The Effect of Industrial Diversification on Firm Taxes

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Abstract

This study investigates whether there is an empirical basis for one predicted benefit from industrial diversification: whether conglomerate firms obtain greater tax savings than single industry firms. The results suggest that, on average, firms operating in multiple industries incur lower tax liabilities than stand-alone firms. However, whether a firm realizes these benefits is affected by the type of industry-based tax positions available to the firm, the firm's demand for debt, and its overall risk strategy. For identification, the study uses a triple difference model based on two temporary tax law changes and an instrumental variables analysis from the diversification discount literature. Results from these tests are consistent with a tax advantage from diversification. Overall, the results in the study inform recurring debates in the media and between management and shareholders over the costs and benefits of diversification as a business strategy.

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1. Introduction

This study investigates whether diversified firms are able to achieve lower tax liabilities than stand-alone firms.[1] Proponents of industrial diversification often cite additional tax savings as a key benefit from operating in multiple industries (Lewellen, 1971; Teece, 1980; Gertner, Scharfstein, and Stein, 1994; Berger and Ofek, 1995; Furrer, 2011). Consistent with this, management at firms like Berkshire Hathaway and General Electric have referenced additional tax benefits as one of the key benefits of maintaining the conglomerate form.[2] Yet, despite predictions for tax benefits along with other argued advantages from operating in multiple industries, such as synergies in operations and improved internal capital markets, the finance literature more commonly documents that diversified firms trade at a discount or perform worse relative to pure play firms (specifically, see earlier studies like Lang and Stulz (1994) and Berger and Ofek (1995); more recently, Laeven and Levine (2007) in banks, and Humphery-Jenner (2013) in private equity funds).

Despite this puzzle of the "diversification discount" in the valuation literature, there is almost no empirical evidence directly testing whether the individual benefits of diversification predicted in prior literature and practice are actually realized. That is, the diversification valuation discount is only a puzzle as long as the assumptions about the proposed benefits of diversification are, in fact, valid; hence, the purpose of this study is to examine the commonly held assumption that industrial diversification unambiguously creates tax benefits for firms.

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[1] Throughout the study, I use the terms diversified firm, conglomerate, and multiple industry firm interchangeably consistent with prior literature.

[2] In his 2014 letter to shareholders, Warren Buffett cited "important tax benefits" as one reason refocusing spin-offs "make no sense for us" at Berkshire Hathaway (p. 33). Similarly, General Electric stated that concerns about losing tax benefits from its financing operations business unit, GE Capital, deterred the decision to sell its financing business for a long-time (*The Wall Street Journal*, April 13, 2015).

Using a broad sample of firms from 1999 through 2013, I begin with an investigation of the average effect of diversification on firm tax liabilities, employing an extensive set of predictors used in prior literature. I find evidence supporting the prediction that firms operating in multiple industries have lower tax liabilities than single industry firms on average. Specifically, firms operating in multiple industries obtain a 4.6 percentage point lower cash effective tax rate (ETR) on average than firms operating in a single industry. This equates to $3.3 million of cash tax savings for the average firm in my sample. Results supporting the average tax savings effect are robust to four measures of diversification.

In the next set of tests, I examine whether there are factors that moderate the potential tax benefits from diversification. Under certain circumstances that flow from prior literature and practice, I predict and find that the diversification effect on taxes is muted or not observed for some firms. Specifically, I find that when tax benefits from diversification are more likely to directly substitute for other industry-specific tax benefits the firm may claim, or when a firm has less demand for additional debt (and resulting debt tax shields), that a diversified firm does not obtain significant tax savings over pure play firms. Further, I find that firms following low to moderate risk strategies do not observe additional tax benefits from diversification. Taken together, this set of cross-sectional tests provide evidence that the main effect is properly identified in the sense that the results conform to the specific predicted sources of diversification tax benefits in the literature.

My final set of tests are used to address concerns regarding potential endogeneity between factors that may influence a firm's choice to operate in multiple industries and its tax liabilities. The first test examines two tax law changes expected to temporarily alter the convexity of the tax function and, therefore, tax benefits from diversification. Because they are temporary tax changes with a limited window in which firms can take advantage of the different tax benefits, it is less likely that firms would suddenly (and temporarily) change the number of industries in which they operate to incorporate the differences in the tax function. The second test uses an instrumental variables approach aimed at addressing selection issues that commonly used in the diversification discount literature. Using these alternate approaches, I find results consistent with my primary results, supporting the prediction of a tax benefit from diversification.

This study contributes to the debate in the diversification literature and practice over the merits of operational diversification as a firm business strategy. Prior literature predicts that there are many potential benefits from diversification (Lewellen, 1971; Teece, 1980; Gertner, Scharfstein, and Stein, 1994; Furrer, 2011), but generally provides evidence supporting a valuation discount or underperformance for diversified firms overall when compared to single industry firms (Lang and Stulz 1994; Berger and Ofek, 1995; Lins and Servaes, 1999; Rajan, Servaes, Zingales, 2000; Scharfstein and Stein, 2000; Laeven and Levine, 2007; Humphery-Jenner, 2013). By documenting tax savings related to diversification, this study is one of the first to offer empirical support to one dimension used in assessing the specific merits of this business strategy. Further, by identifying factors that moderate the tax benefit, I provide a tangible set of conditions for why we may observe differences in valuation effects across diversified firms. While assessing the valuation effect for the average firm is clearly important, directly examining individual benefits and costs of diversification (such as a firm's tax benefit) may provide a greater set of tools for evaluating why diversification has appeared to work for some firms (e.g. 3M and General Electric) but not others. This approach suggests a useful avenue for future research could be the examination of other specific benefits (or costs) of diversification. This topic is timely given recent high profile debates in the media over the merits and pitfalls of diversification as a business strategy.[3]

In addition to contributions to the diversification literature, the results in this study suggest that industrial diversification is also an important factor to consider in future research on firm tax avoidance. While recent research suggests that industry expertise may be advantageous for claiming additional tax benefits (McGuire, Omer, and Wang, 2012), and previous research demonstrates that the influence of other important factors (like firm size) on taxes varies across industries (Zimmerman, 1983), studies in the literature generally link a firm with its primary industry and do not account for whether it has operations in other industries. To summarize this with an analogy, accounting for only the primary industry in which a firm operates, but not accounting for whether it operates in multiple industries, would be like accounting for the fact that a firm is headquartered in the U.S. versus Ireland, but not incorporating whether it operates in multiple countries as opposed to operating only domestically.[4] Moreover, unlike more complicated measures or variables that explain tax avoidance specific to proprietary data of limited accessibility, segment-based industry data is readily available in Compustat and can be easily incorporated into future tax research as an important determinant of a firm's tax rate.[5]

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[3] The business press points to a broad push by shareholders of conglomerates to refocus and discontinue operations in sprawled out industries and, in response, management's responding defense of the benefits of the conglomerate form (*The Wall Street Journal*, January 25, 2016). Examples of firms that have faced this debate recently include DuPont, Abbott Laboratories, Energizer, Tyco, and Johnson Controls (*Reuters*, September 17, 2014; *Bloomberg*, March 1, 2015; *The Wall Street Journal*, August 9, 2015; *The Wall Street Journal*, January 25, 2016).

[4] The two characteristics are also applicable to a similar proportion of firms. For example, from 1999-2013 (in my sample period), 25 percent of the firms on Compustat reported operating in multiple industries (based on reporting business segments in more than one four-digit SIC code), and 22 percent of firms on Compustat reported having foreign operations (based on reporting non-zero and non-missing pre-tax foreign income).

[5] This is in contrast to other factors shown to have important implications for firm tax outcomes that are difficult to incorporate into an empirical examination because these characteristics are not publicly disclosed. For example, Robinson, Sikes, and Weaver (2010) use proprietary survey data to examine whether performance measurement of corporate tax departments (as a profit center as opposed to a cost center) affects firm effective tax rates. They find that firms evaluating tax departments as profit centers have significantly lower effective tax rates than firms evaluating their tax department as cost centers. Firms generally do not publicly disclose how they evaluate their tax department.

The remainder of the paper is organized as follows. Section 2 develops the hypothesis tested in the study and describes related literature. Section 3 details the research design, sample, and results for the primary analysis and cross-sectional tests. Section 4 re-examines the primary analysis using two instrumental variables techniques. Section 5 concludes the study discussing overall inferences and limitations.

2. Hypothesis development and related literature

2.1 Hypothesis development

Diversifying through industry operations has been linked to several sources of tax benefits in prior literature and practice. The first two predicted tax benefits from diversification come from the literature linking hedging to income volatility. Smith and Stulz (1985) define hedging as both the use of operational decisions (such as operating in multiple industries) and derivatives (or other financial instruments) to reduce the covariance of streams of income with the state of the economy. Smith and Stulz (1985) use a simple model of after-tax firm value to argue that if a firm's tax liability is a convex function of pre-tax income (i.e. the marginal tax rate is increasing with taxable income), then by Jensen's Inequality, companies that can reduce the volatility of their income through hedging can obtain lower expected tax liabilities. Graham and Smith (1999) extend this analysis using simulation models to incorporate more realistic features of the tax code, like tax loss carrybacks and carryforwards, investment tax credits, and the Alternative Minimum Tax (AMT) and find that these features do not eliminate this benefit related to tax convexity but rather extend the range of pre-tax income over which the convexity applies.[6] Based on their simulation analysis, Graham and Smith (1999) conclude that the average

[6] They find that primary institutional features affecting firm tax convexity are its tax loss carrybacks and carryforwards. Practically speaking, tax loss carrybacks and carryforwards do not eliminate tax convexity primarily because of the uncertainty of available taxable income to offset within the carryback and carryforward periods and the time value of money (Majd and Myers, 1987).

firm in their analysis faces a convex tax function and that if firms can reduce their pre-tax income volatility by 5 percent then on average they can reduce expected tax liabilities by about 5.4 percent.

The second tax benefit predicted from this literature results from implications of hedging for optimal capital structure. Firms that hedge are expected to carry a lower risk of default and, as a result, lending limits by creditors should be higher (Lewellen, 1971, Leland, 1998). Thus, firms have the opportunity to trade-off risk that was not tax-favored (with more exposure to tax convexity through volatile income streams in the absence of hedging) with tax-favored risk from additional debt capacity, resulting in greater interest deductions and lower tax liabilities (Lewellen, 1971; Stulz, 1996; Leland, 1998). While these first two tax benefits may come from any form of income volatility reduction or hedging, the third and fourth predicted tax benefits from diversification are unique to operational forms of hedging (in this case, operating in multiple industries) as opposed to hedging with derivatives.

These two operations-specific benefits relate to the firm's ability to both use and uphold tax positions. The tax code contains extensive provisions for tax benefits targeted at specific industries.[7] The dimension of industry for tax planning is also stressed by practice. For example, all of the Big Four discuss advantages for industry specific knowledge for tax functions on their websites.[8] Yet, firms often face uncertainty about whether industry-specific tax benefits will

[7] One example is the Investment Credit, which consists of credits specific to coal, gasification, and energy projects and the Credit for Increasing Research Activities ("R&D tax credit") often linked to pharmaceutical, high tech, and manufacturing industries. Other examples include specialized tax treatment for intangible drilling costs for oil and gas companies and elections allowing the averaging/shifting of farm income over multiple tax years in agriculture.
[8] Deloitte: http://www2.deloitte.com/us/en/pages/tax/solutions/tax-services-by-industry.html; Ernst & Young: http://www.ey.com/US/en/Industries; KPMG: http://www.kpmg.com/us/en/services/tax/pages/default.aspx; http://www.kpmg.com/us/en/industry/pages/default.aspx; PricewaterhouseCoopers: http://www.pwc.com/us/en/industrial-products/publications/2015-tax-rate-benchmarking-study.jhtml

remain available, which can affect the extent to which they will use certain tax positions.[9] Related to this, the third tax benefit of industrial diversification is that, by operating in different industries, a diversified firm may have a broader portfolio of tax planning opportunities and may not be as sensitive to unfavorable changes to a single industry's specific tax policies.

Another type of uncertainty that may limit a firm's use of tax positions is its expectation that whether, once a position is taken, it will be overturned by taxing authorities. The fourth benefit of operating in multiple industries is that it may reduce both the likelihood of being audited and the probability that, even if the firm is audited, the position will be overturned. This may result for two reasons. First, firm taxes are often assessed by comparison with industry peers.[10] [11] In fact, the Internal Revenue Service (IRS) has 52 Audit Technique Guides, which are primarily used to assist its examiners assess unique tax and accounting methods of specific industries.[12] When a firm operates in different industries, it may be more difficult for a taxing authority to identify, for example, an appropriate benchmark firm to flag whether the firm as having an abnormally low tax liability or questionable estimates of tax benefits.[13] Further, when a diversified firm does come under audit, it may be more difficult for IRS examiners to evaluate the appropriate tax treatment of a more complex organizational structure (e.g. understanding unique inter-industry transfer pricing techniques available to multiple industry firms). Thus, by reducing uncertainty about both available opportunities to reduce tax liabilities and the likelihood

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[9] For example, a last-minute bill in 2014 extended 54 corporate tax breaks (including specific tax breaks for banks, the retail industry, and research and development) that corporations would have lost access to for their returns that year (*Huffington Post*, December 16, 2014).

[10] In a 2014 report on tax planning benchmarks, Pricewaterhouse Coopers explained that peer group comparisons, which are often based on industry, provide opportunities in planning and shaping the tax function: http://www.pwc.com/us/en/industrial-products/publications/2015-tax-rate-benchmarking-study.jhtml.

[11] The IRS offers Industry Specific Tax Centers to provide businesses with specific guidance and analysis tools for assessing their tax planning relative to their industry.

[12] IRS Audit Technique Guides are available at: http://www.irs.gov/Businesses/Small-Businesses-&-Self-Employed/Audit-Techniques-Guides-ATGs.

[13] For example, it may difficult to identify an appropriate "tax peer" for companies that are diversified like 3M or General Electric.

positions taken will be overturned, diversified firms may be able to pay less in taxes than stand-alone firms. More broadly, the fact that the IRS audits based on industry-specific guidelines should alert tax researchers to the potential importance of investigating factors related to industries, and helps motivate the current study from a practice standpoint.

Despite the potential for additional tax savings, there are at least four reasons diversified firms may not obtain lower tax liabilities than pure play firms (or may even have higher tax liabilities). First, the last benefit mentioned cuts both ways, in the sense that while it may be more difficult for auditors to *audit* a multi-industry firm (given industry-specific tax code provisions), it may also be more difficult or costly for firms to tax coordinate and *plan* for multiple industry operations. Alternatively, pure play firms operating in a single industry may have a tax department that is highly specialized, in a better position to know their industry's tax provisions inside and out, so-to-speak. Dating back as early as Adam Smith, the gains from specialization have been well-established in economics, and there is no reason to believe that gains from specialization should not apply to tax practitioners at large, publically traded companies. An intuitive explanation of the tax cost for operating in multiple industries is simply that these firms' tax departments are simply spread too thin, or less specialized, and therefore less adept at maintaining tax rates as low as single-industry firms.[14]

Second, risk reduction is documented as an important motivator for diversification (Amihud and Lev, 1981). Shareholders can achieve their own desired level of risk through portfolio diversification and, thus, may have higher preference for the risk (and related returns) from any single firm. Instead, managers often maintain a major portion of their total income from their employment with a single firm through profit-sharing schemes, bonuses, and the value

[14] This viewpoint is consistent with the concerns about diverting management resources from the original focus of operations expressed in Lynch and Rothchild (2000).

of stock options. As a result, a risk-averse manager may opt for the conglomerate form as a means to stabilize the firm's streams of income, even if it is not valued by shareholders.[15] As a result, diversified firms may simply not take advantage of additional tax planning opportunities even if they do exist (i.e. demonstrate no significant difference with stand-alone firms in terms of tax savings) or may even choose to reduce tax benefits claimed if diversification is part of an overall firm strategy to reduce risk (paying higher taxes than pure play firms).

Third, prior literature on derivatives and mergers and acquisitions (M&A) suggests firms may not receive all of the specific, predicted tax benefits from other forms of hedging. Graham and Rogers (2002) and Donohoe (2015) test the predictions from Graham and Smith (1999) that there may be tax incentives to hedge through derivatives. While Graham and Rogers (2002) find evidence consistent with greater interest tax shields from derivative use and Donohoe (2015) finds evidence of additional tax benefits unique to transactions with derivatives, neither study finds evidence that supports derivative use providing additional tax benefits from reduced tax convexity. Further, in their multivariate analysis (Table 8), Devos, Kadapakkam, and Krishnamurthy (2009) find no statistical difference between additional interest tax shields from diversifying mergers (between acquirers and targets in different industries) versus focused mergers (between acquirers and targets in the same industry). Overall, the results in these studies cast doubt on some of the individual tax benefit predictions from the general hedging and diversification specific literatures, motivating a more general empirical examination of industrial diversification on taxes.

[15] Based this explanation, Amihud and Lev (1981) predict and find that the number of conglomerate mergers increases as the type of control in the firm moves from strong shareholder control to weak shareholder control and then to management control. At the same time, this type of control does not appear to be a significant motivator for non-conglomerate mergers, suggesting that the effect is not for general growth with mergers as opposed to the conglomerate form distinction. Further, May (1995) finds that firms with CEOs that have more personal wealth vested in their firm's equity tend to diversify firm operations.

Finally, as mentioned in the introduction, while diversification is predicted to provide a number of other *non-tax* benefits that are expected to generate greater firm value (in addition to the tax benefits above), and a significant portion of firms continue to choose to operate in multiple industries, generally the literature finds evidence that, on average, diversified firms are valued at a discount or perform worse relative to pure play firms. This suggests that either firms are not realizing these benefits in reality or that, even if these benefits are being accessed, additional costs of the conglomerate form (which may have alternative tax consequences) offset these benefits for shareholders. While the above alternative points suggest it may be reasonable to expect that diversified firms claim no greater tax advantages than stand-alone firms, I state the following hypothesis based on the greater tax benefit prediction (in the alternative form) given this is the perspective focused on in the diversification literature:

H1: Diversified firms are able to obtain lower tax liabilities than stand-alone firms.

3. Research design, sample, and results

3.1 Research design for hypothesis 1

To examine H1, I employ variations of the following the empirical model from the literature on firm tax avoidance:

$$Tax_{i,t} = \beta_0 + \beta_1\, Diversification_{i,t} + \sum \beta\, Controls_{i,t} + \varepsilon_{i,t} \qquad (1)$$

To measure a firm's tax liabilities, $Tax_{i,t}$,, I use a firm's cash taxes paid scaled by the market value of assets (*Cash taxes paid/MVA*$_{i,t}$). Henry and Sansing (2015) document evidence that scaling by the market value of assets helps address concerns about data truncation bias. Scaling by this variable is particularly important for examining taxes in the setting of diversification for two reasons. First, because effective tax rate (ETR)-based measures divide by pre-tax book income reported in the financial statements, it only allows the measure to capture non-conforming (as opposed to conforming) forms of tax avoidance (Hanlon and Heitzman, 2010). Conforming (non-conforming) tax avoidance is a reduction in firm tax liability that affects a firm's taxable income and pre-tax book income in the same way (differing ways). Because ETR-based measures do not capture conforming tax avoidance, it will not reflect tax benefits of interest deductibility (Hanlon and Heitzman, 2010, p. 141) and potentially bias the results in a way relevant to this study's hypothesis.

In addition, ETR-based measures are generally not considered meaningful in years with negative pre-tax income (Dyreng, Hanlon, and Maydew, 2008; Hope, Ma, and Thomas, 2013).[16] As a consequence of this, studies using ETR measures generally exclude years with negative pre-tax income from the analysis. This restriction is of particular concern in this study because one of the predictions from the literature is that diversification is expected to reduce income volatility, which may indicate that generally profitable diversified firms face less frequent exposure to loss years than stand-alone firms. As a result, this truncation restriction for negative pre-tax income years may affect diversified firms to a different extent than stand-alone firms and introduce a systematic bias in the estimator.

The variable *Cash taxes paid/MVA*$_{i,t}$ is able to capture conforming tax avoidance and allows inclusion of negative pre-tax income years because of the alternative scaling variable, market value of assets. As explained in Hanlon and Heitzman (2010), a tax measure is able to capture conforming tax avoidance if the conforming tax avoidance does not affect the numerator and denominator of the tax measure in a way that preserves the value of the ratio without this type of avoidance (they discuss this in the context of scaling by cash flows from operations as an

[16] For example, say a firm has negative pre-tax income and had negative cash taxes paid (i.e. a refund when it has a loss). The ETR would be positive and potentially larger than for some firms that actually had positive pre-tax income and cash taxes paid. Alternatively, a firm could have negative pre-tax income and positive taxes paid, resulting in a negative ETR when taxes were actually paid.

alternative to pre-tax book income in footnote 49).[17] It is reasonable to expect that lower cash taxes paid as a consequence of interest tax deductions would not affect the market value of assets in such a way that it would maintain the same ratio in the absence of such benefits. Thus, I expect this form of tax avoidance to be more likely to be captured in this alternate measure. Further, the use of market value of assets prevents elimination of negative pre-tax income years because it maintains a meaningful ratio in these years (since the denominator is still positive).[18]

The primary variable for *Diversification*$_{i,t}$ is an indicator for whether a firm operates in multiple industries (*Multiple industries*$_{i,t}$) similar to Berger and Ofek (1995) and prior literature on diversification, taking the value of one when a firm operates in multiple industries and equaling zero otherwise. In addition to *Multiple industries*$_{i,t}$, I examine three alternative proxies for *Diversification*$_{i,t}$ based on firm segment reporting: *# of industries*$_{i,t}$, *% of sales in other industries*$_{i,t}$, and *Sales-weighted distance*$_{i,t}$. The variables *Multiple industries*$_{i,t}$ and *# of industries*$_{i,t}$ follow from the single versus multi-segment firm representation of diversification used in Berger and Ofek (1995). The measure *% of sales in other industries*$_{i,t}$ is based on the measure of multinational or geographical diversification in Creal, Robinson, Rogers, and Zechman (2013), which uses the percent of foreign sales as the extent of diversification. *Sales-weighted distance*$_{i,t}$ captures how similar the segmented industries inside the firm are to the primary industry of the overall firm. This measure is based on the "relatedness" measure used in

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[17] Hanlon and Heitzman (2010) discuss cash flow from operations as an alternative scaler to use to try and capture conforming tax avoidance. However, cash flow does not as clearly eliminate the two concerns above for two reasons. First, it is more reasonable to expect that interest expense and the related tax deduction would affect the cash flow denominator and cash taxes paid in a way that preserves the tax variable ratio in the absence of this expense/deduction than it is to expect that this ratio would be maintained in the presence of this tax benefit when scaling by market value of assets. Further, scaling by cash flow from operations does not resolve the issue of truncation with negative denominator values as cash flow is negative nearly as frequently as when pre-tax income is negative. However, I do want to note that Hanlon and Heitzman (2010) do not offer the alternative cash flow scaling variable as a suggestion for addressing the loss truncation issue.

[18] See Henry and Sansing (2015) for a discussion of the motivation and validation of the alternate scaling variable in addressing truncation bias in tax measures.

Khorana, Shivdasani, Stendevad, and Sanzhar (2011). I use a decile rank form of the latter two measures, *% of sales in other industries*$_{i,t}$ and *Sales-weighted distance*$_{i,t}$. Based on H1 and the standard assumption in the diversification literature, I expect to find that more diverse firms pay less taxes on average (i.e. a negative and significant coefficient on *Diversification*$_{i,t}$ (β_1)).

Following prior literature on tax avoidance, I include an extensive set of control variables to account for other tax planning opportunities, incentives, and common firm activities with differences in book (financial accounting) and tax reporting that may affect firm taxes. The extent of foreign operations (*Foreign pre-tax income*$_{i,t}$) and a firm's decision to not disclose disaggregated geographic earnings (*No disclosure*$_{i,t}$) are associated with lower firm taxes (Rego, 2003; Hope, Ma, and Thomas, 2013). Larger firms may have greater economies of scale for tax planning yet may draw greater attention from tax authorities and the public, generating mixed predictions for the effect of firm size (*Size*$_{i,t}$) on firm taxes (Zimmerman, 1983; Gupta and Newberry, 1997; Rego, 2003). Firms with additional leverage (*Leverage*$_{i,t}$) may benefit from additional debt tax shields. Available tax loss carryforwards (*Tax Loss Carryforward*$_{i,t}$) and whether the firm has gathered (used) more of these carryforwards in the current period (*Increase in tax loss carryforward*$_{i,t}$) can also affect firm taxes. Inclusion of controls for tax loss carryforwards are particularly important in this setting because they may offset some of the consequences of asymmetric tax treatment of income and losses.

More profitable firms (proxied by *Pre-tax income*$_{i,t}$) may have higher taxes simply because of related higher taxable income. Yet, at the same time, these firms may have greater incentives and resources to lower their taxes (Rego, 2003; Henry and Sansing, 2015). The remaining controls represent firm activities that are treated differently for book and tax reporting purposes, which may also affect firm taxes. Specifically, I inlcude controls for fixed assets

(*PP&E* $_{i,t}$), R&D and intangibles intensity (*R&D*$_{i,t}$ and *Intangibles*$_{i,t}$), and the extent of earnings from unconsolidated subsidiaries (*Equity Income*$_{i,t}$). Finally, following the prior literature on diversification, I include firm (i) and year (t) fixed effects to account for other, unobserved, time-invariant factors across firms (e.g. general firm business strategy) and other factors that may vary for all firms across time (e.g. macroeconomic conditions or tax policy changes).[19] [20]

3.2 Sample and descriptive statistics

The Compustat sample used for this study runs from 1999 to 2013. Statement of Financial Accounting Standards No. 131 (SFAS 131) changed the requirements for segment reporting for all fiscal years beginning after December 15, 1997. Because the diversification measures come from business segment data, I begin the sample in 1999 to have consistent segment reporting requirements throughout the entire sample period. I exclude firm-years with more than one observation for a firm (e.g. a year when a firm changes its fiscal year-end). I then require non-missing values for *Cash taxes paid/MVA*$_{i,t}$, *Multiple Industries*$_{it}$, and the control variables discussed in equation (1) as described in Appendix I. Similar to prior literature examining diversification using segment data, and to ensure completeness of firm segment reporting for the diversification measures, I exclude firm-years where the sum of sales or assets

[19]Discussions in prior literature suggest that unobserved, time-invariant factors affecting a firm's diversification choice can influence the observed outcomes of diversification. A common approach to account for these factors in the diversification literature is the inclusion of firm and year fixed effects in an OLS specification (Campa and Kedia, 2002; Dimitrov and Tice, 2006; Lin, Pantzalis, and Park, 2007; Gopalan and Xie, 2011; Ammann, Hoechle, and Schmid, 2012; and Hoechle, Schmid, Walter, and Yermack, 2012). Laeven and Levine (2007), Klein and Saidenberg (2010), and Goetz, Laeven, and Levine (2013) focus on forms of diversification in financial institutions and incorporate bank level fixed effects in their designs for the same purpose. I have also considered industry and year fixed effects. However, this approach fails to account for factors that vary across firms within each industry, which may bias inferences made with this analysis. Results with industry and year fixed effects differ.

[20]All of the studies applying the firm fixed effects model discussed in the prior footnote (except Goetz, Laeven, and Levine (2013)) use two instrumental variable techniques developed in Campa and Kedia (2002) in conjunction with their OLS fixed effects models to address endogeneity concerns. I perform analysis using these two alternate techniques in Section 4.

across reported segments deviated from the firm's total sales or assets, respectively, by more than ten percent.[21] The final sample has 26,910 firm-year observations.

Panel A of Table 1 reports the descriptive statistics for the sample. The number of observations differs for alternate continuous measures of diversification, $Return\ Volatility_{i,t}$, and $SA\ Index_{i,t}$ because these continuous measures are not required for the primary sample, but are confined to the specific analysis using these additional variables. The average $Cash\ tax\ paid/MVA_{i,t}$ of 0.0091 is analogous to an average cash ETR of 0.32, which is consistent with the mean cash ETR values in prior tax avoidance literature.[22] The control variable summary statistics are also similar to those in prior literature.

Table 1 Panel B reports the descriptive statistics for the multiple industry and single industry subsamples. Overall, firm-years with operations in multiple industries make up 20 percent of the full sample. A few other descriptive statistics from this table are worth noting. Related to specific predictions for taxes, on average, firms operating in multiple industries have higher $Cash\ tax\ paid/MVA_{i,t}$ values but lower $Leverage_{i,t}$. The higher $Cash\ tax\ paid/MVA_{i,t}$ and lower $Leverage_{i,t}$ means for multiple industry firms provide preliminary evidence in contrast to the literature's predictions for tax benefits overall and for additional interest tax shields from diversification. Consistent with the comparison of means, in an untabulated correlation matrix, the Pearson (Spearman) correlations show a positive relation between $Cash\ tax\ paid/MVA_{i,t}$ and each of the diversification measures, suggesting $Diversification_{i,t}$ relates to paying higher taxes.

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[21] For example, Berger and Ofek (1995) and Campa and Kedia (2002) require non-missing segment data and exclude observations where the sum of segment values of sales deviates from the Compustat annual total sales value by one percent. In more recent studies, Ammann, Hoechle, and Schmid (2012) and Hoechle, Schmid, Walter, and Yermack (2012) exclude observations where the sum of segment values of sales or assets deviates by five percent. I use a ten percent threshold for this comparison to maintain as many observations as I can while still ensuring completeness. The ten percent threshold for sales and assets is based on the ten percent threshold defining a reportable segment in SFAS 131. Thus, if these values are *within* ten percent of the total (do not exceed a ten percent deviation), I would not expect a reporting firm to be lacking a complete number of segments in that year.
[22] The cash ETR value is calculated by multiplying $Cash\ tax\ paid/MVA_{i,t}$ with the average MVA for the sample ($2.5 billion) and dividing by the average pre-tax income for the sample ($71 million).

At first glance, this suggests that diversified firms may not have access to greater tax savings and may even have higher tax liabilities. However, this observation is based on univariate analysis and does not account for both observable and unobservable differences between firms applied in the later multivariate tests. A final point on the correlation matrix is that the four proxies for diversification are significantly and positively correlated as expected if these variables capture the same construct (Pearson (Spearman) correlations ranging from 0.24-0.85 (0.46-0.99)).

3.3 OLS results using alternative measures of diversification

The results for the OLS estimations of equation (1) are reported in Table 2. The different columns in Table 2 use the aforementioned four alternative proxies for $Diversification_{i,t}$. Generally, the control variables have the predicted associations with taxes from prior literature. For example, I observe that firms with greater values of $Leverage_{i,t}$ and $R\&D_{i,t}$ have lower values of $Tax_{i,t}$. The explanatory power of the estimated model for my sample is also reasonable in comparison with recent tax avoidance studies using similar models.

With respect to H1, the prediction that diversified firms have lower tax liabilities than stand-alone firms on average suggests that the coefficient on $Diversification_{i,t}$ should be significantly negative. Consistent with this, the coefficient on $Diversification_{i,t}$ across all four columns is negative and significant (t-statistics ranging from -1.92 to -2.35), indicating that diversification is associated with paying lower tax liabilities.[23] For ease of interpretation, I focus on column (1) for discussion of economic magnitudes as this uses the primary measure of $Diversification_{i,t}$ in the literature. Based on column (1), I find that, on average, firms operating in multiple industries have a 0.0013 lower $Cash\ tax\ paid/MVA_{i,t}$ than firms operating in a single industry.[24] At the sample average, this is analogous to a 4.6 percentage point lower cash ETR

[23] Results are robust to instead running a simplified firm and year fixed effects model excluding controls.
[24] Results throughout the study are robust to controlling for MVA.

associated with *Diversification*$_{i,t}$.[25] In terms of comparable magnitudes, Gallemore and Labro (2015) find that two of their proxies for internal information quality, the absence of a restatement due to errors and lack of a Section 404 material weakness, are associated with 2 and 5 percentage point reductions in cash ETR, respectively.

The results from Table 2 support the prediction in the diversification literature that operating in multiple industries allows firms to claim greater tax savings. A natural question that follows from this, then, is whether firms should assume that diversification will translate into additional tax savings in all circumstances. In the next section, I consider three conditions that could affect whether diversified firms are able to claim greater tax benefits from diversification.

3.4 Cross-sectional tests for when firms may not obtain tax advantages from diversification

In this section, I investigate settings that could be effective null or zero tests, identifying subsets of firms where I may not expect to observe significant tax savings from diversification, while contrasting them with subsets of firms where I would expect to find the most pronounced effect. Predictable cross-sectional variation in the diversification effect could provide initial evidence that the primary effect is properly identified (or at least not spuriously related to taxes). Further, these cross-sectional tests provide a more nuanced view of the main effect, which could help inform the broader valuation literature on the costs and benefits of industrial diversification.

3.4.1 Research design – R&D activity

One way that diversification may not offer additional tax benefits to firms would be if the additional potential tax benefits it produces directly reduce access to other forms of tax benefits the firm would have as a single industry firm. For example, the General Business Credit (GBC) is an aggregation of the R&D tax credit and 35 other Federal tax incentives, such as the

[25] The cash ETR interpretation for the average sample firm is calculated by multiplying the *Cash tax paid/MVA*$_{i,t}$ coefficient with the average MVA for the sample (2,526) and dividing by the average pre-tax income for the sample (71).

investment credit, enhanced oil recovery credit, renewable electricity production credit, and incentives for agricultural business.[26] However, the aggregate GBC amount is limited to 75 percent of the taxpayer's net tax liability over $25,000. Thus, a firm that already has access to a large amount of one type of industry credit (e.g. a large R&D tax credit) under the GBC may receive a muted tax benefit from accessing other GBC incentives for other industries because it is more likely to already meet the GBC tax benefit limitation. To consider this condition, the first test investigates whether firms with greater levels of research and development (R&D) activity are less likely to observe tax benefits from diversification.

I proxy for the potential tax benefit substitution effect with the extent of R&D activity a firm has ($R\&D_{i,t}$), re-estimating equation (1) for partitions of low, moderate, and high R&D activity. Specifically, I classify a firm as *Low R&D* (*High R&D*) if it has $R\&D_{i,t}$ less than the 33rd percentile (greater than the 67th percentile) for R&D active firms during the year.[27] Firms with $R\&D_{i,t}$ between the 33rd and 67th percentile for R&D active firms during the year are classified as *Moderate R&D*. I predict that if diversification offers distinct, industry-specific tax benefits, like those listed in the GBC, then I should observe significant tax savings (should observe muted tax savings) related to diversification when I expect a firm to have incremental (substitutable) industry-based tax benefits from diversification as proxied by *Low R&D* (*High R&D*). Conversely, if the tax benefit I observe on average is unrelated to industry-specific tax benefits like those in the GBC, then I would be less likely to observe a difference in the diversification effect across the high and low R&D partitions (as evidence of a substitution effect).

[26] For a comprehensive list of the other tax incentives, see IRC Sec. 38(b).
[27] R&D active firms are considered those that have non-zero $R\&D_{i,t}$.

3.4.2 Research design – demand for debt capacity

Next, I examine whether firm demand for debt capacity affects the extent of tax benefits from diversification. One source of tax benefits from diversification is predicted to follow from increased debt capacity and related interest deductions (Lewellen, 1971; Stulz, 1996; Leland, 1998). However, for diversification to generate tax benefits through this channel, a firm must actually take advantage of additional debt financing. Thus, I expect that firms with greater (less) demand for additional debt to be more likely to obtain greater (fewer) tax benefits from diversification. I use whether a firm is financially constrained to proxy for its demand for additional debt capacity.

Traditional pecking order theory suggests that firms prefer internal to external financing, and then debt to equity financing, at least in part because of the high transaction costs of issuing new securities (Myers, 1984; Fama and French, 2002). This model predicts that a firm's use of debt is driven by a firm's net cash flows or financial constraints in that more financially constrained firms are forced into using equity financing when they would otherwise prefer internal funds or leverage. Based on this theory, I would expect that if diversification offers additional debt capacity in general that financially constrained firms would be those most likely to take advantage of it (and resulting debt tax shields).

I proxy for firm financial constraints using the $SA\ index_{i,t}$ from Hadlock and Pierce (2010), where higher values of the index represent greater financial constraint.[28] I re-estimate equation (1) for partitions of low, moderate, and high financial constraints. Specifically, I classify a firm as having *Low Constraints* (*High Constraints*) if it has an SA index value less than the 33rd percentile (greater than the 67th percentile) value for firms in the year it enters the sample. A firm with an SA index between the 33rd and 67th percentile values in the year it enters

[28] See the detailed definition for the variable in Appendix I.

the sample is classified as having *Moderate Constraints*. I predict that if diversification offers firms additional debt capacity and related interest tax shields then I should (should not) observe tax savings specifically related to diversification when firms are more highly (less) constrained.[29] Conversely, if diversified firms do not gain access to additional debt capacity (and related debt tax shields), I should not expect to observe a different effect *from diversification* across the low and high constraint partitions.

3.4.3 Research design – firm risk preferences

Finally, recall the prediction that diversification may be part of a more general, firm strategy or preference and that this may influence observed outcomes from diversification. In my test for the on average effect (in Table 2), I attempt to control for unobserved, time invariant, firm strategies by including firm fixed effects. However, in this last cross-sectional test, I instead focus on teasing out one dimension of general firm strategy and how that affects the tax benefits observed with diversification.[30] Specifically, I consider tax outcomes related to diversification for firms with different risk preferences.

Earlier in the study, I predicted that one reason I may not observe tax benefits from diversification is because it may be part of a firm's general low risk strategy where these firms simply choose not to take advantage of additional tax savings even if they are available. If this prediction holds, then I expect it to be less likely that I observe tax benefits from diversification for firms following a low risk strategy. Conversely, if any additional tax savings are available

[29] This finding could also support an alternative explanation that is still linked to tax advantages of diversification, just not the benefit of interest tax shields I outline specifically above. Law and Mills (2015) find that financially constrained firms pursue more aggressive tax planning. Thus, based on the results of their study, if there are tax advantages of diversification *outside* of additional debt capacity (without the firm demanding any additional debt), I would also expect it to be more likely that financially constrained firms would tax advantage of those tax benefits regardless of their use of additional leverage.

[30] The results in my tests for the on average effect are robust to including the variable I use to proxy for firm risk preference (return volatility) and the variable I use to proxy for demand for debt capacity (SA index) as well. Equation (1) already includes the R&D variable (used for the first cross-sectional test) as a control.

from diversification, I would expect a high risk firm to be the type of firm most likely to claim those tax benefits.

To assess whether differences in firm risk influences observed tax benefits from diversification, I use a common measure for firm risk, a firm's *Return volatility*$_{i,t}$ in the year it enters the sample, and re-estimate equation (1) on partitions for low, moderate, and high risk firms.[31] Similar to the prior test partitioning on the SA index, I classify a firm as *Low Risk* (*High Risk*) if it has return volatility less than the 33rd percentile (greater than the 67th percentile) value for firms in the year it enters the sample. A firm with return volatility between the 33rd and 67th percentile values in the year it enters the sample is classified as *Moderate Risk*.[32]

3.4.4 Results for cross-sectional tests

Results for the cross-sectional tests for firm R&D activity, demand for debt capacity, and risk preference are reported in Tables 3-5, respectively. Columns (1)-(3) in each table report the estimation of equation (1) for firms with low, moderate, and high values of the partitioning variables, respectively. While I do not make specific predictions related to the moderate (middle) columns, I include them for completeness.

The R&D test results in Table 3 show that for firms with low R&D activity (where I expect the greatest potential for incremental, industry-specific, tax benefits from the GBC) *Diversification* $_{i,t}$ has the predicted negative relation with firm tax liabilities (column (1): coefficient -0.0013, *t-statistic* -2.11). Further, for firms with high R&D activity (those more likely to have a substitution effect with the GBC) in (3), I do not find evidence of lower tax liabilities from diversification. Specifically, the coefficient (*t-statistic*) on *Diversification*$_{i,t}$ in this

[31] See the detailed definition for the variable in Appendix I.
[32] A setting I considered but did not include in the cross-sectional analysis is the role of variation in corporate governance on potential tax benefits from diversification. However, this set of cross-sectional tests is the focus of a recent working paper Zheng (2015). Like Zheng (2015), I do not find evidence of differences in the diversification effect across different proxies for corporate governance factors such as institutional ownership or insider ownership.

column is 0.0056 (1.58). A cross-equation test indicates that the coefficient estimates of *Diversification*$_{i,t}$ in columns (1) and (3) (*Low R&D* and *High R&D* firms, respectively) are statistically different (χ_2 = 16.50, *p-value* = 0.000).[33] Overall, the results in Table 3 are consistent with incremental, industry-specific, tax benefits contributing to the on average diversification tax benefit observed in Table 2.

In Table 4, I use the firm's SA index value in the year it enters the sample as a measure of demand for debt capacity. I only observe greater tax savings related to *Diversification*$_{i,t}$ (a negative association with firm tax liabilities) in the partition for firms with high financial constraints (with the highest expected demand for debt capacity) (column (3): coefficient -0.0025, *t-statistic* -2.21). For low constraint (demand) firms in columns (1), I do not find evidence of significant tax savings for diversified firms. Specifically, the coefficient (*t-statistic*) on *Diversification*$_{i,t}$ in this column is -0.0001 (-0.15). A cross-equation test indicates that the coefficient estimates of *Diversification*$_{i,t}$ in columns (1) and (3) (*Low Constraint* and *High Constraint* firms, respectively) are statistically different (χ_2 = 11.13, *p-value* = 0.001). Thus, the results in Table 4 are consistent with firms gaining access to greater debt capacity and related debt tax shields through diversification.

In Table 5, I use the firm's return volatility in the year it enters the sample as a measure of firm risk preference. I do not observe support for additional tax savings from diversification for either low or moderate risk firms. Specifically, the coefficients (*t-statistics*) on *Diversification*$_{i,t}$ in this columns (1) and (2) are 0.0000 (0.04) and -0.0008 (-0.807), respectively. I only find greater tax savings associated with *Diversification*$_{i,t}$ (a negative association with firm

[33] I include the variable *R&D*$_{i,t}$ as a control for each partition to account for variation in R&D activity within the partition. However, if I exclude this control and re-estimate each column, the sign, magnitude, and significance of the coefficient on *Diversification*$_{i,t}$ is very similar and do not change the inferences made above. For example, the re-estimation for column (1) has a coefficient of -0.0014 and the t-statistic is -2.17.

tax liabilities) for high risk firms (column (3): coefficient -0.0035, *t-statistic* -3.09). A cross-equation test indicates that the coefficient estimates of $Diversification_{i,t}$ in columns (1) and (3) (*Low Risk* and *High Risk* firms, respectively) are statistically different (χ_2 = 8.85, *p-value* = 0.003). The results in Table 5 suggest that firms diversifying, potentially as part of a low risk firm strategy, do not claim tax benefits from diversification.

Overall, the results suggest that the primary tax benefits from diversification come through industry specific tax provisions and debt tax shields. However, when the industry specific tax provisions are more likely direct substitutes for other tax savings (such as within the GBC) or the firm has less interest in taking advantage of additional tax-advantaged debt capacity, multiple industry firms do not fare differently in terms of tax liabilities than single industry firms. Further, diversified firms that follow a low or moderate business strategy do not access additional tax savings from diversification. Taken together, this suggests that diversification does not always offer firms additional tax savings and that whether these benefits are claimed is contingent on other firm characteristics and strategies.

4. Endogeneity

The primary concern with endogeneity for my study would be if the firms selecting to operate in multiple industries are those most likely to receive the benefits, which would indicate that my results overstate tax benefits from diversification in general. In addition, there is always a concern that a potential omitted correlated variable (or variables) may drive the results observed. In this section, I use two additional tests in an attempt to address these concerns. The first test examines two tax law changes expected to temporarily alter the convexity of the tax function and, therefore, tax benefits from diversification. Because they are temporary tax changes with a limited window for firms to take advantage of the different tax effects, it is less likely that firms would suddenly (and temporarily) change the number of industries in which they operate to incorporate the differences in the tax function. The second test uses an instrumental variables approach aimed at addressing selection issues that is common in the diversification discount literature.

4.1 Triple difference model

As discussed before, the proposed tax benefits of diversification from the hedging literature are grounded in the fact that the tax treatment of income and losses is asymmetric (has a nonlinear, convex structure). Thus, I would expect the incremental tax benefits of diversification to vary when tax law changes occur that alter the convexity of the tax function. Motivated by this, I consider whether the tax benefits of diversification were reduced for firms affected by two tax law changes expected to reduce tax convexity during my sample period. Specifically, I examine this with firms affected by temporary extensions of tax loss carrybacks.

An extended tax loss carryback period is expected to reduce the convexity of the tax function. To see why, consider an example from Graham and Rogers (2002): assume a firm is equally likely to lose $100,000 or earn $100,000 and that while profits are taxed at 35 percent there is not an equivalent loss refund rate (i.e. asymmetric tax treatment). Even though the expected income equals zero, the firm expects to pay $17,500 in taxes. If a firm can diversify its operations to smooth income volatility (with no difference to the expected income amount), the firm then expects to pay zero dollars in tax. Thus, in this simple example, diversification generates $17,500 of expected tax savings without altering the amount of expected taxable income for the firm.

Now instead, assume that the government enacts a tax law change that would allow the firm to reclaim tax dollars paid on taxable income in previous years in the event it has the

$100,000 loss outcome in the current year. In this case, as long as the firm had sufficient taxable income to offset in the years it carried the loss back to, the firm would receive a $35,000 refund of prior year taxes paid in the loss outcome and the amount of tax the firm expects to pay on average becomes zero. In this latter regime, the predicted tax benefits of diversification in the hedging literature disappear. To the extent that a carryback period is extended, it increases the likelihood of having enough taxable income in the carryback period to offset a current tax loss.[34]

A clear, direct test to investigate this convexity channel would be to observe an exogenous tax law change (such as a carryback extension) that affected one group of firms and not another group of firms. Then, I could test whether the predicted effect occurred for the group affected by the law change and that there was no effect for the group without the change, where the latter acts as a quasi-placebo group. In the real world, however, tax law changes do not occur in a vacuum, meaning that events surrounding the law change generally are related to the reasons the law is enacted. The presence of these events do not necessarily invalidate a test. The presence of these events simply means that it is important to think about the role of these events to assess whether they could bias in the direction of the predicted effect.

The U.S. Federal government generally allows a finite period to first carryback losses for tax purposes and then carryforward remaining losses not offset in the carryback period. [35] In two periods during my sample time frame, the government temporarily increased the window of

[34] Graham and Smith (1999) examine more realistic (complete) representations of the tax structure's convexity that incorporate several specific tax provisions. They find that provisions like tax loss carrybacks and carryforwards significantly reduce the convexity of the tax code, but the impact of other provisions (like tax credits and the alternative minimum tax) is minor.

[35] Since the Taxpayer Relief Act of 1997 (prior to the start of my sample period), the U.S. Federal government has generally allowed firms to carryback losses in this way two years and to carryforward any loss forward up to 20 years to offset future income if there is not sufficient taxable income to offset within the prior two year carryback window. A carryback (carryforward) is generally considered more (less) beneficial as: 1) the firm knows whether it will receive a benefit from the carryback (it knows how much taxable income it had in the past but does not know its future taxable income) and 2) the related tax savings are an immediate refund (the present value of future tax savings are discounted).

years firms could carryback their losses to claim tax refunds from two to five years (more than doubling the carryback period). However, this extension was only applicable to firms that had net operating losses during specific calendar years (the group receiving the "treatment").

In the absence of a tax law change (the counterfactual), I would expect that diversification may actually produce *greater* tax benefits in periods of economic downturn precisely because of the tax convexity channel. Tax asymmetry is most relevant when firms have volatile income, particularly when risk results in volatility that generates tax losses or lower taxable income values (the convex region of the tax function), which is likely heightened in contractionary periods. Thus, all else equal, I would predict that firms operating across multiple industries may suffer less from market level volatility, face a less convex tax region, and therefore obtain greater tax savings than single industry firms during these policy periods. However, if a carryback extension becomes available for certain firms in those time periods, I would expect the additional tax advantage of diversification during the economic downturn to be muted as the extension reduces those firms' exposure to tax convexity even in the absence of a diversified operating structure. Given that the period effect is expected to work in the opposite direction as the effect of the tax law change (expected to generate greater tax savings related to diversification as opposed to less), it is not clear to me how the economic events bias toward the result I expect to find from the tax law change. Thus, I use this setting to investigate the convexity channel predicted in prior literature and for identification of my primary results.[36]

[36] This type of analysis is similar to how Card and Krueger (1994) examine the effect of minimum wage increases on employment using New Jersey as eligible firms and Pennsylvania as ineligible firms and examining both sets of firms both inside and outside the minimum wage policy change period. The minimum wage increase policy also occurred during a recession, and the authors offer a similar sort of discussion as I do above for whether this is expected to bias their findings.

To study these changes, I use the following triple difference model (difference-in-difference-in-differences (DDD)) to examine whether those likely to be affected by these extensions observed muted tax benefits of diversification during the affected tax policy periods:

$$Tax_{i,t} = \beta_0 + \beta_1\ Diversification_{i,t} + \beta_2\ Years\ Effected_t + \beta_3\ Eligible\ for\ Extension_i + \beta_4\ Diversification_{i,t} \times Years\ Affected_t + \beta_5\ Diversification_{i,t} \times Eligible\ for\ Extension_i + \beta_6\ Years\ Affected_t \times Eligible\ for\ Extension_i + \beta_7\ Diversification_{i,t} \times Years\ Affected_t \times Eligible\ for\ Extension_i + \sum \beta\ Controls_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $Tax_{i,t}$, $Diversification_{i,t}$, and $Controls_{i,t}$ are defined as in equation (1).[37] $Eligible\ for\ Extension_i$ is an indicator that varies across firms set equal to one if the firm is expected to be eligible for the carryback extension within at least one of the law change periods and equals zero otherwise. $Years\ Affected_t$ is a time-varying indicator equal to one in years expected to be affected by the law changes and equals zero otherwise.[38] The primary coefficient of interest is the coefficient on the triple interaction $Diversification_{i,t} \times Years\ Affected_t \times Eligible\ for\ Extension_i$ (β_7). A significant, positive coefficient on β_7 indicates that firms eligible for the extension observed less tax benefits associated with diversification than other (ineligible) firms in the years affected by the law change, consistent with tax convexity as a channel driving the diversification tax benefit and the carryback extension mitigating the benefit through this channel.

The results for equation (2) are reported in Table 6 Panel A and B. Panel A reports the regression coefficients for equation (2), and Panel B incorporates the results from Panel A into a

[37] The only controls from equation (1) excluded are $Tax\ loss\ carryforward_{it}$ and $Increase\ in\ tax\ loss\ carryforward_{it}$ because of the inclusion of the $Eligible\ for\ Extension_i$ variable described in Appendix II, which is based on whether the firm has tax loss carryforwards and changes in tax loss carryforwards. I also use industry and year fixed effects (industry at the four digit SIC level) in place of firm and year fixed effects, requiring that there be multiple observations of data available for each industry and year combination.

[38] See Appendix I for detail on variable descriptions. See Appendix II for more institutional information on JCWAA 2002 and WHBAA 2009 in relation to these descriptions.

matrix comparing the effect of diversification across different categories of firms and periods covered in equation (2). Consistent with the tax convexity channel prediction above, in Panel A, the coefficient on the triple interaction is positive and significant at the 10 percent level (coefficient 0.0015, *t-statistic* 1.84); firms eligible for the carryback extension observed less tax benefits from diversification than ineligible firms during the extension carryback policy periods.

However, a more complete illustration of what is involved in this effect may be drawn from walking through the matrix comparison in Panel B. The rows distinguish the diversification effect on taxes across time periods, and the columns distinguish the effect across groups of firms. The cell representing the intersection of the difference column and row represents the incremental effect from diversification on firm taxes while being in the eligible group within the affected policy period *after* differencing out the time invariant differences across the two types of firms (eligible and ineligible) and across the two periods (inside and outside the period affected).

Looking first at the differences across time periods (across the rows), diversification is generally associated with greater tax savings (lower $Tax_{i,t}$) inside the extension periods relative to the periods outside the extension policies both for ineligible and eligible firms (as evidenced by the negative difference values -0.0022 and -0.0007, respectively, along the bottom row although the latter is not statistically significant). This is consistent with the prediction that contractionary periods may contain greater exposure to the convex region of the tax function and that diversified firms weather this exposure more favorably (for tax purposes) than single industry firms.

Looking then at the differences across groups of firms (across the columns), the eligible firms appear to have less tax benefits from diversification than the ineligible firms (as documented by the positive coefficients 0.0010 and 0.0025 for outside and then inside the affected policy period, respectively, along the right column although the former is not statistically significant). This suggests that the eligible firms may benefit less from diversification for tax purposes than ineligible firms in general although this difference is much greater inside the period affected. The positive, significant value, 0.0015, at the intersection of the difference column and row is the incremental effect of the extension policy on the eligible group after accounting for time invariant differences in the diversification effect between firm groups and across affected policy periods. This is consistent with the extension policies applied to eligible firms mitigating tax benefits from diversification through the tax convexity channel. Just to note for comparison of the results in table form (Panel A) versus matrix form (Panel B), the 0.0015 coefficient representing the intersection of the difference row and columns in Panel B is exactly the coefficient on the triple interaction in Panel A.

A limitation of this type of test (outside the discussion considering the events surrounding the tax change above) is that I cannot observe the ideal counterfactual (the same firm subject to a tax policy repeating history in the absence of that policy). Thus, it is possible that the criteria used in selection of a group of firms as qualifying for a tax policy could induce bias when estimating the effect of that policy. In this test, the firms eligible for the carryback extension must have had a tax loss in a certain time period. Thus, if a factor related to firms having a tax loss in this specific period (the selection criteria) also relates to having *higher* taxes in the affected policy period than firms that were ineligible for the policy (did not have a tax loss in the required period), then this may induce bias in the direction of the effect I observe (overstate the result).

4.2 Instrumental variables approach

Campa and Kedia (2002) use the fixed effects approach in my primary analysis and two additional techniques using a simultaneous equation framework, a two-stage least squares (2SLS) and treatment effects model (a form of selection model), to account for the endogeneity of a firm's diversification choice.[39] To this end, I consider a set of firm, industry, and year level instruments ($I_{i,\ t,\ k}$) for diversification proposed in Campa and Kedia (2002) in the following equations where:

$$Tax\ adjusted_{i,t} = \beta_0 + \beta_1\ Diversification_{i,t} + \Sigma\ \beta\ Controls_{i,t,} + \varepsilon_{i,t} \qquad (3)$$

$$Diversification_{i,t} = \alpha_0 + \Sigma\ \alpha\ I_{i,t,k} + \Sigma\ \alpha\ Controls_{i,t} + \mu_{i,t} \qquad (4)$$

Following their study, I use two firm instruments to account for the ease with which a firm can change between being diversified and focused in a single industry. Specifically, firms included in the *S&P Index*$_{i,t}$ and *Listed on a Major Stock Index*$_{i,t}$ are expected to have greater visibility and liquidity, making it easier to move between a diversified and focused structure. The time instruments are proxies for business cycles, macroeconomic conditions, and merger waves. Business cycles and macroeconomic conditions are captured by the concurrent and lagged *# of Contraction Months during the Year*$_t$ and *% Change in Real GDP*$_{t.}$ Merger waves are accounted for by the *Number of M&A Announced during the Year*$_t$ and *Dollar Value of M&A Announced during the Year*$_t$. The two industry instruments represent the attractiveness of a given industry to (potential) conglomerates. Specifically, the measures are the *Fraction of Industry Firms that are*

[39] The approaches and instruments proposed in Campa and Kedia (2002) have been used frequently in the diversification literature to address endogeneity concerns, including in the following studies: Dimitrov and Tice (2006), Laeven and Levine (2007), Lin, Pantzalis, and Park (2007), Klein and Saidenberg (2010), Gopalan and Xie (2011), Ammann, Hoechle, and Schmid (2012), Hoechle, Schmid, Walter, and Yermack (2012), and Hann, Ogneva, and Ozbas (2013).

Multi-Industry$_{i,t}$ and the *Fraction of Industry Sales from Multi-Industry Firms*$_{i,t}$.[40] See Appendix I for additional detail on the variable definitions.

I use an adjusted tax variable as the outcome of interest, *Tax adjusted*$_{i,t}$, which is demeaned by firm and year. Campa and Kedia (2002) explain that by using an adjusted outcome variable in this way the outcome variable is, by construction, uncorrelated with characteristics that affect the outcome of interest on the adjustment dimensions (in this case, time invariant firm characteristics and within year factors). As a result, they expect that, by construction, the instruments are unlikely to be uncorrelated with $\varepsilon_{i,t}$. The authors conclude that given the variables above are expected to be reasonable predictors of a firm's diversification decision and are not expected to affect the outcome of interest (in its adjusted form) directly, then the above set of variables are valid instruments for this design.[41] The remaining variables in equations (3) and (4) *Diversification*$_{i,t}$ and *Controls*$_{i,t}$ are defined in the same way as for equation (1).

The results for the 2SLS and treatment effects approaches are reported in Table 7. For ease of reference, I include the primary fixed effects OLS results from Table 2 in column (1) of Table 7 Panel A, given that these three methodologies are all commonly used in conjunction in the literature.[42] The estimates from equation (3) (equation (4)) are reported in Panel A (Panel B). When comparing the results for my primary OLS specification with the results under these alternative simultaneous equations approaches, the coefficients on *Diversification*$_{i,t}$ in all three

[40] I include one of the instruments used in Campa and Kedia (2002) in both equations (2) and (3) (i.e. use it as a control in both equations rather than as an instrument). The variable is an indicator for whether a firm is incorporated in a foreign country (*Incorporated Outside the U.S.*$_{i,t}$). Given the prevalence of attention to multinational tax planning, I include this variable in both stages as part of $X_{i,t}$ to allow it to have both an indirect effect on firm taxes through the firm's diversification choice and a direct effect on taxes in the second stage.

[41] Larcker and Rusticus (2010) express concerns regarding the use of industry aggregates and lagged variables as instruments. I cannot rule out the authors' concerns for these variables with the aforementioned design. I include the instrumental variable analysis for completeness as it has been used extensively in the diversification literature. However, following the recommendations of Larcker and Rusticus (2010), in my analysis using this design I include a series of diagnostic tests on the use of these instruments in my setting. I note the caveats or limitations related to their concerns in the conclusions from this analysis below.

[42] The 2SLS and treatment effects models are estimated with a maximum likelihood estimator.

columns (for all three approaches) are negative and significant, supporting a consistent tax benefit on average from diversification across all three estimation approaches.

While I include the 2SLS and treatment effects models for completeness given their prevalence in the literature, I express caution when relying on the instrumental variable test inferences in place of the OLS results given the results of several diagnostic tests I examine related to these tests. Wooldridge (2002) and Larcker and Rusticus (2010) recommend that researchers applying an instrumental variables design use a series of diagnostic tests to assess the appropriateness of the design for a specific research setting. Three tests they discuss are used to assess the validity of the set of instruments: an F-test examining the null that the instruments do not enter the first stage, an overidentification test of the null that the instruments are uncorrelated with the error term in equation (3), and a review of an R-squared in a first-stage regression to assess how well equation (4) explains the endogenous diversification choice. These tests of the validity of the instruments help assess whether the set of instruments: 1) are correlated with the diversification choice after accounting for other predictor variables and 2) are uncorrelated with the second stage residual. The final test is a Hausman test used to assess the null hypothesis that the OLS fixed effect specification is a consistent estimator for $Diversification_{i,t}$ under the assumption that 2SLS is a consistent but inefficient estimator.

I report the results of the F-test, overidentification test, and the R-squared for the first stage regressions in Table 7 Panel B. The Hausman test is untabulated but is discussed below. Overall, the F-test and the R-squared related to the first stage regression provide some evidence that the set of instruments are not weak in terms of their ability to predict a firm's diversification choice. However, the overidentification test suggests that it may not be valid to assume the instruments should be excluded from the second stage. Furthermore, the Hausman test does not allow me to reject the null of the exogeneity of *Diversification*$_{i,t}$ in my primary OLS fixed effect specification in comparision with the 2SLS estimator.

Specifically, the F-statistics (p-values) reported in Table 7 Panel B columns (1) and (2) are 2,627 (0.000) and 1,715 (0.000), respectively, vastly exceeding the statistic threshold for a weak instrument suggested in Staiger and Stock (1997). [43] Further, the R-squared and pseudo R-squared for the first stages reported in columns (1) and (2) of 0.210 and 0.214, respectively, suggest that equation (3) explains a meaningful portion of the variation in *Diversification*$_{i,t}$ overall. However, the Hansen J Statistic for the overidentification test reported in Panel A for column (1) allows a rejection of the null that the set of instruments are valid.[44] Finally, a Hausman test comparing the OLS fixed effects specification to the 2SLS specification (untabulated) does not allow me to reject the null that the OLS fixed effects specification is a consistent estimator for my setting (p-value = 0.174) in comparison with the 2SLS estimation.

Overall, while the instrumental variables technique is commonly used to address endogeneity concerns in the diversification literature, the results from the diagnostic tests in my setting are mixed and do not allow me to rely solely on the instrumental variables approach to rule out sources of endogeneity. To the extent that there are omitted factors not that cannot be ruled out by inclusion of firm and year fixed effects in the OLS estimation and that are consistent with both my cross-sectional tests and triple difference test results, my estimates may contain a source of endogeneity bias not otherwise accounted for in the tests above.

[43] The F-test used comes from Bound, Jaeger, and Baker (1995) and Staiger and Stock (1997). These studies suggest that the standard asymptotic approximations for instrumental variables breaks down when instruments are weak, where they offer an F-statistic less than ten as an indication of when the instruments are weak.

[44] The treatreg command in Stata does not support the overid post-estimation command, which is why I do not report an overidentification test statistic for the treatment effects model. However, the same set of instruments and outcome of interest are used in both the 2SLS and treatment effects models, suggesting the instruments would likely generate a similar inference from an overidentification test for the treatment effects specification.

5. Conclusion

An extensive line of academic research spanning multiple decades, along with debates in practice, suggest that the value of corporate diversification as part of business strategy remains a puzzle. This paper takes a unique approach to examining corporate diversification by focusing on a specific, predicted benefit from this literature (namely, additional tax savings) rather than the valuation effect overall. I find that, on average, firms operating in multiple industries have lower tax liabilities than single industry firms. However, where the additional tax benefits from diversification are expected to act as a substitute for tax positions already available, for firms that do not face high financial constraints, or for firms without a high risk preference, I do not observe significant additional tax savings related to diversification. The combined set of results here provide greater understanding about the conditions under which a firm may obtain one of the key cited benefits from industrial diversification. My results suggest an avenue for future research is to examine other, specific benefits (or costs) from diversification (e.g. leveraging research and innovation across multiple products and services) to inform the debate to help provide a greater understanding of why we observe success related to diversification for some firms, but not others.

Like the diversification literature more generally, the results in this study are subject to an important limitation. Ultimately, diversification is a strategy that firms decide whether or not to employ that is not assigned randomly. Thus, it is difficult to rule out the possibility that there are unobservable factors that relate to both this decision and firm tax liabilities. In this study, I attempt to address this concern in multiple ways, such as incorporating an extensive series of controls, firm and year fixed effects, and cross-sectional tests to support the explanations motivating the overall tax benefit prediction. In addition, I apply a triple difference model using tax policy changes and two instrumental variable techniques similar to Campa and Kedia (2002).

While it is always possible that an alternative factor is consistent with the combined results from the techniques above, it is important to note that not all forms of potential endogeneity raise concerns against the tax benefit result I observe. I offer this point not as a means to make light of the concerns about the influence of endogeneity but to simply note that unless a specific factor or source of endogeneity is identified that creates bias in the direction of my results, then it is unclear whether potential endogeneity left unaccounted for in my design overstates as opposed to understates the results I observe.

Table 1
Descriptive Statistics and Correlation Matrix
Panel A Full Sample Descriptive Statistics

Variable	N	Mean	Std dev
Cash tax paid/MVA $_{it}$	26910	0.0091	0.0130
Multiple industries $_{it}$	26910	0.1969	0.3976
# of industries $_{it}$	26229	1.2244	0.5204
% of sales in other industries $_{it}$	25926	28.4220	42.8638
Sales-weighted distance $_{it}$	26098	0.4671	0.8050
No disclosure $_{it}$	26910	0.9569	0.2030
Size $_{it}$	26910	5.0701	2.3750
Leverage $_{it}$	26910	0.7824	1.8742
Market-to-book $_{it}$	26910	2.4106	6.3765
Tax loss carryforward $_{it}$	26910	0.6236	0.4845
Increase in tax loss carryforward $_{it}$	26910	0.3878	0.4873
Pre-tax income $_{it}$	26910	-0.1654	1.2933
Foreign pre-tax income $_{it}$	26910	0.0054	0.0235
PP&E $_{it}$	26910	0.2590	0.2899
R&D $_{it}$	26910	0.0522	0.1343
Equity income $_{it}$	26910	0.0003	0.0026
Intangibles $_{it}$	26910	0.1449	0.2260
Return volatility $_{it}$	22223	-3.4431	0.5520
SA Index $_{it}$	26884	-3.0092	1.1128

Panel B Single and Multiple Industry Firm Descriptive Statistics

	Single industry firms			Multiple industry firms		
Variable	**N**	**Mean**	**Std dev**	**N**	**Mean**	**Std dev**
Cash tax paid/MVA $_{it}$	21612	0.0086	0.013	5298	0.0112	0.0131
No disclosure $_{it}$	21612	0.956	0.205	5298	0.9606	0.1947
Size $_{it}$	21612	4.8809	2.3581	5298	5.8421	2.2859
Leverage $_{it}$	21612	0.8089	2.0569	5298	0.6742	0.7542
Market-to-book $_{it}$	21612	2.505	6.8154	5298	2.0254	4.1064
Tax loss carryforward $_{it}$	21612	0.6239	0.4844	5298	0.6227	0.4848
Increase in tax loss carryforward $_{it}$	21612	0.3922	0.4883	5298	0.3698	0.4828
Pre-tax income $_{it}$	21612	-0.2085	1.4256	5298	0.0104	0.4088
Foreign pre-tax income $_{it}$	21612	0.0049	0.0235	5298	0.0077	0.0235
PP&E $_{it}$	21612	0.2465	0.2885	5298	0.3097	0.2902
R&D $_{it}$	21612	0.0612	0.1466	5298	0.0158	0.0479
Equity income $_{it}$	21612	0.0002	0.0023	5298	0.0006	0.0035
Intangibles $_{it}$	21612	0.1356	0.2226	5298	0.1832	0.2355
Return volatility $_{it}$	17442	-3.4081	.5541	4781	-3.5709	0.5250
SA Index $_{it}$	21586	-2.8780	1.1342	5298	-3.5437	0.8285

Table 1 Panels A and B present the descriptive statistics for different samples. See Appendix I for variable descriptions. All continuous variables are truncated at the 1st and 99th percentiles with the following exceptions. Variables with zero for many observations in the bottom of their distributions (e.g. *R&D* $_{it}$ and *Foreign pre-tax income* $_{it}$) are truncated only at the top percentile. In Panel A, the number of observations differs for alternate continuous measures of diversification because the truncation for these continuous measures is not required for the primary sample.

Table 2
OLS Regressions of Tax on Different Diversification Measures

Dependent Variable:	***Cash tax paid / MVA*** $_{it}$			
	(1)	(2)	(3)	(4)
Diversification $_{it}$	-0.0013**	-0.0008*	-0.0002**	-0.0002**
	(-2.346)	(-1.923)	(-2.174)	(-2.158)
No disclosure $_{it}$	0.0031	0.0049***	0.0031	0.0031
	(1.333)	(3.657)	(1.330)	(1.293)
Size $_{it}$	0.0008***	0.0007***	0.0008***	0.0008***
	(6.251)	(6.027)	(6.158)	(6.040)
Leverage $_{it}$	-0.0000	-0.0000	-0.0000	-0.0000
	(-0.133)	(-0.149)	(-0.351)	(-0.341)
Market-to-book $_{it}$	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(-7.975)	(-7.883)	(-8.016)	(-7.687)
Tax loss carryforward $_{it}$	-0.0054***	-0.0056***	-0.0056***	-0.0055***
	(-10.322)	(-10.361)	(-10.361)	(-10.082)
Increase in tax loss carryforward $_{it}$	-0.0009***	-0.0009***	-0.0008***	-0.0009***
	(-4.787)	(-4.703)	(-4.564)	(-4.839)
Pre-tax income $_{it}$	0.0003***	0.0003***	0.0005***	0.0003***
	(4.187)	(4.062)	(3.860)	(3.763)
Foreign pre-tax income $_{it}$	0.0068	0.0072	0.0063	0.0070
	(1.394)	(1.465)	(1.285)	(1.424)
PP&E $_{it}$	-0.0030***	-0.0029***	-0.0032***	-0.0029***
	(-4.360)	(-4.244)	(-4.077)	(-4.039)
R&D $_{it}$	-0.0017***	-0.0017***	-0.0021**	-0.0016**
	(-2.643)	(-2.666)	(-2.502)	(-2.285)
Equity income $_{it}$	0.1068**	0.0961*	0.1072**	0.1134**
	(2.249)	(1.932)	(2.270)	(2.239)
Intangibles $_{it}$	-0.0007	-0.0007	-0.0009	-0.0007
	(-1.301)	(-1.199)	(-1.469)	(-1.258)
Intercept	0.0097***	0.0089***	0.0103***	0.0103***
	(4.182)	(5.854)	(4.338)	(4.291)
Diversification measure:	*Multiple industries* $_{it}$	*# of industries* $_{it}$	*% of sales in other industries* $_{it}$	*Sales-weighted distance* $_{it}$
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R-squared	0.652	0.654	0.650	0.653
N	26,910	26,229	25,926	26,098

Table 2 presents the estimates of equation (1). Columns (1)-(4) differ based on the measure of *Diversification* $_{it}$ used. Standard errors are robust and clustered by firm, and t-statistics are in parentheses. I define the variables in Appendix I. The symbols ***, **, and * denote statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 3
Effect of Diversification on Firm Taxes with a Different Extent of R&D Activity

Dependent Variable:	***Cash tax paid / MVA*** $_{it}$		
	Low R&D	*Moderate R&D*	*High R&D*
	(1)	(2)	(3)
Diversification $_{it}$	-0.0013**	-0.0031	0.0056
	(-2.110)	(-1.464)	(1.582)
Controls	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes
R-squared	0.657	0.629	0.637
N	20,638	4,008	2,264

Table 3 presents the estimates of equation (1) across firms with increasing values of R&D in columns (1)-(3), respectively. Standard errors are robust and clustered by firm, and t-statistics are in parentheses. I define the variables in Appendix I. The symbols ***, **, and * denote statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 4
Effect of Diversification on Firm Taxes with Different Firm Financial Constraints

Dependent Variable:	***Cash tax paid / MVA*** $_{it}$		
	Low Constraints	*Moderate Constraints*	*High Constraints*
	(1)	(2)	(3)
Diversification $_{it}$	-0.0001	-0.0015	-0.0025**
	(-0.153)	(-1.410)	(-2.208)
Controls	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes
R-squared	0.660	0.652	0.651
N	8,974	10,663	7,256

Table 4 presents the estimates of equation (1) across firms with increasing values of the size-age index from Hadlock and Pierce (2010) in columns (1)-(3), respectively. Standard errors are robust and clustered by firm, and t-statistics are in parentheses. I define the variables in Appendix I. The symbols ***, **, and * denote statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 5
Effect of Diversification on Firm Taxes with Different Firm Risk Preferences

Dependent Variable:	***Cash tax paid / MVA*** $_{it}$		
	Low Risk	*Moderate Risk*	*High Risk*
	(1)	(2)	(3)
Diversification $_{it}$	0.0000	-0.0008	-0.0035***
	(0.035)	(-0.807)	(-3.085)
Controls	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes
R-squared	0.685	0.624	0.607
N	7,971	8,279	6,404

Table 5 presents the estimates of equation (1) across different partitions of firm return volatility. Standard errors are robust and clustered by firm, and t-statistics are in parentheses. I define the variables in Appendix I. The symbols ***, **, and * denote statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 6
Triple Difference Analysis – Temporary Extensions of NOL Carryback Periods

Panel A OLS Regression Results for Triple Difference Analysis

Dependent Variable:	***Cash tax paid / MVA*** $_{it}$
	(1)
Diversification $_{it}$	-0.0008*
	(-1.732)
Years Effected$_t$	-0.0030***
	(-4.630)
Eligible for Extension$_i$	-0.0042***
	(-12.835)
Diversification$_{i,t}$ x *Years Affected*$_t$	-0.0022***
	(-3.554)
Diversification$_{i,t}$ x *Eligible for Extension*$_i$	0.0010
	(1.566)
Years Affected$_t$ x *Eligible for Extension*$_i$	-0.0013***
	(-3.822)
Diversification$_{i,t}$ x *Years Affected*$_t$ x *Eligible for Extension*$_i$	0.0015*
	(1.841)
Controls	Yes
Industry and Year fixed effects	Yes
R-squared	0.277
N	25,611

Panel B Matrices for Differential Diversification Effects Across Subgroups and Periods

Coefficients

	Ineligible firms	Eligible firms	Difference
Outside period affected	-0.0008*	0.0002	0.0010
Inside period affected	-0.0029***	-0.0005	0.0025***
Difference	-0.0022***	-0.0007	0.0015*

T-statistics

	Ineligible firms	Eligible firms	Difference
Outside period affected	-1.73	0.44	1.57
Inside period affected	-4.54	-0.81	2.89
Difference	-3.55	-1.29	1.84

Table 6 presents the estimates of equation (2) in Panel A. Panel B uses the coefficient estimates from the analysis in Panel A to document the differential diversification effect on firm taxes across different subgroups and periods. Standard errors are robust and clustered by firm, and t-statistics are in parentheses. I define the variables in Appendix I. The symbols ***, **, and * denote statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 7
Comparing Instrumental Variables Approaches to the Primary Analysis

Panel A OLS and Second Stages			
Dependent Variable:	***Cash tax paid / MVA $_{it}$***	***Cash tax paid / MVA $_{it}$ - Adjusted***	
	OLS	2SLS	Treatment Effects
	(1)	(2)	(3)
Diversification $_{it}$	-0.0013**	-0.0021***	-0.0017***
	(-2.346)	(-4.455)	(-4.161)
No disclosure $_{it}$	0.0031	0.0001	0.0000
	(1.333)	(0.374)	(0.262)
Size $_{it}$	0.0008***	0.0002***	0.0002***
	(6.251)	(4.870)	(4.597)
Leverage $_{it}$	-0.0000	-0.0000	-0.0000
	(-0.133)	(-0.773)	(-0.800)
Market-to-book $_{it}$	-0.0001***	-0.0000***	-0.0000***
	(-7.975)	(-5.910)	(-5.800)
Tax loss carryforward $_{it}$	-0.0054***	0.0001	0.0001
	(-10.322)	(0.577)	(0.503)
Increase in tax loss carryforward $_{it}$	-0.0009***	-0.0008***	-0.0008***
	(-4.787)	(-5.090)	(-5.096)
Pre-tax income $_{it}$	0.0003***	-0.0001*	-0.0001*
	(4.187)	(-1.701)	(-1.784)
Foreign pre-tax income $_{it}$	0.0068	0.0004	0.0003
	(1.394)	(0.150)	(0.113)
PP&E $_{it}$	-0.0030***	-0.0001	-0.0002
	(-4.360)	(-0.711)	(-0.915)
R&D $_{it}$	-0.0017***	-0.0001	0.0001
	(-2.643)	(-0.151)	(0.136)
Equity income $_{it}$	0.1068**	0.0514**	0.0481**
	(2.249)	(2.260)	(2.131)
Intangibles $_{it}$	-0.0007	0.0007	0.0007
	(-1.301)	(1.587)	(1.501)
Incorporated Outside U.S. $_{it}$		-0.0004**	-0.0004**
		(-2.396)	(-2.340)
Intercept	0.0097***	-0.0096***	-0.0096***
	(4.182)	(-33.171)	(-33.431)
N	26,910	26,905	26,905

Table 7 – continued

Panel B First Stages

Dependent Variable:	***Diversification*** $_{it}$			
	(1) 2SLS (Linear Probability)		(2) Treatment Effects (Probit)	
	Coefficient	t-stat	Coefficient	z-stat
Campa and Kedia (2002) Instruments				
S&P Index $_{it}$	0.0993***	(3.77)	0.3013***	(3.495
Listed on a Major Stock Index $_{it}$	0.0065	(0.48)	0.0477	(0.763)
# of Contraction Months during the Year $_{t}$	0.0017*	(1.93)	0.0099**	(2.493)
# of Contraction Months during the Year $_{t-1}$	0.0015	(1.51)	0.0084*	(1.900)
% Change in Real GDP $_{t}$	0.0024	(0.94)	0.0105	(0.897)
% Change in Real GDP $_{t-1}$	0.0015	(0.92)	0.0084	(1.054)
Number of M&A Announced during the Year $_{t}$	-0.0000	(-0.86)	-0.0000	(-1.562)
Dollar Value of M&A Announced during the Year $_{t}$	0.0000	(1.31)	0.0001**	(2.043)
Fraction of Industry Firms that are Multi-Industy $_{it}$	0.8594***	(24.69)	3.0401***	(22.220)
Fraction of Industry Sales from Multi-Industry Firms $_{it}$	-0.0197	(-1.00)	0.0733	(0.834)
Second Stage Variables				
No disclosure $_{it}$	0.0702**	(2.51)	0.2686**	(2.002)
Size $_{it}$	0.0183***	(6.43)	0.0681***	(5.201)
Leverage $_{it}$	-0.0005	(-0.40)	-0.0146	(-1.082)
Market-to-book $_{it}$	-0.0020***	(-5.39)	-0.0110***	(-4.372)
Tax loss carryforward $_{it}$	0.0443***	(3.94)	0.2164***	(4.420)
Increase in tax loss carryforward $_{it}$	-0.0034	(-0.51)	-0.0035	(-0.116)
Pre-tax income $_{it}$	0.0030	(1.63)	0.0515**	(2.227)
Foreign pre-tax income $_{it}$	-0.0329	(-0.19)	0.1319	(0.172)
PP&E $_{it}$	0.0219	(1.23)	0.1474**	(1.982)
R&D $_{it}$	-0.1106***	(-6.11)	-1.6184***	(-4.907)
Equity income $_{it}$	4.6468***	(2.82)	13.5915**	(2.242)
Intangibles $_{it}$	0.0576***	(2.95)	0.2960***	(3.769)
Incorporated Outside U.S. $_{it}$	0.0026	(0.15)	0.0025	(0.032)
Intercept	-0.2282***	(-4.89)	-2.5866***	(-11.378)
F-test of first stage IVs (F-statistic)	2,627***		1,715***	
(p-value)	(0.0000)		(0.0000)	
Overidentification test (Hansen J statistic)	209.713***		–	
(p-value)	(0.0000)		–	
R-squared (2SLS)/Pseudo R-squared (Treatment)	0.210		0.214	
N	26,905		29,905	

Table 7 Panel A presents the OLS results from Table 2, 2SLS, and treatment effects estimations in columns (1)-(3), respectively. The 2SLS and treatment effects estimations use an adjusted tax measure that is demeaned by firm and year. See Appendix I for variable descriptions. The instrumental variables (exclusion restrictions) used for the 2SLS and treatment effects models are drawn from Campa and Kedia (2002). The only change I make to the set of instruments is to include *Incorporated Outside the U.S.* in both stages rather than as an instrument (i.e. rather than assume it has no direct effect on firm taxes after accounting for the control variables in the second stage). Panel B presents the first stages of the 2SLS and treatment effects models in columns (1) and (2), respectively. T-statistics/Z-statistics are in parentheses. Standard errors are robust and clustered by firm. Variables are defined in Appendix I. The symbols ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Appendix I – Variable Descriptions[45]

***Tax_{it}* proxies**

Cash tax paid/MVA$_{it}$	Cash taxes paid (TXPD) divided by the market value of assets. The market value of assets equals total assets (AT) plus the product of share price and common shares outstanding (PRCC_F x CSHO) less stockholders equity (SEQ), based on the definition of the market value of assets in Henry and Sansing (2015).
Cash tax paid/ MVA - Adjusted $_{it}$	*Cash tax paid/MVA$_{it}$* demeaned by year and firm.

***$Diversification_{it}$* proxies (segment data from Compustat historical segment database)**

Multiple industries$_{it}$	An indicator equal to one if the number of industries (based on primary four digit SIC codes (SICS1)) reported is greater than one; zero otherwise
# of industries$_{it}$	The number of industries (based on four digit primary SIC codes) reported per firm-year
% of sales in other industries$_{it}$	The percent of total segment sales (sum of SALES) that are in different industries (based on primary four digit SIC codes (SICS1)) than the firm's industry
Sales-weighted distance$_{it}$	I first calculate the "distance" of each reported industry unit within a firm. Distance is defined based on the idea of relatedness in Khorana et al. (2011). If a reported industry in the segment data (SICS1) is in the same four digit SIC code as the firm (SIC), it has a distance = 0. If it is in the same three digit SIC code but not the same four digit SIC code, its distance = 1. If it has the same two digit SIC code but not the same three digit SIC code, its distance = 2. If it has the same one digit SIC code but not the same two digit SIC code, its distance =3. If it does not have the same one digit SIC code, then its distance = 4. I then weight each industry unit's distance by industry unit sales (SALES) to get an overall weighted-sales distance measure for each firm-year

Control, Cross-Sectional Test, and Triple Difference Test Variables

No disclosure $_{it}$	An indicator equal to one for observations that do not disclose geographic earnings in the post-SFAS 131 period; zero otherwise, following Hope et al. (2013). If missing, it is set equal to one
Size $_{it}$	The natural log of the product of share price and common shares outstanding (PRCC_F x CSHO)
Leverage $_{it}$	Total liabilities (LT) divided by lagged total assets (AT)
Market-to-book $_{it}$	The product of share price and common shares outstanding (PRCC_F x CSHO) divided by common/ordinary equity (CEQ)
Tax loss carryforward $_{it}$	An indicator equal to one if tax loss carryforward (TLCF) is positive; set equal to zero otherwise.
Increase in tax loss carryforward $_{it}$	An indicator equal to one if tax loss carryforward (TLCF) is greater in the current year than in the prior year; set equal to zero otherwise.

[45] Variables reference Compustat Fundamentals Annual database unless another data source is explicitly referenced in the description.

Pre-tax income $_{it}$	Pre-tax income (PI) divided by lagged total assets (AT)
Foreign pre-tax income $_{it}$	Pre-tax foreign income (PIFO) divided by lagged total assets (AT) where missing values of PIFO are set equal to zero
PP&E $_{it}$	Property, plant, and equipment (PPENT) divided by lagged total assets (AT) where missing values of PPENT are set equal to zero
R&D $_{it}$	Research and development expense (XRD) divided by lagged total assets (AT) where missing values of XRD are set equal to zero
Equity income $_{it}$	Equity in earnings (ESUB) divided by lagged total assets (AT) where missing values of ESUB are set equal to zero
Intangibles $_{it}$	Intangible assets (INTAN) divided by lagged total assets (AT) where missing values of INTAN are set equal to zero
Return Volatility $_{it}$	The natural log of the standard deviation of daily stock returns for the firm over the 12 months leading up to fiscal year-end (CRDP.DSF variable RETX)
SA Index $_{it}$	Similar to Hadlock and Pierce (2010): equals -0.737 x *Size_HP* $_{it}$ + 0.043 x *Size_HP* $_{it}^{2}$ – 0.040 x *Age_HP* $_{it}$ where *Size_HP* $_{it}$ equals the natural log of total assets and age equals the difference between the current year *t* and the first year in Compustat (YEAR1). Following Hadlock and Pierce (2010), total assets is set equal to $4.5 billion if it exceeds this value when determining *Size_HP* $_{it}$, and *Age_HP* $_{it}$ is set equal to 37 for values greater than 37.
Eligible for Extension $_{i}$	An indicator equal to one if *Increase in tax loss carryforward* $_{it}$ equaled one in a fiscal year ending within the 2001-2002 or 2008-2009 calendar years; set equal to zero otherwise. See Appendix II for institutional detail on the policies and tax laws used to identify these periods.
Years Affected $_{t}$	An indicator equal to one if a firm's fiscal year ended between 3/9/2002 and 12/31/2003 or between 11/20/2009 and 12/31/2010; set equal to zero otherwise. See Appendix II for institutional detail on the policies and tax laws used to identify these periods.

Campa and Kedia (2002) Instrumental Variables

S&P Index $_{it}$	An indicator equal to one if the firm was included in the S&P 500 during the fiscal-year; equal to zero otherwise. A firm is determined to have been on the S&P 500 during the year if there was at least one day within the 12 months leading up and including the fiscal-year end date that the firm was included in CRSP.DSP500LIST.
Listed on a Major Stock Index $_{it}$	An indicator equal to one if the firm is listed on Nasdaq, NYSE, or AMEX, (EXCHG codes equal to 14, 11, or 12); equal to zero otherwise
# of Contraction Months during the Year $_{it}$	The number of months in the calendar year the firm's fiscal-year-end falls in that are classified as contraction months on the National Bureau of Economic Research (NBER) U.S. Business Cycle Expansions and Contractions document dated 9/20/10. Set equal to zero if no contraction months on this document for the year.

% Change in Real GDP$_{it}$	The percent change in real Gross Domestic Product (GDP) not seasonally adjusted from the St. Louis FRED for the calendar year the firm's fiscal-year-end falls in.
Number of M&A Announced during the Year$_{it}$	The aggregate number of deals announced in year *t* on SDC Platinum's Mergers & Acquisitions database including completed deals for acquisitions of both U.S. and non-U.S. targets. To be included the deal must have a non-missing date announced and deal number and must not be a buyback or recapitalization.
Dollar Value of M&A Announced during the Year $_{it}$	The aggregate transaction value (in millions of dollars) of deals announced in year *t* on SDC Platinum's Mergers & Acquisitions database including completed deals for acquisitions of both U.S. and non-U.S. targets. To be included the deal must have a non-missing date announced, deal number, and transaction value and must not be a buyback or recapitalization.
Fraction of Industry Firms that are Multi-Industy $_{it}$	The percent of Compustat firms in the year with non-missing business segment data that operate in multiple industries (*Multiple industries*$_{it}$ equal to one).
Fraction of Industry Sales from Multi-Industry Firms $_{it}$	The percent of sales for Compustat firms in the year with non-missing business segment data that operate in multiple industries (*Multiple industries*$_{it}$ equal to one).
Incorporated Outside U.S.$_{it}$	An indicator equal to zero if the country of incorporation (FIC) is equal to USA; equal to one otherwise

Appendix II – Tax Carryback Extensions

Within my sample period, the U.S. Federal government temporarily expanded the tax loss carryback period twice. The first occurrence was part of the Job Creation and Worker Assistance Act of 2002 (JCWAA 2002) enacted on March 9, 2002, which offered firms with net operating losses (NOLs) for tax years ending in 2001 and 2002 the opportunity to carryback their NOLs against the *five* prior tax years' taxable income as opposed to only a two year carryback period (Public Law 107-147). The second expansion resulted from the Worker, Homeownership, and Business Assistance Act of 2009 (WHBAA 2009) signed into law on November 20, 2009, which offered firms with NOLs for tax years ending in 2008 or 2009 the option to carryback their tax loss up to five years (Revenue Procedure 2009-52). Thus, the first steps in an analysis of how these two tax changes influenced the diversification effect for firm taxes is to:

1) Identify the "treatment" group of firms that are more likely to be affected by these carryback period extensions (define $\textit{Eligible for Extension}_i$).
2) Distinguish the periods when the treatment firms accessing the cash taxes paid benefit from these extensions would show up in their financial statements ($\textit{Years Affected}_t$).

In order for the extension to apply, a firm would have had NOLs in the periods of eligibility that would not have otherwise been carried back (used up) in the absence of the carryback extension. I therefore proxy for whether a firm is more likely to be eligible for the extension based on whether a firm had an increase in tax loss carryforwards for at least one fiscal year ending in the periods of eligibility (2001-2002 or 2008-2009).[46] I label this variable,

[46] Generally, NOLs that are not carried back (either because there is not sufficient taxable income to offset or because a firm elects to opt out of using an NOL carryback) are carried forward to be applied against future taxable income. Thus, I assume that additional NOLs available for carryback extension manifest as an increase to NOL carryforward in the relevant policy year.

Eligible for Extension$_i$, which is set equal to one for a firm that had an increase in the periods and is set equal to zero otherwise.

To determine *Years Affected$_t$*, I needed to identify a window of time starting with the earliest fiscal year end that could reflect the additional tax refunds from the extension policies (via *Cash tax paid/MVA$_{it}$*) up through the latest fiscal year end that likely reflects these refunds. For the beginning of each of the two policy windows, I use the dates of enactment for the two extension policies (for JCWAA 2002 and WHBAA 2009, I use March 9, 2002 and November 20, 2009, respectively).[47] The end of each window is based on IRC Sec. 6411(a), which allows a firm to file an application for carryback adjustment for the prior taxable year affected by a NOL carryback within 12 months after that tax year ends. Thus, the relevant ending window used for each policy is 12 months after the end of the eligible NOL period for each policy (12 months after the 2001-2002 eligibility period for JCWAA 2002 is December 31, 2003 and 12 months after the 2008-2009 eligibility period period for WHBAA 2009 is December 31, 2010).[48] I therefore set *Years Affected$_t$* equal to one for fiscal years ending between March 9, 2002 and December 31, 2003 and between November 20, 2009 and December 31, 2010.

[47] WHBAA 2009 is actually an expansion of the American Recovery and Reinvestment Act of 2009 signed into law on February 17, 2009, which only allowed the extended carryback period to "eligible small firms" to most other businesses (Public Laws 111-5 and 107-147). Given that less than 17 percent of my sample have book sales less than the eligible small firm threshold, I use the November 20, 2009 date for my primary period start date. However, if I re-run my triple difference analysis using the February start date, the result for the triple interaction actually has greater statistical significance (is positive and significant at the 5 percent level instead of the 10 percent level).

[48] There may be some portion of firms that both have their tax year ends at the very end of the eligibility period and file their carryback adjustment request at the tail end of the 12 month window after the eligibility period ends where the refund recognized could bleed into the period following what is labeled *Years Affected$_t$* equal to one. However, this should make it harder to find the effect in the window examined by pulling part of the effect into the benchmark period (outside the affected period).

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