined as long-term debt (dltt) divided by total assets (at).

*DISS* Debt issuance, defined as net debt issuance/reduction (dltis−dltr) divided by total assets (at).

*CLTD* Debt renegotiation costs, defined as the current portion of long-term debt (dlc) divided by total assets (at).

*RDE* Research and development expense, defined as research and development expense (xrd) divided by lagged total assets (at). Missing values are set equal to 0.

*PPE* Capital intensity, defined as gross property, plant, and equipment (ppegt) divided by total assets (at).

*INTANG* Intangible assets, defined as intangibles (intan) divided by total assets (at).

*NOL* Net operating loss, defined as tax-loss carryforwards (tlcf) divided by lagged total assets (at). Missing observations are set equal to 0.

*M&A* Indicator variable equal to 1 if cash flow from mergers and acquisitions (aqc) does not equal 0; 0 otherwise.

*FINC* Foreign income, defined as pre-tax foreign income (pifo) divided by lagged total assets (at). Missing observations are set equal to 0.

*HAVEN* Indicator variable equal to 1 for firm-years with at least one subsidiary listed in Exhibit 21 of Form 10-K that is located in a tax haven country; 0 otherwise. See Dyreng and Lindsey (2009).

**Control variables (*CTRL*)**

*SIZE* Firm size, defined as the natural log of total assets (at).

| | |
|---|---|
| *ROA* | Return on assets, defined as income before extraordinary items (ib) divided by average total assets (at). |
| *BM* | Book-to-market ratio, defined as book equity (seq) divided by market value of equity (prcc_f×csho). |
| *CASH* | Cash holdings, defined as cash and cash equivalents (che) divided by total assets (at). |
| *INTCOV* | Interest coverage ratio (inverse), defined as interest expense (xint) divided by operating income after depreciation expense (ebit). |
| *SVOL* | Stock return volatility, defined as the decile of the standard deviation (sdevv) of daily stock returns in each year. Stock return data obtained from CRSP. |
| *IFUND* | Internal fund supply, defined as the sum of cash flows from operations (oancf) and investing (invcf) divided by average total assets (at). |
| *DACC* | Discretionary accruals, defined as the residuals from the performance-matched cross-sectional modified Jones model (see Dechow et al. 1995; Kothari et al. 2005). |
| *BUSSEG* | Business segments, defined as the natural log of one plus the number of business segments. Segment data obtained from Compustat Business Segments. |

**Other variables**

| | |
|---|---|
| *LNUTB* | Unrecognized tax benefit reserve, defined as the natural log of one plus the ending balance of the reserve (txtubend). |
| *TSSCORE* | Tax shelter prediction score. See Lisowsky (2010). |
| *DOM* | Indicator variable equal to 1 for firm-years with no foreign income (pifo); 0 otherwise. |
| *FED* | U.S. federal effective tax rate (three-year), defined as the three-year sum ($t$ to $t$+2) of federal tax expense (txfed) divided by the three-year sum ($t$ to $t$+2) of pre-tax income (pi) less special items (spi). |
| *FRN* | Foreign effective tax rate (three-year), defined as the three-year sum ($t$ to $t$+2) of foreign tax expense (txfo) divided by the three-year sum ($t$ to $t$+2) of pre-tax income (pi) less special items (spi). |
| *STA* | State effective tax rate (three-year), defined as the three-year sum ($t$ to $t$+2) of state tax expense (txs) divided by the three-year sum ($t$ to $t$+2) of pre-tax income (pi) less special items (spi). |
| *%SPEIND* | SPE industry ratio, defined as the percentage of SPE users in a firm's two-digit NAICS industry. |

**Note:** Compustat mnemonics in parentheses.

**Table 1**
**Sample selection**

| | Observations | |
|---|---|---|
| | Firm-Years | Firms |
| Compustat observations with positive assets (1997-2011) | 148,562 | 20,100 |
| Less: Observations with negative three-year pre-tax income | (45,643) | (1,545) |
| Less: Observations with missing data to compute ETRs | (28,271) | (7,186) |
| Less: Financial and regulated firms | (19,761) | (2,775) |
| Subtotal | 54,887 | 8,594 |
| Less: Observations with missing data to compute control variables | (29,354) | (4,028) |
| Primary Sample | 25,533 | 4,566 |

**Table 2**
**SPE distributions**

**Panel A:** Temporal distribution

| Year | (1) Total SPEs | (2) SPE Users | (3) SPEs Per User [(1)/(2)] | (4) Non-Users | (5) Total Obs. [(2)+(4)] | (6) SPE Use [(2)/(5)] |
|---|---|---|---|---|---|---|
| 1997 | 605 | 165 | 3.67 | 1,589 | 1,754 | 9.4% |
| 1998 | 917 | 207 | 4.43 | 1,517 | 1,724 | 12.0% |
| 1999 | 1,910 | 268 | 7.13 | 1,372 | 1,640 | 16.3% |
| 2000 | 4,075 | 520 | 7.84 | 1,036 | 1,556 | 33.4% |
| 2001 | 6,161 | 607 | 10.15 | 1,010 | 1,617 | 37.5% |
| 2002 | 7,827 | 726 | 10.78 | 1,071 | 1,797 | 40.4% |
| 2003 | 9,823 | 802 | 12.25 | 1,054 | 1,856 | 43.2% |
| 2004 | 11,302 | 839 | 13.47 | 970 | 1,809 | 46.4% |
| 2005 | 12,125 | 875 | 13.86 | 909 | 1,784 | 49.0% |
| 2006 | 13,353 | 876 | 15.24 | 828 | 1,704 | 51.4% |
| 2007 | 14,552 | 917 | 15.87 | 805 | 1,722 | 53.3% |
| 2008 | 14,961 | 910 | 16.44 | 785 | 1,695 | 53.7% |
| 2009 | 15,634 | 921 | 16.98 | 708 | 1,629 | 56.5% |
| 2010 | 17,147 | 971 | 17.66 | 666 | 1,637 | 59.3% |
| 2011 | 18,436 | 999 | 18.45 | 610 | 1,609 | 62.1% |
| Total | 148,828 | 10,603 | 14.04 | 14,930 | 25,533 | 41.5% |

**Panel B:** Industry distribution

| | (1) | | (2) | | (3) | | (4) | |
|---|---|---|---|---|---|---|---|---|
| | Total SPEs | | SPE Users | | Non-Users | | Total [(2+3)] | |
| NAICS Industry | Obs. | % | Obs. | % | Obs. | % | Obs. | SPE Use |
| 62: Health Care | 24,872 | 16.7 | 381 | 3.6 | 256 | 1.7 | 637 | 59.8% |
| 71: Arts & Entertainment | 2,274 | 1.5 | 112 | 1.1 | 78 | 0.5 | 190 | 58.9% |
| 81: Other Services | 1,173 | 0.8 | 83 | 0.8 | 62 | 0.4 | 145 | 57.2% |
| 23: Construction | 5,447 | 3.7 | 228 | 2.2 | 172 | 1.2 | 400 | 57.0% |
| 56: Administrative & Support Services | 5,351 | 3.6 | 366 | 3.5 | 335 | 2.2 | 701 | 52.2% |
| 44: Consumer Retail | 11,757 | 7.9 | 468 | 4.4 | 526 | 3.5 | 994 | 47.1% |
| 72: Accommodation & Food Services | 5,793 | 3.9 | 319 | 3.0 | 367 | 2.5 | 686 | 46.5% |
| 54: Professional Services | 4,605 | 3.1 | 569 | 5.4 | 660 | 4.4 | 1,229 | 46.3% |
| 53: Real Estate | 6,568 | 4.4 | 298 | 2.8 | 348 | 2.3 | 646 | 46.1% |
| 45: Miscellaneous Retail | 1,604 | 1.1 | 249 | 2.3 | 308 | 2.1 | 557 | 44.7% |
| 21: Mining, Oil, & Gas Extraction | 8,388 | 5.6 | 656 | 6.2 | 818 | 5.5 | 1,474 | 44.5% |
| 32: Wood & Petroleum Products Manufacturing | 10,942 | 7.4 | 1,451 | 13.7 | 1,888 | 12.6 | 3,339 | 43.5% |
| 31: Food & Apparel Manufacturing | 7,965 | 5.4 | 695 | 6.6 | 968 | 6.5 | 1,663 | 41.8% |
| 51: Information | 19,099 | 12.8 | 994 | 9.4 | 1,398 | 9.4 | 2,392 | 41.6% |
| 49: Couriers & Warehousing | 99 | 0.1 | 38 | 0.4 | 55 | 0.4 | 93 | 40.9% |
| 42: Wholesale Trade | 3,226 | 2.2 | 493 | 4.6 | 717 | 4.8 | 1,210 | 40.7% |
| 61: Education | 490 | 0.3 | 44 | 0.4 | 78 | 0.5 | 122 | 36.1% |
| 48: Transportation | 9,567 | 6.4 | 352 | 3.3 | 626 | 4.2 | 978 | 36.0% |
| 33: Other Manufacturing | 19,225 | 12.9 | 2,742 | 25.9 | 5,121 | 34.3 | 7,863 | 34.9% |
| 99: Other | 246 | 0.2 | 35 | 0.3 | 75 | 0.5 | 110 | 31.8% |
| 11: Agriculture, Forestry, & Fishing | 137 | 0.1 | 30 | 0.3 | 74 | 0.5 | 104 | 28.8% |
| Total | 148,828 | 100.0 | 10,603 | 100.0 | 14,930 | 100.0 | 25,533 | 41.5% |

**Note:** This table reports the temporal (Panel A) and industry (Panel B) distributions of the total number of SPEs, SPE users, SPE non-users, and rate of SPE use. NAICS industries in Panel B are sorted by the rate of SPE use (column (4)), which is calculated as the number of SPE users from column (2) divided by the sum of SPE users and SPE non-users from columns (2) and (3).

**Table 3**
**Descriptive statistics**

| | (1) | | | (2) | | (3) | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | | | SPE Users | | Non-Users | | |
| | Mean | Median | Std. Dev. | Mean | Median | Mean | Median | *t*-stat [(2)−(3)] |
| *GETR* | 0.279 | 0.301 | 0.190 | 0.272 | 0.292 | 0.284 | 0.307 | **−4.83** |
| *CETR* | 0.261 | 0.241 | 0.207 | 0.247 | 0.231 | 0.272 | 0.250 | **−9.14** |
| *SPETOT* | 0.776 | 0.000 | 1.150 | 1.869 | 1.609 | 0.000 | 0.000 | NA |
| *SPEBIN* | 0.415 | 0.000 | 0.493 | 1.000 | 1.000 | 0.000 | 0.000 | NA |
| *LEV* | 0.200 | 0.169 | 0.183 | 0.238 | 0.215 | 0.173 | 0.134 | **28.67** |
| *DISS* | 0.016 | 0.000 | 0.102 | 0.019 | 0.000 | 0.013 | 0.000 | **3.98** |
| *CLTD* | 0.042 | 0.015 | 0.070 | 0.035 | 0.011 | 0.047 | 0.018 | **−14.11** |
| *RDE* | 0.027 | 0.000 | 0.053 | 0.019 | 0.000 | 0.032 | 0.000 | **−18.26** |
| *PPE* | 0.549 | 0.467 | 0.382 | 0.530 | 0.452 | 0.563 | 0.480 | **-6.84** |
| *INTANG* | 0.166 | 0.097 | 0.184 | 0.221 | 0.175 | 0.127 | 0.058 | **41.38** |
| *NOL* | 0.091 | 0.000 | 0.306 | 0.078 | 0.000 | 0.101 | 0.000 | **−5.96** |
| *M&A* | 0.506 | 1.000 | 0.500 | 0.623 | 1.000 | 0.423 | 0.000 | **32.08** |
| *FINC* | 0.016 | 0.000 | 0.035 | 0.021 | 0.000 | 0.012 | 0.000 | **21.98** |
| *HAVEN* | 0.354 | 0.000 | 0.478 | 0.571 | 1.000 | 0.200 | 0.000 | **66.09** |
| *SIZE* | 6.494 | 6.479 | 2.042 | 7.270 | 7.213 | 5.943 | 5.769 | **54.00** |
| *ROA* | 0.057 | 0.053 | 0.082 | 0.053 | 0.052 | 0.060 | 0.055 | **−6.48** |
| *BM* | 0.623 | 0.487 | 0.561 | 0.571 | 0.460 | 0.660 | 0.510 | **−12.52** |
| *CASH* | 0.129 | 0.073 | 0.148 | 0.108 | 0.062 | 0.145 | 0.082 | **−19.59** |
| *INTCOV* | 0.217 | 0.131 | 0.465 | 0.243 | 0.155 | 0.199 | 0.113 | **7.51** |
| *SVOL* | 5.797 | 6.000 | 2.175 | 5.499 | 5.000 | 6.009 | 6.000 | **−18.59** |
| *IFUND* | 0.008 | 0.026 | 0.143 | 0.013 | 0.032 | 0.005 | 0.022 | **4.46** |
| *DACC* | −0.016 | −0.008 | 0.165 | −0.023 | −0.013 | −0.011 | −0.004 | **−5.72** |
| *BUSSEG* | 1.049 | 0.693 | 0.527 | 1.098 | 1.099 | 1.013 | 0.693 | **12.72** |
| Obs. | | 25,533 | | | 10,603 | | 14,930 | |

**Note:** This table reports descriptive statistics for the full sample, SPE users, and non-users, where *GETR* is the dependent variable of interest. Bold *t*-statistics for tests of mean differences between SPE users and non-users denote significance of at least 0.10. When *CETR* is the dependent variable, there are 23,543 observations in column (1), 10,284 in column (2), and 13,259 in column (3). All statistics are similar across both sets of subsamples and *t*-statistics remain statistically significant. Continuous variables are winsorized at 1$^{st}$ and 99$^{th}$ percentiles. Variables are defined in Appendix B.

**Table 4**
**Relation between SPEs and corporate tax avoidance**

| | (1) | | | (2) | | | (3) | | | (4) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *GETR* | | | *GETR* | | | *CETR* | | | *CETR* | | |
| | Coeff. | | *t*-stat | Coeff. | | *t*-stat | Coeff. | | *t*-stat | Coeff. | | *t*-stat |
| **Measures of SPE use (*SPE*)** | | | | | | | | | | | | |
| *SPETOT* | −0.010 | *** | −3.95 | | | | −0.008 | *** | −2.68 | | | |
| *SPEBIN* | | | | −0.014 | *** | −2.75 | | | | −0.012 | ** | −2.44 |
| **Tax-advantaged transactions (*TAT*)** | | | | | | | | | | | | |
| *LEV* | −0.046 | *** | −2.45 | −0.048 | ** | −2.53 | −0.086 | *** | −4.12 | −0.087 | *** | −4.17 |
| *DISS* | 0.055 | *** | 3.37 | 0.057 | *** | 3.47 | 0.044 | ** | 2.51 | 0.045 | *** | 2.59 |
| *CLTD* | −0.084 | ** | −2.57 | −0.084 | ** | −2.58 | −0.054 | | −1.50 | −0.054 | | −1.50 |
| *RDE* | −0.118 | | −1.49 | −0.122 | | −1.54 | −0.075 | | −0.89 | −0.077 | | −0.92 |
| *PPE* | −0.034 | * | −1.88 | −0.034 | * | −1.86 | 0.037 | * | 1.92 | 0.038 | * | 1.94 |
| *INTANG* | −0.096 | *** | −3.51 | −0.098 | *** | −3.57 | 0.040 | | 1.39 | 0.040 | | 1.37 |
| *NOL* | −0.057 | *** | −5.15 | −0.058 | *** | −5.23 | −0.025 | ** | −2.16 | −0.026 | ** | −2.23 |
| *M&A* | 0.004 | | 1.19 | 0.004 | | 1.22 | 0.013 | *** | 3.46 | 0.013 | *** | 3.49 |
| *FINC* | −0.202 | *** | −2.96 | −0.203 | *** | −2.98 | −0.244 | *** | −3.59 | −0.244 | *** | −3.59 |
| *HAVEN* | −0.007 | | −1.21 | −0.008 | | −1.41 | 0.002 | | 0.31 | 0.001 | | 0.23 |
| **Control variables (*CTRL*)** | | | | | | | | | | | | |
| *SIZE* | 0.019 | *** | 3.60 | 0.018 | *** | 3.41 | 0.048 | *** | 8.10 | 0.048 | *** | 7.97 |
| *ROA* | −0.041 | | −1.51 | −0.040 | | −1.49 | −0.125 | *** | −4.75 | −0.125 | *** | −4.75 |
| *BM* | −0.008 | * | −1.77 | −0.008 | * | −1.78 | 0.003 | | 0.70 | 0.003 | | 0.70 |
| *CASH* | −0.047 | * | −1.92 | −0.046 | * | −1.89 | 0.075 | *** | 2.83 | 0.075 | *** | 2.86 |
| *INTCOV* | 0.001 | | 0.12 | 0.000 | | 0.10 | 0.003 | | 0.53 | 0.002 | | 0.51 |
| *SVOL* | −0.001 | | −1.42 | −0.001 | | −1.44 | −0.002 | ** | −2.31 | −0.002 | ** | −2.31 |
| *IFUND* | 0.026 | * | 1.95 | 0.026 | * | 1.96 | −0.001 | | −0.04 | −0.001 | | −0.04 |
| *DACC* | −0.016 | ** | −2.22 | −0.016 | ** | −2.23 | 0.004 | | 0.46 | 0.004 | | 0.46 |
| *BUSSEG* | 0.011 | ** | 2.24 | 0.010 | ** | 2.21 | −0.014 | ** | −2.57 | −0.014 | ** | −2.57 |
| Intercept | 0.244 | *** | 6.30 | 0.251 | *** | 6.48 | 0.009 | | 0.22 | 0.014 | | 0.35 |
| Firm FE | Included | | | Included | | | Included | | | Included | | |
| Year FE | Included | | | Included | | | Included | | | Included | | |
| Adj. $R^2$ | 0.377 | | | 0.377 | | | 0.439 | | | 0.439 | | |
| Within Adj. $R^2$ | 0.019 | | | 0.019 | | | 0.043 | | | 0.043 | | |
| Obs. | 25,533 | | | 25,533 | | | 23,543 | | | 23,543 | | |

**Note:** This table reports the results of estimating Eq. (2) using fixed-effects regressions (both firm and year), where the dependent variable is either *GETR* (columns (1) and (2)) or *CETR* (columns (3) and (4)). By including both firm and year fixed-effects, Eq. (2) is a generalized difference-in-differences model, where the coefficients for *SPEBIN* and *SPETOT* are the difference-in-differences estimators of interest. *, **, and *** denote statistical significance levels of 0.10, 0.05, and 0.01, respectively (one-tailed for *SPE*; two-tailed otherwise). Reported *t*-statistics are based on robust standard errors clustered by firm. Variables are defined in Appendix B.

**Table 5**
**Level of tax-advantaged transactions used within SPEs (RQ1) – Path analysis**

| | Panel A: *GETR* | | | | | | | Panel B:*CETR* | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Total* | | *Direct* | | *Indirect (within)* | | | *Total* | | *Direct* | | *Indirect (within)* | | |
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat | % | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat | % |
| *SPETOT* | | | −0.037 | **−3.95** | | | | | | −0.027 | **−2.68** | | | |
| **Tax-advantaged transactions (*TAT*)** | | | | | | | | | | | | | | |
| *LEV* | −0.030 | **−2.55** | −0.029 | **−2.46** | −0.001 | **−1.87** | 3.6 | −0.053 | **−4.19** | −0.052 | **−4.12** | −0.001 | **−1.79** | 1.8 |
| *DISS* | 0.036 | **3.45** | 0.035 | **3.37** | 0.001 | **2.04** | 2.5 | 0.028 | **2.58** | 0.027 | **2.51** | 0.001 | **1.87** | 2.6 |
| *CLTD* | −0.026 | **−2.60** | −0.026 | **−2.58** | 0.000 | 0.89 | 1.2 | −0.016 | −1.52 | −0.016 | −1.50 | 0.000 | 0.65 | 1.1 |
| *RDE* | −0.016 | −1.59 | −0.015 | −1.49 | −0.001 | **−2.61** | 6.6 | −0.010 | −0.97 | −0.009 | −0.89 | −0.001 | **−2.12** | 8.7 |
| *PPE* | −0.027 | **−1.85** | −0.027 | **−1.88** | 0.000 | 0.70 | 1.4 | 0.028 | **1.94** | 0.028 | **1.92** | 0.000 | 0.79 | 1.3 |
| *INTANG* | −0.052 | **−3.64** | −0.050 | **−3.51** | −0.002 | **−2.39** | 3.5 | 0.019 | 1.31 | 0.020 | 1.39 | −0.001 | **−1.74** | 6.1 |
| *NOL* | −0.066 | **−5.24** | −0.065 | **−5.15** | −0.001 | **−2.83** | 2.0 | −0.025 | **−2.23** | −0.024 | **−2.16** | −0.001 | **−2.03** | 3.3 |
| *M&A* | 0.010 | 1.17 | 0.010 | 1.19 | 0.000 | 0.40 | 1.4 | 0.031 | **3.46** | 0.031 | **3.46** | 0.000 | 0.26 | 0.2 |
| *FINC* | −0.029 | **−3.01** | −0.028 | **−2.96** | −0.001 | −1.21 | 1.7 | −0.034 | **−3.62** | −0.034 | **−3.59** | 0.000 | 0.76 | 0.7 |
| *HAVEN* | −0.017 | **−1.86** | −0.011 | −1.21 | −0.006 | **−3.72** | 34.6 | −0.001 | −0.13 | 0.003 | 0.31 | −0.004 | **−2.59** | 331.2 |
| **Control variables (*CTRL*)** | | | | | | | | | | | | | | |
| *SIZE* | 0.045 | **3.31** | 0.049 | **3.61** | −0.004 | **−3.28** | 8.6 | 0.110 | **7.89** | 0.113 | **8.11** | −0.003 | **2.47** | 2.7 |
| *ROA* | −0.018 | −1.47 | −0.018 | −1.51 | 0.001 | **1.67** | 3.1 | −0.052 | **−4.74** | −0.052 | **−4.75** | 0.000 | 0.81 | 0.4 |
| *BM* | −0.021 | **−1.77** | −0.021 | **−1.77** | 0.000 | 0.30 | 0.5 | 0.008 | 0.71 | 0.008 | 0.70 | 0.000 | 0.41 | 1.4 |
| *CASH* | −0.022 | **−1.85** | −0.023 | **−1.92** | 0.001 | **1.87** | 4.1 | 0.037 | **2.91** | 0.036 | **2.83** | 0.001 | **1.93** | 2.7 |
| *INTCOV* | 0.001 | 0.10 | 0.001 | 0.12 | 0.000 | 0.63 | 13.1 | 0.006 | 0.52 | 0.006 | 0.53 | 0.000 | 0.88 | 2.9 |
| *SVOL* | −0.015 | −1.51 | −0.014 | −1.43 | −0.001 | **−2.07** | 6.1 | −0.023 | **−2.37** | −0.022 | **−2.31** | −0.001 | 1.59 | 2.5 |
| *IFUND* | 0.021 | **1.96** | 0.021 | **1.95** | 0.000 | 0.34 | 0.6 | 0.000 | 0.03 | 0.000 | 0.04 | 0.000 | 0.25 | 19.9 |
| *DACC* | −0.017 | **−2.21** | −0.017 | **−2.22** | 0.000 | 0.37 | 0.6 | 0.004 | 0.49 | 0.004 | 0.46 | 0.000 | 0.90 | 4.8 |
| *BUSSEG* | 0.020 | **2.24** | 0.020 | **2.24** | 0.000 | 0.13 | 0.3 | −0.026 | **−2.57** | −0.026 | **−2.57** | 0.000 | 0.01 | 0.0 |
| Firm FE | Included | | Included | | | | | Included | | Included | | | | |
| Year FE | Included | | Included | | | | | Included | | Included | | | | |
| Within Adj. $R^2$ | 0.018 | | 0.019 | | | | | 0.042 | | 0.043 | | | | |
| Obs. | 25,533 | | 25,533 | | | | | 23,543 | | 23,543 | | | | |

**Note:** This table presents the path analysis decomposing the relation between the source (causal) variable, *SPE*, and outcome variable, *ETR*, shown in Table 4 into direct and indirect paths (Figure 2). In *Total* columns, we estimate Eq. (2) using fixed-effects regressions (both firm and year) after excluding *SPETOT* to examine the total (direct and indirect) effect of each variable on *GETR* and *CETR*. In *Direct* columns, we estimate Eq. (2) including *SPETOT* such that the coefficients for other variables capture the direct effect of each variable on ETRs controlling for SPE use. The *Indirect* columns report the difference between *Total* and *Direct*, reflecting the incremental effect of each variable on ETRs occurring within SPEs. A negative (positive) indirect effect indicates that SPEs result in more (less) tax avoidance for a given variable. The *Indirect%* is the absolute value of the indirect effect divided by the total effect, capturing the proportion of the total effect occurring *within* SPEs. Each variable is standardized (subtract the mean and divide by standard deviation) to simplify coefficient comparisons. Bold *t*-statistics denote statistical significance of at least 0.10 (one-tailed for *SPETOT*; two-tailed otherwise). Reported *t*-statistics are based on robust standard errors clustered by firm. Robust standard errors for *Indirect* are computed using the Sobel Multivariate Delta Method (Sobel 1982) and are adjusted for clustering at the firm-level. Variables are defined in Appendix B.

**Table 6**
**Total incremental tax savings facilitated by SPEs (RQ2) – Path analysis**

**Panel A:** Tax savings estimates

| | *GETR* | | *CETR* | |
|---|---|---|---|---|
| | Average | Maximum | Average | Maximum |
| **Direct effect** | | | | |
| Coefficient | −0.037 | −0.056 | −0.027 | −0.047 |
| ETR effect | −0.011 | −0.017 | −0.009 | −0.016 |
| Firm-level savings (millions) | $7.14 | $10.80 | $5.67 | $9.87 |
| Sample-level savings (millions) | $75,648 | $114,494 | $60,142 | $104,691 |
| **Indirect effect** | | | | |
| Coefficient | −0.014 | −0.034 | −0.010 | −0.027 |
| ETR effect | −0.004 | −0.010 | −0.003 | −0.009 |
| Firm-level savings (millions) | $2.70 | $6.56 | $2.10 | $5.67 |
| Sample-level savings (millions) | $28,623 | $69,514 | $22,275 | $60,142 |
| **Total effect** | | | | |
| ETR effect | −0.016 | −0.028 | −0.012 | −0.025 |
| Firm-level savings (millions) | $9.84 | $17.36 | $7.77 | $15.55 |
| Sample-level savings (millions) | $104,271 | $184,008 | $82,416 | $164,832 |

**Panel B:** Tax savings comparison

| | Estimated sample-level cash tax savings | | | |
|---|---|---|---|---|
| Tax planning strategy | Total ($ billions) | Annual ($ billions) | Period | Reference |
| SPEs | $82.4 to $164.8 | $4.8 to $9.7 | 1997-2013 | Panel A (above) |
| Tax havens | $1.3 (active); $92.9 (deferral) | $0.1 (active); $7.1 (deferral) | 1995-2007 | Dyreng and Lindsey (2009) |
| Round-tripping | $33.0 to $77.0 | $1.3 to $3.1 | 1984-2008 | Hanlon et al. (2015) |
| Tax shelters | $12.4 | $0.5 | 1975-2001 | Wilson (2009) |
| Financial derivatives | $3.8 | $0.4 | 2000-2008 | Donohoe (2015) |

**Note:** This table estimates (Panel A) and compares (Panel B) the tax savings associated with the extent of SPE use (*SPETOT*), defined as the effect of moving from zero SPEs to the mean number of SPEs held by SPE users in our sample (5.48). Average (maximum) estimates are based on coefficients reported in Table 5 (unreported lower bound of the untabulated 95% confidence interval). The direct effects are based on coefficients for *SPETOT* in the *Direct* columns of Table 5, while the indirect effects are based on the sum of the indirect effects of all variables in the *Indirect* columns of Table 5. ETR effects are measured as the percentage point reduction in each ETR (*GETR* and *CETR*) for the mean SPE user. Specifically, we multiply ETR coefficients by the standard deviation of *GETR* and *CETR* (0.190 and 0.207, respectively), divide by the standard deviation of *SPETOT* (1.150), and then multiply by the mean of *SPETOT* (1.869). Average firm-level tax savings (in millions) are calculated by multiplying the ETR effect by −1 and the average three-year sum of pre-tax income less special items for SPE users ($624.5 million) divided by three (to obtain an annual measure). Sample-level tax savings (in millions) are calculated by multiplying the ETR effect by −1 and the aggregate three-year sum of pre-tax income less special items for the sample of SPE users ($6.621 trillion) divided by three. Panel B compares the estimated aggregate cash tax savings of SPEs to other tax planning strategies examined in prior research.

Each estimate is reported as it is in the referenced study. The comparison is not intended to be a comprehensive summary of all tax avoidance strategies, but to provide context for our results.

**Table 7**
**Tax-advantaged transactions enhanced by SPEs (RQ3) – Moderation analysis**

| | Panel A: *GETR* | | | Panel B: *CETR* | | |
|---|---|---|---|---|---|---|
| | (1) Main Effect (*t*-stat) | (2) Interaction (*t*-stat) | (2)/(1) \|Change\| (%) | (1) Main Effect (*t*-stat) | (2) Interaction (*t*-stat) | (2)/(1) \|Change\| (%) |
| *SPETOT* | −0.038*** | | | −0.031*** | | |
| | (−3.30) | | | (−2.59) | | |
| **Tax-advantaged transactions (*TAT*)** | | | | | | |
| *LEV* | −0.034*** | −0.002 | 0% | −0.046*** | 0.022** | 47.8% ↓ |
| | (−3.17) | (−0.21) | | (−4.09) | (2.19) | |
| *DISS* | 0.032*** | 0.011 | 0% | 0.020** | −0.001 | 0% |
| | (3.44) | (1.59) | | (2.10) | (−0.16) | |
| *CLTD* | −0.026*** | 0.014* | 53.8% ↓ | −0.015 | 0.007 | 0% |
| | (−2.84) | (1.72) | | (−1.55) | (0.91) | |
| *RDE* | −0.027** | −0.025** | 92.6% ↑ | −0.009 | −0.010 | 0% |
| | (−2.57) | (−2.30) | | (−0.96) | (−0.96) | |
| *PPE* | −0.029** | −0.001 | 0% | 0.026** | 0.007 | 0% |
| | (−2.19) | (−0.06) | | (2.05) | (0.65) | |
| *INTANG* | −0.051*** | −0.037*** | 72.5% ↑ | 0.026* | −0.013 | 0% |
| | (−3.61) | (−3.30) | | (1.89) | (−1.07) | |
| *NOL* | −0.059*** | 0.028** | 47.5% ↓ | −0.028** | −0.001 | 0% |
| | (−4.76) | (2.23) | | (−2.50) | (−0.06) | |
| *M&A* | 0.009 | 0.005 | 0% | 0.030*** | −0.016** | 53.3% ↑ |
| | (1.21) | (0.60) | | (3.54) | (−2.09) | |
| *FINC* | −0.031*** | 0.008 | 0% | −0.037*** | 0.012 | 0% |
| | (−3.41) | (0.98) | | (−4.17) | (1.43) | |
| *HAVEN* | −0.008 | 0.003 | 0% | 0.004 | 0.006 | 0% |
| | (−0.88) | (0.32) | | (0.40) | (0.69) | |
| Intercept | −0.001* | | | −0.001 | | |
| | (−1.71) | | | (−0.96) | | |
| *CTRL* | | Included | | | Included | |
| Firm FE | | Included | | | Included | |
| Year FE | | Included | | | Included | |
| Within Adj. $R^2$ | | 0.023 | | | 0.043 | |
| Obs. | | 25,533 | | | 25,543 | |

**Note:** This table presents the moderation analysis, which examines whether the relationship between two variables depends on a third variable. We implement moderation analysis by estimating Eq. (2) with an interaction term between *SPETOT* and each covariate, where all variables are demeaned and standardized. In each panel, column (1) reports the main effect of each covariate, column (2) reports the interaction between *SPETOT* and the relevant covariate, and column (3) reports an estimate of the extent to which SPEs enhance the relative tax savings of tax-advantaged transactions captured by each covariate. The results are interpreted as follows. First, the main effect for *SPETOT* (column (1)) reflects the effect of SPEs on ETRs at the mean level of both SPEs and all covariates. For example, in Panel A, a one standard deviation increase in *SPETOT* results in a 0.038 standard deviation decrease in *GETR* (measured at the mean of SPEs and other variables). Second, the interaction effect (column (2)) captures the effect of SPEs on *GETR* changes as each covariate changes. For instance, for a one standard deviation

increase in *LEV*, the effect of a one standard deviation increase in *SPETOT* is associated with a further 0.002 standard deviation reduction in *GETR* (for a total of 0.040=0.038+0.002) about the mean of SPEs and other covariates except *LEV*, which increased by one standard deviation. Third, the percentage change (column (3)) measures the relative increase in tax savings from SPEs. For example, at the mean of *SPETOT*, a one standard deviation increase in *RDE* results in a 0.027 standard deviation decrease in *GETR* (column (1)). If *SPETOT* increases by one standard deviation, the effect of a one standard deviation increase in *RDE* is a 0.063 (0.038+0.025) standard deviation decrease in *GETR*. The incremental reduction (0.025) in *GETR* due to the increase in *SPETOT* reflects a 92.6% increase in tax savings relative to no change in *SPETOT* (0.025/0.027). The arrows denote whether transactions captured by the covariate are more (↑) or less (↓) efficient at generating tax savings when conducted within SPEs. *, **, and *** denote statistical significance levels of 0.10, 0.05, and 0.01, respectively. Reported *t*-statistics are based on robust standard errors clustered by firm. Variables are defined in Appendix B.

**Table 8**
**Other tests**

| | Tax aggressiveness | | Domestic firms | | Jurisdictions | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | *LNUTB* | *TSSCORE* | *GETR* | *CETR* | *FED* | *FRN* | *STA* |
| | Coeff. | Coeff. | Coeff. | Coeff. | Coeff. | Coeff. | Coeff. |
| | (*t*-stat) | (*t*-stat) | (*t*-stat) | (*t*-stat) | (*t*-stat) | (*t*-stat) | (*t*-stat) |
| *SPETOT* | 0.073 | −0.004 | −0.014 | −0.007 | −0.005 | −0.002 | −0.001 |
| | **(2.11)** | **(−1.83)** | **(−4.06)** | **(−2.05)** | **(−2.26)** | (−0.57) | (−0.98) |
| *DOM* | | | 0.009 | 0.010 | | | |
| | | | (1.18) | (1.11) | | | |
| *SPETOT×DOM* | | | 0.007 | −0.001 | | | |
| | | | **(1.84)** | (−0.20) | | | |
| *TAT* | Included | Included | Included | Included | Included | Included | Included |
| *CTRL* | Included | Included | Included | Included | Included | Included | Included |
| Firm FE | Included | Included | Included | Included | Included | Included | Included |
| Year FE | Included | Included | Included | Included | Included | Included | Included |
| Adj. $R^2$ | 0.925 | 0.914 | 0.378 | 0.439 | 0.567 | 0.521 | 0.391 |
| Within Adj. $R^2$ | 0.045 | 0.220 | 0.020 | 0.043 | 0.070 | 0.066 | 0.012 |
| Obs. | 5,474 | 22,834 | 25,533 | 23,543 | 19,504 | 10,425 | 19,265 |

**Note:** This table reports the results of estimating Eq. (2) using fixed-effects regressions (both firm and year), where the dependent variable is indicated in the column heading. Bold t-statistics denote statistical significance levels of at least 0.10 (one-tailed for *SPETOT* other than in column (2); two-tailed otherwise). Reported *t*-statistics are based on robust standard errors clustered by firm. Variables are defined in Appendix B.

**Figure 1**
**Time trends in SPEs and one-year *GETR***

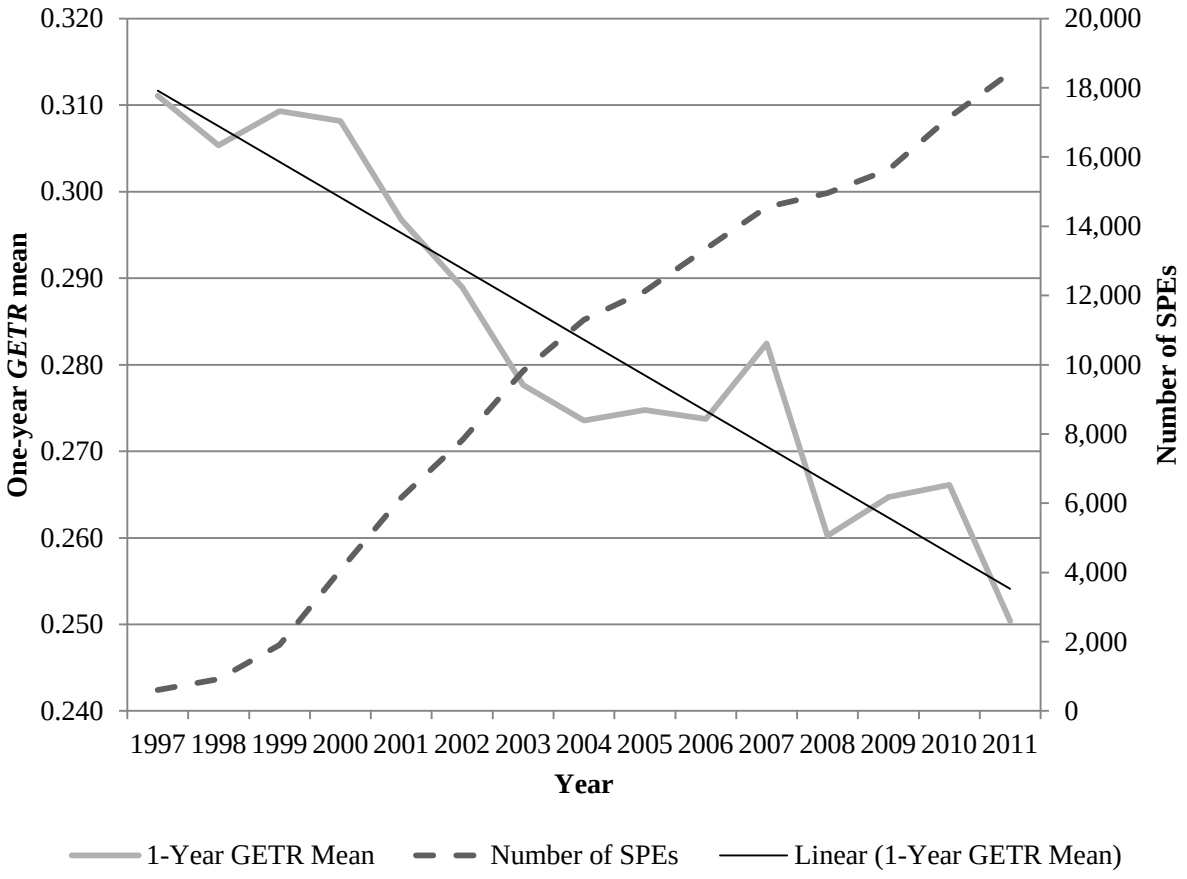
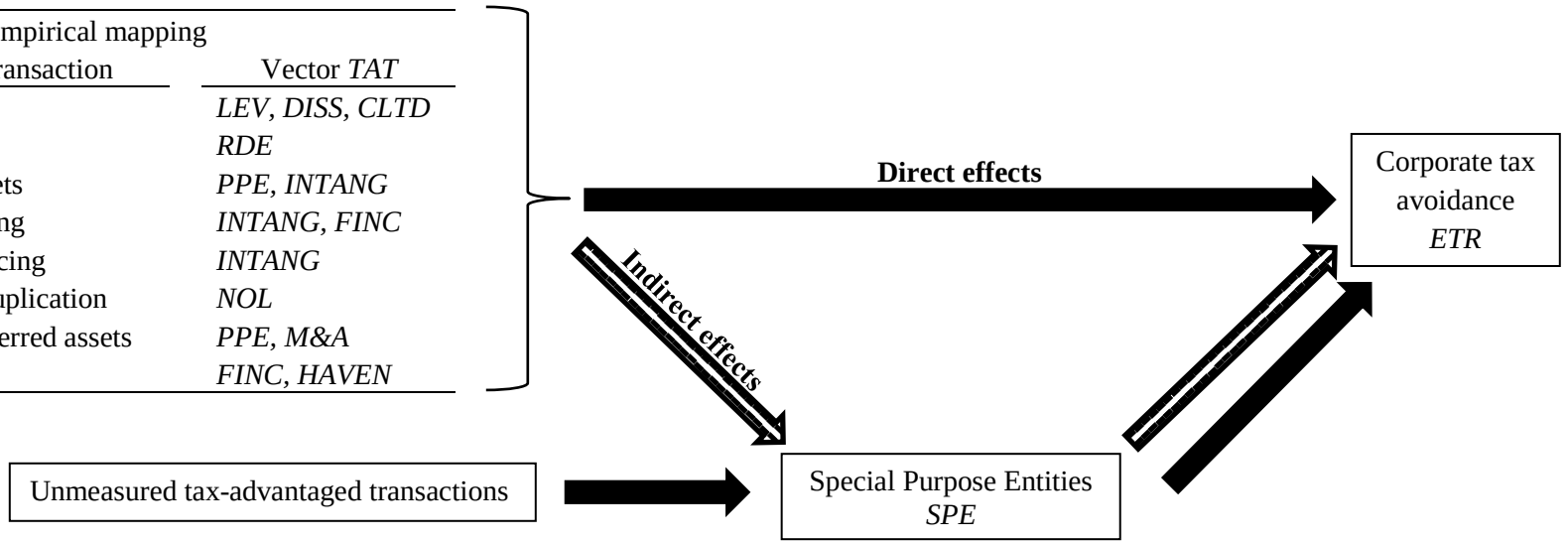


**Figure 2**
**Path analysis diagram**

| Empirical mapping | |
|---|---|
| Tax-advantaged transaction | Vector *TAT* |
| Increase leverage | *LEV, DISS, CLTD* |
| Hold R&D activities | *RDE* |
| Hold depreciable assets | *PPE, INTANG* |
| Foreign transfer pricing | *INTANG, FINC* |
| Domestic transfer pricing | *INTANG* |
| Tax credit and loss duplication | *NOL* |
| Basis shift to tax preferred assets | *PPE, M&A* |
| Foreign tax deferral | *FINC, HAVEN* |




**Note:** This figure diagrams the recursive path (links flow in only one direction) that we consider among manifest (observable) variables, which is guided by the anecdotal evidence discussed in Section 2.3. While regression analysis evaluates overall effects, path analysis considers the existence and relative importance of alternative (indirect) paths of influence that jointly create the overall effects. With *SPE* in Eq. (2), the coefficients for the vector of tax-advantaged transaction variables (*TAT*) captures the direct effect of each measured transaction on corporate tax avoidance (ETRs) absent the use of SPEs (solid arrows). If *TAT* variables perfectly measured every tax-advantaged transaction facilitated by SPEs, the coefficient for *SPE* would equal zero because (1) the direct effects of each transaction would be captured by *TAT* variable coefficients, and (2) regression analysis ignores indirect effects (dashed arrows). However, because it is inherently difficult to measure the vast array of transactions facilitated by SPEs, the coefficient for *SPE* also captures the direct and indirect effects of unmeasured transactions (i.e., those *not* captured by *TAT* due to measurement error or omission). Path analysis identifies and measures the relative importance of such indirect effects.