**Are Multinational Companies “Fooled” by Their Own Tax Planning?**

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November 2017

***Preliminary Draft
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**Keywords:** transfer pricing, income shifting, investment

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The authors appreciate outstanding research assistance from Gurpal Sran. Thanks to Saskia Kohlhase (discussant) and participants at the 2017 Berlin Vallendar Tax Conference.

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We investigate whether intra-firm tax-motivated income distortion affects investment decisions. Firms that are aggressive income shifters report profits in excess of their operational profitability in some affiliates. Biased self-attribution suggests an asymmetric affiliate-level unwinding of tax-motivated profit adjustments. Thus, we expect income shifting to be associated with firm-level overinvestment. We use affiliate-level data to develop a firm-specific measure of sensitivity to tax incentives to identify income shifting firms. Using this measure, we estimate a positive relation between total consolidated investment and income shifting aggressiveness that is incremental to differences in growth opportunities and cash flow. Our findings empirically test the theory in prior literature that transfer pricing methods and tax incentives can lead to distortions in production decisions. Additionally, we extend the literature on investment distortions by documenting that routine and necessary financial decisions can also distort investment levels.

1. **Introduction**

As early as the 1950’s, the management accounting literature advocates various methods of allocating costs and profits among organizational units.[[1]](#footnote-1) The primary goal of internal allocation, including the optimal price at which goods, services, and the rights to intangible property are charged across internal units, is to ensure that decision-making can be decentralized without loss of effectiveness. However, when internal units are in different countries, these intercompany transfer prices also have significant tax implications.

In the multinational setting, tax considerations in intra-firm price setting are regularly acknowledged.[[2]](#footnote-2) Thus, affiliate-level financial results reflect tax differentials across jurisdictions, and these same results are frequently used for affiliate-level investment decisions.[[3]](#footnote-3) Samuelson (1982) and Halperin and Srinidhi (1987, 1991) model how the transfer pricing methods themselves (as prescribed by tax regulations) change firm-level investment decisions, such as the amount and location of production, even absent corporate behavior to minimize global taxes.[[4]](#footnote-4)

More aggressive multinational companies use transfer prices to minimize worldwide income taxes, rather than to optimally trade off aligning managerial incentives and tax considerations, thereby distorting affiliate-level financial results. Some argue tax-motivated transfer pricing incentives have overtaken the internal decision-making objective for many firms. For example, EY (2013) document that 83 percent of firms identified a tax motive as their highest priority in setting transfer prices.[[5]](#footnote-5) In contrast, only 15 percent of respondents chose management accounting motives as the highest priority in setting transfer prices. While managers of such firms may believe their internal control systems will compensate for the traditional role played by transfer prices and decentralized decision making (Springsteel, 1999), we question whether this is true. Thus, we investigate whether tax-motivated distortions of affiliate income affect investment decisions, on average.

A relatively new literature studies the impact of the information environment on investment decisions. Distorted financial accounting values affect investment either because management uses their own manipulated numbers to make internal decisions or because management seizes the opportunity afforded by the misinformation to overinvest. McNichols and Stubben (2008) show that companies that manipulate their financial reporting results over-invest in new assets, suggesting that internal capital market frictions affect investment. Badertscher, Shroff and White (2013) and Shroff, Verdi and Yu (2015) estimate factors that mitigate these distortions; both papers find that a higher quality information environment (at the industry and country-industry level, respectively) is associated with more efficient investment.

Regarding the effect of tax figures and closely related to the setting of McNichols and Stubben (2008), Erickson, Hanlon and Maydew (2004) show that companies pay taxes on fraudulently reported earnings. Similarly, Blouin, Krull, and Robinson (2014) find a negative association between foreign earnings designated as permanently reinvested and domestic investment. Chen, Hepfer, Quinn and Wilson (2017) find that tax-motivated income shifting weakens the information environment. Thus, we predict that tax-motivated income shifting may also fool internal assessments of the performance of affiliates of the multinational firm, leading to inefficient investment.

Our research question is whether financial data of multinational affiliates that reflect aggressive tax-motivated income shifting distort decentralized decision-making, and thus create inefficient investment decisions. We expect this inefficiency to result in net overinvestment at the firm level. Specifically, biased self-attribution (Bem, 1965; Daniel, Hirschleifer and Subrahmanyam, 1998; Malmendier and Tate, 2005) suggests asymmetric affiliate-level responses lead to firm-level overinvestment. Managers of affiliates that benefit from tax-motivated income shifting will report profitability in excess of their operational profitability and will attribute the reported strong results to the their, and the affiliate’s, good performance. These affiliates will overinvest based on their reported profits. On the other hand, managers of affiliates that suffer from tax-motivated income shifting by having income shifted out will remember the role of transfer pricing in generating weak results, inflate the low revenue or discount the high costs, and undertake a level of investment that is closer to predicted. Combining the investment responses of all affiliates creates multinational firms that undertake net overinvestment at the firm-level, and the overinvestment will be related to degree to which the affiliates respond to tax incentives when reporting profitability.[[6]](#footnote-6)

Our research extends Chen et al. (2015), who study the effect of tax-motivated income shifting on market measures of the information environment, to study on the internal information environment. Our work is also related to Buettner, Overesch and Wamser (2014) who examine the sensitivity of property, plant and equipment (PP&E) and employment of German multinationals’ affiliates to tax rates, and an interaction with the intensity of anti-profit-shifting rules. Buettner et al. (2014) predict that limiting profit shifting increases the sensitivity of investment to tax rates, leading to lower investment in higher tax rate countries. Their results are consistent with this prediction for thin capitalization rules. Interestingly, they are not able to document an effect for transfer pricing strictness. Rather than focus on the effect of jurisdictions’ tax enforcement tools, we instead test whether the firm’s act of profit shifting distorts investment by altering the numbers managers use for decision-making. Thus, our research question is different, but related.

To examine the relation between income shifting aggressiveness and investment, we develop a firm-specific measure of the sensitivity of affiliate profitability to tax incentives. We use the income shifting prediction model from De Simone et al. (2017), which extends the Hines and Rice (1994) and Huizinga and Laeven (2008) models of reported profitability as a function of capital, labor, productivity, and tax incentives to allow for the inclusion of unprofitable affiliates. We augment the model by including firm fixed effects interacted with affiliate weighted-average tax incentives *C* (Huizinga and Laeven 2008) and historical annual ownership information to match affiliates to a multinational firm each year. We estimate the model using separate entity (unconsolidated) financials from Bureau van Dijk (BvD), resulting in a sample of 151,083 multinational affiliate-years over the period 2002 to 2014. Our resulting firm-specific measure of income shifting aggressiveness, *G*, is increasing in the extent to which a multinational firm exhibits a greater sensitivity of reported affiliate profitability to tax incentives, averaged across all affiliate-years for that multinational firm.

Next, we match BvD multinational firms to parent firms in *Compustat North America* and *Global* to include our firm-specific measure of income shifting aggressiveness in the Badertscher et al. (2013) investment framework that models capital expenditures as a function of cash flows and investment opportunities. As predicted, we find a positive relation between tax-motivated income shifting and consolidated (firm-level) investment. In terms of economic magnitude, we estimate that a one standard deviation increase in income shifting aggressiveness for the average sample firm is associated with an increase in investment of between 2.34% and 6.30%, depending on the specification.

We contribute to two streams of literature. First, we extend McNichols and Stubben (2008) to show that internal earnings adjustments for tax goals can distort financial reports and affect overall investment levels. Any affiliated entities that trade in goods, services, or the right to exploit intellectual property must determine a transfer price for the transaction; responding to tax incentives by selecting a defensible price that optimizes worldwide income tax is expected. Our results further suggest firms choosing to engage in particularly aggressive income shifting exhibit greater investment distortions. This differs from the setting in McNichols and Stubben (2008) in which managers must make a binary decision to undertake earnings management.

Second, we contribute to the international tax planning literature. First, we empirically test the relations outlined analytically in Samuelson (1982) and Halperin and Srinidhi (1987). Modeling resource allocation decisions of multinational firms both with and without taxation, they find that the transfer pricing methods for tangible goods outlined in IRC Section 482 and related Treasury regulations lead to distortions in production decisions.[[7]](#footnote-7) We test whether these distortions are sufficient such that there is, on average, a relation between cross-border tax-planning responses and over investment by the multinational firm. We also contribute to this literature by developing a firm-level estimate of transfer-pricing aggressiveness. A firm-level measure allows for more powerful cross-sectional tests than extant designs based on consolidated data (e.g., Klassen and Laplante, 2012). Using affiliate-level data to create such an estimate responds to the challenges identified with consolidation-level financial reports (see Donohoe, McGill and Outslay, 2012).

1. **Background and Hypothesis Development**

**Multinational Corporation Tax Planning**

In a decentralized, complex organization, the intra-firm transfer prices are important both for management control and local incentives, and for the computation of taxable income. There is a substantial literature that has explored the tax planning activities by multinational corporations (see Hanlon and Heitzman 2010 for a comprehensive review, updated by De Simone, Klassen, and Seidman 2017). In summary, because multinational corporations operate in multiple countries and these countries tax corporate income at different rates, locating income in lower tax-rate countries reduces the global taxes of the firm.

The goal of reducing taxes can be accomplished by moving high value-adding assets to lower tax rate countries, and by pricing intra-firm sales of goods, services, and rights at prices that report more income in lower tax rate jurisdictions. Much of the literature has focused on the latter and, for example, has explored the effect of tax rate changes (Klassen, Lang and Wolfson 1993), tax havens (Dyreng and Lindsey 2009), changes to accounting rules (De Simone 2016), and customs duties (Blouin, Robinson and Seidman 2017).

**Transfer Prices – Economic Theory**

Seminal work by Hirshleifer (1956, 1957) demonstrates that an appropriate transfer price can achieve efficient outcomes even when production decisions are decentralized. Management accounting has embraced the use of transfer prices as a means of allowing operating unit managers to make acquisition and production decisions in an efficient manner. The resulting profitability of the units is then available for resource allocation decisions by these managers.

However, when the units within the firm are in different countries, the internal prices charged between the units also have significant tax implications. Halperin and Srinidhi (1987, 1991) build on limited prior research by carefully incorporating transfer prices that are constrained by tax regulation in the U.S. Their model demonstrates that relative to the efficient no-tax scenario, production quantities are distorted and transfer prices increase in the face of realistic tax-based transfer price constraints. Even with the assumption that transfer prices do not respond to tax incentives (e.g., tax rates are the same in all jurisdictions), production levels in their model are still distorted by the tax system as the tax-permitted transfer prices lead to unavoidable changes to the internal production and sales coordination processes.

We note, as have others, that transfer-pricing systems are used both for performance measurement of affiliate-level managers and for the computation of taxable income for country-specific tax payments. To permit an efficient outcome in both of these separate uses, some firms adopt a so-called “two-book” system. However, decoupling the two prices is not without cost. Along with the cost of additional bookkeeping, a significant cost of decoupling is the possibility that the non-tax books will be included in any litigation over the firm’s tax-motivated transfer prices. Klassen, Lisowsky, and Mescall (2017) document for a sample of 43 tax executives, only seven (16 percent) indicate “yes” when asked if they compute different prices for tax and assessing performance. Similar evidence is provided in, for example, Ernst & Young (2003).

Hiemann and Reichelstein (2012) discuss both the tax compliance and the management allocation and coordination roles of transfer pricing as they survey recent theoretical research. The objective function analyzed seeks to have the decentralized affiliate managers operate in a manner consistent with the central managers’ value maximizing goal (i.e., goal congruence), rather than to achieve the production outcome in a world without taxes. They first consider situations in which an arms-length price is given (for tax purposes) and determine what internal-only transfer price creates goal congruence. They show that in such a two-book system, the internal transfer price will depend both on the tax rate in the low tax jurisdiction and on the permitted tax transfer price. Thus, even in the situation where there is a separate transfer price for tax minimizing purposes, the internal transfer price differs from the classic Hirshleifer (1956) result because centralized decisions would also consider the tax benefits of reporting profit in the low tax rate jurisdiction when determining overall production levels. With a fixed (given) tax transfer price, such as under an advanced pricing agreement, the decentralized firm is able to achieve the same outcome as achieved with centralized decisions.

In the other extreme – settings where the internal transfer is of intangible assets or the units each contribute to a common intellectual property – Hiemann and Reichelstein (2012) note that the firm cannot achieve goal congruence because the investment objectives and the tax objectives cannot be effectively balanced through a transfer pricing scheme. Depending on the substitutability or complementarity of the investments made by the two units, or on other features of the investment environment, equilibrium unit behavior may lead to either underinvestment or overinvestment, relative to the central planner’s equilibrium.

**Transfer Prices – Empirical Evidence**

To the best of our knowledge, the optimal transfer prices computed in these models have not been subject to archival validation. However, EY conducts a regular survey of international transfer pricing practice. In 2012, in response to the question of which is the highest priority in transfer pricing strategy, 66 percent of respondents indicated “tax risk management”, and 17 percent indicated “ETR optimization” or “cash tax optimization.” Only 15 percent responded “alignment with management/operational objectives” or “performance measurement” (EY, 2013). Responses reported from 2007 were similar: 50, 22, and 25 percent, respectively. One might interpret this evidence to suggest that management considers the tax aspects of transfer prices (whether to increase the success of tax disputes, or to reduce the global tax cost) even more strongly than suggested by theory—leading to a larger distortion in production.

**Transfer Prices – Attribution Theory**

Theoretical models (Halperin and Srinidhi 1987, 1991) predict a positive correlation between the degree to which transfer prices incorporate tax incentives and the investment distortion of the affiliates. Further, psychological research suggests that the managers’ interpretation of their affiliate’s performance may differ between the one receiving the shifted profit and one giving the shifted profit (e.g., Weiner 1985). Attribution theory suggests that the manager with artificially high profit may attribute this outcome to his or her own ability. Such attribution leads to managerial overconfidence that has been shown to affect investment decisions by CEOs (Malmendier and Tate, 2005). This attribution leads to positive expectations of the future and the manager will increase investment in response. However, the manager of the affiliate with artificially low profit will remember the tax-motivated nature of the transfer prices and attribute the low profitability to upper management. With this interpretation of performance, expectations of future success remain high and production may not be decreased to achieve higher profits. Thus, the firm overall will increase production as the transfer price deviates further from the optimal internal resource allocation price.

**Summary and Hypothesis**

In summary, the economics theory of internal trade suggests that in the absence of taxes, managers of independent affiliates can make the same allocation decision as the central manager would. However, with the introduction of differing tax rates and tax authorities that impose strict regulations on the permitted transfer prices in the affiliates, the optimal resource allocation will change. In many settings these features lead to an increase in overall production that is positively related to the tax rate differential. It is unknown the degree to which actual pricing and resourcing decisions comply with the theoretically optimal outcomes. Survey evidence suggests that managers have increasingly embraced the tax motivation for setting transfer prices and abandoned efficient resource allocation as a motive for transfer price determination; such behavior could lead to investment decisions based on unit financial results that reflect tax-motivated income shifting. Finally, the attribution of the observed outcomes may also influence affiliate managers to increase overall production of the firm in the presence of distorted profitability. Thus, collectively, we predict the following hypothesis:

**H1:** The firm’s responsiveness to tax-motivated income shifting incentives is positively related to the firm’s level of overinvestment.

1. **Measuring Income Shifting Aggressiveness**

**Firm-Specific Measure of Sensitivity to Tax Incentives *G***

We first estimate a firm-level sensitivity to tax incentives. We follow the literature (e.g., Hines and Rice 1994; Huizinga and Laeven 2008), using a transformation of the Cobb-Douglas production function to model affiliate-year reported profits as a function of capital, labor, productivity, and tax incentives. Specifically, we follow the model in De Simone et al. (2017) that allows for inclusion of unprofitable affiliates to retain a larger sample of multinational affiliate-years and achieve more precise estimation of tax-motivated income shifting across multinational firms. We extend the model by incorporating firm indicator variables and interacting them with the tax incentive variables of interest: a capital-weighted differential tax rate of the affiliate relative to all related affiliates in the same multinational firm-year (*Cit*), an indicator variable for an unprofitable affiliate (*Lossit*), and the interaction between the two. We present this model in equation (1) below for affiliate *i*, year *t* and firm *f*.

ln(*πit* + 1) = *β0* + *β1\**ln(*TangibleAssetsit*) + *β2\**ln(*CompExpit*) + *β3\*IndustryROAt* *+ β4\*Ageit + β5\*∆GDPt + β6\*∆MarketSizet + β7\*Cit + β8\*Lossit + β9\*Lossit\*Cit* + *β10,f* \**Firmf* + *β11,f* \**Firmf\*Cit* + *β12,f \*Firmf* \**Lossit* + *β13,f \*Firmf* \**Lossit\*Cit* *+ εit* (1)

We obtain all variables to estimate equation (1) from the BvD Osiris database unless otherwise noted. The dependent variable is the natural log of return on assets (ROA) plus one, where return on assets is measured as earnings before interest and taxes (*OPPL*) divided by total assets (*TOAS*). Our proxy for capital is tangible fixed assets (*TFAS*) and our proxy for labor is compensation expense (*STAF*). We measure productivity as *IndustryROAt,* defined as the median ROA by two-digit NACE industry-country-year, calculated using all affiliated and independent companies. *Ageit* is the natural log of one plus year *t* less the first year affiliate *i* is in our sample. We include two variables as proxies for economic shocks that could lead to unprofitability: (i) *∆GDPt*, measured as the year-over-year change in country-year GDP reported by the World Bank, and (ii) *∆MarketSizet*, measured as the two-digit NACE industry-country-year sum of affiliate and independent affiliate sales in year *t* less the sum in year *t-1*, scaled by 1,000,000. The indicator variable *Lossit* is equal to one if the affiliate reports EBIT less than zero, and zero otherwise.

The variables of interest are the tax incentive variable, *Cit*,and its interaction with the firm fixed-effects vector, *Firmf*. The interactions between *Cit* and *Firmf* capture the firm-specific deviation from the sample average sensitivity to tax incentives measured across all affiliate-years of the firm.[[8]](#footnote-8) Because we expect reported income to be decreasing in the weighted-average tax rate differential of an affiliate, we expect *β7* < 0. A negative coefficient on the firm-specific interaction suggests that the firm engages in more income shifting relative to the average sample firm, and vice versa. Following the language in Huizinga and Laeven (2008), we define the total firm-level sensitivity to tax incentives γ*f* *= β7* + *β11,f*. By construction, γ*f* is a time-invariant firm characteristic, reflecting that costly tax avoidance like income shifting is likely long-term (“sticky”) in nature. We multiply estimated γ*f* by negative one to create the empirical proxy *Gf,* which is *increasing* in income shifting aggressiveness.

**Sample for Estimating *G***

The BvD Osiris database contains financial, operating, and ownership information on independent and affiliated companies worldwide. We use unconsolidated company information, including annual ownership information, from Osiris over the period 2002 to 2014 and equation (1) to estimate γ.[[9]](#footnote-9) To remain in the sample of Osiris affiliate-year observations on which we estimate γ, we require each multinational firm-year to contain at least two affiliates in different jurisdictions such that they have the ability to engage in tax-motivated income shifting. We then restrict the sample to affiliates having all variables required for estimation (ROA, tangible fixed assets, compensation expense, age, change in GDP, change in market size, *C*, industry code, and ROA plus one greater than zero). Following De Simone et al. (2017), we drop firms in the banking and insurance industries and affiliate-year observations belonging to multinational firms reporting a consolidated return on sales of less than three percent, as these firms likely have significantly different income shifting incentives. Using these sample selection criteria, our resulting sample for estimating γ contains 151,083 affiliate-years representing 5,610 unique firms. Table 1 details our sample selection process.

[insert Tables 1 and 2 here]

We describe the sample used for estimating equation (1) in Table 2. Panel A presents summary statistics of sample affiliate-years, including all variables used in estimation. Values not expressed as logs or ratios are reported in $USD millions. All variables are winsorized at one and 99 percent. Sample affiliate-years have mean (median) operating profits of $9.07 ($0.96) million and ROA of 7.6 (6.4) percent, and 22 percent of the sample reports EBIT less than zero. Sample affiliates report mean (median) total assets of $205.7 ($20.1) million, tangible fixed assets of $25.9 ($1.2) million, and compensation expense of $19.4 ($4.4) million. By construction, the tax incentive variable *C* is roughly centered around zero; mean and median *C* are 0.002 and 0.001 respectively.

Panel B presents the number of affiliate-year observations by country in which the affiliate is located. France is the most represented country with 30,906 affiliate-years, followed by the United Kingdom, Spain, and Germany. High representation among European countries is consistent with the requirement in the European Union (EU) that companies publicly disclose unconsolidated financial results for affiliates with limited liability. Barbados, Egypt, Jamaica, Macedonia, and Turkey are each represented by only one affiliate-year in our sample. In untabulated descriptive analyses, we examine the frequency of affiliate-years by the location of their parent, finding greatest parent representation in France, followed by the U.S., Germany, and the United Kingdom, and the least parent representation in Argentina and Montenegro.

**Results of Estimating *G***

We report results of estimating equation (1) to obtain the empirical proxy for income shifting aggressiveness *G* in Table 3, Panel A. In the first three columns, we replicate the main result from De Simone et al. (2017) Table 5, Panel B to validate our sample. These three columns report results from estimating variants of equation (1) that exclude the firm indicator variables we will use to estimate *G*. Column (1) excludes the *Loss* indicator variable and its interaction with the tax incentive variable *C*, Column (2) includes the *Loss* indicator variable but excludes its interaction with *C,* and Column (3) includes both the *Loss* indicator variable and its interaction with *C.* Across all three columns, we estimate the same sign and similar magnitudes as De Simone et al. (2017) for the coefficients on capital, labor, productivity, and change in market size as well as the variables of interest. Specifically, in Columns (1) through (3), we estimate negative and significant coefficients on *C* and *Loss.* In Column (3), we estimate a positive and significant coefficient on the interaction between *C* and *Loss,* consistent with the main finding in De Simone et al. (2017) that unprofitable affiliates exhibit less responsiveness to tax incentives than profitable affiliates, or a “shift-to-loss” income shifting strategy.

[insert Table 3 here]

Having validated their model using our sample, we estimate equation (1) including firm indicator variables and their interactions with *Loss, C,* and *Loss\*C.* Column (4) reports these results. All four columns are estimated on the full sample of 151,083 affiliate-years (representing 5,610 unique firms) to generate better estimates of the income shifting prediction model, including the sample average coefficient on *C* to which to compare firm-specific tax-rate sensitivities. In Column (4) we include firm indicator variables, but we only include indicators for the 2,243 unique firms with at least ten affiliate-years available to generate a firm-specific coefficient.[[10]](#footnote-10) For parsimony, we do not report estimated coefficients on these 2,243 firm indicator variables or the interactions. After including these firm indicator variables and their interactions, we continue to find negative and significant coefficients on *C* and *Loss* and a positive and significant coefficient on their interaction, consistent with prior results.

In Panel B of Table 3, we present descriptive statistics for the resulting empirical estimate of firm-specific sensitivity to tax incentives *G.* We measure *G* as the sum of the coefficient on the tax incentive variable *C* and its interaction with the firm indicator variable, multiplied by negative one such that *G* is *increasing* in income shifting aggressiveness. The resulting measure is positive at the mean and median, consistent with firms on average responding to explicit tax incentives when reporting affiliate profitability. In economic terms, the mean value of *G* (0.240) translates to a semi-elasticity of reported ROA of -3.38 at the mean ROA. In contrast, we estimate a negative *G* for 44 percent of the firms in our sample, which suggests these firms respond more to implicit tax incentives, consistent with Markle et al. (2017). We also report the distribution of affiliate-years included in each of the 2,243 unique multinational firms for which we estimate *G*. At the mean (median), we include 59 (28) affiliate-years for each unique firm.

1. **Hypothesis Test**

**Research Design**

To examine the relation between income shifting aggressiveness and investment, we first estimate the following industry-year model for the determinants of investment:

*INVft = δ0 + δ1 Q + δ2 CFft + δ3 LogATft-1 + δ4 ROAft-1 + δ5 Gf + εft* (2)

We obtain all variables from *Compustat North America* and *Global*. Our model specification is informed by prior research, as well our intent to test the model using affiliate-level data, which imposes numerous data constraints. We specify two proxies for the dependent variable, *INVft*, based on investment in fixed assets. The first defines *INVft* as capital expenditures (*CAPXft*) scaled by net fixed assets at the beginning of the period (PPENT*ft-1*). The second, *INV2*, is the change in gross fixed assets (PPEGT*ft* - PPEGT*ft-1 /* AT*ft-1*), following Badertscher et al. (2013).

 We use *Q* to proxy for investment opportunities, and we specify four alternative proxies for *Q*: a) firm-level Tobin’s Q from the prior year (where Tobin’s Q is estimated as market value of equity (*PRCC\_Fft\*CSHOft*)plus consolidated total assets (*ATft*) less the book value of equity (*CEQ f*)*,* scaled by total assets; b) mean and c) median country-industry-year Tobin’s Q from the prior year (where Tobin’s Q is estimated as country-industry-year mean (median) market value of equity (*PRCC\_F\*CSHO*)plus consolidated total assets (*ATft*) less the book value of equity (*CEQ*)*,* scaled by total assets); and d) median country-industry-year price to earnings ratio at the beginning of the year as reported by *WorldScope*.

*CFft* controls for differences in internal financing capability and is defined as cash flow from operations (*OANCF*, where available) scaled by beginning of year net fixed assets (*PPENTft-1*).[[11]](#footnote-11) *LogATft-1* and *ROAft-*1 control for firm size and profitability following Shroff et al. (2015) and are defined as the natural log of beginning of year consolidated assets (ln(*ATt-1*)) and income before extraordinary items scaled by assets, where both are measured at the consolidated level (*IBt*/*ATt-1*). All variables are winsorized at 1 and 99 percent.

We incorporate our empirical measure *G* into the model to test our hypothesis.Recall that our empirical estimate of γ, *G,* is the sum of the estimated coefficients on the tax incentive variable and the interaction between the tax incentive variable and the firm-specific indicator variable, all multiplied by negative one. As such, *G* is increasing in the firm’s income shifting aggressiveness. Our hypothesis therefore predicts *δ5* > 0, or that higher firm-level sensitivity to tax incentives will lead to higher absolute values of unexpected investment.

**Hypothesis Test Sample**

We require *G* for each consolidated firm in order to estimate equation (2) and test our hypothesis. Specifically, we match the 2,243 unique firms from our affiliate-year sample for which we could estimate *G* to consolidated company information from *Compustat North America* and *Global* 2002 to 2014. To remain in the consolidated company sample on which we test our hypothesis, we require an ISIN to facilitate the *Osiris*-*Compustat Global* match for international firms and a ticker to facilitate the *Osiris*-*Compustat North America* match for North American firms. We also require an industry classification (*Compustat* variable NAICS) code to include industry controls because investment is known to vary by industry. In addition to being able to calculate the variables defined above, we require that total assets in year *t* and net PP&E in year *t-1* are positive. Of the 2,243 unique firms with estimated *G* from the affiliate-year sample, we are able to match 2,094 unique firms to *Compustat* meeting these sample selection criteria. These 2,094 unique firms represent 21,306 *Compustat* firm-years*.* We summarize this sample selection process in Table 4.

[insert Table 4 here.]

Table 5 describes the *Compustat* sample used to test our hypothesis. Values are reported in $USD millions and all variables are winsorized at one and 99 percent. Sample firms report mean (median) capital expenditures of $436 ($53.3) million. Mean (median) total consolidated assets are $9.8 ($1.7) billion, lagged net property, plant, and equipment are $2.5 ($0.3) billion, and operating cash flows are $848 ($125) million. On average, sample firms have an estimated Tobin’s Q of 1.63. For the 21,306 firm-years included in the hypothesis test sample, we estimate mean (median) *G* of 0.198 (0.082), indicating that sample firms on average respond to explicit tax incentives when reporting affiliate profitability. Table 6 presents correlations between regression variables.

[insert Tables 5 and 6 here.]

**Hypothesis Test Results**

Table 7 presents results of our hypothesis tests. Panel A reports results using the capital expenditures proxy for investment; the proxy in Panel B uses the change in gross fixed assets. The base investment model of equation (2) is presented in the odd-numbered columns; we include income-shifting aggressiveness in the even-numbered columns. Columns otherwise vary in the proxy for growth opportunities: (1)-(2) use *Qt-1,*(3)-(4) use *MeanQt-1*, (5)-(6) use *MedQt-1*, and (7)-(8) use *MedPEt-1.* We estimate a positive and significant coefficient on *G* in three of the four columns in which it is included in Panel A and each of the four columns in which it is included in Panel B, suggesting that tax-motivated income shifting incentives are also positively related to investment. In terms of economic magnitude, we estimate that a one standard deviation increase in income shifting aggressiveness for the average sample firm is associated with an increase in investment of between 2.34% and 6.30%, depending on the specification.

[insert Table 7 here.]

1. **Conclusions and Future Work**

We study the relation between income shifting aggressiveness and corporate investment efficiency. Using a sample of unconsolidated affiliates of multinational firms, we first estimate a firm-specific measure of income shifting aggressiveness. This measure builds off prior income shifting models and provides a new measure of firm-specific sensitivity to tax incentives that may be useful to future researchers. We then use this measure of income shifting aggressiveness to examine whether firms engaging in aggressive income shifting are “fooled” into overinvesting by their own tax-motivated profit allocations. Such aggregate overinvestment can result from aggressive income shifting leading to reported profitability exceeding operational profitability, thus resulting in overinvestment based on reported profitability. Further, firms may invest more both in affiliates in which reported profitability is greater than actual profitability due to tax incentives *and* in affiliates in which reported profitability is lower but the effect is attributed to income shifting and therefore unwound. We find evidence consistent with a positive relation between income shifting aggressiveness and overinvestment, thereby documenting a previously under-explored consequence of tax-motivated cross-jurisdictional income shifting.

Over the next few months, we plan to further test this result. First, we intend to test our hypothesis at the affiliate-level. We expect to find the overinvestment concentrated in relatively low-tax affiliates who have a tax incentive to report higher than predicted profit. Second, we may test additional measures of investment, such as number of employees and the total compensation expense of observable affiliates to provide a more complete picture of the type of investment decisions affected.

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Table 1: Affiliate-Year Sample Selection to Estimate *G*

|  |  |
| --- | --- |
| Affiliate-years in Bureau van Dijk’s Osiris database with at least one foreign affiliate and not missing earnings before interest and taxes (*EBIT*) 2002 to 2014: | 483,311 |
| Less: Missing NACE code (Osiris variable *NACPRI*) | (37,213) |
| Less: Banks and insurance companies (NACE code 64, 65, or 66 or Fama French industry 11 based on matched SIC code) | (35,570) |
| Less: Firms with consolidated return on sales less than 3 percent | (145,446) |
| Less: Assets less than or equal to zero, or missing (*TOAS* or *TFAS*) | (53,621) |
| Less: Compensation expense less than or equal to zero, or missing (*STAF*) | (52,227) |
| Less: Missing *Age* or measure of economic shock (*ΔGDP*, *ΔMarketSize*)  | (7,168) |
| Less: *ROA+1* less than or equal to zero | (983) |
| Affiliate-years in sample used to estimate equation (1) and *G*: | 151,083 |

Table 1 presents sample selection criteria. To estimate equation (1) and the income shifting aggressiveness measure *G,* the affiliate-year sample includes 151,083 affiliate-years from BvD’s Osiris database with at least two affiliates in different jurisdictions and non-missing EBIT 2002 to 2014, representing 5,610 unique controlled firms.

Table 2: Description of Affiliate-Year Sample Used to Estimate *G*

Panel A: Summary Statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mean** | **Std Dev** | **p25** | **Median** | **p75** |
| *EBIT* | 9.074 | 33.42 | 0.041 | 0.956 | 4.703 |
| *Sales* | 152.6 | 435.50 | 7.685 | 26.86 | 92.21 |
| *TotalAssets* | 205.7 | 729.80 | 5.843 | 20.05 | 82.81 |
| *TangibleAssets* | 25.89 | 96.73 | 0.150 | 1.155 | 8.472 |
| *CompExpense* | 19.42 | 48.11 | 1.448 | 4.356 | 14.07 |
| *ROA* | 0.076 | 0.163 | 0.006 | 0.064 | 0.147 |
| ln*(ROA+1)* | 0.061 | 0.163 | 0.005 | 0.062 | 0.138 |
| ln*(TangibleAssets)* | 13.92 | 2.824 | 11.92 | 13.96 | 15.95 |
| ln*(CompExpense)* | 15.31 | 1.764 | 14.19 | 15.29 | 16.46 |
| *IndustryROA* | 0.043 | 0.034 | 0.023 | 0.039 | 0.058 |
| *Age* | 1.094 | 0.759 | 0.693 | 1.099 | 1.792 |
| *∆GDP* | 0.036 | 0.089 | -0.027 | 0.038 | 0.098 |
| *∆MarketSize* | 1.353 | 4.408 | -0.082 | 0.200 | 0.860 |
| *C* | 0.002 | 0.046 | -0.012 | 0.001 | 0.026 |
| *Loss* | 0.224 | 0.417 | 0.000 | 0.000 | 0.000 |

Table 2 presents descriptive information for the sample used to estimate equation (1) and *G*. Panel A provides descriptive statistics. The affiliate-year sample includes 151,083 affiliate-years from BvD’s Osiris database with at least two affiliates in different jurisdictions and non-missing EBIT 2002 to 2014, representing 5,610 unique controlled firms. All variables are obtained from the Bureau van Dijk Osiris database unless otherwise noted and dollar values are reported in $USD millions unless logged. *EBIT* is earnings before interest and taxes (*EBIT*). *Sales* is operating revenues (*OPRE). TotalAssets* is total assets (*TOAS*). *TangibleAssets* is tangible fixed assets (*TFAS*)*. CompExpense* is compensation expense (*STAF*)*. ROA* is *EBIT* scaled by *TotalAssets. ln(ROA+1)* is the natural log of the sum of *ROA* and one. *ln(TangibleAssets)* is the natural log of *TangibleAssets. ln(CompExpense)* is the natural log of *CompExpense. IndustryROA* iscountry-industry-year median *ROA* for all observable (controlled or uncontrolled) affiliates. *Age* is the natural log of one plus year *t* minus the year the affiliate first appears in the database. *∆GDP* is *GDP* in year *t* minus *GDP* in year *t-1*, scaled by *GDP* in year *t-1*;we obtain GDP data from the World Bank*. C* is the capital-weighted average differential statutory tax rate between the affiliate and all related affiliates in the same firm-year; we compile statutory tax rate data from the University of Michigan, the OECD, KPMG, the Tax Foundation, and Trading Economics. *Loss* is an indicator variable equal to one if the affiliate reports *EBIT* less than zero. All variables are winsorized at 1 and 99 percent.

Table 2: Description of Affiliate-Year Sample Used to Estimate *G* (continued)

Panel B: Affiliate-Year Observations by Country

|  |  |  |  |
| --- | --- | --- | --- |
| **Affiliate Country** | **Affiliate-Year Observations** | **Affiliate Country** | **Affiliate-Year Observations** |
| Argentina | 15 | Jamaica | 1 |
| Australia | 467 | Japan | 2,854 |
| Austria | 2,863 | Korea | 2,374 |
| Barbados | 1 | Latvia | 19 |
| Belgium | 10,339 | Luxembourg | 606 |
| Brazil | 59 | Macedonia | 1 |
| Bulgaria | 819 | Malta | 5 |
| Cayman Islands | 3 | Morocco | 79 |
| Chile | 20 | Netherlands | 2,208 |
| Colombia | 3 | New Zealand | 528 |
| Croatia | 306 | Norway | 4,734 |
| Czech Republic | 4,006 | Panama | 2 |
| Denmark | 1,876 | Poland | 2,773 |
| Ecuador | 10 | Portugal | 3,998 |
| Egypt | 1 | Serbia | 636 |
| El Salvador | 2 | Slovakia | 531 |
| Estonia | 169 | Slovenia | 226 |
| Finland | 4,360 | Spain | 15,658 |
| France | 30,906 | Sweden | 5,705 |
| Germany | 14,673 | Switzerland | 18 |
| Hungary | 2,205 | Taiwan | 5 |
| Iceland | 9 | Turkey | 1 |
| India | 203 | Ukraine | 101 |
| Ireland | 1,375 | United Kingdom | 21,392 |
| Italy | 11,936 | Uruguay | 2 |
| Total |  |  | 151,083 |

Table 2 presents descriptive information for the sample used to estimate equation (1) and *G*. Panel B presents the number of affiliate-year observations used to estimate equation (1) and *G* by affiliate country. The affiliate-year sample includes 151,083 affiliate-years from BvD’s Osiris database with at least two affiliates in different jurisdictions and non-missing EBIT 2002 to 2014, representing 5,610 unique controlled firms.

Table 3: Results of Estimating *G*

Panel A: Estimation Results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | (1) | (2) | (3) | (4) |
| Pred. | ln(*ROA+1*) | ln(*ROA+1*) | ln(*ROA+1*) | ln(*ROA+1*) |
|  |  |  |  |  |  |
| ln(*TangibleAssets*) | - | -0.002\*\*\* | -0.003\*\*\* | -0.003\*\*\* | -0.002\*\*\* |
|  |  | (5.83) | (9.78) | (9.76) | (12.32) |
| ln(*CompExpense*) | + | 0.007\*\*\* | 0.002\*\*\* | 0.002\*\*\* | 0.002\*\*\* |
|  |  | (10.25) | (5.03) | (5.02) | (7.08) |
| *IndustryROA* | + | 0.883\*\*\* | 0.373\*\*\* | 0.369\*\*\* | 0.325\*\*\* |
|  |  | (38.68) | (17.66) | (16.12) | (30.91) |
| *Age* | + | 0.005\*\*\* | 0.001\*\* | 0.001\*\* | 0.000 |
|  |  | (5.32) | (2.23) | (2.19) | (0.04) |
| *∆GDP* | + | 0.035\*\*\* | 0.023\*\*\* | 0.023\*\*\* | 0.030\*\*\* |
|  |  | (4.94) | (5.142) | (5.09) | (8.02) |
| *∆MarketSize* | + | 0.000\*\*\* | 0.000\* | 0.000\* | 0.000\* |
|  |  | (2.63) | (1.46) | (1.38) | (1.51) |
| *C* | - | -0.035\*\* | -0.037\*\*\* | -0.096\*\*\* | -0.072\*\*\* |
|  |  | (2.13) | (3.20) | (6.30) | (2.48) |
| *Loss* | - |  | -0.249\*\*\* | -0.250\*\*\* | -0.263\*\*\* |
|  |  |  | (90.58) | (91.69) | (97.26) |
| *C*\**Loss* | + |  |  | 0.275\*\*\* | 0.153\*\*\* |
|  |  |  |  | (7.02) | (2.56) |
| Includes Firm Fixed Effects and Interactions with Variables of Interest |  | No | No | No | Yes |
| R2 |  | 0.040 | 0.429 | 0.430 | 0.508 |

Table 3 presents results of estimating equation (1) to measure the firm-specific sensitivity to tax incentives *G*. Panel A reports coefficients from estimating variations of equation (1). Columns (1) to (3) present a replication of De Simone et al. (2017) Table 5B using our sample. Column (4) presents results of estimating equation (1) when including firm indicator variables for the 2,243 firms with at least ten sample affiliate-years and the interactions of these indicator variables with *C, Loss,* and *C\*Loss.* The affiliate-year sample includes 151,083 affiliate-years from BvD’s Osiris database with at least two affiliates in different jurisdictions and non-missing EBIT 2002 to 2014, representing 5,610 unique controlled firms. All variables are obtained from the Bureau van Dijk Osiris database unless otherwise noted. *CompExpense* is compensation expense (*STAF*)*. ROA* is *EBIT* scaled by *TotalAssets. ln(ROA+1)* is the natural log of the sum of *ROA,* measured as earnings before interest and taxes (*EBIT*) scaled by total assets *(TOAS),* and one. *ln(TangibleAssets)* is the natural log of tangible fixed assets (*TFAS*)*. ln(CompExpense)* is the natural log of compensation expense (*STAF*)*. IndustryROA* iscountry-industry-year median *ROA* for all observable (controlled or uncontrolled) affiliates. *Age* is the natural log of one plus year *t* minus the year the affiliate first appears in the database. *∆GDP* is *GDP* in year *t* minus *GDP* in year *t-1*, scaled by *GDP* in year *t-1*;we obtain GDP data from the World Bank*. C* is the capital-weighted average differential statutory tax rate between the affiliate and all related affiliates in the same firm-year; we compile statutory tax rate data from the University of Michigan, the OECD, KPMG, the Tax Foundation, and Trading Economics. *Loss* is an indicator variable equal to one if the affiliate reports *EBIT* less than zero. All variables are winsorized at 1 and 99 percent. \*\*\*, \*\*,and \* represent (one-tailed) statistical significance at the 1, 5, and 10 percent levels, respectively. All specifications report t-statistics based on standard errors clustered by firm.

Table 3: Results of Estimating *G* (continued)

Panel B: Summary Statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mean** | **Std Dev** | **p25** | **Median** | **p75** |
| *G* | 0.240 | 4.763 | -0.328 | 0.077 | 0.523 |
| *NumberAffiliate-Years* | 57.43 | 95.42 | 15.00 | 28.00 | 59.00 |

Table 3 presents results of estimating equation (1) to measure the firm-specific sensitivity to tax incentives *G*. Panel B presents descriptive statistics for the 2,243 unique firms for which we estimate a firm-specific sensitivity to tax incentives *G. NumberAffiliate-Years* is the number of a controlled firm’s affiliate-years included in estimation of equation (1). *G* is a firm-specific measure of sensitivity to tax rates calculated as negative one multiplied by the sum of estimated *β7* and *β11* from estimating the following regression using affiliate-level data:

ln(*πi* + 1) = *β0* + *β1\**ln(*TangibleAssetsit*) + *β2\**ln(*CompExpit*) + *β3\*IndustryROAt* *+ β4\*Ageit + β5\*∆GDPt*

 *+ β6\*∆MarketSizet + β7\*Cit + β8\*Lossit + β9\*Lossit\*Cit* + *β10,f*\**Firmf* + *β11,f*\**Firmf\*Cit* + *β12,f\*Firmf*\**Lossit*

 + *β13,f\*Firmf*\**Lossit\*Cit* *+ εit*.

Table 4: Firm-year Sample Selection to Test Hypothesis

|  |  |
| --- | --- |
| Unique firms used to estimate *G*: | 5,610 |
| Less: Missing *G* (unique firms with fewer than ten affiliate-years) | (3,367) |
| Less: Missing *Compustat* match | (149) |
| Unique firms in sample used to estimate equation (2) and hypothesis: | 2,094 |
|  |  |
| Firm-years in sample used to estimate equation (2) and hypothesis (Corresponding firm-years in *Compustat North America* and *Global* databases with non-missing variables required for estimation (*INV, Q, CF, LogAT, ROA, SIC*)2002 to 2014): | 21,306 |

Table 4 presents sample selection criteria to estimate equation (2) and the hypothesis test. The firm-year sample includes 21,306 firm-years from *Compustat North America* and *Global* with non-missing data required for estimation, representing 2,094 unique controlled firms.

Table 5: *Compustat* Firm-Year Sample Used to Test Hypothesis

Panel A: Summary Statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mean** | **Std Dev** | **p25** | **Median** | **p75** |
| *CapExp* |  435.9  |  1,256  |  10.86  |  53.32  |  244.6  |
| *AT* |  9,787  |  24,300  |  406.6  |  1,674  |  6,496  |
| *PPENTt-1* |  2,507  |  7,372  |  52.47  |  282.1  |  1,338  |
| *CFOt-1* |  848.2  |  2,291  |  23.91  |  125.2  |  526.9  |
| *INV1* | 0.276 | 0.275 | 0.130 | 0.200 | 0.316 |
| *INV2* | 0.030 | 0.086 | -0.004 | 0.019 | 0.059 |
| *Qt-1* | 1.628 | 0.917 | 1.064 | 1.344 | 1.840 |
| *MeanQt-1* | 1.639 | 0.504 | 1.266 | 1.539 | 1.894 |
| *MedQt-1* | 1.443 | 0.420 | 1.137 | 1.351 | 1.650 |
| *MedPEt-1* | 19.58 | 14.77 | 12.23 | 16.77 | 22.14 |
| *CFt-1* | 0.106 | 0.080 | 0.057 | 0.097 | 0.145 |
| *LogATt-1* | 21.20 | 1.951 | 19.74 | 21.17 | 22.54 |
| *ROAt-1* | 0.057 | 0.074 | 0.022 | 0.052 | 0.090 |
| *G* | 0.198 | 3.799 | -0.277 | 0.082 | 0.480 |

Table 5 presents descriptive information for the sample used to estimate equation (2) and test our hypothesis. Panel A provides descriptive statistics. The firm-year sample includes 21,306 firm-years from *Compustat North America* and *Global* with non-missing data required for estimation, representing 2,094 unique controlled firms. All variables are obtained from the *Compustat North America* and *Global* databases, dollar values are reported in $USD millions, and values are measured in year *t* unless otherwise noted. *CapEx* is capital expenditures (*CAPX*). *AT* is total assets (*AT). PPENTt-1* is net property, plant, and equipment (*PPENT*) in year *t-1*. *CFO* is cash flow from operation (*OANCF)* if reported; if *OANCF* is missing, cash flow from operations equals (operating income after depreciation – (change in current assets – change in cash) – (change in current liabilities – change in debt in current liabilities – change in taxes payable) – *DEPR*). Change is current assets is (*ACTt - ACTt-1*). Change in cash is (*CASHt - CASHt-1*). Change in current liabilities is (*LCTt – LCTt-1*). Change in debt in currently liabilities is (*DLCt – DLCt-1*). Change in taxes payable is (*TXPt-TXPt-1).* *INV1* is *CapExp* scaled by *PPENTt-1*. *INV2* is *PPEGTt* less *PPEGTt-1*, scaled by *ATt-1. Qt-1* is firm-year market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MeanQt-1* is the country-industry-year mean market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedQt-1* is the country-industry-year median market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedPEt-1* is the country-industry-year median price to earnings ratio reported by *WorldScope* in year *t-1*. *CFt-1* is *CFOt-1* scaled by *ATt-2*. *LogATt-1* is the natural log of *ATt-1*. *ROAt-1* is income before extraordinary items (*IB)* scaled by *ATt-1*. *G* is a firm-specific measure of sensitivity to tax rates calculated as negative one multiplied by the sum of estimated *β7* and *β11* from estimating the following regression using affiliate-level data:

ln(*πi* + 1) = *β0* + *β1\**ln(*TangibleAssetsit*) + *β2\**ln(*CompExpit*) + *β3\*IndustryROAt* *+ β4\*Ageit + β5\*∆GDPt*

 *+ β6\*∆MarketSizet + β7\*Cit + β8\*Lossit + β9\*Lossit\*Cit* + *β10,f*\**Firmf* + *β11,f*\**Firmf\*Cit* + *β12,f\*Firmf*\**Lossit*

 + *β13,f\*Firmf*\**Lossit\*Cit* *+ εit*.

All variables are winsorized at 1 and 99 percent

Table 6: Correlations of Variables Used in Hypothesis Test

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | *INV1* | *INV2* | *Q t-1* | *MeanQ* | *MedQ* | *MedPE* | *CF* | *LogAT* | *ROA* | *G* |
| *INV1* | **1.000** |  |  |  |  |  |  |  |  |  |
| *INV2* | **0.150** | **1.000** |  |  |  |  |  |  |  |  |
| *Qt-1* | **0.221** | **0.058** | **1.000** |  |  |  |  |  |  |  |
| *MeanQt-1* | **0.124** | **-0.015** | **0.547** | **1.000** |  |  |  |  |  |  |
| *MedQt-1* | **0.110** | 0.004 | **0.521** | **0.923** | **1.000** |  |  |  |  |  |
| *MedPEt-1* | **0.042** | **-0.036** | **0.112** | **0.193** | **0.170** | **1.000** |  |  |  |  |
| *CFt-1* | **0.159** | **0.131** | **0.535** | **0.247** | **0.253** | 0.006 | **1.000** |  |  |  |
| *LogATt-1* | **-0.260** | **-0.025** | **-0.060** | **-0.040** | **-0.013** | **-0.046** | **0.028** | **1.000** |  |  |
| *ROAt-1* | **0.172** | **0.148** | **0.574** | **0.273** | **0.275** | **-0.050** | **0.645** | **-0.020** | **1.000** |  |
| *G* | **0.039** | **0.018** | **-0.020** | **-0.031** | **-0.030** | -0.005 | 0.005 | **-0.033** | 0.003 | **1.000** |

Table 6 presents correlations for the firm-year sample and variables used to test our hypothesis. The firm-year sample includes 21,306 firm-years from *Compustat North America* and *Global* with non-missing data required for estimation, representing 2,094 unique controlled firms. *INV1* is *CapExp* scaled by *PPENTt-1*. *INV2* is *PPEGTt* less *PPEGTt-1*, scaled by *ATt-1. Qt-1* is firm-year market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1*. *MeanQt-1* is the country-industry-year mean market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedQt-1* is the country-industry-year median market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedPEt-1* is the country-industry-year median price to earnings ratio reported by *WorldScope* in year *t-1*. *CFt-1* is *CFOt-1* scaled by *ATt-2*. *LogATt-1* is the natural log of *ATt-1*. *ROAt-1* is income before extraordinary items (*IB)* scaled by *ATt-1*. *G* is a firm-specific measure of sensitivity to tax rates calculated as negative one multiplied by the sum of estimated *β7* and *β11* from estimating the following regression using affiliate-level data:

ln(*πi* + 1) = *β0* + *β1\**ln(*TangibleAssetsit*) + *β2\**ln(*CompExpit*) + *β3\*IndustryROAt* *+ β4\*Ageit + β5\*∆GDPt*

 *+ β6\*∆MarketSizet + β7\*Cit + β8\*Lossit + β9\*Lossit\*Cit* + *β10,f*\**Firmf* + *β11,f*\**Firmf\*Cit* + *β12,f\*Firmf*\**Lossit*

 + *β13,f\*Firmf*\**Lossit\*Cit* *+ εit*.

Bolded values are statistically significant at the 10 percent level, respectively. All variables are winsorized at 1 and 99 percent.

Table 7: Determinants of Investment

Panel A: *Inv1* Regressions

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | Pred. | *INV1* | *INV1* | *INV1* | *INV1* | *INV1* | *INV1* | *INV1* | *INV1* |
| *Q* | + | 0.0394\*\*\* | 0.0397\*\*\* | 0.0154\*\*\* | 0.0159\*\*\* | 0.0174\*\* | 0.0180\*\*\* | 0.0003\* | 0.0003\* |
|  |  | (7.1063) | (7.1566) | (2.1116) | (2.1991) | (1.9226) | (1.9957) | (1.6175) | (1.6367) |
| *CFt-1* | + | 0.0541 | 0.0525 | 0.1656\*\*\* | 0.1646\*\*\* | 0.1658\*\*\* | 0.1648\*\*\* | 0.1672\*\*\* | 0.1669\*\*\* |
|  |  | (0.8345) | (0.8093) | (2.7221) | (2.7052) | (2.7184) | (2.7017) | (2.4484) | (2.4434) |
| *LogATt-1* | - | -0.0294\*\*\* | -0.0292\*\*\* | -0.0297\*\*\* | -0.0296\*\*\* | -0.0297\*\*\* | -0.0296\*\*\* | -0.0297\*\*\* | -0.0297\*\*\* |
|  |  | (-12.3967) | (-12.3649) | (-12.5003) | (-12.4721) | (-12.4962) | (-12.4680) | (-11.5339) | (-11.5165) |
| *ROAt-1* | + | 0.3150\*\*\* | 0.3148\*\*\* | 0.4843\*\*\* | 0.4846\*\*\* | 0.4853\*\*\* | 0.4857\*\*\* | 0.4925\*\*\* | 0.4934\*\*\* |
|  |  | (5.5148) | (5.5206) | (8.4341) | (8.4518) | (8.4945) | (8.5147) | (7.6610) | (7.6823) |
| *G* | + |  | 0.0019\* |  | 0.0017\* |  | 0.0017\* |  | 0.0016 |
|  |  |  | (1.5334) |  | (1.4174) |  | (1.4084) |  | (1.1640) |
| Adjusted R2 | 0.1603 | 0.1698 | 0.1704 | 0.1608 | 0.1603 | 0.1608 | 0.1661 | 0.1665 |

Table 7 present coefficients and t-statistics from regressions of 21,306 firm-year observations from *Compustat North America* and *Global* with non-missing data required for estimation. Panel A presents results using *INV1* as the dependent variable. Columns (1), (3), (5), and (7) replicate the main investment model using our sample. Columns (2), (4), (6), and (8) add our firm-specific measure of income shifting aggressiveness *G.* Columns otherwise vary in the proxy for growth opportunities: (1)-(2) use *Qt-1,*(3)-(4) use *MeanQt-1*, (5)-(6) use *MedQt-1*, and (7)-(8) use *MedPEt-1. INV1* is *CapExp* scaled by *PPENTt-1*. *Qt-1* is firm-year market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MeanQt-1* is the country-industry-year mean market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedQt-1* is the country-industry-year median market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1*. *MedPEt-1* is the country-industry-year median price to earnings ratio reported by *WorldScope* in year *t-1*. *CFt-1* is *CFOt-1* scaled by *ATt-2*. *LogATt-1* is the natural log of *ATt-1*. *ROAt-1* is income before extraordinary items (*IB)* scaled by *ATt-1*. *G* is a firm-specific measure of sensitivity to tax rates calculated as negative one multiplied by the sum of estimated *β7* and *β11* from estimating the following regression using affiliate-level data:

ln(*πi* + 1) = *β0* + *β1\**ln(*TangibleAssetsit*) + *β2\**ln(*CompExpit*) + *β3\*IndustryROAt* *+ β4\*Ageit + β5\*∆GDPt*

 *+ β6\*∆MarketSizet + β7\*Cit + β8\*Lossit + β9\*Lossit\*Cit* + *β10,f*\**Firmf* + *β11,f*\**Firmf\*Cit* + *β12,f\*Firmf*\**Lossit*

 + *β13,f\*Firmf*\**Lossit\*Cit* *+ εit*.

\*\*\*, \*\*,and \* represent (one-tailed) statistical significance at the 1, 5, and 10 percent levels, respectively. All variables are winsorized at 1 and 99 percent.

Table 7: Determinants of Investment (continued)

Panel B: *Inv2* Regressions

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | Pred. | *INV2* | *INV2* | *INV2* | *INV2* | *INV2* | *INV2* | *INV2* | *INV2* |
| *Q* | + | -0.0040\*\*\* | -0.0040\*\*\* | -0.0072\*\*\* | -0.0071\*\* | -0.0053\*\*\* | -0.0052\*\*\* | -0.0001\*\*\* | -0.0001\*\*\* |
|  |  | (-3.8202) | (-3.7627) | (-4.5457) | (-4.4717) | (-2.7770) | (-2.7119) | (-3.0269) | (-3.0029) |
| *CFt-1* | + | 0.0845\*\*\* | 0.0842\*\*\* | 0.0758\*\*\* | 0.0756\*\*\* | 0.0745\*\*\* | 0.0743\*\*\* | 0.0726\*\*\* | 0.0725\*\*\* |
|  |  | (7.1298) | (7.1023) | (6.7222) | (6.7033) | (6.6182) | (6.5999) | (6.2208) | (6.2206) |
| *LogATt-1* | - | -0.0027\*\*\* | -0.0027\*\*\* | -0.0026\*\*\* | -0.0026\*\*\* | -0.0027\*\*\* | -0.0026\*\*\* | -0.0029\*\*\* | -0.0028\*\*\* |
|  |  | (-7.2506) | (-7.2004) | (-6.9435) | (-6.8997) | (-6.9990) | (-6.9546) | (-7.3069) | (-7.2691) |
| *ROAt-1* | + | 0.1380\*\*\* | 0.1380\*\*\* | 0.1275\*\*\* | 0.1277\*\*\* | 0.1244\*\*\* | 0.1245\*\*\* | 0.1054\*\*\* | 0.1058\*\*\* |
|  |  | (10.3725) | (10.3793) | (10.4074) | (10.4196) | (10.1291) | (10.1434) | (8.5721) | (8.5995) |
| *G* | + |  | 0.0004\*\* |  | 0.0004\*\* |  | 0.0004\*\* |  | 0.0005\*\*\* |
|  |  |  | (1.7703) |  | (1.7279) |  | (1.7944) |  | (2.1146) |
| Adjusted R2 | 0.0402 | 0.0404 | 0.0404 | 0.0405 | 0.0396 | 0.0398 | 0.0381 | 0.0385 |

Table 7 present coefficients and t-statistics from regressions of 20,822 firm-year observations from *Compustat North America* and *Global* with non-missing data required for estimation. Panel B presents results using *INV2* as the dependent variable. Columns (1), (3), (5), and (7) replicate the main investment model using our sample. Columns (2), (4), (6), and (8) add our firm-specific measure of income shifting aggressiveness *G.* Columns otherwise vary in the proxy for growth opportunities: (1)-(2) use *Qt-1*, (3)-(4) use *MeanQt-1*, (5)-(6) use *MedQt-1*, and (7)-(8) use *MedPEt-1.INV2* is *PPEGTt* less *PPEGTt-1*, scaled by *ATt-1. Qt-1* is firm-year market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MeanQt-1* is the country-industry-year mean market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedQt-1* is the country-industry-year median market value of equity in year *t-1* (*PRCC\_F\*CSHO*)plus *AT* in year *t-1* less *CEQ*in year *t-1,* scaled by *AT* in year *t-1*. *MedPEt-1* is the country-industry-year median price to earnings ratio reported by *WorldScope* in year *t-1*. *CFt-1* is *CFOt-1* scaled by *ATt-2*. *LogATt-1* is the natural log of *ATt-1*. *ROAt-1* is income before extraordinary items (*IB)* scaled by *ATt-1*. *G* is a firm-specific measure of sensitivity to tax rates calculated as negative one multiplied by the sum of estimated *β7* and *β11* from estimating the following regression using affiliate-level data:

ln(*πi* + 1) = *β0* + *β1\**ln(*TangibleAssetsit*) + *β2\**ln(*CompExpit*) + *β3\*IndustryROAt* *+ β4\*Ageit + β5\*∆GDPt*

 *+ β6\*∆MarketSizet + β7\*Cit + β8\*Lossit + β9\*Lossit\*Cit* + *β10,f*\**Firmf* + *β11,f*\**Firmf\*Cit* + *β12,f\*Firmf*\**Lossit*

 + *β13,f\*Firmf*\**Lossit\*Cit* *+ εit*.

\*\*\*, \*\*,and \* represent (one-tailed) statistical significance at the 1, 5, and 10 percent levels, respectively. All variables are winsorized at 1 and 99 percent.

1. For example, Cook (1955), Dean (1955), and Hirshleifer (1956, 1957). [↑](#footnote-ref-1)
2. Hanlon and Heitzman (2010) summarize tax-motivated transfer pricing research in Section 4.4.1. [↑](#footnote-ref-2)
3. Though firms may keep two sets of affiliate-level financial results—one for regulatory filings and another for internal decision-making—this is costly. As described further below, Hiemann and Reichelstein (2012) show that even with two sets of books, cross-affiliate tax differences lead to changes in equilibrium transfer prices as the firm optimally trades off tax and operational efficiency considerations. See also Sansing (2014). [↑](#footnote-ref-3)
4. Halperin and Srinidhi (1987) introduce a tax rate differential to the Hirshleifer (1956) model and show that tax rate differentials themselves do not introduce resource allocation distortions. Rather, limitations on the acceptable transfer pricing methods induce the distortion. [↑](#footnote-ref-4)
5. Tax-motivated transfer pricing generally shifts income by selecting a price for goods, services, or rights to exploit intangibles that allocates low revenue or high cost to a high tax affiliate and high revenue or low cost to a low tax affiliate. Section II provides additional details. [↑](#footnote-ref-5)
6. Because affiliate-level data do not contain the variables needed to estimate investment, we conduct our investment analyses at the firm-level. Following the literature, we use unconsolidated affiliate book financials to examine the sensitivity of reported book profits to tax incentives (e.g., Huizinga and Laeven 2008; Huizinga, Laeven, and Nicodeme 2008; Dharmapala and Riedel 2013; De Simone 2016; Markle 2016; De Simone, Klassen, and Seidman 2017). [↑](#footnote-ref-6)
7. The methods are comparable uncontrolled price method, resale price method and cost plus method. For further details on transfer pricing methods, see for example <https://www.law.cornell.edu/cfr/text/26/1.482-3> [↑](#footnote-ref-7)
8. In *STATA*, firm fixed effects are coded such that the sum of the fixed effects estimates are zero and the intercept is the sample average. [↑](#footnote-ref-8)
9. BvD only reports current year ownership linkages; as such, most studies using BvD data assume current year ownership linkages extend back through the entire sample period (e.g., De Simone 2016; De Simone et al. 2017; Huizinga and Laeven 2008; Markle 2016; Shroff, Verdi, and Yu 2015). We use historical disks to obtain annual ownership information and ensure appropriate linkages of affiliates to multinational firms each year. [↑](#footnote-ref-9)
10. As a result, we estimate *G* for 2,243 unique firms. As discussed below, we are able to match 2,117 of these unique firms to *Compustat* to test our hypothesis. [↑](#footnote-ref-10)
11. If *OANCF* is missing, cash flow from operations equals (operating income after depreciation – (change in current assets – change in cash) – (change in current liabilities – change in debt in current liabilities – change in taxes payable) – *DEPR*). Change is current assets is (*ACTt - ACTt-1*). Change in cash is (*CASHt - CASHt-1*). Change in current liabilities is (*LCTt – LCTt-1*). Change in debt in currently liabilities is (*DLCt – DLCt-1*). Change in taxes payable is (*TXPt-TXPt-1).* [↑](#footnote-ref-11)