Unprofitable Affiliates and Income Shifting Behavior

Lisa De Simone
Stanford Graduate School of Business

Kenneth J. Klassen
University of Waterloo

Jeri K. Seidman
University of Texas at Austin

May 2015

Income shifting from high-tax to low-tax jurisdictions is considered a primary method of reducing worldwide tax burdens of multinational firms. Extant research generally makes the high-tax and low-tax distinctions using statutory or aggregated tax rates. However, current losses also affect the marginal tax rates of affiliates. We extend prior approaches to allow for the inclusion of unprofitable affiliates and test whether the income of unprofitable affiliates deviates from the negative association with tax rates observed in profitable affiliates. We also estimate affiliate-level marginal tax rates that account for loss carryback and carryforward provisions. Results suggest that multinational firms with an unprofitable affiliate adjust their transfer pricing to take advantage of losses and that the marginal tax rate affects this adjustment. Our point estimates imply that an average-sized affiliate facing the average statutory tax rate alters its income shifting by $5.7M upon a change from profitability to loss.

Keywords: transfer pricing, income shifting, losses

The authors appreciate helpful discussions with Jennifer Blouin and Leslie Robinson, as well as comments from Mary Barth, Daniel Collins, Cristi Gleason, Michelle Hanlon, Jost Heckemeyer, Daniel Lynch, Ed Maydew, Edmund Outslay, Kathy Petroni, Richard Sansing, Casey Schwab, Bridget Stomberg, Erin Towery, Benjamin Whipple, and workshop participants at the University of Georgia, the University of Iowa, Michigan State University, Ohio State University, the Stanford Graduate School of Business, the EIASM 4th Workshop on Current Research in Taxation, the 2014 Stanford Accounting Summer Camp, the Tax Policy and the Activities of Multinational Firms Conference at Eberhard Karls Universität Tübingen, and the University of Texas/University of Waterloo International Tax Symposium. The authors are thankful for financial support from the McCombs Research Excellence Fund and the McCombs Supply Chain Management Center of Excellence.

1. INTRODUCTION

Prior research in accounting, finance, and economics finds that firms undertake a strategy of shifting income out of high-tax jurisdictions into low-tax jurisdictions, thus reporting lower profit in high-tax affiliates and higher profit in low-tax affiliates.[1] In a multinational firm with only profitable affiliates, this shifting strategy results in tax savings equal to the dollars of income shifted times the rate differential between the affiliates, net of any costs.

Researchers generally determine intra-firm tax incentives using either the statutory tax rate of the jurisdiction or an aggregated effective tax rate. These methods mask an alternative tax-saving recipient of shifted income: an unprofitable affiliate. Ignoring the potential benefit of a loss carryback or carryforward, an unprofitable affiliate becomes an extremely low-tax affiliate because it has a marginal tax rate of zero. A firm may shift less income out of an affiliate with a loss than would be expected if the affiliate were profitable. With more aggressive tax planning, a firm may even shift income from profitable affiliates into unprofitable affiliates, reporting lower profit in the profitable affiliates and smaller losses in the unprofitable affiliates. We document empirical relations consistent with loss affiliates receiving income from profitable ones.

However, an income shifting strategy that explicitly incorporates the lower tax rates of unprofitable affiliates is not costless. Efficient transfer pricing strategies can be expensive to put in place and thus are often set over a multi-year period. Moving income to benefit from an unprofitable affiliate necessitates re-characterizing the nature of transactions or reorganizing the global supply chain. Each of these requires creation of supporting documentation, procurement of professional services/advice, and/or a reduction in the probability of sustaining a position on

[1] See for example, Collins, Kemsley and Lang (1998); Klassen, Lang and Wolfson (1993); Desai and Dharmapala (2006); Huizinga and Laeven (2008); Weichenrieder (2009); Klasssen and Laplante (2012); Dharmapala and Riedel (2013); Dharmapala (2014); and Dyreng and Markle (2014). Consistent with many of these studies, we use reported book (financial statement) income as a proxy for taxable income.

audit. However, affiliate losses may be relatively short lived as the affiliate often either returns to profitability or ceases operation.[2] Further, firms must consider both the current and the *projected* tax-paying status of affiliates to employ this strategy. Whether the tax savings from this strategy outweigh the costs necessary to change from the "traditional" strategy is an empirical question.

Our paper uses affiliate-level data on multinational firms to explore responses to the income shifting incentives generated by unprofitable affiliates. To include unprofitable affiliates in the traditional logged Cobb-Douglas profit prediction model, we follow Claessens and Laeven (2004) and measure profitability as return on assets plus one. We estimate a model that specifies affiliate profitability as a function of labor; assets; productivity; macroeconomic, industry-level, and firm-level shocks; and tax-related factors on a sample that includes unprofitable affiliates.

We first examine the relation between affiliates' reported pre-tax earnings and jurisdictions' statutory tax rates. This relation is expected to be negative in the presence of income shifting (Hines and Rice, 1994). Consistent with prior literature using only profitable affiliates, we estimate that a one standard deviation increase in the statutory tax rate of profitable affiliates is associated with a 3.9 percent decrease in profitability reported by the average profitable affiliate. We hypothesize that this relation will be less negative, or even positive, for affiliates with losses or very small profits (which we define as profit less than 1.5 percent of assets). We estimate positive coefficients on the interactions of the statutory tax rate with indicators for losses and for very small profits. Further, we estimate that a one standard deviation increase in the statutory tax rate of unprofitable affiliates is associated with a 2.4 percent *increase* in profitability reported by the average unprofitable affiliate. Overall, our point estimates imply that a loss in an average-sized affiliate, with assets of $111M, facing the average

[2] It is possible for a multinational to continue to operate an affiliate with structural losses due to strategic or other reasons. In general, however, one would expect this to be rare.

statutory tax rate is associated with a difference in income shifting behavior of approximately $5.7M, from shifting out $2.9M of reported profit to receiving $2.8M of shifted profit. Thus, we show that the overall relation between statutory tax rates and pre-tax earnings for loss affiliates is positive, consistent with a strategy of shifting profits to loss affiliates, on average.

We next study the relation between affiliates' pre-tax earnings and affiliates' estimated *marginal* tax rates (Scholes, Wilson, and Wolfson, 1992). For unprofitable affiliates, we estimate marginal tax rates as the jurisdictions' statutory tax rate multiplied by a discount rate that is a function of jurisdictions' loss carryover policies, the recent profit history of the affiliate (its ability to benefit from loss carryback, if allowed), and the expected future profitability of the affiliate (its ability to benefit from loss carryforward, if allowed).[3] Because profitable affiliates have a marginal tax rate equal to the statutory rate, we estimate the same relation for profitable affiliates as that described above. However, the response of unprofitable affiliates to the marginal tax rate is larger than that observed for the statutory rate: a one standard deviation increase in the estimated marginal tax rate of unprofitable affiliates is associated with a 6.3 percent *increase* in profitability reported by the average unprofitable affiliate. This suggests that multinational firms react to the incentives provided by the marginal tax rate, consistent with managers taking the expected value of losses into account when setting intercompany transfer prices.

This paper is in the spirit of Gramlich, Limpaphayom, and Rhee (2004) and Onji and Vera (2010), who both study income shifting among Japanese keiretsu members. Both papers document a lower incidence of losses in affiliated members relative to unaffiliated members,

[3] Consistent with many income shifting studies, we use reported book (financial statement) income as a proxy for taxable income (Claessens and Laeven 2004; De Simone 2015; Dharmapala and Riedel 2013; Hines and Rice 1994; Huizinga and Laeven 2008; Klassen, Lang and Wolfson 1993; Klasssen and Laplante 2012; Markle 2015).

suggesting affiliated groups band together to save keiretsu-level income taxes.[4] We contribute to this literature by using a cross-border setting that allows us to exploit variation in tax rates and heterogeneous affiliate tax characteristics to estimate an affiliate-level marginal tax rate. Importantly, we are the first to use a cross-border sample to test tax-motivated "shift-to-loss"[5] income shifting and thus are the first to document that the presence of loss affiliates affects the profitability of affiliated firms.

This study informs policy makers who, in light of increased multinational income shifting and the recent economic downturn, are debating how to curb tax base erosion and profit shifting (OECD, 2013; Saint-Amans and Russo, 2013). By focusing on temporary changes to the multinational corporation's income shifting incentives, our research provides valuable insight into the costs of temporarily altering transfer prices. Our evidence that firms will respond to temporary tax-minimizing opportunities contributes to policy maker analyses of altering tax policies targeted at multinational corporations, such as repatriation tax holidays, temporary tax incentives for foreign direct investors, and patent boxes.

Furthermore, our results inform public economists regarding the semi-elasticity of reported income with respect to changes in statutory tax rates. Our paper suggests that, by using samples of profitable affiliates only, previous estimates of the magnitudes of income shifting in response to tax rate changes should be considered a lower bound.[6] Some shifting by profitable affiliates goes to unprofitable affiliates, rather than to low-tax profitable affiliates. By omitting

[4] This result is also consistent with risk sharing if profitable affiliates absorb unfavorable outcomes of loss members, rather than profitable members using the tax losses of unprofitable members. Kim and Yi (2006) document earnings management in affiliated Korean firms ("chaebols"), consistent with risk-sharing-motivated income shifting.

[5] We use the term "shift-to-loss" to indicate transfer pricing that is altered in the presence of or upon the expectation of an unprofitable affiliate. As described above, a shift-to-loss strategy could involve shifting profit from a profitable affiliate to an unprofitable affiliate or shifting less profit out of an affiliate that is expected to be unprofitable.

[6] Results in the concurrent working paper Hopland, Lisowsky, Mardan and Schindler (2014), who empirically examine levels of payments between affiliated firms in Norway, also support an understatement of sensitivity of transfer prices to tax rate changes in prior literature.

unprofitable affiliates, the estimates include the muted effect to tax rate differences for these affiliates. Our analysis is particularly helpful for policy analyses that involve discrete changes in or large differences between statutory tax rates. Our estimates for unprofitable affiliates provide a lower bound of the effect size for these analyses, as described more fully below.

Similarly, this study suggests that our understanding of the jurisdictions that benefit from or are injured by profit shifting is not complete. Although low-tax jurisdictions generally benefit from income shifting, our results suggest that low-tax jurisdictions also lose expected tax revenues during periods when trading-partner jurisdictions experience economic decline. During such periods, affiliated groups could shift income to unprofitable affiliates instead of affiliates located in low-tax jurisdictions, or even shift income out of profitable affiliates located in low-tax jurisdictions into unprofitable affiliates. Previous research demonstrates income shifting from high-tax to low-tax jurisdictions, which suggests that high-tax revenue authorities should focus their audit efforts on transactions with related parties in low-tax jurisdictions.[7] Our results suggest that revenue authorities should also be concerned about affiliates shifting income out of their jurisdiction into unprofitable affiliates.

Our results also inform researchers. First, researchers should consider the impact of this alternative tax-reducing transfer pricing strategy. Many income shifting studies use aggregated affiliate profits and losses (i.e., consolidated financial statement data), which confounds the two types of income shifting strategies by combining a number of potentially-conflicting transfer pricing incentives.[8] Other income shifting studies restrict their sample to profitable affiliates.[9] The removal of unprofitable affiliates does not fully address the concern, though, because the

[7] See Collins et al. (1998), Clausing (2006, 2009), and Klassen and Laplante (2012).

[8] High-tax profitable affiliates have an incentive to shift income out of their jurisdictions even as high-tax unprofitable affiliates may be recipients of shifted income. Low-tax profitable affiliates are likely to receive shifted income, but in the presence of an unprofitable affiliate, they may also shift income out to the unprofitable affiliate.

[9] For example, Power and Silverstein (2007), Blouin, Robinson and Seidman (2014), De Simone (2015), Markle (2015).

effect of shifting to unprofitable affiliates is also reflected in lower profitability of profitable affiliates. Second, researchers may find our affiliate-level marginal tax rate measure useful as new data allow them to study tax-related questions at an increasingly detailed level.

Finally, this study deepens our understanding of the income shifting practices of multinational firms. Examining a new and economically significant income shifting setting helps answer the call to research in Shackelford and Shevlin (2001) to increase our ability to explain and predict income-shifting strategies beyond mere documentation. Additionally, Hanlon and Heitzman (2010) point out that researchers understand little about how the existence of a loss affects firm behavior. We show that both the potential current period benefit and the potential cost (of a foregone carryback or carryforward benefit) affect transfer prices, thus demonstrating that the existence of a loss significantly impacts this important aspect of firm behavior.

The paper proceeds as follows. Section 2 provides institutional background on how multinationals shift income as well as an overview of the literature on both cross-border income shifting behavior and the effect of losses on firm behavior. The third section develops hypotheses regarding the effect of an unprofitable affiliate on transfer pricing behavior and outlines a research design to test these hypotheses. Section 4 presents results, Section 5 discusses robustness checks we have performed, and Section 6 concludes.

2. BACKGROUND AND RELATED LITERATURE

2a. Income Shifting Background

The most effective income shifting strategies employ two components in concert with each other—an operational decision and an accounting decision. The operational decision entails tax-efficiently structuring the firm's global supply chain such that the affiliated parties to major intercompany transactions are strategically located. As such, multinationals often locate high-

return assets and activities in low-tax jurisdictions and relatively low-return activities in high-tax jurisdictions.[10]

Further, multinationals have incentives to choose prices for these intercompany transactions that optimizes the worldwide tax burden of the firm; this represents the accounting decision component. Transfer pricing guidelines for income tax reporting are established by the OECD, and have been adopted in some form by most European countries. These regulations prescribe that for the purposes of calculating taxable income, any intercompany prices for goods, services and intangibles should be those that would have been realized if the parties were unrelated, known as the "arm's length principle" (OECD, 2010). However, these arm's length prices can be difficult to observe, especially for services, unique intangibles, and unusual or unfinished products (PWC, 2006). This inability to always find exact market price matches for intercompany transactions leaves multinational entities some discretion in setting transfer prices. Further, although many multinationals strive to appropriately price a transaction during the course of the year, they can also make so-called "topside adjustments" to these prices after the financial books have been closed but prior to the filing of the tax return.[11] Thus, the accounting decision for how and when to set the transfer price of an intercompany transaction is flexible and relatively nimble when compared to the operational decision.

When a multinational firm realizes an affiliate will likely earn a loss, the multinational has a number of options to consider. First, the affiliate could simply report the loss as earned. If its jurisdiction allows loss carryback and it was profitable during the allowed carryback period, the reported loss will generate an immediate refund. If its jurisdiction does not allow loss

[10] Examples of high-return activities include the research and development of unique intangibles. Examples of low-return activities include contract manufacturing and limited-risk distribution.

[11] Because we rely on affiliate financial statement information, we are unable to measure the impact of these topside adjustments. However, topside adjustments bias against our tests detecting income shifting behavior.

carryback (or if it was not profitable during the allowed carryback period) but does allow loss carryforward, the reported loss will generate tax savings in the future if the affiliate returns to profitability. If the jurisdiction of the reported loss does not allow loss carryback or loss carryforward, the reported loss generates no tax benefit for the multinational firm. Thus, both the adjustment costs and the benefits are lowest under this option.

Second, in certain jurisdictions, the multinational firm may be able to consolidate across borders to allow a loss in one jurisdiction to offset profit in another jurisdiction. For example, France and Denmark have long-standing cross border consolidation policies with other EU member states. However, due to system limitations such as long lock-in periods and the inability to selectively consolidate only certain affiliates, few multinational companies take advantage of them.[12] This suggests that use of current cross border consolidation policies is relatively costly.

Third, the multinational firm can undertake real activities at the affiliate to minimize the loss.[13] For example, the multinational could move research and development activities to a more profitable affiliate or, as a more extreme example, move a physical factory from one jurisdiction to another. This option likely entails significant adjustment costs and will result in a less tax-efficient structure in the future, assuming the unprofitable affiliate returns to profitability.

Finally, the multinational can adjust transfer prices to minimize the reported loss. Because transfer prices have some inherent flexibility, a multinational could potentially reduce taxes using a traditional strategy when all affiliates are profitable, but change to a shift-to-loss strategy when losses occur in some affiliates. This is the behavior we aim to study.

[12] For example, through 2005, only 13 French companies had opted for cross border consolidation (Dorsey & Whitney LLP, 2006).

[13] We assume that the aggregate level of the multinational's activities was optimal but that its allocation of these activities to affiliates was not. Thus, in our setting, activities are moved rather than decreased.

The inherent flexibility in transfer prices arises because market prices for intercompany transactions can be difficult to observe. Firms generally construct a range of prices based on inexact "comparables," or companies with a similar business profile. Most countries accept any price within the range generated using such methods, and as such, firms often choose the most tax-favored endpoint of the range.

For example, firms with a high-tax affiliate that is purchasing services from a low-tax affiliate will choose a price at the high end of the range to minimize profits in the relatively high-tax jurisdiction and maximize profits in the relatively low-tax jurisdiction. If the high-tax affiliate instead earns a loss, it has several options. First, and most commonly, the firm can choose a transfer price at the other end of the range to minimize the reported loss. Second, the firm can adjust its search for independent comparable transactions in order to expand the range to include a new, more favorable endpoint. Finally, if necessary, the firm can identify risks borne by the unprofitable affiliate that resulted in the loss (e.g., foreign currency exchange or product failure risk), or other previously uncompensated transactions that the affiliate is party to, and compensate the affiliate for that previously un-priced contribution. However, this last option potentially sets a precedent for less tax-favored outcomes in profitable years.

2b. Related Literature

The literature abounds with evidence that firms reduce income taxes by shifting taxable income from relatively higher-tax jurisdictions to lower-tax jurisdictions. Grubert and Mutti (1991) exploit the relation between profitability and the tax rate as a measure of income shifting and variants of their research design are often used in the literature. For example, Klassen, Lang, and Wolfson (1993) use a similar methodology to study changes in income shifting behavior in response to tax rate changes, while Hines and Rice (1994) employ the research design to study

the use of tax havens. The approach of Hines and Rice has become common as a general model of multinational income shifting (Dharmapala, 2014).

Alternative methods for studying tax-motivated income shifting behavior have also been developed. Jacob (1996) considers the volume of intrafirm trade as a measure of income shifting flexibility and shows that tax savings are related to the volume of intrafirm trade. Clausing (2006) finds that the price of intrafirm transactions and trading partners' tax rates are strongly related in a manner consistent with tax-motivated transfer pricing. Overesch (2006) uses intercompany accounts receivable (A/R) to indirectly measure intrafirm prices and shows that the intercompany A/R of foreign-owned German subsidiaries with a loss carryforward is less sensitive to the tax rate differential (between the foreign parent and German subsidiary) than is the intercompany A/R of foreign-owned German subsidiaries without a loss carryforward. Bernard, Jensen, and Schott (2008) find that the prices that U.S. exporters charge arm's-length customers are significantly higher than the prices that they charge related-parties, and that this price wedge is greater for exports to countries with lower tax rates or with higher import tariffs.

While there is ample evidence of tax-motivated income shifting by multinational firms, the literature has largely focused on the benefit of shifting income from higher-tax affiliates to lower-tax affiliates and ignored the benefit of shifting income from a profitable affiliate to an unprofitable affiliate.[14] Because the presence of an unprofitable affiliate can alter the income shifting incentives of relatively low-tax profitable affiliates, this omission may have a profound effect on measurement of income shifting. Although Klassen et al. (1993) discuss the difficulty in measuring the tax incentives of unprofitable firms and the potential confounding effect losses

[14] Much of the tax-motivated income shifting research excludes unprofitable foreign affiliates or unprofitable foreign groups from analysis. However, this does not always address the problem because the effect of unprofitable affiliates should be reflected in the profitability of profitable affiliates, which often remain in the sample. Additionally, research that is only able to measure aggregated foreign versus domestic income, rather than that of specific affiliates, treats the income-shifting incentives of unprofitable affiliates the same as those of profitable affiliates.

have on tax-motivated income shifting behavior, to our knowledge, only Gramlich et al. (2004) and Onji and Vera (2010) attempt to test the effect of unprofitable affiliates on reported profits.[15]

Both Gramlich et al. (2004) and Onji and Vera (2010) find that members of Japanese keiretsu groups (member firms) appear to alter their transfer pricing behaviors in the presence of loss members. Although these results support loss-related income shifting, their data sets do not allow the variation in tax rates necessary to directly study the relation between tax rates and profitability. Further, the costs and benefits of shifting income between keiretsu members will differ from those associated with foreign affiliates in a commonly-controlled group.

In a concurrent study that complements ours, Hopland et al. (2014) examine the levels of intercompany payments between affiliated firms in Norway in the presence of affiliates with a loss. They find evidence consistent with some transfer prices being flexible enough to mitigate affiliate losses.[16] By studying reported book profits in a multinational setting, our study both increases the external validity of their findings and provides evidence that the financial accounts of multinational firms also respond to affiliated losses.

While the tax-motivated income shifting literature has largely ignored the impact of losses on cross-jurisdictional income shifting, the effect of losses on other types of tax efficient behavior has been studied. For example, Mackie-Mason (1990) finds that firms with loss carryforwards are significantly less likely to issue debt than firms without loss carryforwards. More recently, Edgerton (2010) shows that firms with loss carryforwards elect bonus depreciation less frequently than fully taxable firms. In addition, De Simone, Robinson, and

[15] Overesch (2006 and 2009) both tangentially discuss the potential effects of losses on tax-motivated income shifting but neither explicitly investigates the impact of losses on inferences. While the literature on risk-sharing (for example, Chang and Hong, 2000; Khanna and Yafeh, 2005; and Kim and Yi, 2006) inherently studies the effects of unprofitable affiliates on affiliated groups, it primarily does so from a non-tax angle.

[16] Specifically, this study finds that loss affiliates exhibit lower net outgoing transfer payments relative to profitable affiliates, and that this reduction appears to stem from intercompany transfers for intangibles (rather than tangible goods or debt) via topside, tax-only adjustments. These types of adjustments are made to tax accounts only and are made after the financial books are closed but before the tax return is filed.

Stomberg (2014) provide evidence that firms are less likely to be tax aggressive if they have significant loss carryforwards. These studies suggest that the tax shield provided by additional deductions or aggressive exclusions is less desirable for firms with tax losses than for firms without tax losses.

A related literature incorporates the marginal tax rate of the firm as the independent variable of interest. Marginal tax rates, the expected present value of additional taxes on an additional dollar of current period income, generally differ from statutory rates in the presence of losses. Shevlin (1990) proposed a simulation method to estimate these rates, simplified by Manzon (1994), and further improved by Graham (1996). These latter two studies explore the relation between debt and firms' tax rates. Our work differs from these studies because we posit that losses alter the tax planning strategy rather than simply lessening the tax planning incentives. In that sense, our approach is more like Erickson, Heitzman, and Zhang (2012) and Maydew (1997) who find evidence of tax-motivated inter-temporal loss shifting.

We connect these two lines of literature by more directly studying the impact of losses on cross-jurisdictional tax-motivated income shifting behavior. To do so, we develop a method to estimate the expected income of unprofitable affiliates. We then examine the relation between unexplained profits and the benefits of employing a shift-to-loss strategy.

3. CHANGE IN INCOME SHIFTING WITH A LOSS AFFILIATE

3a. Model and Hypothesis

In a multinational group comprised exclusively of profitable affiliates, the traditional strategy of shifting income from high-tax affiliates to low-tax affiliates reduces worldwide taxes. This paper suggests that the presence of unprofitable affiliates temporarily confounds these traditional income shifting incentives both by providing high-tax profitable affiliates additional,

potentially tax-minimizing recipients of shifted income and by altering the incentives of lower-tax affiliates. Essentially, unprofitable affiliates face a reduced marginal tax rate, potentially zero. Low-tax affiliates continue to have an incentive to receive shifted income but now also have potential zero-tax recipients to whom they can shift income.

Hines and Rice (1994) develop a model in which each affiliate in a corporate group reports a pre-tax profit, π_i, that is the sum of the pre-tax profit from the economic activity in the affiliate, ρ_i, the amount of profit shifted into or out of the affiliate, ψ_i, and the cost of any shifting, $a/2 \times \psi_i^2 / \rho_i$. ψ_i would be positive for low tax-rate affiliates and negative for high tax affiliates. Algebraically, this is represented as follows:

$$\pi_i = \rho_i + \psi_i - \frac{a}{2}\frac{\psi_i^2}{\rho_i} \tag{1}$$

This approach is in the spirit of the "all parties, all taxes, all costs" framework of Scholes et al. (1992) in that it attempts to separately identify the benefits and the costs associated with shifting income to an affiliate. In equilibrium, the firm maximizes overall profit, the sum of after-local-tax profits of all its affiliates. They assume profits will not face repatriation taxes and that total profits shifted among affiliates is constrained to be less than or equal to zero.

Because Hines and Rice (1994) estimate their model at the jurisdiction level, aggregating the affiliates of all U.S. companies in the jurisdiction, they do not estimate the income shifted by a particular affiliate. Huizinga and Laeven (2008), however, use this same model to estimate the equilibrium shifting at the affiliate level. Huizinga and Laeven (2008) show that the equilibrium profits shifted to or from jurisdiction *i* is

$$\psi_i = \frac{\rho_i}{a\left(1-\tau_i\right)} \times \frac{\sum_{k \neq i} \frac{\rho_k}{\left(1-\tau_k\right)}\left(\tau_k - \tau_i\right)}{\sum_{k=1}^{n} \rho_k / \left(1-\tau_k\right)} \tag{2}$$

where τ_i is the statutory tax rate in jurisdiction *i*. The fraction of the jurisdiction's income that is shifted is based on the cost parameter, *a*, the jurisdiction's tax rate, τ, and the weighted average of the difference in the jurisdiction's tax rate relative to each of the other jurisdictions' tax rates.

The model does not distinguish between profitable and loss affiliates, that is whether ρ_i is positive or negative; however, since the tax rate is typically the statutory tax rate and a negative value of ρ_i would yield a negative weight, empirical estimates based on this model employ profitable affiliates only (e.g., Huizinga and Laeven, 2008). To analyze the change in equilibrium income shifting if the affiliate in country *j* has losses, we examine the effect of a discrete decrease in the tax rate for affiliate *j*.[17] That is, we assume losses will lower the net present value of taxes paid by the affiliate. To address the challenges that the above model faces in the presence of a loss affiliate, we make two changes to the cost of shifting. First, we replace pre-tax profit, ρ_i, as the driver of the cost of income shifting with K_i, where K_i represents economic activities such as capital or labor. This is consistent with recent proposals from the OECD that suggest that it is economic activity in the jurisdiction that is the standard of how much profit is reasonable in that jurisdiction. Second, we model the cost of shifting as not tax deductible, consistent with an alternative specification considered by Huizinga and Laeven (2008).[18] With these two changes, the equilibrium shifting for the affiliate in country *i* becomes the following:

[17] Throughout the remainder of this section, if an affiliate has a loss, we denote the loss affiliate as being in jurisdiction *j*.

[18] In footnote 5, the authors state that the specification in which costs are not tax deductible, as in equation (3) here, obtains quantitatively similar results to their main specification. Non-deductible costs of income shifting include centrally borne compliance costs (not charged out to the affiliate) as well as potential penalties.

$$\psi_i = \frac{K_i}{a} \times \frac{\sum_{k \neq j} K_k \left(\tau_k - \tau_i \right)}{\sum_k K_k} \tag{3}$$

If the affiliate in jurisdiction *j* suffers a loss, we assume that the loss affects the expected present value of the tax rate for this affiliate, which we denote τ_j^L. We assume that the affiliate's capital, and therefore its cost of shifting, are unaffected by the loss. The resulting change in equilibrium shifting at the unprofitable affiliate that results from the loss is as follows:

$$\psi_j^L - \psi_j^P = \frac{K_j}{a} \times \left(\tau_j - \tau_j^L \right) \tag{4}$$

where the shifting superscripts denote a loss, *L*, or profit, *P*. This difference is positive, leading to the expectation that the amount shifted to a loss affiliate, and thus the reported profits in a loss affiliate, will be higher because the loss reduced its tax rate. If τ_j^L is a constant, e.g., zero, affiliates with higher statutory tax rates prior to becoming unprofitable experience larger changes in statutory tax rates than affiliates in relatively low-tax jurisdictions.[19] Consistent with this logic, equation (4) is increasing in the tax rate τ_j and a higher statutory tax rate in the loss affiliate's jurisdiction amplifies the adjustment to reported profits.

The Appendix provides numerical examples of the effect of a loss affiliate on income shifting. Given an assumed cost structure of income shifting (costs are quadratic, $a = 10$), these examples demonstrate that when an affiliate becomes unprofitable more income is shifted into that affiliate. That is, looking down the Cases in the Appendix, the amount of income shifted into the loss affiliate, *j*, increases when it has losses, as operationalized by a reduction in tax rate τ_j.

[19] A tax rate for loss affiliates of zero is consistent with either affiliates in jurisdictions that do not allow consolidation, loss carryback or loss carry forward, or with affiliates that do not have fact patterns that will provide a benefit when these provisions are allowed (i.e., no profitable affiliate with the same direct parent in the jurisdiction, losses during the carryback period and expected losses during the carry forward period). We relax this assumption in H2. The same positive relation exists if τ_j^L is a constant proportion of τ_j.

The foregoing is the basis for our first hypothesis:

H1: *The magnitude of the unexplained profit is less negatively associated with the statutory tax rate in the loss affiliate's country.*

To formulate hypothesis H1, we assumed τ_j^L was a constant. However, equation (4) specifies the income shifting adjustment as a function of the difference between the regular tax rate in the jurisdiction, τ_j, and the net present value of the tax rate faced by profits shifted to the loss affiliate, τ_j^L; that is, how large is the difference, $\tau_j - \tau_j^L$. Thus, we next consider that there are differences in the benefits of shifting income to a particular affiliate or within a particular firm and specify cross-sectional hypotheses that derive from such differences. In particular, we consider that τ_j^L varies because the benefit of using the unprofitable affiliate's loss by having it receive shifted income differs depending on whether the affiliate expects to receive some benefit from the un-shifted loss. For example, if carryback is allowed and if the affiliate was profitable during the carryback period, the availability of a carryback refund increases the affiliate's marginal tax rate. Additionally, if carry forward is allowed and the affiliate is expected to be profitable in the near future, the affiliate will be able to recover some of the loss in the form of future income savings.[20] We expect to observe less shifting into the loss affiliate (out of the profitable affiliate) when the marginal tax rate is higher.

H2: *The magnitude of the unexplained profit is negatively associated with the marginal tax rate of the unprofitable affiliate.*

Because extant research on income shifting has used profitable affiliates only, as described above, the statutory tax rate and the marginal tax rate are theoretically the same. While differences might exist due to tax credits or tax holidays, these are difficult to measure

[20] These conditions essentially capture when losses arise unexpectedly (when the affiliate was profitable in the recent past but is not profitable currently) and/or when losses are transitory (when the affiliate is not profitable currently but is expected to be profitable in the near future).

empirically and are likely to have little impact absent losses. However, in a setting where unprofitable affiliates are also considered, the marginal tax rate and the statutory tax rate will differ to an extent that their effects may be incrementally examined.

3b. Research Design and Variable Definitions

To estimate their models, Hines and Rice (1994) and Huizinga and Laeven (2008) apply the Cobb-Douglas production function to estimate the profits associated with the economic activity in the jurisdiction.

$$\rho \approx Q - wL = (1 - \beta_3) c K^{\beta_2} L^{\beta_3} A^{\beta_4} e^{u} \tag{5}$$

where ρ is the profit before shifting as in equation (1). Applying log transformations to both sides of equation (6) and incorporating equilibrium income shifting, as specified in Section 3a, yields the following estimation equation:

$$\log \pi_i = \beta_1 + \beta_2 \log K_i + \beta_3 \log L_i + \beta_4 \log A_i + \beta_5 \tau_i + u_i \tag{6}$$

where K_i is jurisdiction capital, L_i is jurisdiction labor, A is a measure of productivity, and τ_i is jurisdiction tax rate (or a broader measure of tax incentive for the affiliate; e.g., C in Huizinga and Laeven, 2008).[21] The model above is commonly used in the income shifting literature. However, it is not conducive to a study of unprofitable affiliates because of its log specification.

Claessens and Laeven (2004) avoid this limitation by specifying π_i as return on assets (ROA) plus one. We employ this approach, scaling the production function in equation (5) by

[21] Variation in explained profit associated with the tax rate of the foreign affiliate is attributed to either income shifting or implicit taxes. A negative coefficient on τ_i suggests that higher rates leads to lower profitability. This result is attributed to income shifting—firms report less taxable profit in higher tax jurisdictions and more taxable profit in lower tax jurisdictions to minimize income taxes. A positive coefficient on τ_i suggests that higher rates lead to higher profitability and is attributed to implicit taxes; under perfect competition, total costs should equalize so that jurisdictions with higher (lower) tax will have lower (higher) non-tax costs resulting in higher (lower) π_i.

assets and adding one to the dependent variable before taking logs.[22] This specification allows us to estimate our regressions on a sample that includes both profitable and unprofitable affiliates.

We add to the model variables intended to capture economic shocks because the Cobb-Douglas production function assumes all factors of production and their effects on output are positive. To realize a pre-tax loss, some element of the affiliate or its environment must provide the negative influence. Because the model below does not allow the tax rate to vary with profitability and the large majority of observations in our sample are profitable, it essentially estimates profit (or loss) given traditional income shifting incentives.

$$\ln(\pi_i + 1) = \beta_0 + \beta_1 * \ln(Capital) + \beta_2 * \ln(Labor) + \beta_3 * Productivity + \beta_4 * Shock + \beta_5 * TaxRate + \beta_6 * VSP + \beta_7 * Loss \quad (7)$$

We estimate this model on a sample of European affiliates. All variables are from the Amadeus database unless otherwise noted. Profit, π_i, is ROA, computed as *EBIT* divided by total assets (*TOAS)*. Following Huizinga and Laeven (2008), *Capital* is tangible fixed assets reported on the balance sheet (*TFAS*) and *Labor* is compensation expense reported on the income statement (*STAF*). *Productivity* is defined as the median ROA by two-digit NACE industry-country-year, calculated using all affiliated and independent firms. The three *Shock* variables we include are *ΔGDP*, *ΔMktSize*, and *Log(Age)*.[23] *ΔGDP* is the percent change in country-year GDP per capita; GDP is as reported by the European Commission. *ΔMktSize* is the country-industry-year sum of all affiliate and standalone sales in year *t* less the sum in year *t*-1, scaled by 1,000,000. *Age* is year *t* less the first year the affiliate appears in the Amadeus database. We measure *TaxRate* as either *STR*, the country-year statutory tax rate, or *MTR*, an affiliate-year

[22] Scaling p_i in equation (5) by assets results in ROA on the left-hand-side of the equation. Scaling the right-hand-side of equation (5) by assets changes the exponent on K_i from β_2 to $(\beta_2 - 1)$.

[23] We use median industry-country-year ROA as the measure of productivity instead of GDP because we include change in GDP as a proxy for economic shock. In earlier versions, we also included the change in market size of the affiliate; however the coefficient on this variable was not statistically significant at conventional levels and so we removed it.

estimated marginal tax rate which we describe in detail later in this section. To avoid multicollinearity when interactions are introduced, the tax rate variables are mean centered (Guenther and Sansing, 2010; Aiken and West, 1991.) All measures are calculated at the affiliate-year, firm-year, or country-industry-year level using Bureau van Dijk's Amadeus database.

We consider affiliates with very small levels of profit separately from both unprofitable and profitable affiliates for two reasons. First, affiliates reporting a small profit may have been unprofitable if not for a shift-to-loss income shifting strategy.[24] Consistent with this, Onji and Vera (2010) find a discontinuity in the probability distribution of affiliate profits in a small range of ROS near zero. To acknowledge this possibility, we include a two indicator variables: *VSP* equals one if *EBIT* is greater than zero but less than 1.5 percent of net sales and *Loss* equals one if *EBIT* is less than zero.[25]

To test hypothesis H1, we interact *VSP* and *Loss* with *STR*, as below:

$$\ln(\pi_i + 1) = \beta_0 + \beta_1 * \ln(Capital) + \beta_2 * \ln(Labor) + \beta_3 * Productivity + \beta_4 * Shock + \beta_5 * TaxRate + \beta_6 * VSP + \beta_7 * Loss + \beta_8 * VSP * TaxRate + \beta_9 * Loss * TaxRate \quad (8)$$

H1 predicts a positive coefficient for β_9. Though we do not formally hypothesize the relation between reported profits and the interaction of *VSP* and *TaxRate,* we do expect that the coefficient on β_8 will be positive and smaller in magnitude than the coefficient on β_9.

To test hypothesis H2, we must first estimate the marginal tax rate for each affiliate. The marginal tax rate is the statutory tax rate multiplied by the affiliate-year expected present value of taxable income on an incremental dollar of current period income (Shevlin, 1990). Thus, to estimate this expected present value, which we refer to as *MTR_Factor*, we need to estimate

[24] This approach also captures the fact that some jurisdictions impose a minimum profitability constraint on controlled foreign affiliates.

[25] As described in footnote 25, we reclassify 4 percent of observations based on additional data from surrounding years.

when the affiliate will next pay taxes (i.e., when it will have used up any loss carryforwards). Because taxes are currently payable for profitable affiliates without a loss carry forward, the *MTR_Factor* equals one for these affiliates, by definition.

It is challenging to estimate affiliates' *MTR_Factor* because simulation procedures like Shevlin (1990) require a significant time series of data and such data are infrequently available at the affiliate level. Thus, we simplify the procedure but maintain its spirit. We first compute the losses carried forward using the two prior years of earnings because affiliates do not disclose their loss carry forward position. This calculation yields an estimate of the current stock of loss carryforwards. We next need to project the future earnings pattern. To do so, we assume perfect foresight for the short run and use the linear trend in profits calculated over two windows: t = −1 to t = +1, and t = 0 to t = +2. The maximum trend generated from these two periods becomes the basis for our future earnings trend. We use the maximum trend both because it provides a conservative estimate of the persistence of a loss and because it allows us to include as many observations as possible by offering two time periods to satisfy the requirement of three consecutive years of data. Finally, we combine the loss carryforward amount, the current period loss (if any), and the trend in earnings to estimate the year in which the affiliate will fully use up prior losses and will begin to pay tax. If this period exceeds the permitted country-specific tax loss carry forward period, the *MTR_Factor* is set to 0; otherwise, the period is used in combination with a discount rate of 5 percent to estimate the *MTR_Factor*.[26] The marginal tax rate, *MTR*, is *STR* x *MTR_Factor*.

[26] *MTR_Factor* = 1/(1+0.05)^t_n, where t_n is the year in which the firm has taxable income again. We also use *MTR_Factor* to broaden the definitions of *VSP* and *Loss* slightly in order to better align observations with mixed incentives. Specifically, for observations with ROS > 1.5 percent but a negative profit slope over the recent past, we set *VSP* = 1. This affects 1,772 observations and means that some affiliates in the *VSP* sample actually reported a larger profit, but all affiliates in the "large profit" sample have an *MTR_Factor* equal to 1. Second, for observations with EBIT < 0 but a positive profit slope over the recent past and no accumulated losses, we reset *Loss* = 0, thus including them in the "large profit" sample. This affects 621 observations, and results are robust to not performing

We test hypothesis H2 in two ways. First, we define *TaxRate* as *MTR* in equation (8). Assuming that *MTR* is a better proxy for the incentives to which corporate managers respond, the coefficient on MTR should be at least as strong as that on *STR*. Thus, H2 predicts a positive coefficient for β_9, a positive coefficient on β_8 that is smaller in magnitude than the coefficient on β_9, and that β_9 estimated using *MTR* will be larger in magnitude than β_9 estimated using *STR*.

Second, we revisit equation (4), which specifies the change in equilibrium income shifting given a loss as a function of $(\tau_j - \tau_j^L)$, or the statutory rate less the marginal rate. Following this, we specify the regression as a function of (*STR*-*MTR*); we also include the main effects of *STR* and (1-*MTR_Factor*) in this specification because *MTR* is an interaction of *STR* and *MTR_Factor*. This specification allows us to estimate the effect of *STR*, and the incremental effect of the extent to which the affiliate's tax rate differs from *STR* due to the losses incurred.

3c. Sample

The Amadeus database contains financial and operating information on independent and affiliated European firms. We use unconsolidated company information from Amadeus over the period 2003 to 2012 for all tests. Our sample selection is detailed in Table 1.

(insert Table 1 around here)

Table 1 outlines that we limit our sample to controlled groups with at least one foreign affiliate with greater than 50 percent total (direct and indirect) ownership.[27] We require that both the parent and this foreign affiliate be located in Europe, where Amadeus includes more detailed information, and that the affiliate not be missing earnings before interest and taxes (Amadeus variable *EBIT*). These criteria yield a beginning sample of 222,461 affiliate-year observations.

---

this reclassification. Finally, results are not sensitive to using the two time periods rather than only the future time period, or to using the maximum trend rather than using the average trend.

[27] Ninety-nine percent of the affiliates in our sample are owned at least ninety percent.

To remain in the sample, we require an industry classification (NACE) code because we expect that profitability varies by industry and so include an industry-level shock measure. We exclude affiliated groups in banking and insurance industries because their profitability is less easily estimated using assets and compensation. We further require that the consolidated group be profitable, reporting a return on sales ($\sum PLBT/\sum REV$) of at least three percent, because consolidated losses create incentives to change the income shifting strategy that are unrelated to our research question (Stock, 2013).[28] For the purposes of estimation, we require tangible fixed assets (*TFAS*) and total assets (*TOAS*), and compensation expense (*STAF)* to be positive and we require all three measures of shock (ΔGDP, $\Delta MktSize$ and *Log(Age)*) for each affiliate. Finally, we require ROA to be greater than or equal to -1.0 and we require future earnings information to calculate marginal tax rate. Our final sample consists of 57,050 affiliate-years representing 1,301 unique controlled groups, of which *Loss*=1 for 9,245 affiliate-years, *VSP*=1 for 5,881 affiliate-years, and 41,924 affiliate-years are identified as profitable (*Loss*=0 and *VSP*=0).

3d. Summary Statistics

Table 2 presents summary statistics by country. The number of affiliate-years by country varies from 146 in Luxembourg to 8,028 in Italy. We also provide averages over the sample period 2003-2012 of key inputs to our country-year proxies. Average statutory tax rates vary by country from a low of 10 percent in Bosnia and Herzegovina and in Serbia to a high of 34 percent in and Belgium, Germany and Italy. Most countries do not allow a carryback and the maximum carryback period is three years (France). All sample countries except Estonia allow a carryforward of at least five years.

[28] We calculate consolidated return on sales for the affiliates in our sample, rather than use the consolidated figures available in Amadeus, to ensure that we appropriately measure the incentives and ability of the affiliates in our sample to achieve a shift-to-loss strategy. This approach also acknowledges that we do not have data for all affiliates in the corporate groups. However, results are robust to alternatively using consolidated figures to calculate the return on sales sample criterion.

(insert Table 2 around here)

Table 3 presents summary statistics for sample affiliate-years. Measures from affiliate unconsolidated financial statements are winsorized at 1/99 percent. As expected given our sample selection, sample affiliates report a positive ROA on average. Approximately 16 percent of the observations report a negative *EBIT* (*Loss*=1) while another 10.3 percent report $0 < \text{ROS} \leq 1.5$ percent (*VSP*=1). The average affiliate in our sample faces a statutory tax rate of 28.7 percent.

(insert Table 3 around here)

Panels B, C, and D present descriptive statistics for affiliates experiencing a loss, very small profit, and profit respectively. Comparing the panels in Table 3, the average unprofitable affiliate is smaller than the average profitable affiliate based on *Total Assets*, *Capital*, *Labor* and *Sales*.

Table 4 presents correlations between our income prediction variables. The correlation between *ln(Capital)* and *ln(Labor)* is positive and statistically significant at 0.593; though concerning, this is in line with prior literature.[29]

(insert Table 4 around here)

4. RESULTS

4a. Results of tests of hypothesis H1

To provide baseline information, we first estimate precursors to the profit prediction model specified in equation (7). Table 5 presents these regressions. On a sample of profitable affiliates, the Cobb-Douglas specification in column (1), using earnings before interest and taxes (*EBIT*) as the measure of output, estimates coefficients consistent with prior research.

[29] For example, Huizinga and Laeven (2008) report a correlation of 0.84 between Capital and Labor.

Specifically, *Capital*, *Labor* and *Productivity* are positively related to profitability as one would expect and the model achieves an R^2 of over 75 percent. When we measure output as *ROA*, we expect a negative coefficient on capital because we deflate both sides by *Capital* before taking logs, and the Cobb-Douglas exponent on capital is generally assumed to be less than one. Consistent with this expectation, we report a negative coefficient on *Capital* in column (2). *Labor* and *Productivity* remain positively related to profitability. Though all of the coefficients other than *Capital* remain identical between columns (1) and (2), the R^2 in column (2) falls dramatically to only 18 percent simply because the ratio *ROA* has significantly more variance relative to size than does the level *EBIT*.

(insert Table 5 around here)

Finally, columns (3) and (4) introduce (*ROA*+1) as the measure of profitability. A comparison of columns (2) and (3) demonstrates that the addition of one to the *ROA* decreases the magnitude of the coefficients, but does not change the sign or significance of them, nor does it change the fit of the model. However, adding one to *ROA* allows us to include unprofitable affiliates in the sample, and their inclusion, in column (4), significantly changes regression estimates. In particular, the importance of *Capital* and *Labor* is reduced whereas *Productivity* becomes more important to the model.

We test our two hypotheses in Table 6. To the model estimated in column (4) of Table 5, we add additional shock and intercept variables to improve the model's performance for loss affiliates in our hypothesis tests. Specifically, column (1) includes the *Shock* variables as well as the *Loss* and *VSP* indicators. This model implicitly estimates expected reported profit given traditional income tax shifting incentives and economic shocks. Consistent with prior income-shifting literature, the main effect of *STR* remains negatively related to profitability. As expected, we estimate negative coefficients on both the *Loss* and *VSP* indicators. By including these

indicators, the other variables better predict profitability. The inclusion of the *Loss* and *VSP* intercept variables, plus the interactions, increases the model's fit from an R^2 of 9.4% to 31.8%.

(insert Table 6 around here)

In column (2), we estimate the full model outlined in equation (8), which interacts the jurisdiction's statutory tax rate with *Loss* and *VSP* to test hypothesis H1. Though the main effect of *STR* remains significantly negative, the interaction of *STR* with both the *Loss* and *VSP* indicators are positive and statistically significant at the 1% level of statistical significance. Using the coefficients reported in column (2), we estimate that a one standard deviation increase in the statutory tax rate of profitable affiliates is associated with a 4.9 percentage decrease in profitability reported by the average profitable affiliate. The coefficient on the interaction of *STR* with *VSP* is smaller than the coefficient on the interaction of *STR* with *Loss*, as expected, but the overall relation between *STR* and reported profits for affiliates with very small profits remains significantly negative. We estimate that a one standard deviation increase in the statutory tax rate for this group is associated with a 5.4 percent decrease in profitability reported by the average affiliate with a very small profit.[30]

The positive coefficient on the interaction of *Loss* and *STR* is consistent with hypothesis H1. In contrast to both groups of profitable affiliates, a one standard deviation increase in the statutory tax rate of unprofitable affiliates is associated with a 2.4 percent *increase* in profitability reported by the average unprofitable affiliate. We estimate that a profitable affiliate with average assets ($111M) and facing the average statutory tax rate (28.7%) shifts

[30] The coefficient on *VSP*STR* mitigates the effect of *STR* for affiliates with very small profits by nearly two-thirds relative to profitable affiliates (-0.0934 for profitable versus -0.0301 for *VSP* affiliates), which suggests that affiliates with very small profits would experience a smaller decrease in profitability that profitable firms. However, though the distribution of the statutory tax rate is similar across the two groups, affiliates with very small profits, by construction, have smaller ROA than profitable affiliates. Thus, as a percentage change in ROA, the effect of a standard deviation increase in *STR* is larger for *VSP* firms (5.4 percent decrease) than for profitable firms (4.9 percent decrease).

approximately $2.9M of profit off its books, while an unprofitable affiliate of the same size receives $2.8M of shifted income, ceteris paribus. Together, these figures suggest that a change from profitability to a loss results in a change in reported profit of nearly $5.7M for the average affiliate.[31] Thus, results in column (2) suggest that the presence of an unprofitable affiliate alters reported profit consistent with a tax-motivated shift-to-loss income shifting strategy.

The estimate for unprofitable affiliates provides insight into the change in profits that results from a large discrete change in tax rates within a single country, or large differences in tax rates across countries (e.g., from the entering of a tax haven). Because the estimates involve affiliates that, if profitable, would face a tax rates equal to the statutory tax rate but now are assumed to face a tax rate that is much lower, the estimates do not represent a marginal effect inherent in extant methods (i.e., those based on Hines and Rice, 1994, and summarized in Dharmapala, 2014). However, because the losses are expected to be temporary, the shifting is expected to be muted relative to a permanent change in tax rates to zero. Thus, the estimates provide a lower bound on the income change that is introduced by a large difference in tax rates across affiliates. Thus, results in column (2) of Table 6 suggest that multinational firms respond to even temporary tax rate changes when those changes are large.

4b. Results of tests of hypotheses H2

We next test the effect of the estimated marginal tax rate on use of a tax-motivated shift-to-loss strategy. Columns (3) through (5) present results of estimating variations of equation (8), replacing *STR* with *MTR*. Results in columns (3) and (4) provide support for H2. As predicted, the main effect of *MTR* remains significantly negative and the interactions between *MTR* and *VSP* and *Loss* remain significantly positive.

[31] The estimate for each group of affiliates is calculated as: (exp(coefficient on *STR**mean *STR*)-1)*mean *TOAS*.

Comparing the main effect of *MTR* in column (3) to the main effect of *STR* in column (1), we estimate that the effect of *MTR* on reported affiliate profits is stronger than the effect of *STR* with respect to both economic magnitude and statistical significance. We estimate that a one standard deviation increase in the marginal tax rate of profitable affiliates is associated with a 4.9 percentage decrease in profitability reported by the average profitable affiliate, which is nearly identical to results estimated using the statutory tax rate.

However, estimated magnitudes of the change in reporting behavior in response to the marginal tax rate for the small profit and unprofitable groups are quite different from those estimated using the statutory tax rate. We estimate that a one standard deviation increase in the estimated marginal tax rate for the small profit group is associated with a 2.1 percentage increase in profitability reported by the average affiliate with a very small profit; this is a much larger response than that reported above for the statutory tax rate. Similarly, a one standard deviation increase in the estimated marginal tax rate of unprofitable affiliates is associated with a 6.3 percentage increase in profitability reported by the average unprofitable affiliate; this effect is more than 2.5 times the effect reported above for the statutory tax rate.[32] These findings suggest that managers respond to the incentives generated by *MTR*, and that the response to the marginal tax rate may be larger for unprofitable affiliates than to the statutory tax rate.

Results in column (5), which specifies the change in transfer pricing behavior as a function of *STR*, (*STR*-*MTR*) and (1-*MTR_Factor*) to mirror equation (4) from our model, present marginally significant results. Although we continue to estimate a significantly negative coefficient on *STR,* the coefficient on the difference between the statutory and marginal rates is

[32] Though we estimate a larger effect in percent shifted for both the profit and loss groups using *MTR*, we estimate that effect of a change from profitability to a loss is similar to that calculated using *STR*. Using the estimates described in footnote 30, we calculate that a change from profitability to loss for an average-sized affiliate facing the average *MTR* of 25.7 percent alters their reported profit by $5.1M.

not significantly different from zero. However, the positive coefficient is consistent with the negative influence of *STR* declining as the *MTR* differs from *STR* to a greater degree. To the extent that the coefficient on *STR-MTR* is larger than that on *STR*, this is evidence of income being shifted into the affiliate when the affiliate's *MTR* is zero. The coefficient on (1-*MTR_Factor*) is positive as expected but not significant. Our findings overall provide some support for H2 and confirm that the transfer pricing of multinational firms responds to both the statutory tax rate and the marginal tax rate.

5. ADDITIONAL TESTS AND ROBUSTNESS

To confirm the robustness of our results, we undertake a number of additional tests. First, we alternatively proxy for the tax incentives using an adaptation of *C*, a measure developed by Huizinga and Laeven (2008) to take into account the entire portfolio of tax rates faced by a firm and used in concurrent income shifting research such as De Simone (2015) and Markle (2015). In our study, *C* represents a capital-weighted differential tax rate of the affiliate relative to all related firms in the same multinational group-year. Both the sign and significance on these untabulated results are similar to those presented in Table 6.

We next test the sensitivity of our results to our treatment of affiliates with very small profits (*VSP*=1). First, we consider that affiliates with very small profits are indeed profitable and simply exclude the *VSP* indicator and its interaction with *TaxRate*. Inferences remain unchanged. Although we obtain the same signs, significance, and similar magnitudes of most variables, we obtain only one-tailed significance on the interactions between *Loss* and *STR* (estimated coefficient of 0.1302, t-statistic of 1.44) and between *Loss* and *MTR* (estimated coefficient of 0.1567, t-statistic of 1.47). Second, we consider that the subset of affiliates with very small profits likely includes affiliates that would have been unprofitable absent income shifting. We

instead assign them to the *Loss*=1 group and re-estimate results presented in Table 6. Results are consistent with those reported in Table 6. The estimated coefficient on the interaction between *Loss* and *STR* is 0.1204 (t-statistic of 1.96), and the estimated coefficient on the interaction between *Loss* and *MTR* is 0.1493 (t-statistic of 2.33); thus the coefficients on the interactions between *Loss* and *TaxRate* are smaller in magnitude but statistically significant at the 5% level (two-tailed). Finally, we simply omit affiliates with very small profits from the sample. Again, results are generally consistent with those reported in Table 6, although the interactions of interest lose some significance. The estimated coefficient on the interaction between *Loss* and *STR* is 0.1542 (t-statistic of 1.69), and the estimated coefficient on the interaction between *Loss* and *MTR* is 0.1763 (t-statistic of 1.65). Results are also robust to classifying affiliate-years as *Loss* or *VSP* using only *EBIT* and *ROS* (i.e., without reclassifying them based on *MTR*).

Another robustness test we undertake is aimed at ensuring results are not affected by our inability to observe data for all affiliates. Thus, we limit our sample to multinationals with only affiliates for which we have data. Imposing this restriction drastically reduces our sample to 8,487 affiliates. Nonetheless, estimating our tests on this sub-sample generates similar inferences as those reported in Table 6. We observe similar signs, magnitudes, and significance on most variables of interest except the interaction of *VSP* with *STR,* which remains positive (estimated coefficient of 0.0549) but is only significant at the 10% level (one-tailed t-statistic of 1.56)).

Finally, in untabulated tests we examine whether the presence of a loss affiliate in a multinational group-year biases the estimated effect of an affiliate's statutory tax rate on reported profits. Specifically, we re-estimate the first three columns (the EBIT > 0 specifications) reported in Table 5 but include a group-year indicator variable equal to 1 if the affiliate has a related unprofitable affiliate. We interact this indicator variable with *STR* to capture the change in the transfer pricing incentives of profitable affiliates in the presence of unprofitable affiliates. We do

not obtain significance on the interaction in any of the three regressions estimated. This is perhaps not surprising given that 85 percent of the profitable observations in our sample are affiliated with at least one unprofitable affiliate.

6. CONCLUSION

Our paper studies a tax-motivated income shifting strategy that exploits losses earned by unprofitable affiliates of a multinational group. By shifting income from profitable affiliates to unprofitable affiliates, multinational corporations can reduce their worldwide tax burden. However, there are considerable costs associated with this strategy. We provide evidence that the sign on the tax incentive variable for unprofitable affiliates reverses relative to profitable affiliates, suggesting that these affiliates report a significantly smaller loss than otherwise predicted and consistent with use of a shift-to-loss strategy. Next, we use historical loss and observed growth in pre-tax income to develop of a measure of the marginal tax rate by affiliate-year. Our results suggest that multinational firms react to the incentives provided by estimated marginal tax rates, consistent with managers taking a more nuanced approach to tax-motivated transfer pricing than has been previously documented. Together, these findings deepen our understanding of multinational income shifting strategies.

The estimation methods used in our study allow for the inclusion of unprofitable affiliates in future income shifting studies. Specifically, using return on assets plus one allows for the inclusion of most observable affiliate-years while keeping the traditional log-log specification used in many prior studies. Further, we include several proxies for economic shock that improve the explanatory power of the models when including unprofitable affiliates. Finally, we estimate an affiliate-year marginal tax rate that more accurately captures the tax incentive of each affiliate, which is especially relevant for unprofitable affiliates who are more likely to face a

marginal tax rate significantly different from the statutory tax rate. We look forward to future research using these methods, for example to explore how multinational firms shift profits to unprofitable affiliates or to consider the costs associated with undertaking such a strategy.

References

Aiken, L., and S. West, 1991. *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park, CA: Sage Publications.

Bernard, A. B., J. B. Jensen, and P. K. Schott, 2008. "Transfer Pricing by U.S.-Based Multinational Firms," Tuck School of Business Working Paper No. 2006-33 and US Census Bureau Center for Economic Studies Paper No. CES-WP- 08-29.

Blouin, J. L., L. A. Robinson and J. K. Seidman, 2014. "Conflicting Transfer Pricing Incentives and the Role of Coordination," University of Pennsylvania, Dartmouth College and University of Texas at Austin working paper.

Chang, S. J., and J. Hong, 2000. "Economic Performance of Group-Affiliated Companies in Korea: Intragroup Resource Sharing and Internal Business Transactions," *The Academy of Management Journal* 43(3): 429-448.

Claessens, S., and L. Laeven, 2004. "What Drives Bank Competition? Some International Evidence," *Journal of Money, Credit and Banking* 36(3): 563-583.

Clausing, K.A., 2006. "International Tax Avoidance and U.S. International Trade," *National Tax Journal* 59(2): 269-287.

Clausing, K. A., 2009. "Multinational Firm Tax Avoidance and Tax Policy," *National Tax Journal* 62(4): 703-725.

Collins, J., D. Kemsley, and M. Lang, 1998. "Cross-Jurisdictional Income Shifting and Earnings Valuation," *Journal of Accounting Research* 36(2): 209-229.

Desai, M.A., and D. Dharmapala, 2006. "Corporate Tax Avoidance and High-Powered Incentives," *Journal of Financial Economics* 79: 145-179.

De Simone, L., 2015. "Does a Common Set of Accounting Standards Affect Tax-motivated Income Shifting for Multinational Firms?" Forthcoming in *Journal of Accounting and Economics*.

De Simone, L., J. R. Robinson and B. Stomberg, 2014. "Distilling the Reserve for Uncertain Tax Positions: The Revealing Case of Black Liquor," *Review of Accounting Studies* 19(1): 456-472.

Dharmapala, D., 2014. "What Do We Know about Base Erosion and Profit Shifting? A Review of the Empirical Literature," University of Illinois working paper.

Dharmapala, D., and N. Riedel, 2013. "Earnings Shocks and Tax-Motivated Income-Shifting: Evidence from European Multinationals," *Journal of Public Economics* 97: 95-107.

Dorsey & Whitney LLP, 2006. "Marks & Spencer v Halsey: The Implications for Cross Border Loss Relief in the European Union," BNA Inc.

Dyreng, S. and K. Markle, 2014. "The Effect of Financial Constraints on Tax-Motivated Income Shifting by U.S. Multinationals," Duke University and University of Waterloo working paper.

Edgerton, J., 2010. "Investment Incentives and Corporate Tax Asymmetries," *Journal of Public Economics* 94: 936-952.

Erickson, M. M., S. M. Heitzman, and X. F. Zhang, 2012. "Tax-Motivated Loss Shifting," *The Accounting Review* 88(5): 1657-1682.

Graham, J., 1996. "Debt and the marginal tax rate." *Journal of Financial Economics* 41: 41–74.

Gramlich, J. D., P. Limpaphayom, and S. G. Rhee, 2004. "Taxes, Keiretsu Affiliation, and Income Shifting," *Journal of Accounting and Economics* 37(2): 203-228.

Grubert, H. and J. Mutti, 1991. "Taxes, Tariffs and Transfer Pricing in Multinational Corporate Decision Making," *Review of Economics and Statistics* 73(2): 285-293.

Guenther, D., and R. Sansing, 2010. "The Effect of Tax-Exempt Investors and Risk on Stock Ownership and Expected Returns," *The Accounting Review* 85(3): 849-875.

Hanlon, M. and S. Heitzman, 2010. "A Review of Tax Research," *Journal of Accounting and Economics* 50(2-3): 127-178,

Hines, J. R. and E. M. Rice, 1994. "Fiscal Paradise: Foreign Tax Havens and American Business," *The Quarterly Journal of Economics* 109(1): 149-182.

Hopland, A., P. Lisowsky, M. Marden, and D. Schindler, 2014. "Income Shifting Under Losses," Norwegian School of Economics, University of Illinois and University of Munich working paper.

Huizinga, H. and L. Laeven, 2008. "International Profit Shifting within Multinationals: A Multi-country Perspective," *Journal of Public Economics* 92(5-6): 1164-1182.

Jacob, J., 1996. "Taxes and Transfer Pricing: Income Shifting and the Volume of Intrafirm Transfers," *Journal of Accounting Research* 34(2): 201-312.

Khanna, T. and Y. Yafeh, 2005. "Business Groups and Risk Sharing around the World," *Journal of Business* 78(1): 301-340.

Kim, J. B., and C. H. Yi, 2006. "Ownership Structure, Business Group Affiliation, Listing Status, and Earnings Management: Evidence from Korea," *Contemporary Accounting Research* 23(2): 427-464.

Klassen, K. J., M. Lang, and M. Wolfson, 1993. "Geographic Income Shifting by Multinational Corporations in Response to Tax Rate Changes," *Journal of Accounting Research* 31(Supplement): 140-173.

Klassen, K.J., and S.K Laplante, 2012. "Are U.S. Multinational Corporations Becoming More Aggressive Income Shifters?" *Journal of Accounting Research* 50: 1245-1285.

Mackie-Mason, 1990. "Do Taxes Affect Corporate Financing Decisions?" *Journal of Finance* 45(5): 1471-1493.

Manzon, G., 1994. "The role of taxes in early debt retirement." *Journal of the American Taxation Association* 16 (1): 87–100.

Markle, K., 2015. "A Comparison of the Tax-Motivated Income Shifting of Multinationals in Territorial and Worldwide Countries," forthcoming in *Contemporary Accounting Research*.

Maydew, E., 1997. "Tax-Induced Earnings Management by Firms with Net Operating Losses." *Journal of Accounting Research* (35): 83-96.

Onji, K. and D. Vera, 2010. "Tax Law Asymmetries and Income Shifting: Evidence from Japanese Capital Keiretsu," *The B.E. Journal of Economic Analysis and Policy* 10(1): article 4.

Organization for Economic Cooperation and Development (OECD), 2010. "OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations."

Organization for Economic Cooperation and Development (OECD), 2013. *Addressing Base Erosion and Profit Shifting*, OECD Publishing. http://dx.doi.org/10.1787/9789264192744-en

Overesch, M., 2006. "Transfer Pricing of Intrafirm Sales as a Profit Shifting Channel—Evidence from German Firm Data", Center for European Economic Research Discussion Paper No. 06-084.

Overesch, M., 2009. "The Effects of Multinationals' Profit Shifting Activities on Real Investments," *National Tax Journal* 62(1): 5-22.

Power, L. and G. Silverstein, 2007. "The Foreign Source Income Repatriation Patters of U.S. Parents in Worldwide Loss," *National Tax Journal* 60(3): 537-549.

PWC Transfer Pricing Network, 2006. "Comparability: Business comments on the OECD Discussion Draft."

Saint-Amans, P. and R. Russo, 2013. "What the BEPS Are We Talking About?" OECD Forum 2013.

Scholes, M. S., G. P. Wilson, and M. A. Wolfson, 1992. "Firms' Responses to Anticipated Reductions in Tax Rates: The Tax Reform Act of 1986," *Journal of Accounting Research* 30(3): 161-185.

Shackelford, D. and T. Shevlin, 2001. "Empirical tax research in accounting." *Journal of Accounting and Economics* 31: 321-387.

Shevlin, T., 1990. "Estimating corporate marginal tax rates with asymmetric tax treatment of gains and losses." *Journal of the American Tax Association* 11: 51–67.

Stock, K., 2013. "Tax Shelters Don't Always Work. Just Ask Amazon." *Bloomberg Businessweek*, May 21, 2013.

Weichenrieder, A.J., 2009. "Profit Shifting in the EU: Evidence from Germany," *International Tax and Public Finance* 16: 281-297.

Appendix
Numerical Examples

Below are equilibrium profits shifted using equation (3). Two alternatives are presented for two cases: all affiliates are profitable, and one affliation, *j*, has a lower tax rate due to losses; and there is value to the loss and there is some value to the loss. Differences across the scenarios are computed for affiliate *j*. Throughout these examples we use capital as the proxy for economic activity *K*.

	Loss has no value			**Loss has some value**			**Diff for *j***
Affiliate:	A_i	A_j	A_Z	A_i	A_j	A_Z	
Cost of shifting, $a = 10$							
Case 1: all affiliates profitable							
Economic profits, ρ	5	3	2	5	3	2	
Capital, K	105	60	35	105	60	35	
Tax rate, τ	0.4	0.3	0.2	0.4	0.3	0.2	
Equilibrium income shifted in (out), ψ	-0.683	0.210	0.473	-0.683	0.210	0.473	
Case 2: affiliate *j* has losses, leading to a tax rate of two thirds, no change in economic profits							
Economic profits, ρ	5	3	2	5	3	2	
Capital, K	105	60	35	105	60	35	
Tax rate, τ	0.4	0.0	0.2	0.4	0.2	0.2	
Equilibrium income shifted in (out), ψ	-1.628	1.470	0.158	-0.998	0.630	0.368	0.840
Change between Case 2 and Case 1							
Equilibrium income shifted in (out), ψ	-0.945	1.260	-0.315	-0.315	0.420	-0.105	0.840

Comparing the two scenarios (down the columns) reveals that reducing affiliate *j*'s tax rate through losses leads to greater income shifted into the loss affiliate. Comparing across the rows, when the loss has some value, there is less shifting into the loss affiliate.

Table 1: Sample Selection

European affiliate-years in Bureau van Dijk's Amadeus database with at least one foreign EU affiliate and not missing earnings	222,461
Less: Missing NACE code (Amadeus variable *NACPRI*)	(16,733)
Less: Banks and insurance company (NACE codes 64, 65 or 66)	(52,094)
Less: Group consolidated return on sales (*PLBT/REV*) less than 3 percent	(54,663)
Less: Assets less than or equal to zero, or missing (Amadeus variables *TOAS* and *TFAS*)	(18,648)
Less: Compensation expense less than zero or equal to zero, or missing (Amadeus variable *STAF*)	(15,971)
Less: Missing a measure of economic shock (*ΔGDP, ΔMarketSize, Age)*	(4,338)
Less: ROA+1 less than or equal to zero	(271)
Less: Missing future earnings information to calculate *MTR_Factor*	(2,693)
Total affiliate-years used for esimation	57,050

The affiliated firm sample consists of a total of 57,050 European affiliate-years over the period 2003-2012 with at least one foreign affiliated firm also located in Europe and sufficient data from Amadeus and the European Commission for estimation. Of these, we characterize 9,245 affiliate-years as unprofitable (*Loss*=1), 5,881 affiliate-years as having a very small profit (*VSP*=1), and 41,924 affiliate-years as profitable (*Loss*=0 and *VSP*=0).

Table 2: Sample Composition and Measures by Country

Country	Affiliate-Year N	Group-Year N	Mean over Sample Period				
			STR	CB Period	CF Period	MTR	MTR_Factor
Austria	553	319	0.25	0.00	99.00	0.19	0.77
Bosnia and Herzegovina	207	148	0.10	0.00	5.00	0.09	0.93
Belgium	4,658	1,754	0.34	0.00	99.00	0.34	1.00
Bulgaria	315	194	0.12	0.00	5.00	0.12	0.98
Czech Republic	2,249	1,158	0.22	0.00	5.00	0.18	0.77
Germany	4,995	1,400	0.34	1.00	99.00	0.28	0.83
Denmark	984	647	0.25	0.00	99.00	0.25	1.00
Estonia	677	565	0.22	0.00	0.00	0.17	0.78
Spain	5,814	2,533	0.32	0.00	15.00	0.31	0.95
Finland	2,829	1,360	0.26	0.00	10.00	0.22	0.84
France	7,297	2,433	0.33	3.00	99.00	0.29	0.87
United Kingdom	2,399	1,073	0.29	1.00	99.00	0.24	0.83
Croatia	810	375	0.20	0.00	5.00	0.15	0.76
Hungary	1,740	799	0.17	0.00	99.00	0.11	0.66
Ireland	149	111	0.13	1.00	99.00	0.13	1.00
Italy	8,028	3,066	0.34	0.00	5.00	0.33	0.97
Luxembourg	146	123	0.29	0.00	99.00	0.26	0.89
Netherlands	309	234	0.28	1.00	9.00	0.28	1.00
Norway	2,241	1,268	0.28	0.00	99.00	0.25	0.88
Poland	2,009	1,260	0.20	0.00	5.00	0.16	0.78
Portugal	1,107	745	0.26	0.00	6.00	0.22	0.87
Romania	1,199	936	0.18	0.00	5.00	0.15	0.86
Serbia	438	358	0.10	0.00	10.00	0.08	0.82
Sweden	4,503	1,988	0.27	0.00	99.00	0.27	0.99
Slovenia	357	226	0.22	0.00	99.00	0.22	0.99
Slovakia	1,037	736	0.19	0.00	5.00	0.15	0.78
All Countries	57,050	25,809	0.24	0.27	47.62	0.21	0.87

The sample consists of a total of 57,050 European affiliate-years 2003-2012. This table provides the number of affiliate-year observations by country, the number of group-years with a presence in each country, as well as average country-year measures by country over the sample period. *STR* is the affiliate's statutory tax rate. *CB Period* is the number of years a carryback is allowed. *CF Period* is the number of years a carryforward is allowed; 99 represents an infinite loss carryforward period. *MTR* is the estimated affiliate-year marginal tax rate, equal to *STR* multiplied by *MTR_Factor*. *MTR_Factor* is the affiliate-year expected present value of taxes due on an incremental dollar of current income given a linear projection of profitability and the affiliate's accumulated losses.

Table 3: Descriptive Statistics

Panel A: All Affiliates							
		N	Mean	p25	Median	p75	Std
Income	EBIT	57,050	6,038,044	48,636	490,997	2,583,606	22,302,215
Prediction	ROA	57,050	0.091	0.017	0.067	0.149	0.253
Variables	Capital	57,050	20,590,922	94,702	766,525	5,862,011	81,307,953
	Labor	57,050	11,046,307	469,978	1,676,129	6,133,885	33,577,976
	ln(EBIT)	47,144	13.664	12.237	13.659	15.100	2.191
	ln(ROA)	47,144	-2.556	-3.159	-2.420	-1.761	1.187
	ln(ROA+1)	57,050	0.071	0.017	0.065	0.139	0.195
	ln(Capital)	57,050	16.135	14.637	15.993	17.487	2.122
	ln(Labor)	57,050	14.323	13.060	14.332	15.629	2.029
	Productivity	57,050	0.080	0.042	0.070	0.110	0.076
	ΔGDP	57,050	0.025	0.005	0.031	0.053	0.044
	ΔMarketSize	57,050	0.148	-0.020	0.022	0.199	1.023
	Age	57,050	4.547	2.000	4.000	7.000	2.669
	Loss	57,050	0.162	0.000	0.000	0.000	0.369
	VSP	57,050	0.103	0.000	0.000	0.000	0.304
Tax	T_n	57,050	78.422	0.000	0.000	199.000	96.79
Variables	STR	57,050	0.287	0.260	0.300	0.333	0.063
	MTR	57,050	0.257	0.210	0.280	0.333	0.099
	MTR_Factor	57,050	0.895	1.000	1.000	1.000	0.279
	STR-MTR	57,050	0.029	0.000	0.000	0.000	0.080
Other Firm	Sales	54,371	89,305,754	2,762,784	10,617,062	44,263,564	280,200,000
Attributes	ROS	54,371	0.221	0.015	0.055	0.113	29.90
	TotalAssets	57,050	111,400,000	2,274,680	8,822,008	39,315,492	413,100,000

The sample consists of a total of 57,050 European affiliate-years 2003-2012. *EBIT* is earnings before interest and taxes. *ROA* is *EBIT* scaled by *Assets,* where *Assets* is total assets. *Capital* is total fixed assets. *Labor* is compensation expense. *ln(EBIT)* is the natural log of *EBIT, ln(ROA)* is the natural log of *ROA, ln(ROA+1)* is the natural log of *ROA* plus one, *ln(Capital)* is the natural log of *Capital,* and *ln(Labor)* is the natural log of *Labor. Productivity* is country-year-industry median ROA for all observable companies in Amadeus. *ΔGDP* is *GDP* in year *t* less *GDP* in year *t*-1, scaled by *GDP* in year *t-1*. *ΔMktSize* is the country-industry-year sum of affiliate and standalone firm sales in year *t* less the sum in year *t*-1, scaled by 1,000,000. *Age* equals year *t* minus the year the affiliate first appears in the Amadeus database. *Loss* is set to 1 if affiliate *EBIT* is less than zero unless *MTR_Factor*=1. *VSP* is set to 1 if $0 < ROS \leq 1.5$ percent or *MTR_Factor*<1, where *ROS* is *EBIT* scaled by operating revenues (net). T_n is the number of years until the affiliate is estimated to use up accumulated losses given a linear projection of income growth based on a three-year window. *STR* is statutory tax rate. *MTR* is the affiliate-year estimated marginal tax rate equal to *STR* multiplied by *MTR_Factor*. *MTR_Factor* is the affiliate-year expected present value of taxes due on an incremental dollar of current income given a linear projection of profitability and the affiliate's accumulated losses.

Table 3: Descriptive Statistics (cont.)

Panel B: Unprofitable Affiliates (*LOSS*=1)							
		N	Mean	p25	Median	p75	Std
Income	EBIT	9,245	-1,538,841	-1,195,532	-284,164	-73,884	2,990,863
Prediction	ROA	9,245	-0.117	-0.148	-0.055	-0.016	0.161
Variables	Capital	9,245	10,938,580	47,868	391,246	3,072,387	53,860,601
	Labor	9,245	7,041,481	242,557	875,669	3,512,045	25,053,605
	ln(EBIT)	-	.	.	.	.	.
	ln(ROA)	-	.	.	.	.	.
	ln(ROA+1)	9,245	-0.156	-0.161	-0.056	-0.016	0.321
	ln(Capital)	9,245	15.677	14.026	15.462	17.057	2.253
	ln(Labor)	9,245	13.700	12.399	13.683	15.072	2.094
	Productivity	9,245	0.041	0.010	0.047	0.078	0.082
	ΔGDP	9,245	0.022	0.003	0.033	0.053	0.049
	ΔMarketSize	9,245	0.105	-0.015	0.017	0.179	0.574
	Age	9,245	3.979	2.000	4.000	6.000	2.594
	Loss	9,245	1.000	1.000	1.000	1.000	0.000
	VSP	9,245	0.000	0.000	0.000	0.000	0.000
Tax	T_n	9,245	91.869	0.000	5.723	199.00	98.37
Variables	STR	9,245	0.282	0.250	0.300	0.333	0.063
	MTR	9,245	0.148	0.002	0.173	0.254	0.122
	MTR_Factor	9,245	0.521	0.008	0.753	0.907	0.407
	STR-MTR	9,245	0.134	0.029	0.074	0.260	0.120
Other Firm	Sales	8,769	43,866,188	863,337	3,486,452	15,886,308	183,100,000
Attributes	ROS	8,769	-1.082	-0.237	-0.077	-0.025	10.920
	TotalAssets	9,245	107,100,000	1,233,716	5,188,851	25,567,668	430,900,000

We characterize 9,245 affiliate-years as unprofitable (*Loss*=1). All variables are as defined in Panel A.

Table 3: Descriptive Statistics (cont.)

Panel C: Very Small Profit Affiliates (*VSP*=1)							
		N	Mean	p25	Median	p75	Std
Income	EBIT	5,881	1,390,096	23,409	96,736	438,468	8,480,968
Prediction	ROA	5,881	0.039	0.008	0.018	0.038	0.084
Variables	Capital	5,881	10,469,730	50,664	365,532	2,605,221	55,128,528
	Labor	5,881	8,507,551	367,536	1,227,820	4,342,492	27,991,546
	ln(EBIT)	5,842	11.572	10.097	11.497	12.998	2.208
	ln(ROA)	5,842	-4.128	-4.862	-3.992	-3.263	1.448
	ln(ROA+1)	5,881	0.036	0.007	0.018	0.037	0.064
	ln(Capital)	5,881	15.692	14.210	15.545	16.994	2.088
	ln(Labor)	5,881	14.063	12.815	14.021	15.284	1.964
	Productivity	5,881	0.065	0.033	0.059	0.087	0.055
	ΔGDP	5,881	0.025	0.005	0.028	0.048	0.041
	ΔMarketSize	5,881	0.117	-0.024	0.018	0.189	0.656
	Age	5,881	4.756	2.000	5.000	7.000	2.731
	Loss	5,881	0.000	0.000	0.000	0.000	0.000
	VSP	5,881	1.000	1.000	1.000	1.000	0.000
Tax	T_n	5,881	84.061	0.000	2.000	199.000	97.84
Variables	STR	5,881	0.283	0.250	0.300	0.333	0.063
	MTR	5,881	0.210	0.100	0.260	0.314	0.129
	MTR_Factor	5,881	0.733	0.667	1.000	1.000	0.413
	STR-MTR	5,881	0.074	0.000	0.000	0.100	0.117
Other Firm	Sales	5,764	78,867,386	2,240,207	7,982,752	34,560,420	253,500,000
Attributes	ROS	5,764	0.044	0.006	0.011	0.021	0.704
	TotalAssets	5,881	75,079,620	1,483,578	5,635,050	24,016,249	321,600,000

We characterize 5,881 affiliate-years as having a very small profit (*VSP*=1). All variables are as defined in Panel A.

Table 3: Descriptive Statistics (cont.)

Pandel D: Large Profit Affiliates (*LOSS*=0 and *VSP*=0)							
		N	Mean	p25	Median	p75	Std
Income	EBIT	41,924	8,360,887	271,978	1,035,541	4,156,582	25,371,279
Prediction	ROA	41,924	0.144	0.052	0.100	0.184	0.260
Variables	Capital	41,924	24,139,215	121,885	986,438	7,553,692	88,785,267
	Labor	41,924	12,285,574	568,664	1,977,804	7,208,619	35,777,149
	ln(EBIT)	41,302	13.960	12.581	13.887	15.265	2.021
	ln(ROA)	41,302	-2.334	-2.933	-2.285	-1.685	0.955
	ln(ROA+1)	41,924	0.126	0.051	0.095	0.169	0.117
	ln(Capital)	41,924	16.298	14.847	16.166	17.620	2.073
	ln(Labor)	41,924	14.497	13.251	14.497	15.791	1.992
	Productivity	41,924	0.091	0.050	0.077	0.116	0.074
	ΔGDP	41,924	0.026	0.005	0.033	0.053	0.043
	ΔMarketSize	41,924	0.161	-0.021	0.023	0.206	1.137
	Age	41,924	4.643	2.000	4.000	7.000	2.661
	Loss	41,924	0.000	0.000	0.000	0.000	0.000
	VSP	41,924	0.000	0.000	0.000	0.000	0.000
Tax	T_n	41,924	74.666	0.000	0.000	199.000	95.98
Variables	STR	41,924	0.288	0.260	0.300	0.333	0.062
	MTR	41,924	0.288	0.260	0.300	0.333	0.062
	MTR_Factor	41,924	1.000	1.000	1.000	1.000	0.000
	STR-MTR	41,924	0.000	0.000	0.000	0.000	0.000
Other Firm	Sales	39,838	100,800,000	3,804,608	13,609,852	53,493,416	299,800,000
Attributes	ROS	39,838	0.534	0.045	0.080	0.139	34.55
	TotalAssets	41,924	117,400,000	2,804,578	10,488,850	44,916,741	420,200,000

We characterize 41,924 affiliate-years as profitable (*Loss*=0 and *VSP*=0). All variables are as defined in Panel A.

Table 4: Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	ln(EBIT)	**1.000**														
		(0.00)														
(2)	ln(ROA)	**0.362**	**1.000**													
		(0.00)	(0.00)													
(3)	ln(ROA+1)	**0.208**	**0.786**	**1.000**												
		(0.00)	(0.00)	(0.00)												
(4)	ln(Capital)	**0.847**	**-0.190**	**0.023**	**1.000**											
		(0.00)	(0.00)	(0.00)	(0.00)											
(5)	ln(Labor)	**0.729**	**0.016**	**0.065**	**0.747**	**1.000**										
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)										
(6)	Productivity	**0.180**	**0.316**	**0.305**	**0.028**	**0.109**	**1.000**									
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)									
(7)	ΔGDP	-0.002	**0.059**	**0.055**	**-0.029**	**-0.038**	**0.120**	**1.000**								
		(0.71)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)								
(8)	ΔMarketSize	**0.055**	0.007	**0.008**	**0.053**	**0.019**	**0.028**	**0.158**	**1.000**							
		(0.00)	(0.12)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)							
(9)	ln(Age)	**0.108**	**-0.026**	**0.054**	**0.143**	**0.156**	**-0.027**	**-0.175**	**-0.114**	**1.000**						
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)						
(10)	Loss	.	.	**-0.513**	**-0.095**	**-0.135**	**-0.223**	**-0.030**	**-0.018**	**-0.099**	**1.000**					
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)					
(11)	VSP	**-0.359**	**-0.498**	**-0.061**	**-0.071**	**-0.043**	**-0.065**	-0.005	**-0.010**	**0.024**	**-0.149**	**1.000**				
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.27)	(0.02)	(0.00)	(0.00)	(0.00)				
(12)	STR	**0.104**	**-0.079**	**-0.025**	**0.156**	**0.167**	**-0.075**	**-0.073**	**0.124**	**-0.145**	**-0.033**	**-0.017**	**1.000**			
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
(13)	MTR	**0.098**	**-0.079**	**-0.038**	**0.142**	**0.147**	**-0.093**	**-0.068**	**0.125**	**-0.148**	**-0.019**	**-0.007**	**0.952**	**1.000**		
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.09)	(0.00)	(0.00)		
(14)	STR-MTR	**0.044**	-0.005	**0.034**	**0.076**	**0.097**	**0.040**	**-0.031**	**0.022**	**-0.020**	**-0.051**	**-0.035**	**0.354**	**0.050**	**1.000**	
		(0.00)	(0.26)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
(15)	(1-MTR_Factor)	**-0.148**	**-0.165**	**-0.342**	**-0.075**	**-0.123**	**-0.170**	-0.005	**-0.023**	**-0.037**	**0.589**	**0.197**	**-0.044**	-0.003	**-0.134**	**1.000**
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.23)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.46)	(0.00)	(0.00)

ln denotes the natural log of the term in parentheses. *EBIT* is earnings before interest and taxes. *ROA* is *EBIT* scaled by *Assets,* where *Assets* is total assets. *Capital* is total fixed assets. *Labor* is compensation expense. *Productivity* is country-year-industry median ROA of all observable companies in Amadeus. *ΔGDP* is *GDP* in year *t* less *GDP* in year *t*-1, scaled by *GDP* in year *t-1*. *ΔMktSize* is the country-industry-year sum of all firm sales in year *t* less the sum in year *t*-1, scaled by 1,000,000. *Age* equals year *t* minus the year the affiliate first appears in the Amadeus database. *Loss* is set to 1 if *EBIT* is less than zero unless *MTR_Factor*=1. *VSP* is set to 1 if $0 < ROS \leq 1.5$ percent, where *ROS* is *EBIT/Sales* and *Sales* is operating revenues (net), unless *MTR_Factor*<1. *STR* is the country-year statutory tax rate. *MTR* is an affiliate-year estimate of marginal tax rate equal to *STR* multiplied by *MTR_Factor. MTR_Factor* is the affiliate-year expected present value of taxes due on an incremental dollar of current income given a linear projection of profitability and the affiliate's accumulated losses. *STR-MTR* is the difference between *STR* and *MTR. (1-MTR_Factor)* is one less *MTR_Factor.*

Table 5: Income Shifting Model

$$\ln(\pi) = \beta_0 + \beta_1 * \ln(Capital) + \beta_2 * \ln(Labor) + \beta_3 * Productivity + \beta_4 * STR$$

	Sample	EBIT>0	EBIT>0	EBIT>0	Full Sample
	Dependent Variable	ln(EBIT)	ln(ROA)	ln(ROA+1)	ln(ROA+1)
	Prediction	(1)	(2)	(3)	(4)
Intercept		-1.7229 ***	-1.7229 ***	0.2472 ***	-0.0263 *
		(0.1003)	(0.1003)	(0.0100)	(0.0181)
ln(Capital)	Depends	0.7566 ***	-0.2434 ***	-0.0215 ***	-0.0020
		(0.0124)	(0.0124)	(0.0009)	(0.0017)
ln(Comp)	+	0.1874 ***	0.1874 ***	0.0123 ***	0.0048 ***
		(0.0141)	(0.0141)	(0.0009)	(0.0014)
Productivity	+	4.6568 ***	4.6568 ***	0.4702 ***	0.7661 ***
		(0.2187)	(0.2187)	(0.0220)	(0.0495)
STR	-	-0.4971 ***	-0.4971 ***	-0.0438 ***	-0.0223
		(0.1958)	(0.1958)	(0.0165)	(0.0231)
N		47,144	47,144	47,144	57,050
adj. R-sq		0.7587	0.1778	0.1752	0.0942
Cluster		Group	Group	Group	Group
FE		No	No	No	No

This table estimates the profit prediction model on the sample of 47,144 European affiliate-years 2003-2012 with at least one foreign affiliated firm also located in Europe and sufficient data from Amadeus and the European Commission for estimation for which *EBIT* is greater than zero in Columns (1)-(3) as well as on the full sample of 57,050 observations in Column (4). *EBIT* is earnings before interest and taxes. *ln(EBIT)* is the natural log of *EBIT*. *ROA* is *EBIT* scaled by *Assets,* where *Assets* is total assets. *ln(ROA*) is the natural log of *ROA*. *ln(ROA+1)* is the natural log of *ROA* plus 1. *ln(Capital)* is the natural log of total fixed assets. *ln*(*Labor)* is the natural log of compensation expense. *Productivity* is a measure of country-year-industry median ROA. *STR* is the country-year statutory tax rate. All specifications include standard errors clustered by group. *, **, and *** represent one-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Hypothesis Tests

$$\ln(ROA+1) = \beta_0 + \beta_1*\ln(Capital) + \beta_2*\ln(Labor) + \beta_3*Productivity + \beta_4*Shock + \beta_5*VSP + \beta_6*VSP*Shock + \beta_7*Loss + \beta_8*Loss*Shock + \beta_9*TaxRate + \beta_9*VSP*TaxRate + \beta_{11}*Loss*TaxRate$$

TaxRate		STR	STR	MTR	MTR	STR
Prediction		(1)	(2)	(3)	(4)	(5)
Intercept		0.1376 ***	0.1383 ***	0.1377 ***	0.1382 ***	0.1379 ***
		(0.0114)	(0.0114)	(0.0113)	(0.0113)	(0.0114)
ln(Capital)	-	-0.0037 ***	-0.0037 ***	-0.0037 ***	-0.0037 ***	-0.0037 ***
		(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)
ln(Comp)	+	0.0004	0.0004	0.0004	0.0004	0.0004
		(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Productivity	+	0.4720 ***	0.4673 ***	0.4708 ***	0.4679 ***	0.4707 ***
		(0.0349)	(0.0352)	(0.0350)	(0.0351)	(0.0350)
ΔGDP	+	0.0865 ***	0.0869 ***	0.0863 ***	0.0869 ***	0.0863 ***
		(0.0187)	(0.0186)	(0.0188)	(0.0187)	(0.0188)
ΔMarketSize	+	-0.0008	-0.0006	-0.0007	-0.0007	-0.0007
		(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
ln(Age)	+	0.0061 ***	0.0059 ***	0.0060 ***	0.0059 ***	0.0060 ***
		(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)
VSP	-	-0.0805 ***	-0.0806 ***	-0.0804 ***	-0.0805 ***	-0.0811 ***
		(0.0022)	(0.0022)	(0.0022)	(0.0022)	(0.0026)
Loss	-	-0.2603 ***	-0.2601 ***	-0.2603 ***	-0.2602 ***	-0.2615 ***
		(0.0071)	(0.0072)	(0.0070)	(0.0071)	(0.0070)
TaxRate	-	-0.0597 ***	-0.0934 ***	-0.0692 ***	-0.0932 ***	-0.0697 ***
		(0.0186)	(0.0198)	(0.0178)	(0.0198)	(0.0177)
VSP*TaxRate	+		0.0633 ***		0.0991 ***	
			(0.0240)		(0.0227)	
Loss*TaxRate	+		0.1580 **		0.1798 **	
			(0.0910)		(0.1070)	
STR-MTR	+					0.0917
						(0.0907)
1-MTR_Factor	+					0.0027
						(0.0061)
N		57,050	57,050	57,050	57,050	57,050
adj. R-sq		0.3184	0.3187	0.3185	0.3187	0.3185
Cluster		Group	Group	Group	Group	Group
FE		No	No	No	No	No

This table estimates the profit prediction model on a sample of 57,050 European affiliate-years 2003-2012 with at least one foreign affiliated firm also located in Europe and sufficient data from Amadeus and the European Commission for estimation. The dependent variable is *ln(ROA+1)*, the natural log of *EBIT* scaled by *TotalAssets* plus 1. *ln(Capital)* is that natural log of total fixed assets. *ln*(*Labor)* is the natural log of compensation expense. *Productivity* is a measure of country-year-industry median ROA. *ΔGDP* is *GDP* in year *t* less *GDP* in year *t*-1, scaled by *GDP* in year *t-1*. *ΔMktSize* is the country-industry-year sum of all affiliate and standalone firm sales in year *t* less the sum in year *t*-1, scaled by 1,000,000. *ln(Age)* is the natural log of *Age,* measured as year *t* minus the year the affiliate first appears in the Amadeus database. *STR* is the country-year statutory tax rate. *MTR* is an affiliate-year estimate of marginal tax rate equal to *STR* multiplied by *MTR_Factor*. *MTR_Factor* is the affiliate-year expected present value of taxes due on an incremental dollar of current income given a linear projection of profitability and the affiliate's accumulated losses. In Regression (3), *Tax* is set equal to *STR-MTR,* the difference between *STR* and *MTR,* which is also equal to the interaction of *STR* and *(1-MTR_Factor). (1-MTR_Factor)* is one less *MTR_Factor*. *STR* and *MTR* are centered around zero. *VSP* is set to 1 if $0 < ROS \leq 1.5$ percent, where *ROS* is *EBIT/Sales* and *Sales* is operating revenues (net), unless *MTR_Factor*<1. *Loss* is set to 1 if affiliate *EBIT* is less than zero unless *MTR_Factor*=1. All specifications include standard errors clustered by group. *, **, and *** represent one-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.